

AUSTRALIAN VETERINARY EMERGENCY PLAN

AUSVETPLAN

Enterprise Manual

Pig industry

Version 3.0, 2011

AUSVETPLAN is a series of technical response plans that describe the proposed Australian approach to an emergency animal disease incident. The documents provide guidance based on sound analysis, linking policy, strategies, implementation, coordination and emergency-management plans.

Primary Industries Ministerial Council

This enterprise manual forms part of:

AUSVETPLAN Edition 3

This strategy will be reviewed regularly. Suggestions and recommendations for amendments should be forwarded to:

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DISEASE WATCH HOTLINE

1800 675 888

The Disease Watch Hotline is a toll-free telephone number that connects callers to the relevant state or territory officer to report concerns about any potential emergency disease situation. Anyone suspecting an emergency disease outbreak should use this number to get immediate advice and assistance.

Preface

This enterprise manual for pig production constitutes part of the **Australian Veterinary Emergency Plan** or **AUSVETPLAN** (Edition 3). AUSVETPLAN is a coordinated national response plan for the management and, wherever possible, eradication of exotic disease incursions and outbreaks of certain emerging or endemic animal diseases. The term emergency animal disease (EAD) is used to collectively describe these disease categories.

Enterprise manuals, a component of AUSVETPLAN, are prepared for animal industries in which the risk of harm from an EAD is expected to be higher than normal. For example, the way in which stock are managed may result in a higher likelihood of rapid spread of a disease agent, and thus impact on the response to an outbreak (known as an EAD response) and its associated costs.

Enterprise manuals address the risks associated with so-called risk enterprises. These are defined as livestock or related enterprises that are a potential source of major infection for many other premises, and can thus increase the potential size of an outbreak and affect its nature. Piggeries fit the criteria in many ways. One of the greatest risks for piggeries is the high concentration of animals, and the many movements on, off and between pig enterprises. Another factor is the multisite nature of the larger enterprises. Also, in the case of foot-and-mouth disease, pigs are a natural amplifier of the causative virus and often excrete large quantities of virus before showing any clinical signs. This can substantially increase the risk to surrounding livestock enterprises and threaten disease control efforts. Smaller piggeries also present a special set of risks as they may have minimal biosecurity and little appreciation of disease management, and may sell pigs through largely uncontrolled markets. Artificial breeding is widespread; therefore, boar stations would become critically important if they became infected with an agent that can be spread by semen.

This manual is aimed at both government officers and pork industry personnel who may be involved in EAD preparedness. For government officers, the manual provides an overview of the pork industry, and the nature and operations of piggeries in Australia (Section 2). Piggery features that are relevant to disease control or eradication are described, and guidelines on managing an EAD on a piggery are provided. For owners or managers of piggeries, the manual provides information on EAD management and the procedures that would be used during an EAD response (Section 3), as well as guidelines for preparing an EAD response plan (Appendix 2).

Publication of this manual follows widespread consultation within the pork industry and with government.

Detailed instructions for the field implementation of AUSVETPLAN are contained in the disease strategies, operational procedures manuals, management manuals and wild animal manual. Industry-specific information is given in the relevant enterprise manuals. The full list of AUSVETPLAN manuals that may need to be accessed in an emergency is shown below.

AUSVETPLAN manuals¹

Disease strategies

- Individual strategies for each of 35 diseases
- Bee diseases and pests
- Response policy briefs (for diseases not covered by individual manuals)

Operational procedures manuals

- Decontamination
- Destruction of animals
- Disposal
- Livestock welfare and management
- Public relations
- Valuation and compensation

Enterprise manuals

- Artificial breeding centres
- Feedlots
- Meat processing
- Saleyards and transport
- Poultry industry
- Zoos

Management manuals

- Control centres management (Parts 1 and 2)
- Laboratory preparedness

Wild animal response strategy

Summary document

¹ The complete series of AUSVETPLAN documents is available at www.animalhealthaustralia.com.au/programs/emergency-animal-disease-preparedness/ausvetplan/

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1 Disease management and emergency animal disease preparedness

1.1 Australia's animal health services

In Australia, each state and territory has operational responsibility for the control and eradication of animal diseases within its borders. Animal health authorities located within the relevant department of primary industries administer legislation relating to responses to emergency animal diseases (EADs), including movement controls, treatment, slaughter, disposal, decontamination, and compensation. Inspectors have wide powers, including the ability to enter premises, examine records, order livestock musters, control livestock movements, request that animals or products be submitted for testing, and isolate and destroy diseased or suspected diseased livestock. The Australian Government advises on, and coordinates, national animal health policy, and is responsible for quarantine and international animal health matters, including export certification and trade negotiation, and disease reporting to the World Organisation for Animal Health (OIE).

1.2 The risk of an emergency animal disease entering Australia

Importation of live pigs and semen is prohibited under import protocols; therefore, these sources are unlikely to be implicated in an EAD outbreak. Importation of pigmeat is allowed in Australia, but is subject to risk management measures such as cooking, freezing, curing, canning, and removal of certain tissues or parts of the carcass. These measures ensure a level of protection for the pig industry.

However, people returning from overseas who have had contact with pigs could transfer a disease agent to Australian pig herds via their footwear or clothing. Travellers continue to bring undeclared processed and unprocessed food into the country. If undetected, these products could find their way into food refuse and into illegally fed swill, which could then pose a serious risk to animal health.

In addition, another livestock species may be the primary source of infection for a disease that is then transferred to pigs. Therefore, the risk factors for other industries are also relevant.

The likelihood of an outbreak originating from any of the above livestock sources is low. However, the consequences of an EAD outbreak to the Australian pork industry are potentially high, making the maintenance of strict biosecurity a pre-eminent concern for all piggeries.

1.3 Principles of emergency animal disease management

In Australia, the traditional role of governments (Australian, and state and territory) in managing animal health is complemented by a close association between government and the livestock industries. National animal health priorities are determined in consultation with the livestock industries, which participate in policy development, support targeted activities and contribute to emergency responses.

As part of their preparedness arrangements, state and territory animal health authorities develop operational plans for managing EADs that are consistent with AUSVETPLAN and their own legislative framework. These plans are made in conjunction with the state or territory emergency management organisation and support agencies, and contain considerable detail on the various procedures described in this manual.

EAD responses are planned and implemented at three levels – national, state or territory, and local. In the event of an EAD outbreak, relevant state or territory animal health officials manage all aspects of its control and eradication according to a nationally agreed plan. They work with livestock industry liaison officers (ILOs), and the owners and managers of ‘at-risk’ or ‘infected’ premises to resolve the outbreak and return enterprises to normal operations.

The chief veterinary officer (CVO) of the state or territory in which an EAD outbreak occurs is responsible for implementing the disease control measures. The CVO works with the Consultative Committee on Emergency Animal Diseases (CCEAD), which provides the link between the Australian Government, the state and territory governments, and the relevant livestock industry(ies) for technical and veterinary decision making during animal health emergencies.

The CCEAD advises a high-level national management group (NMG) on response policy. The NMG determines whether an agreement to share the costs of a response between Australia’s governments and the relevant livestock industry(ies) should be invoked. The NMG manages national policy and resourcing of the response. Both the CCEAD and the NMG base their decisions on current information provided by the affected state or territory, and on guidance provided in AUSVETPLAN.

The pork industry has representation on both committees, coordinated through Australian Pork Limited. These representatives receive education in EAD management and their roles through the National EAD Training Program.

1.4 Emergency Animal Disease Response Agreement

The EAD Response Agreement (EADRA)² provides a framework for the Australian Government, the state and territory governments, and the major livestock industries to manage EAD outbreaks cooperatively. It describes the funding of EAD responses, and the sharing of the costs between government and the affected livestock industries.

Four categories of diseases are used to determine the liability for costs. These categories have been developed according to the benefits of controlling the disease, as assessed by the likely impact of the specific EAD on human health, socioeconomics, the environment and livestock production. An EAD response is initially funded by the affected state or territory, with refunds made by the Australian Government on behalf of all funding parties according to an agreed formula for the particular disease, as described in the EADRA. The NMG makes decisions about activation and use of cost-sharing arrangements during an EAD response.

² The full title of the agreement is the *Government and Livestock Industry Cost Sharing Deed in Respect of Emergency Animal Disease Responses*. For more information, see www.animalhealthaustralia.com.au/programs/emergency-animal-disease-preparedness/ead-response-agreement/

The EADRA also contains many other important instructions that provide the basis for a coordinated national EAD response. In particular, it refers to using existing plans, such as AUSVETPLAN; sets standards for accounting, auditing and training personnel; and provides the incentive for developing and maintaining government and industry biosecurity measures.

Table 1.1 describes the four disease categories and their respective shared-cost arrangements for a sample of emergency animal diseases that affect pigs.

Table 1.1 Disease categories and shared-cost arrangements

Category	Pig-specific EAD	Shared-cost arrangement ^a
1	Japanese encephalitis Rabies	100% government
2	Foot-and-mouth disease Vesicular stomatitis	80% government 20% pig industry
3	African swine fever Classical swine fever Trichinellosis	50% government 50% pig industry
4	Porcine reproductive and respiratory syndrome Swine influenza Transmissible gastroenteritis	20% government 80% pig industry

EAD = emergency animal disease

^a Where other livestock industries are affected by an EAD, they also contribute to the industry portion of the costs.

1.5 AUSVETPLAN

AUSVETPLAN is the national contingency planning framework for the management of EAD incidents in Australia. The plan ensures coherent operations and procedures in the management of an EAD incident among national, state and territory animal health authorities and emergency management organisations.

Animal Health Australia, the custodian of AUSVETPLAN, works closely with Australian, state and territory governments, and livestock industries to determine priorities and regularly review AUSVETPLAN to ensure that it is current and appropriate. Finalised manuals that deal with response policy are endorsed by government.

Everyone involved in the EAD preparedness of piggeries should understand the nature and structure of AUSVETPLAN. **Enterprise manuals** do not stand alone and must be read in association with other AUSVETPLAN documents.³

Readers should also be aware of:

- the standard operating procedures that are prepared by the appropriate jurisdiction and support AUSVETPLAN
- plans involving other areas of state and territory emergency management arrangements (eg police, local government)
- diagnostic resources

³ www.animalhealthaustralia.com.au/programs/emergency-animal-disease-preparedness/ausvetplan/

- training materials.

A series of individual AUSVETPLAN manuals cover all the elements of EAD preparedness and management; they are:

- **Summary Document.** This describes the components of AUSVETPLAN and outlines their functional relationships.
- **Disease strategies.** These are authoritative references to the Australian control and eradication policies for 35 significant diseases. They provide information about the nature of the disease; the principles of its control and eradication; and control policies, strategies and recommendations. Sufficient information is included to allow authorities to make informed decisions about controlling an EAD outbreak. The available pig-related disease strategies are:
 - African swine fever
 - Aujeszky's disease
 - classical swine fever
 - foot-and-mouth disease
 - Japanese encephalitis
 - porcine reproductive and respiratory syndrome
 - rabies
 - swine vesicular disease
 - vesicular stomatitis.
- **Response policy briefs.** These provide brief information on a further 27 EADs that are subject to cost sharing, but are not covered by full disease strategies as they have a low likelihood of entry, and any consequences are likely to be less severe. Pig-specific diseases covered by a response policy brief are:
 - Menangle virus (porcine paramyxovirus)
 - Nipah virus
 - swine influenza
 - Teschen disease
 - trichinellosis
 - vesicular exanthema.
- **Operational procedures manuals.** These describe in detail the recommended procedures for different aspects of an EAD response, such as animal destruction and disposal, decontamination of infected sites, and communication management.
- **Management manuals.** These provide detailed information on specific components of the response. For example, the **Control Centres Management Manual (Parts 1 and 2)** provides details of the management structure, and roles and responsibilities at the national, state or territory, and local levels. The other management manual is the manual for **Laboratory Preparedness**.
- **Enterprise manuals.** These cover specific risk enterprises – such as abattoirs, artificial-breeding centres, beef-cattle feedlots and piggeries – that pose special economic or disease eradication problems, or are important in the epidemiology or impact of the disease. They provide information and guidance to two target groups:

- government personnel involved in EAD preparedness who may be unfamiliar with the operations of the industry of which the enterprise is part
- industry personnel and veterinarians who need information on strategies that may be adopted to improve preparedness and guidance on the operational procedures that may be applied to exclude, contain or eradicate an EAD.
- **Wild animal response strategy.** This sets out the management strategies and overall control procedures for wild animals during an animal health emergency.

This complex web of plans is illustrated in Figure 1.1.

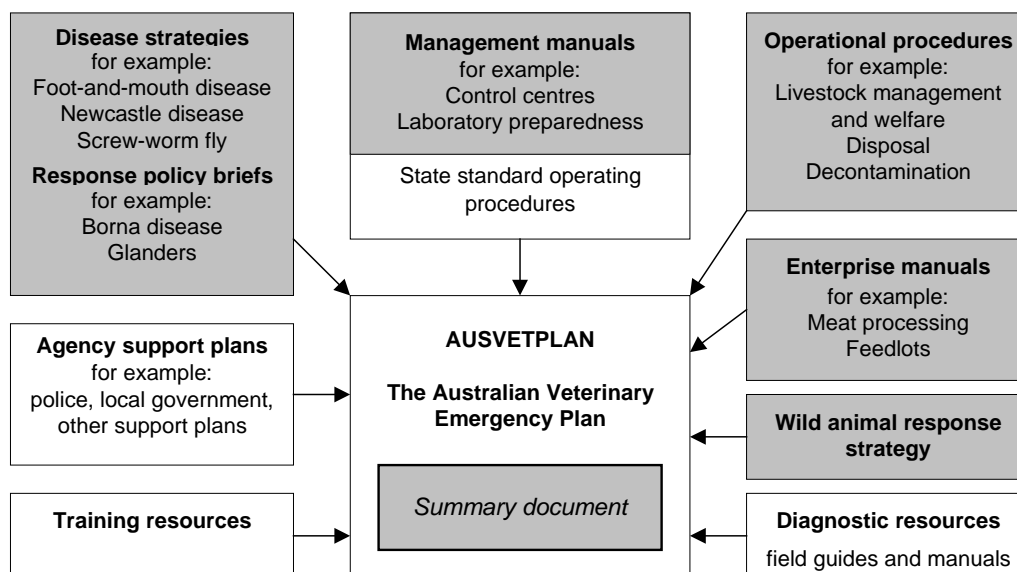


Figure 1.1 Available AUSVETPLAN manuals that cover all aspects of emergency animal diseases

1.6 Controlling a major disease outbreak

Control of an EAD outbreak is a complex operation, requiring rapid mobilisation of resources and coordination of a diverse team of people. An EAD response may require input from all tiers of government and from a range of portfolios, as it may need to address not only animal health issues, but also financial, social, economic, human, trade and recovery issues.

The fundamental aim of national EAD control policy is to eradicate an EAD if this is reasonably feasible. Key factors taken into account are those related to the disease and affected population. For example, the principal option used for many EADs is eradication by stamping out where this is applicable to the EAD in question and is considered to be cost-effective. This may involve:

- quarantine of premises and/or movement controls
- valuation and compensation
- destruction and disposal of infected and exposed susceptible animals
- decontamination of infected premises

- surveillance of susceptible animals
- restriction of the activities of certain enterprises
- an industry and public awareness program.

Other measures that may be used where necessary include:

- vaccination
- vector or wild animal control
- treatment of affected animals
- use of sentinel pigs.

In some circumstances, a modified stamping-out approach may be used if it is possible to slaughter animals safely at an accredited abattoir to produce a marketable product.

Sometimes, eradication is not considered feasible because the incursion is already widespread when diagnosed or is considered likely to spread further despite the application of stamping out. In these cases, other control measures may be selected, such as vaccination, with a view to possible containment and eventual eradication; or a state or territory and/or industry-based control program to manage a disease that is likely to become endemic in the population. Where the NMG has reason to believe that eradication is not possible and the disease can only be contained, or in any situation where the cost of an EAD response plan will exceed an agreed limit on funding, the NMG may decide to stop cost sharing.

All disease-control field activities have significant implications for piggeries. Factors that need to be taken into account in developing an appropriate response include the protection of valuable breeding stock and business continuity. Disease-control activities are managed from a local disease control centre (LDCC), usually established in the vicinity of the outbreak. The LDCC is responsible for all activities within the restricted area, including investigations of reports of disease outbreaks, consultation with livestock producers, specimen collection, property quarantine, valuation of livestock and property, livestock slaughter and disposal, and property decontamination.

Information on the structure, roles and responsibilities of the state disease control headquarters (SDCHQs) and LDCCs is contained in the **Control Centres Management Manual, Part 1**.

ILOs in the pig industry are trained and accredited to undertake prescribed AUSVETPLAN roles in both SDCHQs and LDCCs. They are a point of contact for local producers and a source of advice to the LDCC managers.

The response to an incursion of an exotic pig disease will be determined by the epidemiology of the incursion, including:

- how early the incursion is detected
- the extent of the incursion
- the location of affected premises
- whether other species of livestock are affected
- the characteristics of the agent involved.

1.6.1 Livestock movement restrictions

Controlling the movement of livestock that are susceptible to a disease is an essential component of livestock disease control. However, such regulatory controls have significant potential to adversely affect piggery operations, especially where they are maintained for an extended period.

1.6.2 National livestock standstill

For the most serious EADs, such as foot-and-mouth disease, a national standstill on the movement of all livestock may be declared by the state and territory authorities, with immediate effect from the time of strong suspicion or diagnosis. The standstill will apply for at least 3 days and possibly up to 7 days. This means that no susceptible stock may be moved from their current location, and those undergoing transport at the time of declaration are required to stop moving as soon as possible. However, they may complete their journey if this is approved. Guidelines for managing pigs that are in transit to an abattoir or other location at the time of the declaration will be provided by the disease response authorities. A national standstill on livestock movement potentially reduces the spread of a disease and provides time for the EAD response to trace animals, carry out surveillance to determine the outbreak size and develop a management plan.

1.6.3 Declared areas

A national standstill is likely to be followed by the declaration of control areas (CAs) and restricted areas (RAs). These declared areas are geographic areas of land where the movement of livestock (and other materials) may be restricted for extended periods.

A CA forms a buffer between an RA and areas considered to be free from disease. An RA is a relatively small area around an infected premises (IP) that is subject to the most intense surveillance and movement controls. Initially, a CA may be declared over the whole state or territory, but will usually be reduced in size as authorities learn more about the extent of the outbreak. A CA will generally maintain a minimum radius of 10 km, including the RA. Live susceptible animals and their products will be subject to movement controls.

The initial RA is generally based on a minimum 3-km radius around an IP, and is 'drawn' so it contains all known IPs and dangerous contact premises, and as many as practicable trace premises and suspect premises. Movement of live animals out of the RA is usually prohibited, while movement within and into it would only occur following the issue of an official permit by a stock inspector. Guidelines for establishing an RA are provided in the relevant **Disease Strategy** for the EAD. Multiple RAs may exist within one CA.

As for RAs, animal movements out of a CA will usually be prohibited. Vehicles and specified products will only be allowed out of a CA into the free area by official permit. The actual movement conditions will depend on the disease and will be determined by the lead agency. Information on movement conditions will be available in the press. Usually, permits will be made available for specific movements to continue where the risk is low.

Once the nature and distribution of a disease are understood, infected and disease-free zones may be established for longer term control of the disease agent and to assist in protecting Australia's export trade. These will generally be based on the RAs and CAs.

Figure 1.2 illustrates how controls over the movement of pigs may affect access to declared areas; similar principles may apply to people and equipment.

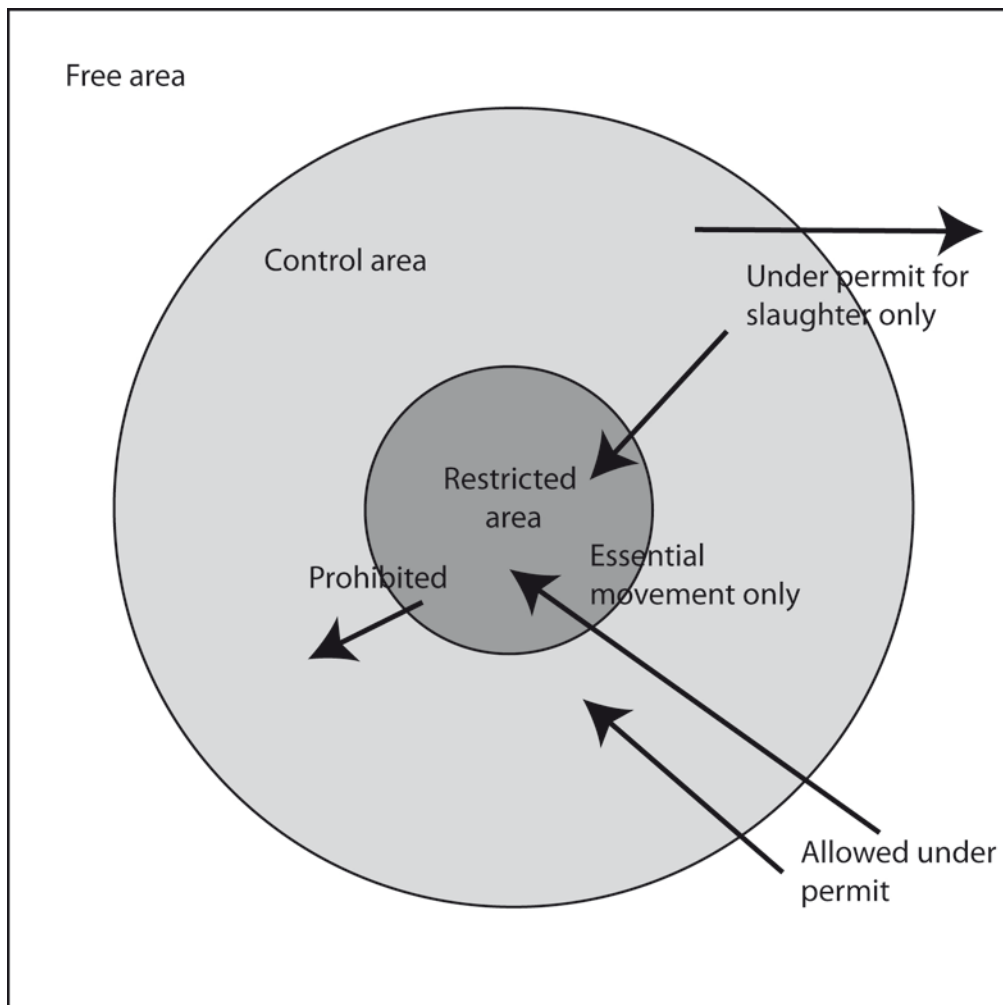


Figure 1.2 Schematic illustration of standard movement controls

It is important to recognise that the designation of declared areas can change during an EAD response as authorities learn more about the nature and distribution of the disease. These changes create uncertainties that make forward planning for the resumption of livestock movements even more difficult.

Premises classifications in an EAD response are as follows:

- **Infected premises:** A defined area (which may be all or part of a property) in which an EAD meeting the case definition exists or is believed to exist, or in which the causative agent of that EAD exists or is believed to exist.
- **Dangerous contact premises (DCP):** A premises that may or may not contain a susceptible animal(s), including those not showing clinical signs, but, following a risk assessment, is considered highly likely to contain an infected animal(s) or contaminated animal products, wastes or things, which present an unacceptable risk to the response if the risk is not addressed.
- **Suspect premises (SP):** A temporary classification of a premises that contains a susceptible animal(s) not known to have been exposed to the disease agent but showing clinical signs that require investigation.
- **Trace premises (TP):** A temporary classification of a premises that contains a susceptible animal(s) that tracing indicates may have been exposed to an infected

animal(s), or contaminated animal products, wastes or things, and that requires investigation.

- **At-risk premises (ARP):** A premises in an RA that contains a susceptible animal(s), but is not considered at the time of designation to be an SP, DCP, IP or TP.
- **Premises of relevance (POR):** A premises in a CA that contains a susceptible animal(s) but is considered at the time of designation not to be an IP, DCP, SP or TP. The animal(s) on such a premises is/are subject to procedures applicable in the CA, such as heightened surveillance and movement restrictions.
- **Resolved premises (RP):** An IP that has completed the required control measures and is subject to the procedures and restrictions appropriate to the area in which it is located.
- **Unknown status premises (UP):** A premises that has been identified as having an unknown animal status.
- **Zero susceptible stock premises (ZP):** A premises that contains no susceptible animals.
- **Assessed negative (AN):** A qualifier that may be applied to a premises previously defined as a DCP, SP, TP or ARP that has been cleared of suspicion at the time of designation. The animals on such a premises are subject to the procedures (such as heightened surveillance) and movement restrictions appropriate to the declared area in which the premises is located. (Note: AN is a description to document progress in the response and in the proof-of-freedom phase and, as a qualifier, is not to be used at the same level as the other premises classifications.)

Although these designations seem complex, it is important to understand that a property may fit into only one classification at any given time. In addition, not all of these classifications may be needed in a particular EAD response. Based on the disease risk, the highest priorities for investigation by the disease control authority are IPs, DCPs, SPs and TPs.

On an IP, SP, DCP or TP, quarantine and movement controls will apply. On an SP, DCP or TP, other disease control actions will follow only if the premises is reclassified as an IP. On an IP, live pigs may be destroyed as part of a stamping-out strategy, or other disease control actions may be compulsorily applied by the authorities.

Classification of properties according to the above criteria is an important part of EAD control and eradication. Any restrictions that apply to a classified property will be fully explained by the disease control authority at the time of classification.

1.6.4 Compartmentalisation

In some cases, the costs resulting from slaughter and destruction of pigs and their byproducts can be limited by partitioning within enterprises, provided that disease control is not compromised. Many piggeries already use isolation between sections and clear operational divisions (separate services, staff and equipment) for endemic disease control, or for technical or commercial reasons.

This concept, involving the use of 'compartments', means that a subpopulation of animals is defined according to:

- management and husbandry practices
- an effective biosecurity system
- a high capability for tracing animals and byproducts through the market chain.

Compartments may be defined before a disease outbreak to mitigate the impact of diverse geographical locations, and to make disease control and continuing trade easier. Compartmentalisation can be effective only if it is part of a national disease control strategy using surveillance and monitoring, stamping-out strategies, on-farm biosecurity and protection of the compartment from the incursion of disease agents.

Under compartmentalisation, if an EAD breaks out in a sector of an industry, disease control efforts could be focused on that compartment rather than a geographic zone, thus increasing the efficiency of the response. For example, large-scale piggeries with high-quality biosecurity practices that are not affected by the disease may be able to continue production, and exports could continue (subject to the agreement of trading partners). Compartmentalisation has much to offer the pig industry, where populations of pigs on multiple sites are managed as a group.

However, the recognition of compartments is not an overarching international agreement, but an outcome from an existing bilateral agreement between the veterinary services of the countries concerned. Such agreements between trading partners take time to be developed, considered and finalised due to the detailed information, costing and resourcing, and national frameworks that would be required to support this approach. An importing country will want to be satisfied that its animal health status will not be compromised if it allows imports from a compartment in an exporting country. The importing country will take into account an evaluation of the exporting country's veterinary services, the outcomes of a risk assessment, its own legislation and status with respect to the EAD concerned, and other relevant OIE standards. There is a risk that an importing country may select the compartments it will accept imports from and potentially restrict imports to directly benefit its own pigmeat industry. Alternatively, the country may not accept such proposals at all. The practical implementation of compartmentalisation by countries is still developing, and some degree of evolution of the concept should be expected.

Responsibilities for implementing biosecurity measures for zones and compartments differ. Managing disease-free zones is a responsibility of veterinary authorities. For compartmentalisation, the private sector needs to take the lead role and work cooperatively with the veterinary services to develop appropriate arrangements. The veterinary authority will ultimately have responsibility for the outcome. The OIE recognises these responsibilities and, in the case of a livestock industry, states that:

Industry's responsibilities include the application of biosecurity measures, documenting and recording movements of animals and personnel, quality assurance schemes, monitoring the efficacy of the measures, documenting corrective actions, conducting surveillance, rapid reporting and maintenance of records in a readily acceptable form.⁴

The pig industry is well placed to formally adopt compartmentalisation (following government protocols) because of the advanced state of its biosecurity arrangements, especially within the larger multisite piggeries, where compartmentalisation has potential to provide major benefits. Should the concept be adopted by relevant trading partners, and governments (Australian, state and territory) and industry consider it applicable to the pig industry, individual piggeries that want to use the principles of compartmentalisation for their piggery will need approval from the state or territory CVO.

⁴ www.oie.int/index.php?id=169&L=0&htmfile=chapitre_1.4.3.htm

Although compartmentalisation may provide an advantage in the management of some pig diseases, market value must be balanced against cost to domestic trade.

1.7 Training in emergency animal disease preparedness

The National EAD Training Program,⁵ managed by Animal Health Australia, provides training for livestock producers, veterinarians, other government personnel and representatives of the Australian livestock industries. The program's purpose is to prepare people for roles they may undertake in an EAD response. Each livestock industry ensures that there is a pool of skilled people trained to work as ILOs and industry liaison coordinators. It is a requirement of the EADRA that, where possible, jurisdictions use accredited, trained staff to combat an EAD.

⁵ www.animalhealthaustralia.com.au/training-centre/emergency-animal-disease-training-program/

2 The Australian pig industry

The size and geographical distribution of the pork industry across Australia vary according to a range of factors, including climate, the availability and price of feed, the size and nature of imports of pork, currency fluctuations, and competition from other meat products.

In 2009–10, the Australian Bureau of Statistics reported the number of pigs in Australia at 2.3 million (ABS 2010). In 2009, the largest pig herds were in New South Wales (556 000) and Queensland (630 000), which together made up half of the Australian herd. Victoria has the next largest herd (418 000), followed by South Australia (373 000), Western Australia (246 000) and Tasmania (14 000). It is estimated that the top 50 producers in Australia account for about 54% of production.

Nearly 80% of breeding is through artificial insemination, giving boar stations a pivotal role in the industry's performance.

Pigmeat imports have grown significantly over the past 20 years as amended quarantine arrangements (in line with Australia's commitments under the World Trade Organization Agreement on Sanitary and Phytosanitary Measures) have allowed imports to be sourced from more international suppliers. Under current arrangements, all imported pigmeat must be used in the processed meat market. Up to 70% of the ham, bacon and smallgoods produced in Australia are made from imported pigmeat. However, the domestic industry has achieved a steady increase in annual output through improvements in production efficiency and an increase in slaughter weight, from 55–60 kg/head in the 1980s to an average of 72.4 kg/head in 2009.

Continual financial pressures on the pork industry result from fluctuations in the terms of trade, currency, drought, export markets, frozen pigmeat imports, and supply and demand from international markets. However, the industry has been quick to exploit expansion opportunities and supply pork to countries such as Singapore and Japan when the pig industries in countries supplying these markets (Malaysia and Taiwan) were affected by diseases.

The Australian pork industry has a significant positive impact on local, regional, state and national economies through substantial income generation and employment. In 2006–07, the pig production sector generated an estimated \$2.9 billion in output, \$840 million in value-added product and 7928 full-time jobs.

Australian Pork Limited (APL) market surveys indicate that approximately 56% of the 5 million pigs slaughtered each year are part of an integrated supply chain that includes production and primary processing. The remaining pigs sold for slaughter are sourced either through saleyards, spot market, or forward and general contracts.

Pigs are slaughtered to produce chilled, frozen and cured products, including whole carcasses, specific cuts and further processed products. Finished products are usually stored chilled or frozen on the processing site. Chilled, uncooked products have a shelf life of 7–10 days. Frozen products may be stored for longer, but their shelf life is as short as possible for commercial reasons. Some further processed products have a shelf life of up to 24 weeks.

2.1 Industry management

2.1.1 Australian Pork Limited

APL, a not-for-profit company, manages marketing, export development, research, innovation and strategic policy development for the Australian pork industry. APL is a rural industry service body that aims to secure a profitable, sustainable future for the pork industry. Funding is primarily from statutory pig slaughter levies, with additional funds for research provided by the Australian Government. APL's members own approximately 92% of Australia's pig production.

APL focuses on service delivery to pig producers and the broader pork industry while ensuring legislative compliance for expenditure of funds. A key part of APL's strategic direction has been to develop management structures and mechanisms to guide industry development and protect the investment of participants in the pork industry. These drivers have led to several key initiatives relevant to understanding how the industry operates.

The following programs and issues, which are highly relevant to the pork industry and emergency animal diseases (EADs), are discussed below:

- PorkSAFE
- Australian Pork Industry Quality Assurance Program (APIQ[✓][®])
- pig identification
- National Livestock Identification System for pigs (NLIS Pork) and the PigPass National Vendor Declaration (PPNVD)
- pig welfare.

AusPig and Australian Pig Check are discussed briefly, but neither is highly relevant to EAD control.

2.1.2 PorkSAFE

PorkSAFE is the Australian pork industry's emergency management plan for any actual or potential incident or perceived critical issue at either the farm or product level that could adversely affect the reputation, people, operations or assets of the industry. According to the plan, an incident may 'have a consequential impact on public health, public perception, domestic markets and international trade'. PorkSAFE, which is based on the Incident Control System developed in the United States, provides maximum flexibility to deal with a range of potential incidents, including biological or chemical contamination, significant animal welfare issues and EADs.

PorkSAFE is a dynamic document that ensures that an incident is rapidly identified and assessed, and then dealt with efficiently and effectively. Like all plans based on the Incident Control System, it provides individual roles and responsibilities, position descriptions and contact details of key personnel.

In the event of an EAD outbreak, PorkSAFE manages industry involvement and ensures effective and timely communication through the media and directly with producers, APL staff and other key stakeholders.

2.1.3 Australian Pork Industry Quality Assurance Program

APIQ✓[®] is the pork industry's on-farm quality assurance (QA) program that assists producers to manage farm risks by following good agricultural practices (GAP), based on hazard analysis critical control points (HACCP). APIQ✓[®] includes standards for:

- management
- animal welfare
- traceability
- food safety
- biosecurity.

The PigPass QA program (covering food safety only) is being progressively replaced by APIQ✓[®]. Producers seeking renewal of QA certification will be required to move to APIQ✓[®] as their annual PigPass QA certification renewal falls due. New entrants to industry QA may implement APIQ✓[®] at any stage.

The APIQ✓[®] standards aim to be consistent with government regulations in food safety, biosecurity and animal welfare. They refer to existing standards, including:

- *Model Code of Practice for the Welfare of Animals – Pigs*, 3rd edition (2007)
- *Australian Animal Welfare Standards and Guidelines – Land Transport of Livestock* (2009)
- *Australian Pork Industry Biosecurity Code, Version 2* (2011).

Although APIQ✓[®] and PigPass QA traditionally provided producers with an appreciation of key animal health issues, historically, only 30% of producers have adopted industry QA; however, these producers represent 91% of Australia's sow herd. The EAD response for the remaining 70% of producers, who are typically smallholders, will be more complex because the owners' or managers' understanding of EAD response management and the impact on piggery operations might be less sophisticated.

2.2 Pig identification

NLIS (Pork) and state legislation require all pigs being transported for sale or slaughter in Australia to be accompanied by an approved movement document to trace their movements back to the property identification code (PIC) of the property of origin. The PPNVD is the recommended and approved movement document in most states, but other movement documents, including waybills, are still accepted in some states, provided that regulatory requirements are covered. NLIS (Pork) is a mob-based tracing system incorporating PICs, registered pig brands and PPNVDs.

The PigPass System is administered by APL on behalf of the industry. APL maintains the PigPass database and website and runs the PigPass helpdesk service (1800 001 458, Monday to Friday, 8 am – 5 pm). PPNVDs serve two key purposes:

- They enable tracing of pigs in the event of an EAD outbreak or food safety emergency.
- They identify areas of potential risk for processors when supplying their markets (eg the QA status and the chemical residue status of the pigs in the consignment).

To obtain a PPNVD, pig producers need to be registered on the PigPass database, which requires registrants to provide their PIC, a full property address, and the name and contact details of the person responsible for pig husbandry. With the exception of Queensland

(where owners of two or fewer pigs are not required to provide a tattoo number), all states must provide a registered pig brand or tattoo that is linked to their PIC.

Before movement for sale or slaughter, pigs over a specified weight (New South Wales and Victoria, 25 kg; South Australia, 20 kg; Queensland, 30 kg) or age (Western Australia and Tasmania, 10 weeks) must be identified with a slap brand that shows the registered swine brand that is linked to the PIC of origin. In Queensland and Victoria, pigs under the weights specified above must also be identified. In Victoria, pigs under 25 kg must be identified by visually readable ear tags printed with the registered swine brand associated with the PIC of origin. In Queensland, pigs under 30 kg must be identified with either an ear tag displaying the PIC of origin or a slap brand showing the registered swine brand associated with the PIC of origin. People who own two or fewer pigs in Queensland may use an ear tag to identify their pigs, rather than a brand. The law in New South Wales, South Australia, Western Australia and Tasmania does not require identification of pigs under the minimum branding weight. However, it is recommended that all pigs are identified before movement to maintain traceability, and buyers or abattoirs may require identification. Ear tags generally stay with the animal for its lifetime, although they are often lost. Applying the tag shortly before movement helps to avoid its getting lost. Animals may have multiple tags or tattoos if they have lived on a number of properties. More information on pig identification can be obtained from each state's primary industries or agriculture department.

In addition to these requirements, most commercial piggeries have sophisticated and accurate inventory control systems that are important for food safety and disease management. Many integrate identification technology into their business, resulting in detailed records that would be of considerable assistance in tracing pigs during an EAD response. Multisite piggeries may use their own recording systems when moving batches of pigs between sites where ownership is not changing. APIQ[✓][®]-certified producers are required to keep accurate records of all pig movements, including property-to-property movements where ownership does not change.

Box 2.1 Pig identification

Features relevant to the control of EADs

NLIS (Pork) and state legislation require all pigs over a certain weight or age to be tattooed with a registered swine brand (linked to the property identification code of origin) before movement, and to be accompanied by an approved movement document. Pigs under the minimum branding weight or age are often not identified before movement in states other than Queensland and Victoria. Pig identification, in conjunction with a movement document (usually the PigPass National Vendor Declaration – PPNVD), provides a means to trace pig movements in the event of a disease outbreak.

The PPNVD is the recommended and approved movement document in most states, and identifies areas of potential risk for processors in supplying their markets. The PigPass system is administered by APL. Other movement documents, such as waybills, may be used by some producers in some states.

Piggery records will often provide considerable information on the movement of pigs between properties and sites. APIQ[✓][®]-certified producers are required to keep accurate records of all pig movements, including property-to-property movements where ownership does not change.

More information about the PPNVD system can be obtained by calling the PigPass helpdesk on 1800 001 458 or visiting www.pigpass.com.au. More information on pig identification can be obtained from each state's primary industries or agriculture department.

2.3 Pig welfare

Maintaining high welfare standards in the pig industry has become a major issue because international and domestic consumers have become increasingly aware of how intensively housed animals are managed. The resulting public and consumer perception of how pigs are housed and treated affects buying decisions. It is therefore important that producers can demonstrate to consumers their compliance with best practice.

As a result, the industry has been engaged with government for many years in developing the national model codes of practice for the welfare of animals⁶ that reflect this concern. The required standard under APIQ[✓]® is the *Model Code of Practice for the Welfare of Animals – Pigs*. Producers certified under APIQ[✓]® need to demonstrate compliance with standards, which require:

- arranging contingency plans for feed and water delivery, and for failure and maintenance of equipment and facility, to minimise risks to pigs
- providing appropriate facilities to protect pigs against weather extremes and injury
- providing sufficient nutritious and palatable food and fresh water for pigs to maintain a healthy body condition
- training staff and maintaining competency to ensure good stockmanship and care for sick and injured pigs
- ensuring that animal health and husbandry measures and practices are in place that are designed to optimise the health and welfare of the herd and minimise risks to pigs
- ensuring traceability
- providing animal welfare in the form of PigCare (the Australian pork industry's program for on-farm welfare assessment of pigs)
- providing on-farm euthanasia for prompt and humane destruction of sick and injured pigs.

All pig producers are encouraged to become APIQ[✓]® certified, but it is not compulsory. Producers whose pigs are processed through export abattoirs must have approved on-farm quality assurance such as APIQ[✓]®.

All pig producers are required to manage their pigs in accordance with state and territory animal welfare regulations, which now regulate the standards in the *Model Code of Practice for the Welfare of Animals – Pigs* (3rd edition) in most states.

⁶ www.publish.csiro.au/nid/22/sid/11.htm

Box 2.3 Pig welfare

Features relevant to the control of EADs

Pigs are managed under prescribed conditions to protect their welfare, including controls on travel, feeding, handling, management of injuries and euthanasia, where necessary. Each of these could potentially be affected by an EAD response.

AusPig and Australian Pig Check

AusPig is decision-support software that helps producers make informed decisions on formulation of pig diets; implementation of different feed levels; use of capital, labour and other resources; and, therefore, marketing of pigs for maximum profit. Australian Pig Check is a program that provides performance data against which producers can benchmark their results.

2.4 Industry training

APL supports a wide range of training programs and materials, and subsidises their use by pork producers. Publications and programs relevant to the control of diseases include:

- a booklet about antemortems, to train producers to perform an antemortem examination as a component of on-farm QA
- *Care of the Compromised Pig*, a manual that provides strategies and guidance for producers to use in the care and management of sick pigs
- *Biosecurity at your Piggery*, which explains the key elements involved in a piggery biosecurity plan
- *Eradicating Diseases of Pigs*, which provides proven strategies for producers to use to eradicate a range of important endemic pig diseases
- *Pathology of the Pig* (a diagnostic guide), a practical guide for anyone who performs postmortem examinations on pigs
- *The Good Health Manual*, which helps producers identify pig health problems and their causes and treatments, and describes practices that can help prevent recurrence of these problems.

In addition to this program, piggeries certified under APIQ[✓][®] must provide suitable staff training and maintain appropriate training records. State animal welfare regulations also require people responsible for pigs to be considered 'competent' to perform their role, or be supervised by someone who is considered competent, as per the model code and state requirements. This requires pig producers to complete training, or achieve recognition of prior learning, in at least the following areas:

- moving and handling pigs
- inspecting and assessing the health and wellbeing of pigs
- carrying out vaccinations, health treatments and elective husbandry procedures
- humane destruction of pigs suffering an incurable disease, untreatable injury or painful deformity

- maintaining records of inspections and assessments of pigs
- performing euthanasia (this is an optional unit).

Piggery employees are trained to recognise the normal appearance and behaviour of pigs, and the normal production parameters of the farm, so that they can recognise any abnormality or change. They are also trained in biosecurity and disease recognition, including how to recognise the main signs of key pig EADs and the risks these diseases pose.

APL works with Animal Health Australia and registered training organisations to ensure that piggery employees are trained in the various skills required to plan, implement and manage an effective property-based workplace health and safety program.

Box 2.4 Training

Features relevant to the control of EADs

Piggery management and employees are generally well trained for their tasks. Most receive specific training in disease control and EADs. Therefore, they are very capable of assisting in the management of a serious disease event.

2.5 Biosecurity management

The pig industry is aware of the risks of disease transmission and practises a high level of biosecurity. A formal industry biosecurity program is designed to control both endemic diseases and EADs. Compliance with standards covering breeding and production of pigs from birth to sale is an integral part of APIQ[✓][®]. APIQ[✓][®]-certified piggeries are required to document their biosecurity management procedures, including minimising the likelihood of disease entering, spreading or escaping.

The following standards apply to APIQ[✓][®]-certified piggeries. A lower level of biosecurity may be encountered in other piggeries, especially those run as sidelines to other agricultural pursuits.

All movements are controlled, and most farms restrict the entry of people, machinery and vehicles, and restrict access to all areas. A single route is used by all incoming and outgoing vehicles, machinery and equipment.

Visitors entering the piggery complex are assessed for their biosecurity risk and are required to sign a visitors' book to assist trace-back and trace-forward in the event of an EAD outbreak. On some farms with high health status, visitors are required to sign an undertaking that they have not visited other farms or other potentially contaminated sites in the previous 24–72 hours. Should they need to have contact with pigs, they are required to change into clean protective clothing and farm boots before entering any shed or adjacent area, or will be supplied with lightweight plastic disposable shoe covers.

Employees are trained to understand the mechanisms of disease spread, including the potential for introducing and transmitting diseases by pigs, feedstuffs, people, vehicles, machinery and equipment, feral animals and wildlife, and manure and effluent. They are usually required to have no contact with pigs at their homes. They may be required to shower on entry and will change into clean protective clothing and farm boots when entering the farm, or will be supplied with lightweight plastic disposable shoe covers.

Buildings in piggeries are usually bird-proof and rodent-proof. However, this is not always the case, and many piggeries with a minimal approach to biosecurity will not have suitable screening on sheds. Outdoor and free-range farms may have little protection from contact with wildlife, foxes, feral pigs or cats.

Further details on biosecurity requirements are provided on the Farm Biosecurity website.⁷

The pork industry biosecurity program was reviewed in 2010, and will be available on the APL website.⁸ More information on the APIQ✓[®] biosecurity standards can be found on the APIQ✓[®] website.⁹

Box 2.5 Biosecurity

Features relevant to the control of EADs

Most sectors of the pig industry are aware of the risks of disease transmission and practise a high level of biosecurity.

Industry biosecurity standards are incorporated into APIQ✓[®], which covers more than 85% of pig production.

Some commercial and many noncommercial pig producers are likely to have minimal appreciation of basic biosecurity, EADs or disease control practices.

2.6 Monitoring pig health

Carcases and various organs of pigs are commonly examined at abattoirs for the presence and severity of a range of pig diseases that can significantly affect production efficiency. Results defining the health status of growers are reported to producers and their veterinarians, who can then accurately plan disease control strategies.

Slaughter pigs are checked because many of the diseases that affect grower pig performance do not cause any clinical symptoms, although the lower growth rates of subclinically affected pigs may significantly reduce profitability. Slaughter monitoring allows a more accurate assessment of disease levels and supplements information from production records.

For each disease, a report may be provided that will show the prevalence or proportion of pigs that show lesions. The more significant diseases are generally reported in greater detail to producers, who receive reports with tables and graphs for each disease.

This type of monitoring shows the importance placed on disease recognition and control in the pig industry, and the level of interest many individual producers have in the health of their pigs. In some cases, pathology could indicate the presence of a subclinical problem associated with a mildly pathogenic EAD.

⁷ www.farmbiosecurity.com.au/

⁸ www.australianpork.com.au

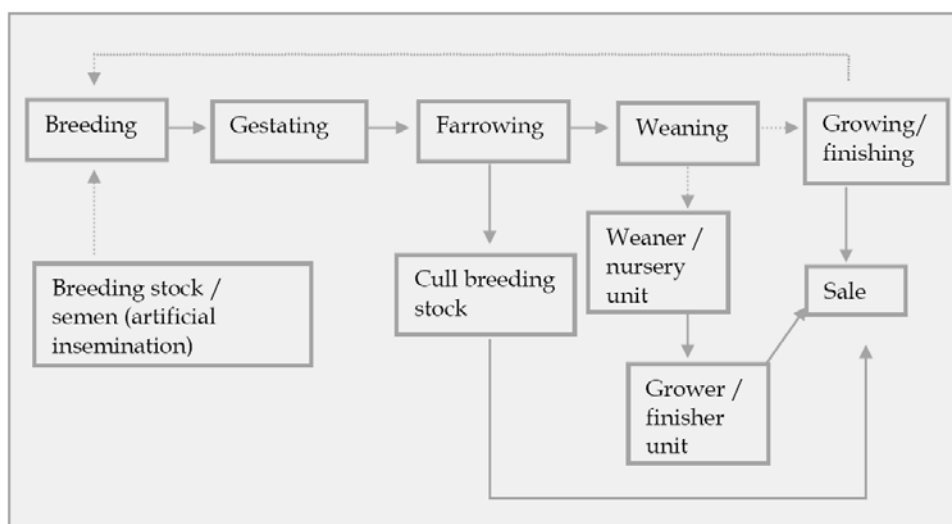
⁹ www.apiq.com.au

2.7 Pig production¹⁰

Pig production can be divided into five production stages: breeding, gestating or dry sows, farrowing, weaning and growing/finishing (Figure 2.1). Most pigs are reared in intensive piggeries where there is a high degree of control over diet, environment and health status through all stages of production.

Individual piggeries or production units can include one or more of the above lifecycle stages. They can be generally described as farrow-to-finish piggeries (all stages on-site), breeder piggeries, weaner piggeries or grow-out piggeries. Some piggeries – referred to as multisite piggeries – are distributed across many sites and across more than one state. In each case, the different classes of pigs are managed separately to provide for their specific requirements.

Sows are moved within a breeding facility to farrowing quarters a few days before parturition. After weaning, they are returned to the breeding quarters while the piglets move to weaner accommodation. As the pigs grow, they may be moved more than once into other grower accommodation.



Source: APL 2010b

Figure 2.1 Piggery production systems

Small units generally operate a continuous farrowing system, in which sows are mated and farrowed on a weekly basis. A batch-farrowing system, in which sows are formed into groups, mated and farrowed at set intervals, is common because it allows for an all-in-all-out production system (see Section 2.7.4).

The size of enterprises varies from small noncommercial ‘backyard’ operations to very large fully integrated operations that house tens of thousands of pigs on multiple linked sites. Pigs may be reared indoors in conventional penned housing or in deep-litter sheds. Outdoor pig units, where pigs are raised in paddocks or pens, operate in some areas and

¹⁰ This description of pig production in Australia is largely derived from several APL publications (APL 2006, 2010a, 2010b). The work of the authors is acknowledged.

generally supply niche markets. Semi-intensive piggeries keep dry sows outside, and the mating and growing portions of the piggery inside.

The number of pigs associated with each sow provides a rapid way to assess the number of pigs in a piggery. At any time, each sow typically has 2.5–3 nursery pigs and 5.5–6.5 finisher pigs within the production system, resulting in an overall average of 9–10.5 inventory pigs per sow (or roughly 10×). A sow can produce 20 pigs per year on average. Forty sows farrowing per week from a 1000-sow herd, with 10 piglets per litter, gives a weekly batch of 400.

‘Standard pig unit’ is a useful term for management. A sow is 1.6 standard pigs, a 60-kg grower is 1.0 standard pig, and a sow with a litter is 2.4 standard pigs.

The location of piggeries is subject to many factors, especially environmental considerations. The majority are located in areas that are close to feed supplies (either grown on-site or purchased) or feed mills.

Many pigmeat businesses have formed cooperatives and alliances with others in the supply chain. Integrated producers, independent processors and small domestic processors ultimately produce product for supermarkets, butchers and food service outlets, such as restaurants.

2.7.1 Types of piggeries

Although this manual is directed at the control of EADs on all piggeries, the larger commercial operations, which house very large numbers of pigs, potentially present the greatest challenge to a successful EAD response.

In contrast, the smaller piggeries present the greatest risk of an EAD outbreak, because they may purchase pigs from questionable sources, have less knowledge of EADs, pay less attention to biosecurity and be less aware of the importance of early notification of disease symptoms.

The following information categorises piggeries into their well-recognised types. The real situation is even more complex, but this classification is used here for convenience, as it highlights the features of each management system most relevant to the control of EADs.

Farrow-to-finish piggeries

Farrow-to-finish is the conventional type of intensive pig farm, where breeding, farrowing, weaning and growing/finishing of pigs all occur on one farm until sale, at around 18–26 weeks of age. Many farms also have quarantine facilities where incoming stock (if the farm does not breed its own replacements) are housed for a short time (usually 4–6 weeks) before they come into the herd. The following description of this type of system illustrates many of the features of modern piggeries.

Many farrow-to-finish piggeries operate as ‘closed herds’, in which replacement breeding stock are selected from within the herd or are derived from artificial insemination. Other farrow-to-finish piggeries introduce breeding stock from outside herds, or use some introductions and some of their own pigs for breeding. As a general rule, 12–15% of the sow herd is needed as replacement breeding stock. Cull sows are sold direct to slaughter, but also through saleyards. The size of the breeding herd limits the number of matings; hence, output and profit drive the overall herd performance.

Artificial insemination is common and will be carried out 1–5 days after weaning the previous litter. Semen is delivered or collected on-site, and processed once or twice per week.

The breeding stage includes the boars and gilts, dry sows waiting for either confirmation of pregnancy or mating, and the gilt pool (see below) and gilt development pool. Boars are usually housed individually, whereas dry sows may be housed in individual stalls, or in group pens or yards (or in a combination of these). Gilts are generally group housed. The breeder gilts are collectively known as the 'gilt pool' (ie a group of young females selected as potential replacements for the breeding herd). If the herd has a within-herd replacement program, these gilts will be selected from, and then moved out of, the grower/finisher area. They remain in the gilt pool until all preparation (eg vaccination, tagging, puberty stimulation) is complete and gilts have achieved target mating age and weight (30 weeks, 130 kg). If gilts and young boars are purchased, they will remain in a quarantine area outside the main farm perimeter for 4–6 weeks to undergo acclimatisation procedures; this ensures that purchased gilts do not bring disease onto the farm and are vaccinated to protect them from diseases endemic to the herd. Sows are often housed in stalls for the first weeks of gestation to confirm pregnancy, and to facilitate individual feeding and management. After several weeks, they are generally moved to group pens to complete their gestation. They usually enter the farrowing house on the Thursday or Friday of the week before they are due to farrow, although this may vary in some piggeries.

Each sow and litter is generally housed in an individual pen (referred to as a farrowing pen) that provides protection from draughts. The creep area is separated from the main stall by side rails to protect the piglets from being crushed by the sow, and the area also provides the piglets with exclusive access to additional feed and heat.

Common infectious diseases in the farrowing house include enterotoxigenic *Escherichia coli*, *Haemophilus parasuis* (Glässer's disease) and *Streptococcus suis*. The last two occur more often in the weaner house, but they start in the younger age groups. Coccidial organisms (*Isospora suis*) are nearly always present, but usually controlled.

After farrowing and within the first 48 hours after birth, the pigs are processed. Depending on the farm, this may involve docking tails, administering iron injections, clipping teeth, notching ears and castrating males. On most farms, the pigs are treated for coccidiosis prophylactically at 4–5 days of age.

Pigs are commonly weaned at 3–4 weeks of age into a purpose-built weaner house or straw-bedded shelter. Weaners can be stressed by the change in diet (from milk to solid feed), mixing with other pigs and environmental changes, all of which increase their susceptibility to disease. Newly weaned pigs are housed in a warm, dry, draught-free environment to counter these abrupt changes. They are fed a special weaner diet, usually with an antimicrobial to control *Lawsonia intracellularis* (proliferative enteritis) and other infections. Alternatively, water medication may be used soon after weaning to control postweaning *E. coli* infections and proliferative enteritis at about 7–10 weeks of age. Group sizes depend on the facility. They range from as many as 1000 pigs in ecosheds to as few as 15–20 pigs in a pen.

The most important diseases after weaning include postweaning enterotoxigenic *E. coli*, Glässer's disease, streptococcal septicaemia, proliferative enteritis, erysipelas (*Erysipelothrix rhusiopathiae*), enzootic pneumonia (*Mycoplasma hyopneumoniae*), *Actinobacillus pleuropneumoniae* and swine dysentery (*Brachyspira hyodysenteriae*). Internal and external parasites are present on many farms, but rarely cause problems.

By 8–10 weeks of age, the pigs move to a grower facility. More space per pig is provided, and the diets typically change again. Grower pigs require less environmental controls than newly weaned pigs. They are often fed in ‘phases’, so that the diet is tailored to provide optimal nutrition for each growth stage. Throughout the growth stage, pigs are fed ad libitum to maintain maximum growth rates.

Males and females can be separated at this stage. Depending on the farm practices, the pigs may stay in a group until they are sold. If housed in straw-based shelters as growers, they may be moved to a larger shelter, or the group will be split at about 16–18 weeks of age. The first heavy pigs for sale may be removed at about 18 weeks. Practices vary considerably.

Pigs turned-off as baconers generally have a live weight of 94–95 kg (71–72 kg carcase weight), but the weight may be higher. Most are subject to a tightly managed specification by purchasers, with little room to compromise. Pigs that do not meet this specification for any reason will be heavily discounted in value. This means that anything that results in a finisher pig being held back from market by even a few days could result in heavy financial losses to the owner.

The pigs are transported, usually early in the morning, for slaughter the same day. Feed and water restrictions apply before transport. Where significant distances are travelled, the pigs will be rested in a lairage for 12 hours and killed the following day.

Box 2.6 Farrow-to-finish piggeries

Features relevant to the control of EADs

Having all types of pigs in the one place, even though they may be housed separately, increases the potential for disease to spread between groups by feed or water contamination, sharing of air space, or workers who may attend to all stages of production.

Breeder piggeries

The breeder piggery is a production system in which only gilts, sows, boars and suckling piglets are farmed at the one site. Management focuses on mating, pregnancy, farrowing and weaning. After farrowing and a period of lactation (typically 3–4 weeks), piglets are weaned and sent off-site to a grower–finisher site.

Generally, boars are housed individually, whereas dry sows are housed in individual stalls or group pens. Sows are often housed in stalls for the first weeks of gestation to confirm pregnancy and to allow individual feeding and management. They are then usually moved to group pens to complete their gestation.

Box 2.7 Breeder piggeries

Features relevant to the control of EADs

Breeding farms are usually well isolated. In an EAD response, it may be possible to allow them to continue to operate, provided that isolation and biosecurity can be confirmed and maintained.

Weaner piggeries

A weaner piggery includes only weaner pigs, generally from 3–4 weeks to 8–10 weeks of age. Groups of pigs are generally moved into all-in-all-out rooms or sheds each week. Some

farms run on a batch basis, and the whole site is filled at the same time. On the largest farms in Australia, pigs are moved onto a weaner site from two or three breeder sites that generally have a similar health status. On the largest farms, thousands of pigs are transported each week.

Specialist weaner production systems are popular with contract growers using purpose-built, environmentally controlled facilities or deep-litter housing.

Box 2.8 Weaner piggeries

Features relevant to the control of EADs

Groups of weaners may be derived from several sites, which results in mixing, and an increase in stress and disease risk. Once established, a disease can be expected to spread rapidly within a weaner group.

Grower-finisher piggeries

A grower-finisher piggery includes grower pigs (about 10–16 weeks of age) and finisher pigs (from about 16 weeks to 22–26 weeks of age). They may be housed in conventional sheds, deep-litter housing, outdoors, or a combination of these.

Typically, the weight of pigs is 25–65 kg during the grower period and 65–95 kg during the finisher period. The number of pigs housed within a shed or shelter is periodically adjusted to allow for their increasing weight and size.

The preferred housing is based on all-in-all-out or batch-production systems. These have less potential for entry of a disease than a piggery with progressive arrivals. Straw-bedded shelters lend themselves well to these systems. One shelter for 200–400 pigs is common, but large sizes may create problems when sorting the pigs for sale.

Growing and finishing pigs require fewer environmental controls than newly weaned pigs. They are often fed in 'phases', so that the diet is tailored to provide optimal nutrition for each growth stage.

Finisher farms lend themselves well to contracting schemes. They are often situated on grain farms that have space and surplus labour and can use effluent from the piggery on crops.

Box 2.9 Grower piggeries

Features relevant to the control of EADs

Pigs may be moved between sheds during growth to bring together groups of similarly weighted pigs before market.

The batch-production system has less potential for a disease to enter than a piggery with progressive arrivals.

Multisite piggeries

Larger piggeries are typically structured as multisite operations, where one or more breeder farms provide weaners to nursery and weaner sites at 3–4 weeks of age, and then to grower and finisher sites. For example, there may be two- or three-stage grower chains of linked

properties comprising weaners being transported from the breeding site to a nursery weaner site for 5–7 weeks, and from there to grower–finisher farms (10–17 weeks and 17–24 weeks, respectively). A multisite piggery of this type may have 5–15 separate piggery units separated by 10–150 km and extending over state borders.

The multiple grow-out sites may be owned within one group, but are more commonly owned by individual contract growers who manage the pigs on an agistment basis according to protocols prepared by the parent company.

Such multisite operations involve continual pig movements. They generally use their own transport or engage a single transport company that uses vehicles exclusive to that operation.

This complexity is a significant feature of the pork industry and needs to be well understood if an EAD affecting the industry is to be effectively and efficiently managed.

Box 2.10 Multisite piggeries

Features relevant to the control of EADs

A high standard of health monitoring and biosecurity should operate between and within sites.

Multiple grow-out sites may be owned within the one group or by individual contract growers.

2.7.2 Housing systems

Piggery housing systems include conventional indoor housing, deep-litter housing, and outdoor or free-range facilities.

Conventional indoor housing

Conventional indoor housing is a traditional intensive production system in which all animals are confined indoors within a structure designed to modify the environment for all or part of the production cycle. The pigs are fed on prepared or manufactured feedstuffs or rations to meet their nutritional requirements.

Conventional sheds suit all classes of pig and are usually separated into pens of varying group sizes. The flooring is usually partly or fully slatted, or includes open channel dunging areas. For sheds with slatted flooring, spilt feed and water, urine and faeces fall through the slats into underfloor channels or pits. These are regularly flushed to remove effluent from the sheds.

The sheds are usually environmentally controlled and incorporate varying levels of automation (eg partial-feeding stalls, electronic-feeding stations, trickle and floor feeding, climate controls for protection from summer heat or winter draughts).

The stocking rate (square metre/pig) and stocking density (cubic metre/pig) are important; it is difficult to maintain good hygiene and air quality unless there is adherence to standards. Maximum stocking rates for each class of pig are provided in the *Model Code of Practice for the Welfare of Animals – Pigs* (3rd edition), which allows 20–30% of space for a dunging area, such as slats (AWWG 2008). The general practice is for pigs to be provided with a little more space than these minimums.

Box 2.11 Conventional housing

Features relevant to the control of EADs

Although the pigs are housed in pens of varying sizes, there is little opportunity to effectively segregate sick pigs from healthy ones.

Deep-litter housing

Deep-litter housing in sheds (ecosheds) is widely used for accommodating compatible groups of pigs, such as weaners, growers, finishers, and dry and gestating sows. These sheds are frequently open-ended buildings with a poly-tarp-hoop roof and gates to prevent the pigs moving out of either end. They are established on a specially prepared earth floor or a reinforced concrete slab. Low-permeability flooring makes cleaning easier and prevents nutrients from leaching into groundwater. Variations include converted conventional sheds or skillion-roof sheds with bedding over the flooring.

Bedding varies according to price and availability. It may be fibrous (hay), or particulate (rice hulls or sawdust), or made of similar loose material that absorbs manure, eliminating the need to use water for cleaning. Rice hulls are preferred over cereal straw when the delivery price is comparable because of its lower costs of handling and ease of spreading. Regular top-up of bedding is needed, and stocking densities must be carefully managed to maintain dry, low-odour conditions within sheds.

Although ecosheds may be relatively inexpensive to build and may provide some welfare benefits, bedding may be difficult to buy and expensive during drought years, particularly for finisher pigs and dry sows, which require more bedding than other pig classes.

In Australia, an estimated 30% of pigs are raised in ecosheds because of the low cost of construction. Weaners, growers and finishers generally move through these sheds in batches (all-in-all-out), with spent bedding cleaned out only after each batch. Spent bedding also requires management.

Box 2.12 Deep-litter housing

Features relevant to the control of EADs

The batch nature of many of these systems reduces the likelihood that an EAD will spread between structures.

Isolation and control of a disease within a deep-litter housing system may be possible without affecting other sheds.

The bedding used is an unlikely source of infection with an EAD.

Outdoor or free-range facilities

Environmental factors, combined with high summer temperatures and seasonal infertility, generally restrict populations of outdoor pigs in Australia to coastal areas in Western Australia and New South Wales, and areas in southern Victoria. The outdoor sow population is estimated at 15 000–18 000 sows. A very small proportion of these piggeries are referred to as ‘extensive piggeries’, because the animals rely primarily on foraging and grazing, rather than on supplementary feed, to meet more than 50% of their nutritional requirements.

Herds are kept in small paddocks (rotational) and enclosures (feedlot), sometimes with simple communal shelters for dry sows, kennels for weaners, and individual huts for farrowing sows and nursing sows. They may be managed in static groups (no new additions are made to the group after its formation) or dynamic groups (animals are continually added and removed from the group).

In a rotational outdoor piggery, pigs are kept in small paddocks, with huts or other basic housing. The paddocks may be rotated with a pasture or cropping phase. During the stocked phase, the pigs are supplied with prepared feed, water, wallows and foraging. During the non-pig phase, the area grows pastures or crops that are harvested to remove the nutrients deposited in pig manure during the stocked phase.

Feedlot outdoor piggeries continuously accommodate pigs in permanent outdoor enclosures. These enclosures must be located within a controlled drainage area so that all stormwater run-off is controlled and kept separate from stormwater run-off from areas outside the pig enclosures. The base of the enclosure must be sealed to prevent nutrients and salts from leaching into groundwater.

Generally, sows are housed outdoors in a shared hut within a paddock and fed pelleted diets. The sites are rotated about every 2 years. The sows farrow in huts, but the piglets are weaned into straw-bedded shelters. Systems vary, but by 6-8 weeks of age the piglets have been moved off-site to a growing unit.

Outdoor systems were developed as a low-cost and intervention system. They rely on efficient management, putting sufficient sows before the boars to meet production targets, high-quality diets and good survival. The relatively low cost of keeping a sow is used to hold a surplus to ensure that weaned targets are met and grower facilities are filled. This is maintained on some farms, but others have introduced management procedures more common to indoor intensive farms than outdoor farms, such as artificial insemination and trough feeding for sows to improve the efficiency of production.

The design of many free-range enterprises allows access to pigs by wild birds, feral animals, vermin and aerosols. Most such enterprises have multi-aged herds that are often held in adjacent paddocks, so many of the principles of separation and between-herd hygiene cannot be practised. Other hygiene and biosecurity procedures may be the same as on other commercial farms, but commercial farms have a higher emphasis on preventing the entry of wild birds, feral animals and vermin. Generally, free-range farms are at greater risk of security breaches by feral pigs and can pose environmental risks if not carefully managed.

Box 2.13 Outdoor piggeries

Features relevant to the control of EADs

Where pigs are continually added to groups, the risk of disease transmission is greatly increased.

Most outdoor piggeries have multi-aged herds, so the principles of separation and between-herd hygiene cannot be practised.

These farms are at greater risk of security breaches by feral pigs.

2.7.3 Types of piggery management

Piggeries are managed in one of four ways: commercial, integrated, contract growers and breeders, or smallholder and noncommercial.

Commercial piggeries

Commercial piggeries are businesses with substantial fixed investment in the premises and a large operating expenditure. They are subject to considerable variations in the price of their inputs, and the value of their product in domestic and international markets. They use expert knowledge and management skills to balance these factors, while ensuring that the day-to-day operation runs smoothly.

These enterprises vary greatly in size and in the way they operate. There are many combinations of housing, production phases and locations, and associated variations in the nature and size of risks, which can all be associated with an EAD outbreak.

Box 2.14 Commercial management

Features relevant to the control of EADs

Commercial piggeries are sophisticated and complex businesses managed by individuals with extensive industry and business experience.

Management and employees are generally well trained for their tasks. Most receive specific training in disease control and EADs, and are very capable of assisting in the management of a serious disease event.

Integrated piggeries

The largest pig producers in Australia operate as vertically integrated supply-chain consortiums, combining dedicated breeder farms, contract growers, feed mills, and integrated slaughtering and processing facilities.

Only pigs under the same ownership are generally introduced to the complex. The exceptions are periodic movements of pigs from the single-seed stock-breeder supplier to the sow farm. These movements are planned to occur each week of the year and are independent of market demand. They are affected by season (summer) because this affects fertility. Producers try to counter this effect by mating more sows.

These integrated multisite systems provide sophisticated support services. They have veterinary, nutritional, genetic, management and training support, and employ biosecurity measures that exceed the requirements of the industry code of practice. They may be high health-status herds, but are equally likely to have 'conventional' health status. High health-status herds are free from *Mycoplasma hyopneumoniae*, swine dysentery, atrophic rhinitis, internal and external parasites, and *Actinobacillus pleuropneumoniae*. Conventional health-status herds carry several or all of these diseases, but generally still operate under strict biosecurity protocols to minimise further introductions of other diseases or disease strains.

Box 2.15 Integrated piggeries

Features relevant to the control of EADs

Integrated piggeries operate under high biosecurity and are the least likely of all piggeries to introduce an EAD.

Management and employees are well trained, and most have specific training in disease control and EADs.

These businesses are likely to have an abattoir as a key component for slaughter of pigs, whether for salvage or for rendering.

Piggeries run by contract growers and breeders

Contractors do not own the pigs they farm, but meet a client's requirements for production of pigmeat suitable to their market or for the supply of breeding stock according to specification. The precise arrangements vary, but generally one party provides the labour and housing facilities, and the other provides the feed, pigs and technical knowledge, and/or sells or slaughters the pigs. Some contracting schemes pay a set weekly amount, while others pay bonuses that depend on feed efficiency and survival rates. Because the health status of herds may vary, complex biosecurity arrangements are generally in place.

The size of contract farms varies. In the largest systems, semen may be transported from an in-house semen centre to contract breeder herds. Gilts may be transported from contract multiplication herds to contract breeder sites. Thus, there may be regular movement of animals and semen throughout the enterprise.

Box 2.16 Contract growers and breeders

Features relevant to the control of EADs

Piggeries run by contract growers and breeders operate under strict protocols and high biosecurity and, unless introducing pigs from multiple sources, are at a low risk of introducing an EAD.

There is only a small number of breeder companies; therefore, semen distribution, which may be a factor in disease transmission, is well defined.

Management and employees are well trained, and most have specific training in disease control and EADs.

Smallholder and noncommercial growers

Smallholder producers are generally considered to be those with fewer than 20 sows. They include owners who may keep only one pig as a pet and those with a few for personal consumption. Many of this group are noncommercial in that they do not farm for profit and may have little interest in the business or technical aspects of pig farming.

As a group, smallholders and noncommercial farms present many challenges to disease management as their knowledge of pig diseases and ability to recognise an exotic disease may be minimal. They may have no interest or capability to implement and manage the many aspects of biosecurity. Many of the smaller owners are transient, and a significant number (33%; Schembri et al 2010) have never had contact with a veterinarian. Communication with this group is difficult, and it is challenging to introduce improved practices. Other complications are variation in state legislation (mainly relating to requirements for identification and movement documentation), a lack of requirement for vendors and purchasers to identify themselves, poor pig identification at saleyards where many progeny from these operations are sold (often weaners for cash), and minimal knowledge of the bans on swill feeding.

Pigs are kept under a range of housing systems, but are commonly outdoors. All such enterprises should register with APL (through the PigPass system) and the state government for environmental and biosecurity purposes, and ensure that they have any

necessary local council approvals; however, this is rarely done. As a result, many of these piggeries are unknown to authorities or the industry. In addition, it is highly likely that they will purchase pigs from markets, will not use any quarantine on arrival, will not maintain records of pig movements on or off the property, and will not monitor subsequent health of the pigs.

Many such operations present a significant risk to the industry, and reducing this risk to manageable levels is a challenge. As a result, several industry initiatives aim to improve the status of this sector by improving communication and education, and identification and thus traceability of the pigs.

In 2010, a new stream of APIQ[✓]® certification, designed for smallholders, called APIQ[✓]® SH was introduced for producers who keep 20 or fewer sows or sell up to 400 pigs in a year. It requires smallholders to meet the same standards as large holders, but the manuals and record-keeping processes have been simplified to suit smaller production systems.

Box 2.17 Smallholder and noncommercial growers

Features relevant to the control of EADs

Many smallholder and noncommercial growers do not farm for profit and may have little interest in the business or technical aspects of pig farming. Thus, they have little appreciation of the potential impact of EADs. Many are transient owners and, as a group, may be unknown to authorities. They are difficult to contact and communicate with.

They are often located in peri-urban areas where they are unlikely to have direct contact with commercial piggeries.

Knowledge of pig diseases and swill-feeding bans, and implementation of any biosecurity measures may be minimal. Many will have never had contact with a veterinarian.

Specific knowledge of EADs and control arrangements is unlikely.

A large proportion will buy and sell pigs through markets using substandard identification and will have minimal records, making tracing difficult.

Pigs are kept in a range of housing systems, but are commonly outdoors. The growers may have no approvals to operate.

2.7.4 Aspects of pig management to consider in preventing EADs

In the context of EADs, aspects of pig management include:

- movement
- records
- location
- batch-production (often weekly) systems
- site structure
- feed supplies
- provision of feed to pigs
- water
- waste

- effluent
- manure, sludge and deep litter
- carcasses
- temperature and ventilation
- maintaining pig health
- wildlife and feral animal control.

Movements associated with pig production

Because of the distributed nature of multisite piggeries, there are frequent movements of livestock transports on and off most of these piggeries. Breeding sows are moved, and other pigs are moved from breeder to nursery sites, and then to grower-finisher sites, and ultimately to an abattoir (or potentially to market first if they do not meet specifications).

Weaners and slaughter pigs are the most commonly transported classes of pigs, and movements often occur across state borders. More than 90% of pigs are sold directly for slaughter or moved to a contract grower, and the remainder are sold through saleyards or via some other arrangement.

The larger piggeries assign dedicated trucks to these movements and manage them according to strict cleaning and biosecurity protocols. Smaller piggeries are generally aware of the health risks associated with transport between piggeries, but may not have dedicated trucks. However, some will work with other nearby piggeries to achieve a group level of biosecurity similar to that of the larger enterprises.

All types of movements are documented according to the requirements in the enterprise's biosecurity manual. This information forms a basis for tracing during an EAD response and for limiting movements if necessary.

Inward movements include grain supplies and other components of rations or prepared feed from a commercial feed mill. Dedicated trucks may be used in the larger piggeries. In smaller piggeries, a truck may visit several farms on each trip; this requires additional care in cleaning and managing contact with clean parts of other piggeries.

Outward movements include movement of dead pigs to a rendering plant or a burial site, and movement of deep litter from sheds for use as fertiliser.

Box 2.18 Movements

Features relevant to the control of EADs

The multiple movements of pigs associated with piggery management are only likely to be a major concern where pigs are sourced from a market or small piggery, or biosecurity is poor.

If trucks have been cleaned and disinfected appropriately between loads, movements of feed and materials on and off piggeries are unlikely to pose a high risk during an outbreak of an EAD.

Records

All piggeries should maintain records for commercial reasons (eg invoicing, production planning, performance evaluation, quality control) and, in some cases, for technical reasons, such as to assist in tracing operational problems.

Depending on the type of enterprise, records may include details of:

- all movements on and off each premises, including visitors
- the source, number and location of animals of each class
- illness and mortalities
- feed deliveries
- vaccination and medication records
- production statistics
- feed consumption.

On breeder farms, records that should be kept include the breeder herd of origin, date of farrowing, mortality, bodyweight, feed consumption, vaccination, medication and movement of stock. Water consumption may also be recorded.

Box 2.19 Records

Features relevant to the control of EADs

All APIQ[✓][®]-certified piggeries will have good records that document the source of pigs, feed and other materials, and that can greatly assist tracing.

There may be minimal or no record keeping on smallholder and noncommercial farms.

Piggery location

Piggeries are usually located close to supplies of grain and other feedstuffs. Access to labour, major highways, abattoirs and saleyards is also an important consideration in piggery sustainability and environment management. Climate can have a significant impact on the environmental performance of a piggery, especially wet conditions, which may result in excessive odour.

As a result of these factors, several areas in Australia have a high concentration of pig properties and consequently increased potential for spread of an EAD. Piggeries are becoming larger, which means that special measures are needed to maintain efficient production while complying with environmental guidelines. These include the trend to reduce the total numbers and production phases on a single site by developing sites for each class of pig. Although the larger commercial producers will aim to isolate and separate components of their enterprise and implement strict biosecurity protocols, this is not always the case with older and smaller farms.

Location is subject to a range of planning controls designed to ensure that community standards are met with respect to a piggery's impact on the environment. Each state and territory has its own legislation, codes of practice, regulations and guidelines for the development and operation of piggeries, as well as more general legislation governing water use, land clearing and other relevant issues. There are also applicable local government planning and approval regulations.

Approval for a piggery is required from the relevant state or territory environmental protection agency, as well as local government. Requirements vary between states and between councils in each jurisdiction, and do not always take into account site-specific or management-specific features, which can markedly influence environmental risks.

The *National Environmental Guidelines for Piggeries* (APL 2010b) provide guidance for environmental assessments for new piggeries and options for existing piggeries to achieve positive environmental outcomes. The guidelines incorporate current scientific information and a risk assessment approach to maintaining piggeries, and facilitate a consistent regulatory approach to environmental controls throughout Australia.

Box 2.20 Piggery location

Features relevant to the control of EADs

State and territory governments have imposed strict controls on the location of piggeries. As a result, piggery managers have extensive experience in dealing with environmental impacts.

Piggeries are concentrated in several areas of Australia, making it easier to assess the general risk from an outbreak of an EAD.

Individual piggeries are usually reasonably well isolated from other piggeries and other intensive livestock enterprises.

Smallholder, family and medium-sized farms are most likely to run other livestock.

Batch-production systems ('all-in-all-out')

Many piggeries manage their pigs in batches as a key component of health management. Batches of pigs of the same age or class are housed together. They may be weaners, growers or finishers of the same age, or they may be sows due to farrow during the same week.

Batches may be based on individual units at a site or on an entire site. The process requires all pigs to be removed from a shed or site before the next group of pigs is moved in, with the facilities being thoroughly cleaned between each batch. This results in an 'all-in-all-out' process. The time between batches varies significantly, depending on the type of piggery, its size and the intensity of throughput. The flexibility of the batch system will also vary, depending on the number of sheds or rooms available and the flow of pigs. Batches may be managed so that one shed or room is emptied, cleaned and disinfected each week. In multisite piggeries, between one and four batches per week may leave a breeder farm. In very large piggeries, a 'week-of-pigs' may be the basic management unit through which the various units are managed until consignment to the abattoir.

The quality of cleaning that can be achieved with batch production contributes to improved growth rates and reduced levels of disease. A high-pressure hose can be used without the risk of wetting pigs or spreading microorganisms to other pigs. However, the opportunity to rest sheds in intensive, large-scale piggeries may be limited.

Box 2.21 Batch production

Features relevant to the control of EADs

Batch production means that any disease agent that is present should remain confined to that batch. Other batches of pigs present on a farm may not need to be destroyed (where that is the default policy).

Site structure

The term 'piggery complex' is sometimes used to include:

- all buildings or paddocks where pigs live
- adjoining or nearby areas where pigs are yarded, tended, loaded and unloaded
- adjacent areas where piggery byproducts are accumulated or treated, pending on-site use or transport off-site
- areas where pig-feeding facilities are maintained, or areas where feed is stored, handled or prepared (including feedmills).

A piggery complex itself does not include any areas of land where byproducts such as effluent, pond sludge or separated solids are applied, unless it is a rotational outdoor intensive piggery.

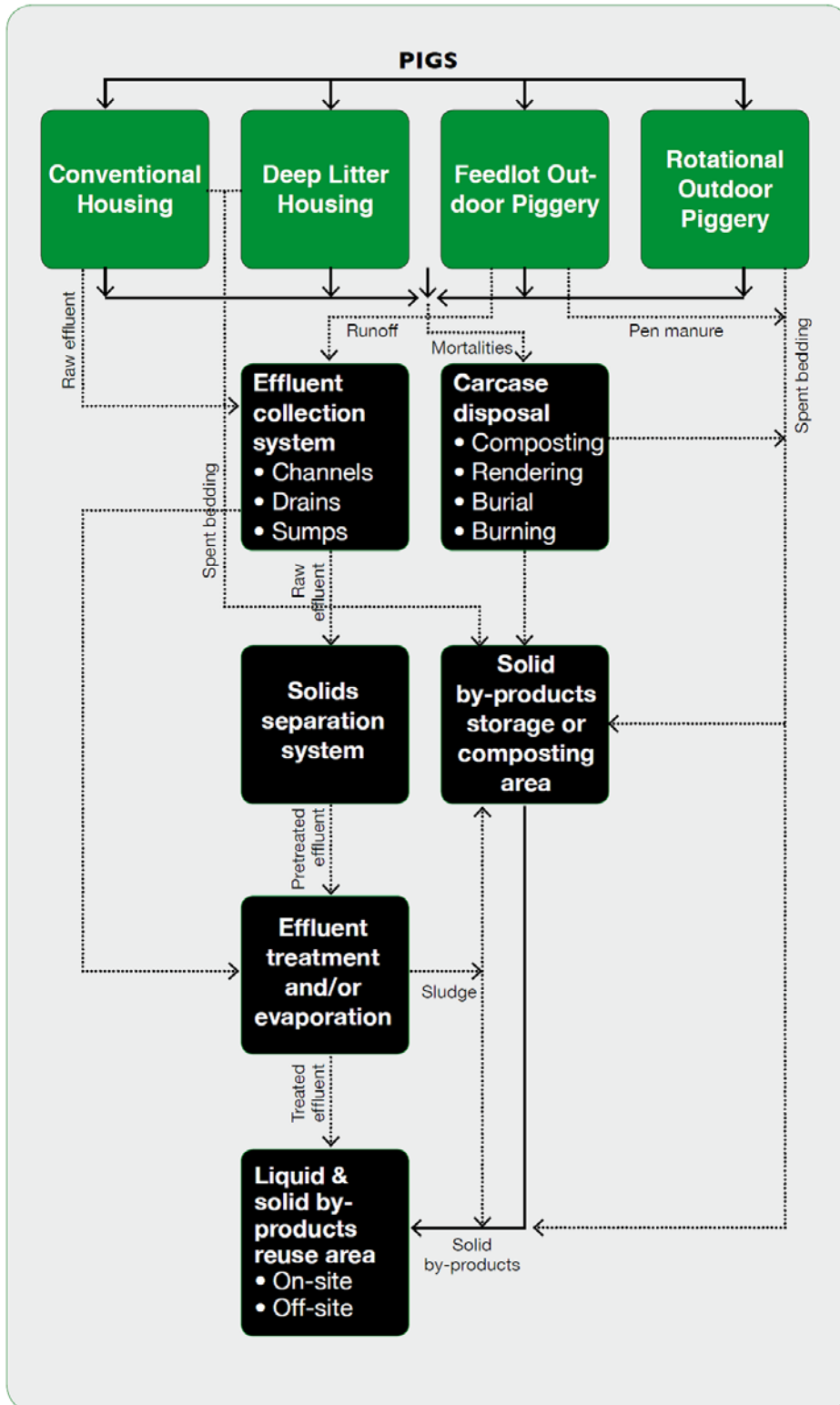
A typical commercial piggery comprises an administration area, a feed preparation area, pig housing and a waste disposal area. Generally, the number of entry gates is limited (usually to one), and people and vehicles cannot enter without authorisation. Records are maintained of all vehicles, people and pigs entering and leaving. All visitors are required to sign a register. Vehicles are not allowed into areas designated as 'clean' unless necessary and authorised. If so, they are required to park as far away from pig sheds as practicable.

Biosecurity protocols mean that loading ramps and feed silos should be at, but outside, the perimeter fence, if possible. If this is not possible, signposted 'dirty' areas should be designated at loading ramps and silos. Drivers are required to remain in the designated dirty area and piggery staff in the clean area.

In APIQ[✓][®]-certified piggeries, dirty and clean areas for staff and visitors entering sheds are defined. Staff and visitors entering sheds remove their street clothes in the designated dirty area, then change into protective boots and clothing, and wash their hands and any necessary equipment before moving into the clean area. Staff or visitors are not allowed to enter sheds if they have entered sheds or handled pigs on another piggery that day. If an exception is made, showering before entry is generally required.

Many large piggeries have a dedicated wash area with a concrete apron, where machinery and vehicles are washed.

See Figure 2.2 for a diagram of a typical piggery site structure.



Source: APL 2010b

Figure 2.2 Piggery byproducts flow diagram

Box 2.22 Site structure

Features relevant to the control of EADs

Entry to a piggery is generally tightly controlled, and all movements in and out are recorded.

Areas within the piggery complex may be designated as ‘clean’ and ‘dirty’ to provide a convenient way to control access.

Feed supplies

Feed management is critical to the operation of a piggery. Strict protocols are usually in place to manage each aspect, from supply to delivery to each unit in the piggery. Generally, pigs are allowed to feed ad libitum from weaning until market weight.

Feed accounts for 55–75% of the total costs of running a piggery; thus, feeding and nutrition can have a significant impact on profits. Selecting the combination of feed ingredients that will result in optimal production at minimum cost is complex – more than 40 individual nutrients need to be considered. The feed used for pigs consists of grains as a source of energy, and protein that may be supplied in vegetable protein meals (eg soybean, sunflower, canola) or animal protein meals (eg meat, fish, blood). Vitamins and minerals are supplied as a premix that is added during mixing.

Rations may be prepared on-site from grain and forage grown on the complex. This is most common on small to medium-sized piggeries, although some large piggeries have multiple sites where grain is grown specifically for feed. Most bulk grain supplies are purchased regionally, and many loads may arrive each day on a large piggery.

In larger piggeries, the various rations are prepared by commercial feed merchants to the specification of the piggery and delivered either in the feed company’s vehicles or by contractors. Some larger producers and integrated piggeries have their own feed mills or mix their own feed. Mixing feed on farm allows specific nutritional requirements to be catered for, but is time consuming and requires specialised equipment. An advantage of commercially prepared pelleted feeds is that they have been heat treated, which kills most microorganisms. Cross-contamination and recontamination are very real possibilities in most feed mills.

Different diets (up to 7–10 and possibly more for larger piggeries that have infrastructure that allows simple changeover of diets) are provided for each stage of a pig’s growth. The diet is progressively changed as the pigs go through weaner, grower and finisher stages. This may be a continual process, involving changing the feed (over several days to a week) by introducing an increasing proportion of the new feed, to avoid dietary disruption.

Deliveries to a piggery (whether a single site or multisite) will generally be by a vehicle(s) that is only used for deliveries to that piggery. In most piggeries, feed vehicles need to drive close to the individual pig units to deliver feed, but the risks associated with this are low, as there is little or no contact with the piggery itself. Some farms have feed-delivery points (auger or blower intakes) located outside the perimeter fence to prevent access of trucks and drivers to livestock areas.

Box 2.23 Feed supplies

Features relevant to the control of EADs

Many piggeries have multiple daily deliveries of feed, which must be continual to provide for the welfare of the pigs.

Vehicles delivering feed may have contact with hoppers close to pig housing, but the separation distances are generally adequate to prevent transmission of disease agents. Some decontamination on exit may still be required.

It may be possible to process grain that is contaminated with an EAD agent into piggery rations on-site in a way that destroys the EAD agent.

In an EAD response, the cost of feed is normally the responsibility of the owner. However, in some situations, the disease control authority may require pigs to be kept for an extended period before eventual destruction. In such cases, responsibility for the cost of feeding and maintaining the pigs may need clarification.

Provision of feed to pigs

In all feeding systems, the feeding method is managed to ensure that all pigs have adequate access to feed. This requires trained staff, knowledge of ingredients, and regular inspection of pigs and delivery systems. Various stressors influence voluntary feed intake; these can be classified as environmental (eg temperature, humidity, ventilation), social (eg space allocation, group size, mixing, competition) and immunological (eg disease, injury). Temperature is probably the most significant stressor. Variations in feed intake can also be attributed to genetic differences and the stage of production.

An adequate intake of colostrum is essential in the early life of the newborn piglet. Supplementary feeding (creep feeding) of piglets during suckling helps to alleviate digestive problems at weaning by allowing piglets to adjust slowly to dry feed. This is more common when piglets are weaned later than 2–3 weeks. Feeding in this way may result in greater weaning weights. Generally, the feeds comprise a small flaky pellet or moist mash that is supplied on a 'little and often' basis, with strict attention to the cleanliness of the system.

Immediately postweaning, various stressors result in poor feed intake and often a slight reduction in growth rate. Trough feeding of weaners is generally used.

Sows are fed carefully as they need adequate reserves at farrowing for milk production and successful mating after weaning. Lactating sows require both an adequate feed intake and correct diet to ensure that they produce enough milk for preweaning growth of the nursing litter. Depending on the system, they may have free access to feed or may be fed 2–3 times daily.

Each pig needs adequate access to feed; otherwise, uneven growth, poor condition and reduced welfare may result. The objective is for each pig to have adequate feeding space, separated from lying and dunging areas. Floor feeding may be used, provided that the stocking rate is appropriate and each pig receives sufficient feed. Wastage when floor feeding is used can be fairly high, and sows may have greater variability in body condition because of aggression. Social aspects of floor feeding are important, as uneven feed distribution may be exploited by dominant animals.

Trough feeding is generally regarded as better than floor feeding. Dry sows housed in stalls or group pens generally have restricted feed, and are fed concurrently with mechanical drop feeders or manually. Trough-feeding systems must have a trough size adequate for the number of sows in the pen. The design of the trough should prevent the pigs from walking, lying, urinating or dunging in it.

Electronic feeding stations are commonly used for large groups of pigs housed with increased space. In such systems, pigs are individually identified with an electronic collar, ear tag or implant. The electronic feeding station can recognise a pig's electronic identification and provide individual allocation of the feed. This type of system requires frequent inspection to ensure that the animals are obtaining their correct allocation of feed.

Liquid feeding systems are used in many piggeries. They have a number of advantages, including:

- improved pig performance
- reduced feed loss, and therefore an improvement in the pig's environment
- increased accuracy of rations
- improved intakes at high ambient temperatures
- reduced feed wastage.

There may also be better environmental outcomes through a reduction in piggery effluent and improved health.

The amount of feed required for pigs in outdoor systems is generally higher than in conventional indoor systems, in part due to wastage. Provision of feed needs to be adjusted according to weather conditions, and considerable management skills may be required to manage changing nutritional requirements. Feed may be presented to outdoor pigs by hand, through mechanical feeders, ad libitum or using fixed paddock feeders that can be replenished manually.

Box 2.24 Provision of feed

Features relevant to the control of EADs

Feed that has been stored in a secure silo may have avoided contamination, but the nature of the feed and its composition should be considered on a case-by-case basis.

Water

A continuous and substantial supply of high-quality water is essential to the operation of a piggery for the health and wellbeing of the pigs, and also for cooling, cleaning and feed constitution (where liquid feeders are used). Water may be drawn from underground aquifers, surface water (eg dams and streams) or the mains supply. Some piggeries have an on-farm chlorination plant to ensure water quality.

Most piggeries use nipple drinkers rather than bowls or troughs because of the difficulty in keeping bowls or troughs clean. However, nipple drinkers can become blocked, potentially leading to dehydration of penned animals. One nipple drinker per 10 pigs is generally used for weaner and grower pigs. Average consumption is 3 litres/day for weaners, 5–6 litres/day for growers/finishers, 11 litres/day for dry sows and 17 litres/day for lactating

sows. Factors such as quality, flow rate, temperature and availability can affect the amount of water consumed.

Water may also be provided via liquid feeding as an alternative to separate feeders and waterers. Usually a ratio of 2.5:1.0 (water:feed) is used, but this may vary. This system is popular for lactating sows, as it reduces the need for cleaning, reduces water and feed wastage, and may increase feed intake.

The water supply to a piggery must be capable of providing significantly more than the normal requirement, because during an EAD response, large amounts of water may be needed for decontamination of vehicles, equipment and sheds.

Box 2.25 Water

Features relevant to the control of EADs

Maintaining an adequate supply of water is important to piggeries. Sufficient capacity is required to supply the pigs with drinking water; to clean pens, yards and vehicles; and for decontamination during an EAD event.

Water quality on piggeries is likely to be high, facilitating its use for cleaning and mixing with disinfectants for decontamination.

Waste

Disposal of effluent and solid waste is a major consideration in the siting, structure and management of a piggery.

All piggery waste needs to be considered in terms of the possible transfer of pathogens that can cause human or pig disease. The *National Environmental Guidelines for Piggeries* (APL 2010b) describe good agricultural practices that will protect human health and prevent the transfer of pig pathogens.

Effluent

Flushing systems are used in many intensive piggeries to keep the piggery clean. The process of flushing away the 2.5–3.0 kg of manure produced by each standard pig per day results in large volumes of effluent and sludge. Typically, this is initially stored in large holding ponds where anaerobic decomposition occurs. Pipes or lined, open channels may be used to convey the effluent from the sheds to the pond.

Although disposal can be achieved by evaporation in drier areas, effluent is commonly applied to pastures and crops because of its high nutrient value. When it is applied to crops and pastures, an accurate estimate of its composition is required to determine the appropriate rate of application. It may be diluted with water when used for irrigating crops. However, soils do not have an unlimited capacity for effluent reuse, and the sites need to have soils suitable for irrigated crop production and rapid nutrient removal.

During extended periods of wet weather, effluent cannot be applied to land, and the pond system must have sufficient capacity to contain both the inflow of waste and the volume added from rainfall.

Livestock should not have access to effluent treatment lagoons and, for at least a month, should not graze areas where effluent has been applied.

Box 2.26 Effluent

Features relevant to the control of EADs

Effluent may contain infective disease agents such as the virus that causes Aujeszky's disease. It may be possible to contain effluent for the duration of any quarantine period. Treatment and decontamination may also be possible within existing systems.

Use of existing effluent containment systems may be possible to contain run-off from cleaning and decontamination activities.

Manure, sludge and deep litter

Manure management is an important task on many piggeries, especially where pigs are housed outdoors or in shelters. Pig manure, which includes faeces and concentrated urine, has a high nitrogen content. It will often be composted with straw or other organic bedding material, as on its own it is too strong to be used directly as a fertiliser.

About 200 kg of wet litter is produced per pig during the growing and finishing phase of production. Unlike manure, wet litter can be applied directly to pasture or crops. However, it is more commonly composted and used as a broadacre fertiliser at a rate of 15–20 tonnes/hectare to improve the availability of nitrogen to the crop. It may also be sold to increase the profitability of the piggery.

Box 2.27 Manure and sludge

Features relevant to the control of EADs

Manure has the potential to harbour disease agents, and movement of raw manure off-site does present a risk. However, manure is generally under tight control and treated so that survival and transmission of disease agents is unlikely. Nevertheless, contamination of manure is relevant to the control of foot-and-mouth disease and some other EADs, and may require attention in some circumstances.

Regular cleaning of pens significantly improves animal health and welfare.

Most piggeries will have on-site equipment and expertise in pen cleaning that can be used to minimise the number of extra personnel and pieces of equipment that need to be brought on-site.

Most piggeries will be able to compost manure and other waste material from pens. If suitable, composting can be used to control the EAD in question.

In many piggeries, composted manure can be spread onto land on the same property, which minimises the cost of disposal.

Carcasses

Piggeries typically have annual mortality rates of 10–15%, 4–6% and 6–10% among suckers, the growing herd (weaners, growers, finishers) and sows, respectively.¹¹ Carcasses are removed from the pens following daily inspection. The larger carcasses are generally lifted using a loader or carry-all rather than being dragged away – this latter option could result in the discharge of blood and other body fluids, and potentially create occupational health

¹¹ Mortality rates mentioned are for intensive systems. Those for outdoor units can vary due to environmental factors, which should be taken into account.

and safety issues. A single postmortem site is used, generally some distance from the piggery to reduce visual pollution. The area may be secured by fencing to reduce entry of wildlife or feral pigs.

On farm, dead pigs are usually buried, burnt or composted. At processing plants, they are usually rendered. However, pick-ups of dead stock by contract waste disposal companies are common in Victoria. Biosecurity measures must be implemented to prevent spread of disease by pick-up staff, equipment and vehicles.

Some piggeries have a contingency plan for the disposal of large numbers of pigs and possibly the entire population. This will be based on knowledge of the soil type and profile, and the characteristics of the watertable in the immediate vicinity of the piggery. In many cases, the plan will have pre-approval from environmental authorities. Even if pre-approval has been obtained for mass disposal on-site, the relevant environment protection agency will need to be advised that this disposal method is to be used and provide a representative to join the disposal team.

Box 2.28 Carcasses

Features relevant to the control of EADs

Piggeries are experienced in dealing with a small numbers of pig carcasses of all classes. Many will have a contingency plan to manage the disposal of large numbers of carcasses.

Many sites will have logistical, physical and environmental limitations on disposal of large numbers of pig carcasses.

Even where pre-approval has been obtained for mass disposal on-site, the relevant environment protection agency should be advised that this method is to be used and provide a representative to join the disposal team.

Temperature and ventilation

Pigs of all ages are susceptible to temperature changes. The critical temperatures vary with the weight of the pig and the specific conditions within a piggery. Young pigs suffer most from the cold; older and larger animals succumb first to rising temperatures.

The most favourable temperature for newborn piglets is 30–35 °C. The temperature is gradually reduced so that, by the 4th week, it is maintained at 24–26 °C. Early in its life, the piglet's ability to withstand cold is very limited, and losses can occur very quickly where the microclimate remains below 16 °C. Most piggeries will have thermometers and closely monitor the temperature.

Temperatures above 27 °C are considered undesirable for growers, finishers and breeders. Heat stress, porcine stress syndrome and death are all possible outcomes of poor temperature management. Pigs can control their temperature only by evaporative cooling; a mix of overcrowding and poor ventilation can be particularly difficult to manage.

There are three ways to control temperatures in piggeries:

- Ventilating (on its own) will reduce the temperature of a shed.
- Insulating the roof and walls will reduce heat gain or loss by conduction.
- Draught-proofing will reduce uncontrolled air change.

If there is sufficient air movement at the pig level, the potential for heat stress can be further reduced with the use of drip cooling in farrowing areas and spray cooling elsewhere.

Independent of environmental conditions, a minimum amount of fresh air (depending on the number and class of animals housed) must be introduced into a building to remove water vapour, carbon dioxide, ammonia, airborne dust, bacteria and odours.

Box 2.29 Temperature and ventilation

Features relevant to the control of EADs

The propensity of pigs to be readily stressed by temperature must be taken into account when planning control activities. Otherwise, pig welfare could be compromised.

Maintaining pig health

Daily health monitoring is carried out by employees who are trained in the early detection of endemic pig diseases, and who understand their responsibilities to report unusual signs of disease. All piggeries maintain regular inspections, including checks of production records and postmortem examination of abnormal mortalities, because several endemic diseases can spread rapidly if not detected early.

In intensive piggeries, good hygiene practices help minimise disease problems and maximise production. These depend primarily on the design of the piggery, management, routine cleaning and disinfection, and good housekeeping.

Ventilation is particularly important, as adequate airflow helps remove many airborne particles, including clumps of microorganisms. This improves air quality and reduces the risk of respiratory disease. Overcrowding, especially in hot, humid weather, lowers hygiene because pigs defecate more to keep themselves cool. It also increases susceptibility to disease, heat stress and porcine stress syndrome.

Most piggeries employ a veterinarian (and often a pig specialist) to assist with disease control. Larger piggeries have one or more veterinarians on their staff.

Routine treatments and postmortem examinations are commonly performed by piggery staff under the general direction of a veterinarian. Animals showing signs of illness will either be held in a hospital pen until healthy or returned to their original pen after treatment if the matter is minor. As a result, any disease is likely to be detected early and dealt with promptly.

Most farms do not have a quarantine facility for new breeding stock, reducing their ability to provide any real protection against diseases they could introduce. High health-status herds are most likely to have an effective isolation facility. Where one is used, introduced stock may be held for a month for observation by a trained person.

An isolation facility is not practical for grower-finisher farms, which regularly introduce growing pigs as part of multisite enterprises. All-in-all-out systems provide a degree of isolation for each batch, which generally ensures that any introduced disease will remain contained.

Box 2.30 Maintaining pig health

Features relevant to the control of EADs

A high standard of daily disease monitoring and follow-up provide confidence of early detection of unusual signs of disease.

Most piggeries have an alert and trained workforce that is experienced in the daily monitoring of pig health and early reporting of possible disease. They can promptly implement site control and can be incorporated into health monitoring activities during an EAD response.

However, additional effort may be needed to familiarise health-monitoring personnel with EADs, especially EADs with clinical signs that have not previously been seen in Australia.

Newly introduced pigs may not have undertaken any quarantine before entering a piggery. However, batch management will generally provide adequate biosecurity.

Wildlife and feral animal control

Buildings in piggeries may be bird-proof and rodent-proof, but some farms or components (such as ecosheds) are difficult to protect. Free-range farms generally have no protection and are more likely to be open to direct contact with wildlife, foxes, feral pigs or feral cats.

Water reservoirs, such as dams and effluent ponds, are difficult to protect from waterfowl. They may need to be evaluated during an EAD response to determine whether they are attracting excessive numbers of wild birds.

Box 2.31 Wildlife and feral animals

Features relevant to the control of EADs

Some piggeries (especially smaller and noncommercial ones) will have inadequate or minimal biosecurity against the entry of wildlife and animals such as feral pigs.

3 Emergency animal disease contingency planning

Knowledge of the procedures used by government authorities to control emergency animal diseases (EADs) will assist piggery managers to prepare a piggery EAD response plan (see Appendix 2) to be used when an EAD is suspected or confirmed. This will complement the work of the state or territory disease control authorities managing a response, and assist the development of a collaborative approach to control.

As the scale of pigmeat production increases, the disease risk increases through:

- increased management complexity
- increased potential for human error
- multiple movements on and off multisite operations
- proximity of farms to one another.

At the other end of the scale, smallholder and noncommercial piggeries present another set of disease risks, which could include:

- minimal management
- lack of knowledge about EADs
- minimal biosecurity
- difficulties in tracing pigs (eg if they are purchased from markets)
- poor appreciation of EAD response management.

Viruses (the disease agents that cause most EADs) can be transmitted between pigs and piggeries in many ways, depending on the specific virus and its ability to withstand environmental conditions. Contact with an infected animal is the most common way infection is spread once an EAD agent has been introduced into a country. Live pigs pose the greatest danger of spreading disease agents because they may be transported from farm to farm (eg gilts and boars, weaners and growers), and from farm to saleyards (all categories of pig).

However, some viruses can also be carried mechanically on inert materials, including vehicles and equipment. Although these sources are less likely to transmit viruses than an infected animal, this mode of transfer must be considered in planning preventive measures. In addition, pigs transported to abattoirs in open trucks could disperse virus-laden dust and waste during the journey.

Each type of piggery has a range of issues affecting EAD preparedness and control. This manual seeks to help all producers improve their understanding of the potential impact of EADs. It also describes control procedures and encourages producers to prepare a response plan that best suits their enterprise.

In most outbreaks of a pig-specific EAD, piggeries not directly affected may be able to continue to operate, subject to some initial movement restrictions and additional hygiene and security measures. Products and byproducts may have to be held at abattoirs until

cleared, treated or decontaminated. People, vehicles and equipment will need to be decontaminated before entering and leaving piggeries.

The socioeconomic impact on the industry and affected individuals, and the consequent loss to associated parts of the industry must be balanced against the direct costs and the benefits to the industry of eradicating the disease.

The information provided in this section must be read in conjunction with the following AUSVETPLAN manuals that contain current and detailed information:

- **Summary Document**
- **Operational procedures manuals**
 - **Valuation and Compensation**
 - **Destruction of Animals**
 - **Disposal**
 - **Decontamination**
 - **Public Relations**
 - **Livestock Welfare and Management**
- **Disease strategies** (for major EADs).

Piggery managers should be familiar with the structure and content of these manuals, and able to access them via the internet.¹²

Definitive advice on all situations is not possible because of the uncertainties involved in responding to EAD outbreaks. Different EADs have specific clinical features that can differ in intensity and location. The scenarios described in this manual are based primarily on the detection of foot-and-mouth disease (FMD) in Australia. FMD is a good example because it is highly contagious, affects pigs and has implications for the other major livestock industries. Where applicable, the issues associated with an outbreak of a pig-specific disease, such as porcine reproductive and respiratory syndrome (PRRS), will be highlighted, as well as the implications of a disease that may be infectious for humans (zoonoses). Information on special considerations that apply for significant EADs is in Appendix 1.

Control of a highly contagious disease requires prompt action if spread of the disease through the industry and other industry sectors is to be stopped. Thus, the major initial action taken during significant EAD outbreaks is controlling the movement of pigs (and other susceptible species) and potentially infectious materials to contain the disease and increase the likelihood of successful containment. Individual property quarantine on infected premises (IPs), suspect premises (SPs) and dangerous contact premises (DCPs), and movement controls based on declared areas (control and restricted areas) will be imposed.

¹² www.animalhealthaustralia.com.au/programs/emergency-animal-disease-preparedness/ausvetplan/

A hierarchy of increasing EAD response actions and impacts on piggeries will apply in the following situations:

1. Immediate effect on piggeries following a diagnosis.
2. A piggery with no suspicion of disease located in a restricted area (RA) or control area (CA).
3. A piggery with an actual disease or evidence of contact with infection (such as strong links to an IP).

3.1 Immediate effect on piggeries during a livestock standstill

In an EAD outbreak, animal health authorities may immediately restrict the movement of pigs (and other livestock species) as a key disease control action. In a worst-case scenario for a rapidly spreading disease such as FMD, this may be by implementing a nationally agreed standstill on all livestock movements, generally for a minimum of 72 hours, which will affect the operations of all piggeries. For some pig EADs, movement restrictions are likely to be limited to specific regions, or to the affected state or territory. The restrictions will have legal force under the relevant state or territory legislation, and a formal permit may be required before any movement may occur.

In areas directly affected or likely to be affected by a disease, producers will learn of the restrictions by formal notification from a stock inspector or when a load of pigs encounters a security roadblock while travelling. Piggeries in areas not directly affected by a disease declaration will commonly learn of the nature and extent of restrictions via the media or a PorkSAFE alert.

Whatever the situation, producers may need to manage a medium-term situation in which no pigs will be permitted to arrive on their property, leave their piggery for slaughter, or move to a weaner or grower piggery. This will have wide implications for pig farms when managing and organising:

- feed supply
- transport operators
- on-farm and off-farm veterinarians
- effluent removal
- other livestock species present at the piggery
- movement of people
- artificial insemination.

Pigs that have left a piggery will generally be allowed to continue to their destination. Where pigs cannot promptly arrive at their destination or return to their source piggery, they may have to be directed to another premises, such as an abattoir. This will be authorised by animal health authorities to ensure the welfare of the pigs.

Movement restrictions may continue beyond an initial standstill – for as long as the declarations remain in force – if the piggery is located within a CA or RA, as described in Section 3.2.

During a standstill and disease response, all contacts with infected, suspect and dangerous contact premises will be traced by the state or territory authorities. Tracing will apply not

only to pigs, but to all animal products, vehicles (eg livestock transport vehicles, feed trucks, cars), materials (eg hay and grains) and people (eg veterinarians, contractors, feed representatives, visitors).

Piggeries should ensure that their movement records are set up to identify the source of pigs (property identification code [PIC] of last property of residence) and the pigs' current locations on the property. This will allow options for the segregation of newly arrived pigs to be assessed and accurate information to be provided if the piggery is contacted with a request for information on a trace.

Although the initial impact on small producers is likely to be minimal, larger producers will face increasing difficulty in managing their pigs under such controls. Most producers could manage for a week or even longer before serious impacts become evident.

The implications of a situation involving prolonged movement restrictions and some options to manage during the affected period are discussed in Section 3.2.

Box 3.1 Management for certain piggeries during temporary movement restrictions

Breeder farms

Biosecurity on primary breeding farms will be high because of the value of the stock. Since movement is generally one way (ie off piggeries), these piggeries present little risk. It is not expected that they would be involved in a disease outbreak, except in the unlikely event of the windborne spread of an agent.

Other breeder facilities are of almost equivalent status and risk. An audit of all movements on and off the premises should be undertaken to identify all possible points of contact with potential sources of infection.

Breeding stock in transit will normally be able to complete their journey, or may be directed to immediate slaughter, if available.

Weaner farms

Weaner farms are at risk of disease because the pigs may be sourced from several sites and are therefore susceptible to disease. There may also be rapid spread because the pigs have been mixed and will already be under stress.

Weaner pigs in transit from a breeding facility to other farms are unlikely to be affected but are highly susceptible to many EAD agents. If they cannot promptly and safely complete their journey, they have no carcass value, and a decision on their disposition (probably slaughter) will require prompt action.

Grower-finisher farms

Grower-finisher farms are at the highest risk of infection being brought onto the farm due to the regular introduction of new stock. Normal biosecurity precautions will usually be effective. This type of production unit will be most affected by the need to move high-value pigs to slaughter while they are in specification.

Outdoor and free-range farms

In most cases, it is expected that outdoor and free-range farms will be able to hold pigs for several days without major problems.

3.2 Piggery with no suspicion of disease located in a restricted or control area

In addition to the preceding issues, piggeries located in RAs and CAs will be affected by the more intensive and prolonged disease control actions taken to further restrict the spread of the disease. This includes indentifying IPs, SPs, DCPs and trace premises.

The industry liaison officers in the local disease control centre (LDCC) and state disease control headquarters play a key role between the operations section of the control centres and piggeries within the RA and CA, respectively, to help minimise the effect on business continuity while the movement restrictions are in place.

Piggeries with an agreed piggery EAD response plan (see Appendix 2) may have an advantage, as the LDCC may more readily accept their proposed pig movements during the disease response.

3.2.1 Pig movements

Depending on the disease, a grower-finisher operation may be able to continue operations if an abattoir is part of an integrated enterprise or is included in the declared area in which the operation is located. For example, in the case of some EADs, including Aujeszky's disease, PRRS and transmissible gastroenteritis (TGE), it is unlikely that any restriction would be placed on healthy pigs consigned for immediate slaughter. Restrictions would also not apply for a mosquito-borne disease such as Japanese encephalitis (JE).

If finished pigs are permitted to travel to an abattoir, business decisions on their eventual marketability will be required. It may not always be practical to process and maintain large numbers of pigs in storage when they are ready to market. Pigs may need to be stored when the presence of an EAD results in loss of access to an export market and the piggery relies solely on that export market, or where an abattoir has limited freezer capacity.

Although weaner pigs may be permitted to travel to a grower-finisher piggery, the source will be closely scrutinised to ensure that the source piggery is not implicated in the outbreak. A permit to move pigs sourced from outside a declared area to the piggery may be difficult to obtain.

Where pigs are allowed entry to a piggery during the emergency, they should initially be isolated as far away as possible from other pigs as an additional precaution against disease transmission.

3.2.2 Managing a disease-free piggery when controls over pig movements are prolonged

Producers will need to consider a range of options to manage their pigs through the emergency. Given the variable nature of pig-producing enterprises, such options will need to be tailored to each piggery and its operations.

Options that could be considered for single-site piggeries include delaying weaning, euthanasing piglets and weaners, 'boxing-up' age grades and increasing the stocking density. This last option can be done by:

- increasing the amount of pen space available to groups of pigs; this would be specific to the farm and could include building pens around ecosheds, or creating or extending yards to house more weaners and growers outdoors
- increasing the pen stocking rate

- restricting feed supply or adjusting the composition of diets, which would ensure that pigs are fed (and secure their welfare), but may mean they no longer have the specialised feed for their class or age.

However, each of these strategies is associated with potential welfare issues from reduced feed amount or composition, decreased feeder space per pig and increased behavioural problems (eg tail biting).

In hot weather, when pig growth is slower, flexibility will be reduced as pigs will have to be held for longer. Generally, more flexible management will be possible in spring and autumn.

Multisite piggeries and integrated operations will need to make additional plans to hold all classes of pigs on their current site. Although the above options will assist with initial plans, breeder farms will need to make decisions on the continuation of farrowing, and management of piglets and weaners. Batch-farrowing operations may find it easier to manage these problems. Euthanasing piglets and weaners is a possibility, as is aborting pregnant sows. However, this last option is not generally seen as acceptable.

It may be possible to facilitate the transfer of pigs between associated properties by developing with animal health authorities, before any outbreak, a pre-agreed compartment plan for the whole enterprise, which would effectively quarantine it from the rest of the industry. Additional information on this concept is provided in Appendix 2.

3.2.3 Additional disease management measures

Additional disease management measures include disease tracing and surveillance, and use of vaccines.

Disease tracing

Tracing movements of exposed and potentially exposed animals, and identifying all infected and potentially infected piggeries will be high priorities in a response to an EAD. These actions will continue until the extent of the outbreak is determined. Disease investigation officers will require access to records of all movements on and off the property for up to the past 21 days. They will also need access to the staff responsible for managing pig movements.

Piggeries that purchase pigs from multiple sources or markets have a high risk of being caught up in this process. Their disease status will probably be classified as suspect or trace until the situation is clarified.

Disease surveillance

Piggeries located in declared areas will be affected by the activities of surveillance teams seeking additional information about the extent of disease spread to assist in establishing disease-free or lower risk zones. These teams will have authority to enter piggeries, seek information from key staff, examine pigs and collect samples as necessary.

Within an RA, surveillance will generally involve visual inspection of pigs, but could involve serological testing on piggeries. If a property has a piggery EAD response plan (see Appendix 2), disease control officers may not need to enter the property if the state or territory administration considers the employees capable of recognising EAD symptoms.

Surveillance within a CA will generally be less intensive than in an RA. It may involve abattoir surveillance, serological surveys and investigation of suspected disease reports.

The frequency of inspections will depend on the incubation period of the disease and the risk of exposure. Factors such as the potential for spread of the disease agent by wind or the presence of feral pigs in the area could result in increased intensity and frequency of surveillance inspections. The causative organism of diseases such as African swine fever and swine vesicular disease (SVD) can survive for long periods in the environment. This is likely to prolong eradication and result in an extended period of surveillance.

Use of vaccines

Although vaccination may be considered for a pig EAD under an agreed specific response plan, in most cases stamping out is the standard policy. Vaccines are available overseas for Aujeszky's disease, classical swine fever, JE, PRRS and swine influenza, but none are approved for use in Australia. Processes to access vaccines for emergency use are in place, and vaccines and their prioritisation for use are under review. However, vaccines for the EADs of pigs will not be immediately available following the detection of an outbreak. A decision on the applicability of using a vaccine will be made for each case by the Consultative Committee on Emergency Animal Diseases (CCEAD), taking into account a range of factors, including the nature and distribution of the disease.

The use of vaccination is a complex issue. It is only likely in the event of a protracted outbreak when a specific EAD response plan recommends such action and the policy is agreed by the CCEAD and the national management group. For example, the risk of infection entering a piggery may be minimised by vaccinating all animals in the piggery; pigs may be vaccinated to reduce their propensity to excrete active virus; the likelihood of entry of an EAD such as classical swine fever or PRRS may be reduced by vaccinating all pigs on arrival at a piggery; or new infections may be prevented by vaccinating pigs before they enter a piggery. Vaccination could also be used to create buffer areas to reduce the spread from an IP, as well as to gain time so that disease eradication can proceed.

The use of an FMD vaccine is part of the AUSVETPLAN disease strategy for FMD. How and when an FMD vaccine would be used would be determined by the CCEAD on a case-by-case basis, depending on a combination of complex factors, including:

- the nature and extent of the outbreak
- the assessed risk to pigs in the piggery
- the availability of vaccines
- the potential to salvage vaccinated animals
- other cost-benefit factors.

Other issues that complicate the decision to use vaccines include:

- the resource-intensive and expensive nature of the operation, especially if revaccination is required
- the requirement that each vaccinated pig is individually identified
- the strict requirements for handling vaccines and the training to administer them
- concerns over the management after the outbreak of healthy, vaccinated animals, which may need to be slaughtered towards the end of the campaign to achieve eradication and country freedom from disease – this may pose significant social and trade problems

- uncertainties about the effectiveness of vaccination under Australian conditions
- the risk that vaccination teams may inadvertently spread a disease.

For these reasons, the use of any vaccine will always be treated with caution.

3.2.4 Increasing biosecurity

Piggeries located within a declared area can take a number of steps to improve their existing biosecurity programs and thus reduce the likelihood of a known EAD entering their properties. The specific actions that can be taken will depend on the piggery and its nature. Documenting these additional actions and alerting staff to them is an important precaution that should be included in the piggery EAD response plan (see Appendix 2). The following sections describe some specific areas that require attention.

Personnel

The entry of people should be further restricted to those with a clear and pressing need to enter. Any contact with pigs and their housing should be avoided or subject to careful assessment and precautions.

Piggery staff and their families living on-site or nearby should start special cleaning and disinfection precautions to ensure that they do not move the disease agent from the piggery.

Vehicles

Entry of vehicles onto the piggery during the time of declaration should be tightened to restrict access to essential vehicles. Before any vehicle is allowed onto the piggery, the previous location should be checked to ensure that the vehicle has not entered or had contact with any property that has evidence of disease or is under investigation for any reason. A systematic washing and decontamination procedure should be introduced for vehicles that must enter the perimeter.

Pig management

Precautions that can reduce the likelihood of a disease spreading include avoiding the mixing of pigs from different pens – for example, mixing of weaners from different source properties. Special care should be taken to separate and group together pigs taken from hospital pens. Any pigs identified as high risk for any reason should be kept separate or disposed of as appropriate.

Before pigs are slaughtered, sheds should be closed as much as the weather permits to reduce the chance of virus being spread by birds, vermin or the wind. Information on disposal of carcasses, contaminated equipment and bedding material that cannot be handled promptly may be provided on the quarantine notice applicable to the premises. Where possible, contaminated items should be held in a shed or under cover, or in some other way that prevents virus from being spread.

Equipment and materials

As far as possible, the entry of equipment and materials from any other piggery should cease. For necessary introductions, a systematic decontamination procedure should be introduced.

Feed and feed ingredients may need to be sourced from outside a declared area. Vehicles carrying feed should, if possible, be dedicated to the task and to the particular piggery.

Piggery site preparation

When a piggery is known to be within a declared area, a general clean-up should be undertaken to reduce the likelihood of anything contributing to disease spread. This includes cleaning away any accumulated rubbish, managing areas that might house vermin, fine-tuning procedures for removing manure and effluent, checking perimeter fencing and starting bird-control precautions. A pest-control program should be started, noting that most rodenticides (based on anticoagulants) take up to 2 weeks to provide control.

In the case of FMD, additional precautions that prevent contact of pigs with any stock outside the piggery should also be taken. Other livestock may have to be moved, under permit, from direct contact with any part of the piggery complex.

Box 3.2 Management of piggeries located in a declared area

Breeder farms

If breeder farms cannot move weaned pigs under permit, early decisions will be required to manage the daily or weekly output. This may include holding pigs temporarily on the premises, or destroying them before or after weaning. These difficult decisions will be made by the piggery manager.

There will also be difficulties for primary breeding farms where gilts due to be moved will need to be held on-site.

Weaner farms

Weaner farms will need to hold maturing pigs until movement to a grower facility is approved, make arrangements to hold them and grow them out on-site, or destroy them.

Grower-finisher farms

Grower-finisher piggeries will be able to move pigs to slaughter by permit for several diseases. If they are forced to hold pigs on-site for an extended period, they may rapidly exceed their holding capacity and ability to provide feed.

Outdoor and free-range farms

For certain diseases, pigs held outdoors may pose a greater risk of disease transmission than those held in an intensive piggery. Thus, where possible, the biosecurity of outdoor units may need to be increased.

3.3 Piggery with actual disease or evidence of contact with infection

Many uncertainties are associated with managing a piggery that has infected animals or where there is reliable evidence of contact with an infection such as FMD. However, there is also a large body of information about the policies that apply and the actions that the disease control authorities may take.

The primary objectives in managing an outbreak of FMD and most of the pig-specific EADs are to:

- prevent contact between infected and other susceptible animals
- contain the infection to the IP
- prevent the production of large volumes of virus by infected animals
- minimise the amount of virus in the environment.

These objectives can best be achieved by quarantine of IPs and SPs, and widespread movement controls, including the early establishment of zoned areas that comply with internationally agreed standards. This will allow export markets for all livestock products to be reclaimed as quickly as possible.

Stamping out is the preferred eradication option for most of the EADs affecting pigs because it can quickly resolve a limited outbreak, resulting in the least impact on the industry. It will be the method of choice in the case of an outbreak of FMD. However, stamping out is not the preferred option for:

- insect-borne viral diseases, such as JE (where stamping out would be ineffective)
- milder diseases, such as swine influenza (where a containment policy will operate).

For some diseases (eg SVD or TGE), stamping out would only be applied if a limited number of herds were affected. For other EADs, such as PRRS, stamping out may be modified to allow some slaughter of pigs when they reach saleable weight.

Piggeries affected by an EAD may be able to take actions to reduce the spread of disease between sheds, and limit or slow the spread of a disease through the piggery. Although this may not affect the final outcome on a property, it may provide valuable time to implement control procedures.

There are also steps that can be taken between and within properties to assist the overall disease control response. For example, internal quarantine barriers (isolating noninfected areas from the infected or suspect areas) could be used to reduce the extent of diseases that are spread primarily by close contact. An internal quarantine area, where known suspected infected pigs are held, should:

- not have direct contact with other animals, equipment and vehicles
- not be exposed to effluent or run-off from other parts of the premises, or lead to run-off to other parts of the premises
- have facilities arranged so that these pigs can be handled and fed last
- be handled by dedicated staff, or staff who undertake a decontamination procedure before handling other pigs.

This may be difficult to achieve, but with preplanning may be an option that could allow many animals to be salvaged.

As discussed in Section 3.2.3, animal health authorities may allow vaccination where it is considered that it will help to achieve eradication, or where the disease is found to be widespread and stamping out has been ineffective.

Stamping out is such an overwhelming process that it is important for pig producers to understand the processes involved. A description of valuation, destruction and disposal of

pigs, and decontamination of a piggery follows (Sections 3.3.2 to 3.3.4). Detailed information is provided in the relevant **Operational Procedures Manual**.¹³

Piggery managers should note that all activities will be under the control of the state or territory disease control authorities, and will be managed by a site supervisor. A specific team of technicians (an infected premises operations team, or IPOT) will carry out most actions.

Managers should work closely with the site supervisor, but can only do this effectively if they understand the processes used and have implemented training so that their piggery staff can provide local knowledge and assistance. In large piggeries, it will be helpful if the piggery manager nominates a 'pig controller' to oversee the handling and moving of all pigs in accordance with the plans developed by the IPOT, and an 'equipment and vehicles controller' to oversee the management of feed and feed ingredients.

In all cases, the first step for the animal health authorities will be to place an IP or DCP under a formal quarantine notice, as defined in the relevant state or territory legislation. The terms of such quarantine will vary depending on the circumstances, but generally will formally restrict all pig movements and require the owner or manager to take specific steps to manage the disease.

3.3.1 Management of continuing piggery operations

Management of a piggery that has been declared as an IP or a DCP will require the piggery manager to collaborate with the site supervisor and obtain approval for actions that affect the response. Although the site supervisor is the government officer responsible for all official disease control actions on the premises, the piggery manager can assist by ensuring that proposed actions take account of the piggery's structure and method of operation, including the best location for destruction and disposal of pigs. Ongoing attention will also be required to biosecurity, vehicle and personnel controls, and the care of pigs until destruction.

Vehicle movements

While pigs remain on the piggery, vehicles will need to enter and leave the premises. These may include feed trucks and personal vehicles, as well as excavators and front-end loaders. If the disease can be spread by contaminated objects, vehicle movements must be minimised and tightly controlled, and this may involve restricting the entry of passenger vehicles. It may be possible to develop, in conjunction with the site supervisor, a procedure and route to prevent incoming feed or grain carriers crossing paths with other vehicles, personnel or equipment, and preferably to keep them outside the perimeter fence. This may eliminate the need for their decontamination.

A stringent procedure for disinfecting vehicles leaving a property may be required. This would be supervised by the IPOT.

People movements

Visitors to the piggery should be restricted to those associated with the disease control program. It may be preferable to make arrangements for employees to remain on-site as

¹³ www.animalhealthaustralia.com.au/programs/emergency-animal-disease-preparedness/ausvetplan/operational-procedures-manuals/

much as possible during the clean-up to reduce the potential for transfer of disease elsewhere.

Decontamination of personnel and their clothing may be necessary to prevent the spread of some diseases. This would also be under the control of the IPOT. Records of the destinations of all persons would be maintained.

3.3.2 Valuation and compensation

Payment of compensation for pigs that die or are necessarily destroyed as part of the control of an EAD (as well as any other property that is destroyed) is an integral part of managing EADs. However, it only applies when any destruction is authorised by the state disease control authorities. The EAD Response Agreement contains guidelines for what compensation should be paid (see Appendix 3). The relevant jurisdiction's legislation provides the power for the destruction of livestock and property, and determines the process by which compensation is paid.

The valuation and compensation procedures described in the **Valuation and Compensation Manual**¹⁴ ensure that:

- payment of compensation for pigs and property is rapid and equitable
- valuation procedures do not unnecessarily delay destruction and other eradication measures
- issues that may impinge on valuation procedures are clearly identified
- valuers are properly appointed, and aware of their role and responsibilities.

Authorised valuers are contracted to the relevant state or territory authority, and operate under the direction of the IPOT manager located in the LDCC. They will have appropriate experience in valuing pigs or property, and will be trained in the procedures detailed in the manual.

The definition of 'owner' is relevant, as the authorised valuer has to gain agreement to all valuations. This will not usually be a problem, as the definition includes any legal representative of the owner. A formal definition of 'owner' is given in relevant state or territory legislation. Contract growers are not considered to be owners of the stock they are growing and do not receive compensation for pigs destroyed.

Some items are not eligible for reimbursement, including:

- pigs that die from causes other than the EAD or that would not have been compulsorily slaughtered had they survived
- consequential losses of any kind
- property not intended for decontamination that was inadvertently damaged during a control procedure.

Payment of compensation is a two-stage process. In the first stage, the value of pigs is determined as if they were disease free and as if they were sold on the property where they are to be, or have been, destroyed or have died (ie 'at the farm gate'). In determining a value for a pig, consideration is given to its age, sex, breed, body condition, live weight and other

¹⁴ www.animalhealthaustralia.com.au/wp-content/uploads/2011/04/vac11final.pdf

factors relevant to its class. The determination is guided by information provided in the **Valuation and Compensation Manual**.

The second stage of the process occurs during the restocking of the piggery after it has been released from all restrictions. If the cost of replacement pigs of equal class to those destroyed is greater than the initial compensation paid, top-up compensation is available to make up this shortfall. If the replacement cost is equal or less, top-up compensation is not made available. A time limit may apply to the availability of top-up compensation following the release of the piggery from all restrictions.

As with all financial transactions during an emergency EAD response, payment of compensation will be subject to audit and scrutiny.

3.3.3 Destruction of pigs

In a rapidly spreading disease event, it will be necessary to destroy a large number of pigs quickly to reduce the potential for further spread of the disease agent. It is essential that animals are speedily and humanely slaughtered. Speed is essential because live animals will continue to produce and possibly spread the disease agent.

Guidance on the on-site destruction of pigs using good animal welfare practice is described in the **Destruction of Animals Manual**.¹⁵ This manual provides instructions on acceptable techniques for humane destruction of pigs. The aim is to achieve euthanasia in a single treatment by a rapid loss of consciousness, leading to death with no return to consciousness, and with an acceptable, minimal level of stress to the animal before its death.

Although the logistics involved in destroying large numbers of pigs may at first seem insurmountable, considerable experience has been gained during the management of major outbreaks, such as the 2001 outbreak of FMD in the United Kingdom. During an emergency, resources can be obtained to enable the scaling up of certain activities, such as destruction and disposal, to ensure that they are completed in a timely manner and achieve the objective of minimising further disease spread.

Piggery managers should note that it is a responsibility of the disease control managers to manage any necessary destruction of pigs, including the supply of resources and any additional facilities and equipment required.

A range of destruction methods is outlined in the **Destruction of Animals Manual**, including the use of firearms with free bullets, captive-bolt firearms and lethal injection. Use of carbon dioxide to destroy large numbers of pigs at the same time – possibly in the back of sealed trucks – may prove practical (and acceptable for welfare).

More than one destruction technique may be used. Safety, practicality, availability and efficiency, plus layout of the premises and equipment available on-site, are all taken into account when choosing methods. Trained personnel authorised by the government authority will undertake the task. They will be briefed on welfare and safety aspects of destruction before beginning work.

Destruction of pigs would have to be done in a manner that supports the disposal method(s) chosen for that site. Options include moving pigs to temporary yards erected

¹⁵ www.animalhealthaustralia.com.au/wp-content/uploads/2011/04/Dest3final.pdf

next to the disposal site (eg a trench constructed as specified in the **Disposal Manual**) or an area where mass composting can occur. If heavy equipment is required during the process, destruction will have to be in a place that allows access for such equipment.

Destruction and disposal through an abattoir or by rendering will be considered as options for several diseases, such as Aujeszky's disease and PRRS. This will require careful assessment and approval from the IPOT, after consideration of all relevant factors and consultation with the piggery manager. Where a suitable abattoir is available and willing to process pigs under these conditions, processing, freezer and rendering capacity will be limiting factors.

The aim should be to have pigs slaughtered at an abattoir within the state, because state borders would probably be closed. However, this might not be possible. Other problems may arise, particularly at domestic abattoirs, where there may be no staff on hand to manage pigs that need to be delivered at night. Pigs could also be rejected by an abattoir where there is any concern about their disease status. It may also be necessary for a piggery to provide feed to an abattoir where slaughtering and processing are slow, or to have an agreement that the abattoir will feed, house and dispose of animals at the producer's cost for as long as necessary.

Each piggery will have characteristics that help define the best method for destruction of pigs. In addition to considering this issue as a part of preparedness, when an infection with an EAD is confirmed, a written plan outlining options for destruction of the pigs will be required. Piggery managers can assist this process by considering the destruction methods suitable for the site, the destruction site itself, the order of destruction of animals, the estimated timeframe, and the personnel, facilities and equipment needed. This plan should include an assessment of the occupational health and safety (OH&S) risks associated with the procedure.

3.3.4 Disposal of carcasses

Disposal is a significant part of any stamping-out response. On-site disposal options will be organised and managed by the IPOT, in consultation with the piggery manager. A number of disposal options are available, and more than one option may be used on any one site. In all cases, the first reference document will be the **Disposal Manual**.¹⁶

Disposal of large numbers of dead pigs will present major logistical problems. Primary methods for disposal include burial, burning and composting. Each has positive and negative features, taking into consideration the available facilities, the disposal site, animal welfare and personnel safety.

Each method of disposing of pigs results in pollution of some kind. Burial may result in the contamination of groundwater by the resulting liquid waste, and burning produces airborne pollutants and is visually undesirable from a public perspective. Composting may result in surface-soil contamination and potential run-off into watercourses. In some cases, the watertable may make burial undesirable or impossible. Prior consultation with the relevant environment protection agency should be a part of planning.

In all cases, provision will need to be made to clean and decontaminate vehicles and equipment leaving the disposal site.

¹⁶ www.animalhealthaustralia.com.au/wp-content/uploads/2011/04/DISP-3_0-22FINAL18Jul07.pdf

There may be opportunities to combine several options to increase the overall efficiency of the disposal process. This should be considered not only during, but in advance of, an emergency.

Burial

Burial can be conducted both on-site if the property is large enough and has suitable soil and watertable characteristics, and off-site if this is the preferred option and authorised by the IPOT. Off-site burial infers prior arrangements and approval of a suitable site, and requires additional sealed transport vehicles. Existing landfill sites should be considered, as they may be approved to receive animal carcasses and will have the necessary infrastructure to manage long-term containment issues. The risks associated with transport of carcasses in sealed vehicles to such sites can be managed.

The piggery EAD response plan should include information on whether burial on-site is possible. To determine this, discussions will be needed with local biosecurity and environment protection officers. If burial on-site is not suitable, other burial options should be considered.

Burial on-site will be managed by the IPOT and the piggery manager. Excavators are the most efficient equipment for constructing long, deep, vertically sided pits. (Guidelines for pit dimensions and structure are provided in the **Disposal Manual**.) Excavators also facilitate separation of topsoil from subsoil, and can be used to fill the pits with carcasses and cover them with soil. Selecting the pit design will be a responsibility of the expert team, who will consult with engineers and environment protection agencies on construction of the pit and the need for any lining. The dimensions of the pit will depend on the equipment used, the site and the number of pigs to be buried.

The IPOT and piggery manager will need to consider a number of environmental, OH&S and land-use matters before pit construction. The appropriate authorities (eg state or territory environment protection agency, worker's compensation authority and local council) must be consulted.

Advantages and disadvantages of burial are summarised in Table 3.1.

Burning

Construction of pyres for cremation will depend on the local conditions, available fuel supplies and the carcasses to be destroyed. Carcasses are placed on top of sufficient combustible material so that the arrangement of fuel and carcasses allows adequate airflow and achieves efficient combustion. Guidelines for pyre construction and quantity of fuel recommended are provided in the **Disposal Manual**.

Pit burning is a variation for burning material in a pit aided by fan-forced air.

The comparative logistics and efficiencies of all possible off-site and on-site locations for burning need to be fully examined for each location.

Other novel local approaches to carcass disposal, including industrial or power-station furnaces or commercial incinerators, also need to be considered.

Advantages and disadvantages of burning are summarised in Table 3.1.

Composting

Composting is a natural process in which beneficial microorganisms decompose and transform organic materials into a useful and biologically stable product that is safe for the environment. The process, if carefully implemented and monitored, generates sufficient heat to destroy most disease agents. Composting can be undertaken in an open area that allows access by machinery and equipment.

Aerobic or 'dry' composting is a proven and widely accepted method of disposing of animal waste and carcasses, and is often used where burial and burning are not feasible. Most piggery managers will be familiar with the process because of the need to regularly dispose of carcasses, afterbirth and stillborn pigs. Disposal of large numbers of carcasses by composting in an EAD emergency would require significant scaling up from the processes currently used on piggeries.

Composting requires large quantities of carbonaceous material such as sawdust, manure, straw and peanut hulls, with a ratio of about 3:1 carbonaceous material to pig carcasses. The organic matter reduces odour, attracts few insects and absorbs leachate from the decaying carcasses. Sawdust is considered the ideal carbon source due to its small particle size, ease of handling, absorbency qualities and high carbon content. It is used in the approximate ratio of 6 m³ of sawdust to 1000 kg of pigs. Whatever material is used, regular turning is required.

Although composting can be used to effectively dispose of pigs and associated waste, it may be difficult to implement in an EAD response where there are large numbers of carcasses.

Useful information on managing the composting of large numbers of animals has been prepared by the New South Wales Department of Primary Industries.¹⁷

Advantages and disadvantages of composting are summarised in Table 3.1.

Salvage via an abattoir and rendering

There is potential for financial savings from slaughtering pigs at an abattoir for food processing (human or pet food) or rendering, depending on the disease involved and the policies adopted in the response. However, the logistical difficulties, slaughtering capacity and likely value of the pigs at the time of the outbreak means that the opportunities for using these options are likely to be limited. They will be more attractive where the piggery is close to a suitable facility and the potential for financial savings is high.

In the case of rendering, only plants using a high-temperature batch rendering process with biologically secure separation of raw product and end product are likely to be approved.

Rendering is more likely to be used in outbreaks of EADs in which the number of animals requiring disposal is small.

Advantages and disadvantages of this method of disposal are summarised in Table 3.1.

¹⁷ www.dpi.nsw.gov.au/__data/assets/pdf_file/0009/249543/procedure-disposal-of-large-animals-by-composting.pdf

Table 3.1 Advantages and disadvantages of disposal methods for pig carcasses

Disposal method	Advantages	Disadvantages
Burial	<p>Speed</p> <p>Ability to fill and cover one part of a site while another is under construction</p> <p>Public acceptance</p> <p>Low risk of odours</p>	<p>Need for a suitable area of land</p> <p>Potential risk to groundwater</p> <p>Possible need to treat leachate and gas</p> <p>Possible need for ongoing site monitoring</p> <p>Need for tight biosecurity for transporting pigs to the site</p> <p>Impact on future use or rehabilitation of the site</p> <p>Requirement for large amounts of equipment</p> <p>Occupational health and safety concerns</p> <p>Long period required for decomposition if not handled appropriately</p>
Burning (pyre)	<p>Speed with which the process can be initiated</p> <p>Involvement of minimal technology</p> <p>Need for only short-term monitoring</p> <p>Suitability where a high watertable or unstable or rocky soil types preclude burial</p>	<p>Poor public perception (eg during the foot-and-mouth disease outbreak in the United Kingdom in 2001)</p> <p>Time and resources required to build a pyre</p> <p>Time taken to burn carcasses thoroughly</p> <p>Risk of spread of fire</p> <p>Need for large volume of fuel</p> <p>Rehabilitation of the site, including disposal of ash</p> <p>Public health considerations, including effect on asthma sufferers</p> <p>Effect on air quality, including smell</p> <p>Fire restrictions that may be in place</p>
Burning (pit)	<p>Compared with burning on a pyre:</p> <ul style="list-style-type: none"> • efficient combustion achieved by higher temperatures • better fuel economy • reduced likelihood of fire spreading 	<p>Need for large volumes of fuel</p> <p>Need for specialist operators</p> <p>Noisy operation</p> <p>Limited volume of material that can be handled</p>

Composting	<p>Generation of a useful and safe product</p> <p>Familiarity of piggery managers with the process</p>	<p>Need for large areas of land away from environmentally sensitive water bodies and with an adequate buffer from any residence (does not usually generate offensive odours but may not be aesthetically pleasing)</p> <p>Need for large amounts of carbonaceous material</p> <p>Need for suitable transport to move pigs and carcasses to the site</p> <p>Need for holding yards if pigs are to be slaughtered on-site</p> <p>Need for removal of finished compost</p> <p>Need for heavy machinery to construct and manage compost</p> <p>Need to control run-on and run-off from rainfall; roofing may be necessary in high-rainfall areas to keep rain from leaching through the pile</p> <p>Need to manage potential pests, such as birds, insects, foxes and especially feral pigs</p> <p>Time required to complete the process</p> <p>Difficulty in ensuring a uniform process</p>
Salvage via an abattoir and rendering	Potential for financial savings	<p>Logistical difficulties</p> <p>Insufficient capacity of abattoirs (for slaughtering) and rendering plants</p>

3.3.5 Decontamination of facilities and equipment

Decontamination refers to a combination of physical and chemical processes that kill, remove or reduce disease agents to noninfective levels. In an EAD response, decontamination would be carried out by a specialised group from the IPOT because eliminating agents from premises, clothing, vehicles, tools, carcasses or the environment requires a good understanding of the general properties of each disease agent, and the subtle ways in which they may persist in the environment and infect other animals. For example, although the viruses that cause FMD and Aujeszky's disease are relatively easily destroyed, they can persist, if protected, for long periods in materials such as contaminated bedding, manure and feeding troughs.

If premises are easy to decontaminate, they can be returned to normal operation more quickly. Decontamination is easier if gross organic matter is reduced. Impervious surfaces such as metal or plastic are easier to decontaminate than wood or fibreboard – for example, impervious floors (bitumen or concrete) are more easily cleaned. Steel, cement, plastic and some wooden structures (eg feed and water troughs, posts, rails, wires and cables) can be readily decontaminated, but it may be impossible to decontaminate some wooden structures. These factors may create special problems for wooden-slatted piggeries and outdoor piggeries. In these facilities, materials will be destroyed if they cannot be effectively cleaned.

Preparatory cleaning of surfaces by brushing with a detergent solution is effective in removing disease agents and is an important step towards effective chemical decontamination.

Where decontamination of indoor pens is necessary, manure should first be removed. If the disease-causing agent has poor persistence, such as with PRRS, it may be appropriate to just remove manure from the pen, then wash and spell the pen for an appropriate period. In other cases, disinfection with a suitable chemical will follow cleaning. Resting of pens may be necessary for some contagious diseases. The length of the resting period will depend on the disease.

Outdoor pens and yards also require removal of manure. Shelters should be cleaned, and walls, structures and surrounds may have to be disinfected if the agent is highly persistent. Ecosheds should have all straw or other bedding removed and the concrete floors cleaned. It may be effective to mound the straw and compost it in situ.

Disinfection of offices and other buildings may be necessary because the transit of people may result in areas at high risk of contamination.

When equipment has to leave the premises, it is likely that the IPOT will establish a preliminary clean-down area where items are cleaned with water and possibly detergents. Items are then presented to the entry/exit point clean and ready for final disinfection before exiting the premises. At both sites, fresh water, an ability to contain run-off and a hard base will be needed. Existing structures may be used, or these special areas may be created for the on-site response. The entry/exit point may be on the property boundary or at a defined line that differentiates the clean area from the dirty area. The IPOT and the piggery manager should jointly select these sites.

For additional information, consult the **Decontamination Manual**.¹⁸

3.3.6 Proof of freedom

Establishing whether a property, an area or the whole country is free from an EAD is termed 'proof of freedom'. This is a complex process because premises and a declared area cannot be assumed to be free from the disease agent without intensive efforts to establish that the agent is no longer present.

Depending on the EAD response, healthy sentinel animals may be placed in pens, yards or shelters for a defined period after decontamination is completed.

A program of surveillance may also be required. The nature and period of surveillance will depend on the disease and its causative agent. Each AUSVETPLAN disease strategy details the surveillance procedures used in various stages of an outbreak.

Restocking of partly or fully destocked premises under supervision will be permitted by the state or territory disease control headquarters after a period that will depend on the nature of the disease and the persistence of the agent.

¹⁸ www.animalhealthaustralia.com.au/wp-content/uploads/2011/04/DECON3_2-01FINAL12Dec08.pdf

Appendix 1 Emergency animal diseases of major concern to piggeries

Many emergency animal diseases (EADs) could affect an Australian piggery, including foot-and-mouth disease (FMD), which also affects the cattle, sheep and goat industries. The information provided on diseases in this appendix is intended to help producers understand the key features of the critical EADs that could occur in Australia. The relevant **Disease Strategy or Response Policy Brief**¹⁹ must be consulted when there is a heightened risk of an incursion and especially in the event of an actual outbreak. These documents and Animal Health Australia's website²⁰ (which has links to information including the operational plans developed by state or territory primary industry departments) should also be consulted for information on EADs of pigs.

Major considerations affecting this discussion of EADs in pigs include the following:

- FMD stands alone as the only exotic disease affecting pigs that is also a major threat to the other livestock industries. The pig industry would be only a relatively small part of the livestock industries affected by an outbreak and only one of many parties seeking a prompt and effective response. It is also possible that an outbreak of FMD in another species of livestock (and not in pigs) will result in movement restrictions that are likely to affect the profitability of individual pig producers and the pig industry in general.
- Where significant numbers of feral pigs are close to a piggery, they present a significant risk of harbouring or spreading pig EADs. The best protection is a pig-proof fence around the farm. In addition, a local area control and monitoring program could be established to control their numbers. Depopulation of feral pigs in an area may be feasible in a localised EAD outbreak.
- Regardless of which EAD has been detected, movement restrictions of some magnitude will initially be applied while the situation is thoroughly assessed, and the nature and distribution of the disease determined. In every case, pig producers must have a plan to hold pigs on farm for a minimum of 72 hours and potentially much longer.

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¹⁹ www.animalhealthaustralia.com.au/programs/emergency-animal-disease-preparedness/ausvetplan/

²⁰ www.animalhealthaustralia.com.au/

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African swine fever

African swine fever is a highly contagious viral disease causing variable mortality, fever, reddening of the skin, incoordination, diarrhoea and pneumonia. It is clinically indistinguishable from classical swine fever, and laboratory tests are necessary to identify either disease.

African swine fever is present in most of a sub-Saharan Africa and remains endemic in the Iberian Peninsula after spreading there in the 1960s. It spread from there to a number of other countries, but has subsequently been eradicated from most of them. Outbreaks have since occurred in the Caucasus – Georgia, Russia, Azerbaijan and Armenia. The disease has not occurred in Australia, and the pig population is highly susceptible.

An uncontrolled outbreak of African swine fever would cause severe production losses, with consequent dislocation and financial losses in the pig industry and associated services.

The virus survives for long periods under most environmental conditions and is resistant to many treatments. It is stable over a wide pH range, but is very sensitive to lipid solvents and detergents, and to oxidising agents such as hypochlorite. It may survive for many months in raw, unprocessed, frozen meat, and some data indicate that it can remain viable on premises for 3 months or longer.

Pigs with acute disease shed high concentrations of the virus in oral secretions and in faeces and urine. Transmission readily occurs by contact between pigs. Ingestion by pigs of products from infected pigs and use of infected semen may also transmit the disease. Transfer of the disease by veterinarians, veterinary instruments (especially hypodermic needles), vehicles that have carried infected pigs and flies have all been implicated. African swine fever is not transmitted in the air from one piggery to another, but it does spread in the air within a piggery.

The disease can be spread by blood-sucking insects, such as mosquitoes, and an insect control program should be carried out on properties implicated in a disease outbreak.

This disease can spread rapidly over long distances by transport of infected pigs or infective materials, and strict movement controls are essential to successful eradication. Given the variable and possibly inapparent nature of the infection, it may take several weeks before there is any confidence in the distribution of the disease. Thus, the imposition of movement controls will have a significant impact on the industry. It may be possible to apply different movement controls to piggeries of different statuses once the distribution is understood.

Eradication is extremely difficult, even in controlled herds. If feral pigs become infected, eradication of the disease from Australia may be impossible. Eradication of major outbreaks in other countries has only been achieved by national depopulation of pigs. There is no effective vaccine for this disease.

The default policy for responding to an outbreak of African swine fever is to control and eradicate the disease in the shortest possible time by subjecting infected and suspect

piggeries to stamping out. This policy may need to be modified if the disease is found to be already well established in the pig industry. The actual policy will be determined by how early the outbreak is detected, the extent of the outbreak, the location of infected premises, virus and virulence factors, and whether feral pigs are involved.

African swine fever

Relevant features

African swine fever is indistinguishable from classical swine fever and is equally challenging to diagnose, given the wide variety of nonspecific clinical signs, the variable course of the disease and the postmortem pathology.

The virus is very hardy and can survive for long periods outside the host, making the rapid elimination of major sources of virus imperative.

Pigs with acute disease shed high concentrations of the virus, so it is readily transmitted between pigs. Mechanical transfer on instruments, on vehicles and by biting insects may occur.

The inapparent nature of some forms of this disease makes its establishment in feral pigs especially significant. Smallholder producers are also a risk as they are not easily identifiable, may fail to report disease and may have insufficient biosecurity measures to prevent transmission.

The default response policy is to control and eradicate the disease in the shortest possible time by subjecting infected and potentially suspect piggeries to stamping out. This policy may need to be modified where the disease is found to be already well established in the pig industry.

Initial movement controls would prevent piggeries from turning off any pigs. It may be necessary for piggeries to retain all animals until specific local restrictions are lifted.

Because of the inapparent nature of some forms of African swine fever, it may be some weeks before there can be any confidence that no other properties in an area are incubating the disease. Significantly, during such a period, quarantine measures will be maintained and movements restricted.

Aujeszky's disease

Aujeszky's disease is a viral disease affecting the nervous, respiratory and reproductive systems of pigs. It can also affect wild animals, with sporadic cases in cattle, sheep, goats and dogs; it is invariably fatal in these other species. The disease occurs in most countries of Europe and Asia, and in feral pigs in parts of the United States. It has never been diagnosed in Australia, and the risk of importation is low.

The most severe signs of disease occur in young animals; infection in adult pigs is often mild. The first signs of infection may be abortions, mummified foetuses and stillbirths, which could shortly be followed by disease in piglets. Although the disease mainly affects the respiratory and nervous systems, respiratory signs were not a feature of Aujeszky's disease in New Zealand, where the disease presented as a fatal neurological disorder in piglets and reproductive disease in pregnant sows. Nervous signs are more commonly seen in young pigs, and respiratory signs are usually seen in older animals. The proportion of pigs infected will depend on a range of factors and may vary between 10% and 90%.

Gross lesions are often minor or absent upon postmortem examination. There may be a pussy inflammation of the nasal cavity and pharynx, tonsillitis with fluid retention, and congestion or consolidation of the lungs. In the central nervous system, congestion of the meninges may be noted.

Pigs that recover from infection are immune to further infection. However, during periods of stress, recovered asymptomatic pigs may excrete virus. Effective vaccines have been developed that protect pigs against clinical disease, and reduce the amount and duration of virus shed. Latent infections are not prevented, and transmission of the virus to other pigs may still occur.

Aujeszky's disease is mainly spread by oral and nasal secretions; nose-to-nose contact is the most significant route. Spread may be slow from farm to farm, but within a farm it can be relatively rapid. The incubation period can be as short as 2–4 days in suckling pigs and 3–6 days in finishers. Virus excretion begins 2–5 days after infection and continues for at least 2 weeks. A very high percentage of pigs can become latent carriers for one year or longer, and intermittently excrete virus when the pig is stressed.

The virus is rapidly inactivated by sunlight and dry conditions, but can survive for extended periods in contaminated straw and feeding troughs (10–30 days at 24 °C) and for up to 3 days in effluent. It can survive in offal, but its viability in meat is reduced by postmortem pH changes, and the virus is thus not considered a high-risk contaminant of pigmeat products. The virus can survive on contaminated equipment and veterinary instruments, but humans are not carriers. Acutely infected boars can transmit the virus through semen. Under favourable conditions in densely populated pig-farming areas, windborne spread from farm to farm can occur; however, it is highly unlikely that these conditions would occur in Australia.

The default response policy is to control and eradicate Aujeszky's disease in the shortest possible time using stamping out, with appropriate support from a number of strategies. The actual response policy will be determined by how early the outbreak is detected, the extent of the outbreak, the location of affected premises, the prevalence and severity of clinical signs within infected premises, and whether feral pigs are involved. Strategies to support stamping out include quarantine and movement controls, tracing and surveillance, disposal of infected pigs and decontamination of premises, the use of abattoirs and rendering plants for slaughter and disposal where possible, and zoning and compartmentalisation to define infected and disease-free areas.

The default policy will apply if Aujeszky's disease is not known to be widespread, the infected or suspect population is discrete and able to be controlled, and destruction and disposal of infected herds are manageable. In some circumstances, processing of pigs via approved abattoirs may be allowed. Vaccination may be used to reduce the level of virus in populations and to protect genetically valuable herds. If the disease is found to be widespread when diagnosed or continues to spread despite stamping out, the policy for long-term control will be determined by consultation between government and the pig industry.

Movements of pigs, especially to other pig-producing premises or saleyards, will be disrupted by an outbreak of this disease. However, for animals that are free from clinical signs, direct movement to immediate slaughter will be allowed. It is unlikely that there would be control over semen.

In declared areas, especially in areas where feral pigs exist, compartmentalisation of individual or integrated pig enterprises may be implemented. This would be subject to the enterprise's ability to apply appropriate biosecurity to ensure an acceptable separation between infected and at-risk pigs.

Various vaccines have been shown to be effective, but a gene-deleted vaccine is the vaccine of choice. Vaccination would be considered for breeding animals in herds that have a high prevalence of infection.

Aujeszky's disease

Relevant features

Aujeszky's disease is a viral disease that affects the nervous, respiratory and reproductive systems of pigs. It can also affect wild animals, other livestock, dogs, cats and rodents, with fatal results.

Severe signs are seen in young animals; infection of adult pigs often produces mild or inapparent signs. Nervous signs are more commonly seen in young pigs, and respiratory signs are usually seen in older animals.

Pigs that recover from infection are immune to further infection. Latent infections lasting for one year or more are possible and, during periods of stress, recovered asymptomatic pigs may excrete virus, which significantly complicates control.

The disease is mainly spread by oral and nasal secretions, with nose-to-nose contact the most significant route. Spread may be slow from farm to farm, but within a farm it can be rapid.

The virus is readily inactivated by sunlight and dryness, but can survive extended periods in straw, feeding troughs and offal. It is not considered a high-risk contaminant of pigmeat. It can survive on contaminated equipment and veterinary instruments. Humans are not carriers of the virus.

The accepted response will be to eradicate Aujeszky's disease in the shortest possible time using stamping out, supported where appropriate by a number of strategies. The actual response policy will be determined by how early the outbreak is detected, the extent of the outbreak, the location of affected premises, the prevalence and severity of clinical signs within infected premises, and whether feral pigs are involved.

For animals free from clinical signs, direct movement to immediate slaughter will be allowed. It is unlikely that there would be control over semen. Compartmentalisation of individual or integrated pig enterprises may be implemented where they have appropriate biosecurity.

Classical swine fever

Classical swine fever (hog cholera) is a highly contagious viral disease that results in a wide range of clinical signs and variable mortalities. The disease may appear in an acute, chronic or subclinical form, depending on factors such as the virulence of the strain of virus and the age of the pigs. Outbreaks have occurred in Australia on four occasions – each case was most likely a result of swill feeding.

Because this is an extremely variable disease, it cannot be diagnosed on clinical signs or gross pathology alone. In its acute form, many pigs would be ill and there would be

significant deaths that would quickly bring the disease to the attention of managers. However, classical swine fever can also occur in a mild and inapparent form in which the clinical signs may be nonspecific, such as an increase in ill-thrift. A differential diagnosis must be done to differentiate classical swine fever from other EADs that result in nonspecific signs and from common endemic conditions that produce similar signs. A definitive diagnosis can only be achieved by the submission of samples to a veterinary laboratory.

Transmission is by direct contact with infected pigs or by ingestion of infected products. Although acutely or subclinically infected pigs shed virus for a relatively short period, persistently infected pigs shed virus continuously or intermittently. Thus, the movement of infected pigs is the most important method of spread to new locations. However, the virus has been transmitted by farmers, veterinarians, inseminators and castrators through the use of contaminated instruments, such as the use of hypodermic needles on more than one pig or farm. Pigs exposed to the virus prenatally may be persistently infected for life. There may be an incubation period of several months before they show signs of disease, and virus can be excreted throughout this period. In pigs exposed postnatally, the incubation period is short (2–10 days). The virus can survive in fresh pigmeat and some processed pigmeat products. This can be prolonged for months when meat is stored cool, or even for years when it is stored frozen.

The default policy on responding to an outbreak of classical swine fever is to control and eradicate the disease in the shortest possible time by subjecting infected and suspect piggeries to stamping out. This policy may need to be modified if the disease is found to be already well established in the pig industry. The actual policy will be determined by how early the outbreak is detected, the extent of the outbreak, the location of infected premises, virus and virulence factors, and whether feral pigs are involved.

Live virus vaccines are used by many countries to control classical swine fever and are considered to be very safe and stable. The vaccine produces lifelong immunity from clinical disease within a few days after a single vaccination. During an outbreak, vaccines help to prevent the spread of the disease. However, vaccination is restricted in some countries because it may not be compatible with eradication. No vaccines are currently approved for use in Australia.

The virus is susceptible to a range of disinfectants, including common detergents and alkalis. It can be inactivated in swill by heating, with the swill maintained at a temperature of at least 90 °C for 60 minutes or, if under 300 kPa pressure, 121 °C for 10 minutes.

Classical swine fever

Relevant features

Diagnosis is very challenging because of the wide variety of nonspecific clinical signs, variable course of the disease and lack of specific postmortem pathology.

In acute infections, the virus is generally shed for a short period; however, shedding may start during the incubation period and continue until death, which leads to the risk of spread to other pigs.

Pregnant sows exposed to strains of moderate or low virulence can pass the virus to piglets in utero. The piglets may then shed large quantities of virus for many months with no signs of disease.

The virus is very persistent in the environment and meat products, and is relatively resistant to heat and pH changes.

The disease may spread rapidly, principally by direct contact with infected pigs or by ingestion of carcass material.

An effective vaccine is available but does not prevent shedding of virus. No vaccines are approved for use in Australia.

The inapparent nature of some forms of this disease makes it especially difficult to control in feral pigs; it is also difficult to control among smallholder producers, who are not readily identifiable, may fail to report disease and may have inadequate biosecurity measures to prevent transmission.

Initial movement controls would prevent piggeries from turning off any pigs. It may be necessary for piggeries to retain all animals until specific local restrictions are lifted.

Because of the inapparent nature of some forms of the disease, it may be some weeks before there can be any confidence that no other properties in an area are incubating the disease. Significantly, during this time, quarantine measures will be maintained and the movement of pigs restricted.

Foot-and-mouth disease

FMD is an acute, highly contagious viral disease of all cloven-hoofed animals, including domestic and wild cattle, domestic and feral pigs, sheep, goats, water buffalo, camel, deer and alpaca. It is characterised by fever and the formation of fluid-filled blisters (vesicles) and erosions in the mouth and nostrils, on the teats, and on the skin between and above the hoofs. Very large amounts of virus are present in all tissues, secretions and excretions before and during the development of clinical signs.

In pigs, the main sign is lameness because of blisters around the top of the foot, on the heels and between the claws. Infected pigs prefer to lie down and may hobble and squeal if made to move. The horny layer may separate and become easily removed from the underlying tissue. Snout blisters may develop, but they quickly rupture. In sows, blisters may develop on the teats and spread over the skin of the mammary glands. Abortion is common and may even be the presenting clinical sign. Significant mortality can occur in piglets. Clinical signs are usually seen after 2 or more days, but the incubation period can be as long as 9 days. Pigs are primarily infected through ingesting contaminated feed, but may also potentially be infected by artificial or natural breeding.

Transmission occurs most readily when animals are in close proximity. Thus, FMD would spread rapidly in a piggery, and clinical signs would be detected within a relatively short time. Spread of infection between properties and areas is usually due to the movement of infected animals or contaminated vehicles, equipment and people, and their clothing and products. The virus could be widely distributed before clinical disease is seen.

The virus is excreted in large quantities in pigs' expired air, all secretions and excretions (including milk and semen), and from ruptured vesicles. Pigs excrete about 1000 times more virus in expired air than ruminants, and this excretion can begin 4 days before clinical disease is apparent. These factors are significant in the potential for virus to spread rapidly from any infected piggery. The virus may remain infective in the environment for several weeks and possibly longer in the presence of organic matter such as soil, manure and dried animal secretions, or on chemically inert materials, such as straw or other bedding.

FMD is the greatest threat to Australia's livestock industries and export markets because it has the potential for rapid and extensive spread, and an outbreak would jeopardise the export of all cloven-hoofed animals and their products. The threat to the pig industry is significant, as this disease may be present in another species yet result in significant restrictions on the movement of pigs. FMD may spread rapidly between all of the major livestock industries. The presence of FMD would result in international restrictions on exports and may affect consumer perceptions of meat consumption.

Piggeries are high risk and present special problems in control because of the concentration of animals. This risk is compounded in piggeries that receive pigs from many sources or markets.

Control policy is to eradicate FMD in the shortest possible time, while limiting the economic impact.

The use of vaccine to control FMD is a complex issue. The vaccine is made to order overseas so that it covers the strain of the virus causing the disease. Its use in Australia would be tightly controlled. Vaccination is a resource-intensive and expensive option that could extend the disruption to markets, defer the declaration of freedom and exacerbate the devastating effects on producers. However, there is an increasing global expectation that vaccine would be used in 'vaccinate-to-live' programs.

The use of vaccination in piggeries would reduce the uncontrolled spread of FMD and assist in managing the destruction and disposal of large numbers of pigs. However, it would also carry significant financial implications for managers because of the ongoing care of pigs that will remain under very tight restrictions for some time and may ultimately be destroyed. Vaccinated animals must be positively identified as they may need to be slaughtered before proof of freedom from FMD is declared – although the vaccine may protect the animal from clinical disease, it may not prevent infection or shedding of the virus.

Foot-and-mouth disease

Relevant features

Foot-and-mouth disease (FMD) would have the most severe impact on piggeries because of the impact on operations of disease control strategies and movement restrictions.

FMD is the only major EAD affecting pigs that also affects other species of livestock. This means that the industry may be affected even if the disease is not present in pigs. It also means that local grazing livestock present a risk of disease spread to a piggery.

Initial movement controls would prevent piggeries from turning off any pigs. It may be necessary for piggeries to retain all animals until specific local restrictions are lifted.

Pigs excrete large amounts of virus in respiratory aerosols and, as the main amplifying hosts, are extremely important in spreading the disease. Disease control authorities are thus likely to pay special attention to any piggery located in a declared area.

Infected and potentially suspect piggeries would be subjected to stamping out, which involves quarantine, slaughter of all infected and exposed pigs, and disposal of carcasses and contaminated animal products. Decontamination to eliminate the virus on infected premises would follow.

Vaccination may be used to minimise the spread of FMD, but is associated with several issues.

Sentinel pigs would be introduced 30 days after disinfection, and restocking would be permitted after an unspecified buffer period (which is likely to be several months). Surveillance for at least 6 months would follow.

Japanese encephalitis

Japanese encephalitis (JE) is an acute mosquito-borne disease mainly affecting pigs, horses and humans. The disease results in abortion, stillbirths or mummified foetuses in sows, and can cause fatal fever and encephalitis in piglets, horses and humans. Inapparent infections occur in cattle, sheep, bats, goats, dogs, cats, rodents, snakes and frogs. Pigs and waterbirds are important amplifying hosts. Australian native fauna could be a significant host for JE virus.

JE occurs in widely dispersed areas in eastern Asia, and there is serological evidence of infection in humans and pigs in southwestern Papua New Guinea. The virus has been isolated from human cases of encephalitis on islands in the Torres Strait, where there is serological evidence of infection in dogs, pigs, horses and humans. In March 1998, seroconversions occurred for the first time on the Australian mainland at the tip of Cape York Peninsula. There were also two cases of clinical disease in humans. The disease has not been found in livestock in Australia.

If the virus enters mainland Australia, it will be transmitted by competent mosquito vectors, with pigs and birds contributing most to the resulting epidemic pattern. The mosquito most likely to be a vector in Australia (*Culex annulirostris*) inhabits all of the country.

Nonpregnant sows show no overt signs of infection; however, pregnant sows may abort, produce mummified foetuses, or give birth to stillborn or weak piglets at term. There is evidence that many pigs become infected without developing clinical signs. Most human infections are asymptomatic, but may progress to severe illness with an abrupt onset of high fever, chills, severe headache, sensitivity to light, nausea, vomiting and other signs of central nervous system infection.

Infection can only be diagnosed by either isolation of JE virus, or detection of JE-specific antibody in serum samples.

A high level of immunity (probably lifelong) is produced in animals following infection with the virus. In countries where the disease is endemic, vaccines are available. Protective immunity develops in pigs within 14–21 days of vaccination with a single dose of an attenuated vaccine. Manufacturers advise that three doses of inactivated vaccine are required to produce protective immunity.

Because of the wide range of susceptible hosts and potential insect vectors, it is unlikely that JE could be eradicated from Australia if it became established. It would need to be controlled through vaccination, although the availability of a suitable vaccine is uncertain.

JE has potential to cause serious disease in humans, and has important implications for the health and international trade of horses. Thus, the overall policy is to control JE in domestic animal populations as necessary to support public health agencies, and the pig and horse industries.

Japanese encephalitis

Relevant features

Japanese encephalitis (JE) is an acute mosquito-borne disease mainly affecting pigs, horses and humans. It results in abortion, stillbirths or mummified foetuses in sows, and can cause fatal fever and encephalitis in piglets, horses and humans.

If the virus enters mainland Australia, it will be transmitted by competent mosquito vectors, with pigs and birds contributing most to the epidemic pattern of the disease.

The virus cannot persist in the environment outside mosquitoes and vertebrate hosts.

Environmental considerations should be directed towards procedures that control insect vectors, including the removal of wastewater that could facilitate mosquito breeding.

In some circumstances, it may also be useful to consider options to increase the separation between piggeries and human populations.

Pigs develop a high viraemia of 2–4 days duration and are major amplifiers of the virus.

Because of the wide range of susceptible hosts and potential insect vectors, it is unlikely that JE could be eradicated from Australia if it became established. It would need to be controlled through vaccination, although the availability of a suitable vaccine is uncertain.

Porcine reproductive and respiratory syndrome

Porcine reproductive and respiratory syndrome (PRRS) is characterised by a marked increase in late-term abortions, stillborn and weak piglets; lowered farrowing rates; severe respiratory disease and high death rates in suckling and weaned pigs; and deaths and a delayed return to oestrus among sows. There may be no clinical evidence of disease in some herds.

PRRS was first diagnosed in Canada in 1979 and spread rapidly through North America in the late 1980s. Over the following 10 years, the virus became endemic in most of the world's pig populations. PRRS has never been diagnosed in Australia.

In sows, the disease episode occurs in phases. The first, which lasts about 2 weeks, is a period of acute illness characterised by lethargy and reduced appetite. The disease spreads quickly through a herd over 7–10 days. The second, or reproductive, phase of the disease occurs as a result of transplacental transmission of the virus. This phase is characterised by late-term reproductive failure and can last from 1 to 4 months.

There is no single consistent feature of PRRS virus infection, and the above description may not be immediately evident given the naivety of the Australian pig herd to the virus.

Gross lesions are usually only observed in respiratory and lymphoid tissue, and are most marked in neonatal and young weaned pigs. Lungs are mottled tan and red, and fail to collapse. Under field conditions, most PRRS-infected pigs are co-infected with one or more pathogens, complicating the diagnosis based on pathology.

Animals that recover following infection are immune and protected from subsequent infection with the same serotype. In an infected herd, a high proportion of pigs will give a positive blood test. Vaccines are available overseas to control PRRS and may be of value in preventing and controlling the disease. However, vaccines should not be relied upon.

The virus spreads easily by direct contact as well as by inhalation, ingestion and coitus, and through needles and possibly bite wounds. There is some evidence of aerosol transmission up to 150 metres. The incubation period for individual animals is 4–8 days, but signs may take longer to emerge in a herd.

The virus can survive in water for 11 days, but is unlikely to survive in the environment for extended periods because it cannot withstand drying and is quickly inactivated in the absence of moisture. There is evidence that it could be spread by infected meat.

The response policy is to control and then eradicate PRRS by the most cost-effective method, using stamping out or a modified process involving salvage of saleable exposed pigs at approved abattoirs and the slaughter of remaining pigs as they grow to a saleable weight. There would be a requirement for pigs from affected farms to be processed by cooking, and sale of pigs for fresh pigmeat from affected farms would be prohibited.

The movement of replacement breeding stock around the country will increase the risk of spread. Following infection, some producers could be expected to eliminate infection through farm depopulation programs, combined with salvage and slaughter. Vaccination strategies could also be used to control the disease to the point where eradication from a farm becomes possible.

Vaccination will not be used unless the eradication program fails and the disease becomes endemic. Effective vaccines are available. If PRRS becomes established in Australia, eradication will require special industry commitment and regulatory controls.

Porcine reproductive and respiratory syndrome

Relevant features

Eradication of porcine reproductive and respiratory syndrome (PRRS) virus from herds or subpopulations may be possible using depopulation, or partial depopulation, and eradication by controlled exposure and careful monitoring for the presence of virus.

The disease moves relatively slowly within the herd. Provided that a PRRS virus incursion is detected quickly, there is time to define the extent of infection using blood tests before embarking on any course of action.

There is no need to apply disease control measures to abattoirs, meat processing premises or saleyards, and routine cleaning is all that is needed for decontamination of farm premises.

Pigs can be permitted to move to an approved abattoir, provided that they are slaughtered within 4–6 hours of arrival to minimise the contamination of lairages.

Pigmeat from PRRS-infected farms should be processed as cooked products to prevent any transmission. This may have implications for the sale value.

An approved control program may involve vaccination of seronegative replacement breeding stock 60–90 days before introduction, and breeding to stabilise infection and eliminate it over a 3-year period.

Swine influenza

Swine influenza is a highly contagious viral disease of the respiratory tract of pigs, caused by a type A influenza virus. Various strains of this virus can cause epidemics of acute respiratory disease in pigs, with high morbidity but low mortality. The virus can also persist in endemic situations. Strains of swine influenza virus can be directly transmissible to humans.

Epidemics of swine influenza occur fairly regularly each winter in North America, particularly the mid-western United States, and in Europe. Outbreaks have also been reported in many other parts of the world. In July 2009, pandemic (H1N1) influenza occurred in pigs at several piggeries in New South Wales, Victoria and Queensland, most likely due to infection from piggery workers. These were the first cases recorded in pigs in Australia. A management plan to eradicate the disease from these piggeries was implemented.

The zoonotic potential of swine influenza viruses should be kept in mind when planning and implementing an outbreak response.

Pigs are the main hosts of swine influenza viruses, but there is increasing evidence of interchange of influenza viruses among pigs and other mammalian and avian hosts, either directly or after genetic reassortment. This may be significant in the emergence of new strains pathogenic to humans.

The incubation period in pigs is usually 1–3 days. Pigs begin excreting the virus within 24 hours of infection and may shed the virus for 7–10 days. In immunologically naive herds, swine influenza typically presents as an acute to chronic respiratory disease, with infected pigs showing fever, anorexia, weight loss, coughing, sneezing, nasal discharge and respiratory difficulty. Australian herds with H1N1 infection have also reported abortions in sows with high fevers. In some cases, there is no clinical evidence of the disease.

The main method of spread is via the movement of infected pigs. Humans and birds may also be a source of infection for pigs, and pigs may infect humans and birds. Influenza viruses are not found outside the respiratory tract and associated lymph nodes of pigs; it is therefore unlikely that they would be transmitted in pigmeat or pigmeat products.

Whether swine influenza becomes endemic in a piggery will depend on agent activity, and the number, susceptibility and density of immunologically naive pigs. Farrow-to-finish operations are likely to be of higher risk because the infection is maintained immunologically by the continual production of immunologically naive animals through regular farrowing. Commercial herds are most at risk, especially the larger operations.

Inactivated vaccines for some swine influenza strains are available for use in pigs overseas, but not in Australia. They may not prevent infection or viral shedding. Effective strain-specific vaccines are unlikely to be available at the beginning of an outbreak, but could be developed as part of a response if necessary.

The default response policy for swine influenza is to contain its spread until the outbreak dies out or has been eradicated.

Swine influenza

Relevant features

In immunologically naive herds, swine influenza typically presents as an acute to chronic respiratory disease, with infected pigs showing fever, anorexia, weight loss, coughing, sneezing, nasal discharge and respiratory difficulty.

The risk of infection of humans with some swine influenza strains is significant, and human health risks must be addressed during a response (eg vaccination of piggery workers and issuing personal protective equipment).

Staff with influenza-like symptoms must be managed appropriately and advised not to attend work if they have any signs of respiratory disease or fever. Vaccination of piggery workers with the current human influenza vaccine may be warranted.

Veterinarians should wear protective clothing to minimise the risk of becoming infected and of transmitting infection, and should receive appropriate influenza vaccination.

Effective personal and environmental hygiene and sanitation practices can inactivate influenza viruses or remove them from the environment.

There is little risk of infection from pork and pork products if the pigmeat is handled using hygienic practices.

Swine vesicular disease

Swine vesicular disease (SVD) is an acute, highly contagious viral disease of pigs, characterised by the formation of vesicles on the feet and lower limbs that are clinically indistinguishable from those caused by FMD. SVD virus has also been recovered from sheep and cattle, but disease in these animals is uncommon and they play no part in transmission. The disease was first recognised in Italy in 1966, and since then there have been outbreaks in a number of countries, including Portugal and southern Italy. It may be present in some countries in Asia, but has not been confirmed. It has not occurred in Australia.

The clinical signs of SVD are often mild and easily missed, and may only be detected when animals are individually examined. Pigs housed on rough or hard surfaces tend to have more severe lesions. The earliest signs are fever and loss of appetite, which last for 1–3 days. Infected pigs are lethargic and unwilling to stand. Young pigs tend to show more severe clinical signs than older pigs. Blisters (vesicles) appear around the coronary bands, and may coalesce and rupture easily within 36 hours, leaving a shallow ulcer. The coronary band, horn and sole may separate from the underlying tissue; the line of separation appears as a dark, horizontal line.

Experimental vaccines have been produced, but in endemic areas the disease is too mild to warrant vaccination.

SVD virus is highly resistant to inactivation, a major feature when considering the control of SVD. It is more resistant to heating and desiccation than FMD virus, and resists treatment with detergents and many commonly used disinfectants. It can survive almost indefinitely in refrigerated or frozen pigmeat.

Swill feeding has been responsible for most primary outbreaks. Pigs are mainly infected by ingestion of contaminated feedstuff, direct contact with infected pigs or contact with contaminated surfaces. Virus is shed in the vesicular fluids and other body excretions, starting within 1 day of infection and continuing for up to 3 months. Movement of infected pigs with no visible clinical signs of disease and movement of pigs in contaminated vehicles are the two major causes of secondary outbreaks of disease. Effluent from infected piggeries that drains onto roads or pastures or into creeks could infect or contaminate animals, vehicles, equipment or people.

The policy for controlling an outbreak of SVD is to eradicate the disease by the most cost-effective method, using either stamping out (where only a small number of herds are affected) or an approach in which all saleable exposed pigs are slaughtered at an approved abattoir. If the disease is widespread when found, an industry program may be the only way to reduce its impact on production.

The possibility of confusion with FMD makes any outbreak of SVD a major concern and prompt eradication the preferred option, given the potential for disruption to international trade in ruminants, pigs and their products.

Swine vesicular disease

Relevant features

Swine vesicular disease (SVD) is an acute, highly contagious viral disease of pigs, characterised by the formation of blisters (vesicles) on the feet and lower limbs that are clinically indistinguishable from the lesions caused by foot-and-mouth disease (FMD).

The possibility of confusion with FMD makes an outbreak a major concern and prompt eradication the preferred option.

Clinical signs are often mild and easily missed, and may only be detected when animals are individually examined. Earliest signs are fever and loss of appetite, and infected pigs are lethargic and unwilling to stand. Young pigs tend to show more severe clinical signs than older pigs.

SVD virus is highly resistant to inactivation, a major feature when considering the control of the disease. It can survive almost indefinitely in refrigerated or frozen pigmeat.

Swill feeding has been responsible for most primary outbreaks. Pigs are also infected by direct contact with infected pigs or by contact with contaminated surfaces.

Movement of infected pigs with no visible clinical signs of disease and movement of pigs in contaminated vehicles have been the major causes of secondary outbreaks of disease.

Effluent from infected piggeries that drains onto roads or pastures or into creeks could infect or contaminate animals, vehicles, equipment or people.

The policy for control of an outbreak of SVD is to eradicate the disease by the most cost-effective method, using either stamping out (if only a small number of herds are affected) or slaughtering all saleable exposed pigs at an approved abattoir.

Transmissible gastroenteritis

Transmissible gastroenteritis (TGE) is an acute, highly contagious viral disease of pigs, characterised by profuse diarrhoea and vomiting. It mainly affects young pigs, with many showing symptoms and a high mortality rate. Pigs of all ages are susceptible; however, in pigs older than 5 weeks, infection is milder and there are fewer deaths. The disease is found in many parts of the world, including Europe, the Americas, China, Japan and Southeast Asia. It has not been recorded in Australia.

When introduced into a susceptible naive herd (epizootic TGE), the disease spreads rapidly within 2–3 days, with some degree of appetite loss and diarrhoea in most animals. There is occasionally vomiting. The severity of clinical signs, duration of the disease and mortality rates all decline with age. If the disease becomes endemic in a herd, the clinical signs become less severe. Mortality in piglets is usually around 10–20%. In large units, the disease may persist and clinically re-emerge every 3–4 months. Faecal shedding of TGE virus may persist for up to 2 weeks after recovery from infection.

In natural infections, lesions are confined to the gastrointestinal tract. The stomach may be distended with curdled milk and may be congested. The small intestine is distended with yellow, foamy fluid and contains curdled milk. The intestinal wall is generally thin and almost transparent due to severe atrophy of the intestinal villi.

Pigs that recover from enteric infections with TGE virus develop immunity that gives protection against reinfection for at least 6 months. Herds that have experienced an acute outbreak tend to remain free from the disease until a turnover of farrowed sows results in a large percentage of naive animals within the herd. TGE vaccines produce only partial protection against infection. They may be used to boost immunity in previously infected animals as part of a specific eradication strategy.

TGE virus is very susceptible to sunlight, high temperatures and a range of chemicals. It can survive in the environment for up to 3 days. Carcass material can be a source of infection. Freezing or postslaughter acidification do not significantly affect infectivity.

The main sources of infection are the movement of pigs on and off infected premises and the movement of livestock trucks that have carried pigs. Within a piggery, infection is likely to spread by ingestion of infected faeces, inhalation or ingestion of droplets of faeces, or transfer of carrier stock. There is potential for mechanical transmission via implements. Spread by starlings could be significant during the winter months.

Movement controls associated with an outbreak of TGE will largely be applied to infected properties and are thus unlikely to cause major disruptions other than the prohibition of live pig sales.

The policy for control of an outbreak of TGE is to eradicate the disease by the most cost-effective method, using either stamping out (where only a small number of herds are affected) or slaughter of saleable exposed pigs at an approved abattoir. Alternatively, the virus could be released in herds to allow immunity to develop, followed by elimination of infection from individual herds. If the disease is considered to be out of control, the response will be determined following consultation between the government and the pig industry.

Transmissible gastroenteritis

Relevant features

Transmissible gastroenteritis is an acute, highly contagious viral disease primarily affecting very young piglets and characterised by profuse diarrhoea and vomiting, and high morbidity and mortality.

There is a very short incubation period, and disease spreads rapidly within a herd.

Lesions are confined to the gastrointestinal tract. The stomach and small intestine are congested and distended with yellow, foamy fluid or curdled milk.

Pigs that recover from enteric infections with TGE virus develop immunity that results in protection against reinfection for at least 6 months. TGE vaccines produce only partial protection against infection. They may be used to boost immunity in previously infected animals as part of a specific eradication strategy.

TGE virus can survive in the environment for up to 3 days, but is very susceptible to sunlight, high temperatures and a range of chemicals. Carcass material can be a source of infection.

Movement of pigs and pig transports is likely to be the main method of spread between piggeries. Movement controls will be largely restricted to infected properties and are unlikely to cause major disruptions other than the prohibition of live pig sales.

The policy for control of an outbreak of TGE is likely to be stamping out or slaughter of all saleable exposed pigs at an approved abattoir.

Appendix 2 Preparing a piggery emergency animal disease response plan

Emergency animal disease (EAD) preparedness is concerned with taking steps to prepare for all conceivable eventualities that will follow an EAD incursion or outbreak and developing plans to manage them or mitigate their effects.

A piggery EAD response plan, for management of operations following confirmation of an EAD outbreak, greatly improves risk management and EAD preparedness in the pig industry. The process of developing the plan involves managers and staff examining a series of risk-associated issues. Using these as prompts, practical actions that are specific to their enterprise and will achieve a state of optimum readiness are considered and documented. During development of the plan, consultation with departmental animal health officers trained in EAD responses is highly recommended.

There is ample evidence both in the pig industry and elsewhere that planning and careful consideration of such issues can pay significant dividends should a disease emergency of even a minor nature arise.

The process of developing the plan needs to consider existing piggery biosecurity, and each of the disease control actions and processes that may apply, as described in this manual. Piggery management should examine the impact of each of these measures on operations, including structural and environmental features, and how an EAD response would affect the piggery.

Developing the plan is a two-stage process. The first is to examine the piggery's existing biosecurity protocols and assess their effectiveness in a situation where all movements have been restricted because an EAD is detected in Australia. The aim is to identify areas where the standards and operational measures that protect livestock operations from the introduction and spread of pests and diseases can be improved. This includes examining the security of the perimeter fencing, routes of entry and exit, control of people and vehicles, cleaning and disinfection procedures, and health monitoring and management.

The second step is to examine the two scenarios outlined in this manual: where the piggery remains disease free but is located in a declared area, and where it is confirmed as a dangerous contact or infected premises from which pigs will need to be removed.

In each case, additional planning for the impacts on piggery operations will ease the difficult and often emotional decisions that will need to be made.

In every situation, all staff must be briefed on their responsibilities with respect to contact with the media; any media comment applicable to the disease situation on the piggery may only be made by the appointed representative of the piggery. **The representative will only comment on matters agreed by the local disease control centre (LDCC) and that directly affect the enterprise, given that the EAD outbreak might be associated with trade sensitivities.** Obviously, each piggery will need to advise its suppliers, clients and so on of the situation on the piggery. Communication with Australian Pork Limited (APL) is an important part of managing the media.

The following box outlines some of the additional considerations that may be relevant, depending on the piggery's circumstances and the nature of the EAD. **Piggery managers**

need to consider their own set of circumstances and not rely exclusively on this information. They also need to **discuss the issues with their local animal health authorities.**

If you suspect an EAD on your property

Immediately contact your veterinary adviser, state or territory department, or phone the **Emergency Disease Watch Hotline on 1800 675 888.**

Contain potentially infected animals. Prevent any avoidable contact between suspect and seemingly healthy animals.

Contact APL if veterinarians have a high level of suspicion of an EAD on your piggery.

Quarantine staff from suspect animals and ensure that they have no contact with the media.

Assist the disease control authorities (and the state or territory department of health in the case of a zoonosis) to investigate the outbreak, assess the effect on pigs and eliminate the infection from your premises.

Do not address the media directly, as there may be legal and trade implications, and public safety may be compromised.

Improving piggery biosecurity following declaration of an emergency animal disease outbreak

This section describes actions that every piggery should immediately undertake when there is a declared EAD incursion. Following a declaration, there will be movement restrictions that affect piggeries, but these are likely to be short lived.

Perimeter control. Consider the need for additional signage to deter people – including government and utility employees and contractors, campers and bushwalkers – from entering any part of the piggery complex. Implement a procedure to immediately check the perimeter fence to ensure that an effective barrier is maintained for all species, especially pigs.

In some areas, it may be prudent to carry out a ground survey for feral pigs so that their presence or absence is confirmed and plans can be made accordingly.

Pig arrivals. Where applicable, carefully scrutinise the source of all pigs and refuse entry to any further consignments whose property of origin may be under suspicion for any reason. Increase the intensity of inspection on arrival and have a procedure for immediate in-depth assessment of any pig showing signs of illness. If possible, hold all arrivals in a quarantine area separate from other pigs for as long as is practicable. Where practicable, increase the separation between groups of pigs.

Pig consignments. Consider a program to reduce the number of pigs in the piggery while the emergency continues. If it can be implemented, such a program may provide an increase in capacity that will enable operations to continue for longer than would otherwise have been possible.

Health monitoring. Review the clinical appearance of the EAD concerned and ensure that all employees involved in daily health monitoring and handling of pigs are aware of the clinical signs of disease and the importance of immediate notification of any suspicious

signs. Manage the health status of sheds to maintain the isolation of pens or sheds that have had no direct contact with each other.

Effluent management. Review on-site controls that restrict movement of, or access to, effluent.

Dead pig management. Review procedures, especially postmortem examination, and the cleaning and decontamination of the personnel involved. If composting is routinely used for disposing of dead pigs, consider the option of burial for the duration of the EAD response as a quicker way to ensure that a carcass is no longer accessible.

Stockfeed. Ensure that incoming feedstuffs are sourced from disease-free properties and that commodity vehicles have no contact with piggery equipment or personnel, and are cleaned and disinfected on arrival. Drivers who must leave their vehicle while on the piggery should be cleaned and decontaminated, and have no contact with pig housing.

Vehicle movements. Scrutinise more closely vehicular traffic and allow only those movements that are critical to the continuing functioning of the piggery. Ensure that vehicles and farm machinery are washed and decontaminated before entry and, if necessary, repeat as they leave. Restrict the movement of vehicles and machinery within the piggery to essential activity, and wash and clean vehicles that must move between areas.

People movements. Re-examine the need for people to enter and leave the property, including contractors, agents, suppliers, neighbours and family members, and develop a list of the absolute maximum number and type of person that will be allowed entry. Consider the potential for necessary visitors to park their vehicles outside the gates, and to enter only after appropriate cleaning and decontamination. Tightly control the areas people can go to and limit the need for employees to move between areas of the piggery unless movement is essential to the performance of their role. Wherever possible, confine workers to specific areas of the operation and arrange activities so that the highest risk pigs are dealt with last.

Animal welfare. Estimate when any concern about the welfare of pigs may become an issue as a result of overcrowding if pigs cannot be turned off for some time. Ensure that animal health authorities are informed of this estimate as far ahead as possible.

Business continuity. Outline any options that may be available to the piggery for alternative markets, or any other possibilities that can be assessed at the time if it appears that movement from the piggery to an abattoir or to a grower-finisher facility will be stopped for a significant period.

Planning to manage a piggery with no suspicion of disease located in a restricted or control area

In addition to the biosecurity enhancements described in the previous section, piggeries located within a restricted area or control area will need to consider the following additional issues.

Pig movements

The critical importance of pig movements to the viability of the pig industry is described in this manual. All producers will be affected by movement restrictions. However, the degree to which movement restrictions will affect a business will depend not only on the duration of the restrictions, but also on the size and nature of the piggery, and the options that

management has determined will be most effective in protecting the business and, where possible, allowing trade to continue.

Large, integrated operations have an option to investigate, in conjunction with animal health authorities, the potential for the principles of compartmentalisation to apply to the whole of their operation. To do so, they will need to convince the authorities that a combination of factors – including the isolation of the piggery’s components from other livestock enterprises, high-standard biosecurity arrangements and a well-trained workforce – provide confidence that the risk of an EAD agent entering the establishment is so low that their operation will be viewed favourably when movement permits are issued during the disease control activities.

In all other cases, piggery management should plan on the basis of a worst-case scenario in which pigs cannot move on or off of the piggery for a protracted period. This involves determining how all classes of pigs will be maintained in a healthy state until a decision is made to remove the restrictions, or deciding on their ultimate destination or disposal.

Under current welfare guidelines, the person in charge of the pigs has responsibility for their care and welfare. This may mean that a contract grower has responsibility and that the way in which the pigs are normally fed or managed may need to be changed. There may be significant budgetary pressures, since cost-sharing under national arrangements does not apply to the cost of continued feeding of the pigs while they are confined to the piggery.

Options outlined in this manual for managing production when controls over pig movements are prolonged need to be examined within the context of the piggery’s operations to see whether any offer a practical solution. In particular, delaying weaning, euthanasing piglets and weaners, ‘boxing-up’ age grades, increasing the stocking density by increasing pen space and pen stocking rate, restricting feed supply, or adjusting the composition of diets need to be assessed.

Pigs that are travelling at the time of a movement control declaration may need to be returned, redirected or delivered to their destination, which affects transport operators. There should be a process that guides how to advise transport operators of the options that will be considered. Where necessary, a memorandum of understanding (MOU) should be developed with the transport operators to ensure that the required action is undertaken.

If pigs are to be delivered to an abattoir, consider developing an MOU with the abattoir covering their unloading, care, feeding and slaughtering under the conditions of an EAD response.

Once an EAD response is under way, all such arrangements need to be advised to the LDCC and industry liaison officer so that assistance can be provided wherever possible (eg issuing permits for special movements).

Feed supplies

Feed supplies must be maintained to all pigs at a sufficient level to ensure their welfare throughout an emergency. This may require the development of MOUs with both transporters and feed suppliers to ensure that there are no impediments to supply during an EAD outbreak.

Disease tracing

Consider the impact if a pig is traced from an infected, suspect or dangerous contact property to the piggery. Determine what can be done in the interim to ensure that the location of all pigs is known, and whether additional management arrangements may be necessary in the period until the subsequent status of the piggery is determined.

Disease surveillance

Consider how to manage government disease surveillance teams on the piggery so that their free movement is facilitated. Consider how they will move between sheds and premises with negligible risk of carrying disease agents on their clothing or equipment.

Using vaccines

If a vaccine is approved for use, all pigs will need to be vaccinated. Consider how this may best be performed on the piggery. This may be done with the pigs in situ, or in a race or pen. Vaccination teams can be formed by the disease control authorities, but piggery managers should consider how they can best use their staff to increase the efficiency of this process.

Depending on the size of the piggery, it may prove most effective to have piggery staff perform the vaccination to reduce the potential stress of unfamiliar people in the unit. Although this would ultimately be a decision of the state or territory authorities, its application implies a degree of training beyond what may be normally required, and it would be prudent to have at least one staff member familiar with vaccination techniques.

Piggery preparation

In the case of an FMD outbreak, other livestock (such as cattle and sheep) that are routinely in close contact with a piggery present a disease risk to the pigs because the virus is extremely infectious. There is potential for such stock to move to other properties; therefore, this stock should be removed promptly (under permit) from the vicinity of a threatened piggery.

Plan for a general clean-up of the piggery by identifying all areas where there may be accumulations of rubbish. Plan to carry out a reliable pest-control program.

Planning to manage a piggery declared as an infected or a dangerous contact premises

Depending on the disease, a piggery declared as an infected or dangerous contact premises will be placed under a quarantine order and subjected to intensive actions by the disease control authorities. In a worst-case scenario, all pigs on the piggery may need to be destroyed.

All EAD control or eradication activities on the piggery will be under the formal control of an infected premises operations team (IPOT), and the piggery manager will be a key adviser to the site supervisor. However, the normal roles of employees in continuing management of the pigs will only be affected where drastic actions are required because of spreading disease.

Actions such as vaccination, removal of suspect animals or implementation of internal quarantine to isolate diseased from healthy pigs may offer a reprieve, and in some cases

may be all that is required. For example, an outbreak of swine influenza will normally be contained on a piggery and allowed to run its course if the piggery is secure.

Managing staff

Piggery managers need to plan for the effect of a devastating event, such as depopulation of the piggery, on employees. Employees should be fully briefed and reassured at the earliest opportunity, and provided with counselling if required. Recognise that not all staff may be suitable to assist with the actual destruction of pigs by animal health authorities.

Ensure a close working relationship with the IPOT to ensure that the majority of piggery employees are retained for the duration of all response operations. Using staff knowledge of the site, and its operations, facilities and equipment will maximise the efficiency and effectiveness of the actions. However, staff will need to be made aware that they may be quarantined on-site for the duration of the control activity.

In some cases, it may be prudent to plan to transfer administrative staff to temporary premises outside the piggery perimeter to reduce the potential for them to become contaminated as a result of the increase in people movements associated with the response. Transferring relevant piggery records to temporary premises may also help tracing and other investigations to continue without disruption to other administrative activities.

Where a zoonotic disease (eg swine influenza) is involved, occupational health and safety (OH&S) considerations associated with employees continuing to work in the piggery must be a priority. Consider the availability of suitable personal protective equipment for a zoonotic disease outbreak, and ensure that at least one set is immediately available so that essential pig management can continue.

Managing biosecurity

People movements. The IPOT will further restrict entry and exit to the piggery, and place a formal security team at the entrance. Many additional people will need to enter the property to conduct the eradication procedures, so consider where they and their equipment can be located, and the implications for continuing management of employees and the pigs. All people entering and leaving will be under strict control.

Vehicle movements. Consider arranging for vehicles to park outside if there is no need for them to enter. Areas for parking and for decontamination of vehicles that must enter the piggery should be identified and prepared. Vehicles and machinery that must enter will be logged, and their cleaning and decontamination will be under the control of the IPOT.

Stockfeed. Feed will continue to be delivered until all pigs are destroyed. Vehicles must have no contact with piggery equipment or personnel, and must be cleaned and decontaminated before leaving.

Actions that will assist the eradication of an emergency animal disease

The actions described here are intended to provide a picture of the activities the IPOT will undertake and will have legal control over in a worst-case scenario. Managers need to be aware of these so that they can provide practical and effective advice to the site supervisor and raise awareness among staff.

Planning for stamping out can conveniently be divided into two areas: actions that build upon, or are related to, the tighter biosecurity and other actions described earlier; and actions that are related to the processes of valuation, destruction, disposal and decontamination that will follow.

Valuation

The process to value pigs is provided in the **Valuation and Compensation Manual**,²¹ which should be consulted so that this process is well understood. There is no formal protocol to use piggery records in determining the value of pigs, but it is inevitable that these records would prove useful to the valuer. Consider how to manage records so that the required information is available without affecting confidential information. It would also be useful if the information could be provided off-site so that the valuer only has to enter the piggery when essential.

Plan the order in which pigs may be valued so that the process can proceed in an efficient manner. Compensation is paid to the owner of the pigs, so ownership details will be required if the relevant pigs are on a grower-finisher contract.

Destruction

Destruction of pigs is the responsibility of the disease control authorities under an order, and it is not necessary for piggery staff to be involved. Routine destruction of sick pigs may continue; however, permission should be obtained from the site supervisor to ensure that pigs with the EAD are eligible for compensation.

To assist the IPOT, consider the destruction methods most suitable for the piggery – identify a destruction site, identify the order of destruction of different classes of pigs, and estimate the required timeframe, personnel, facilities and equipment. Options such as destroying pigs in pens and transporting the carcasses to a disposal site, or of moving live pigs to a disposal site adjacent to temporary yards should be considered. The option selected will depend on the characteristics of the site and the number of animals involved. Piggery managers also need to assess the OH&S risks associated with the procedure(s).

Disposal

Consider the disposal methods that best suit the piggery site, and work with the IPOT to make a selection. If available, an area of land on the property should be identified that may be used to compost or bury large numbers of animals, and possibly the entire population. Alternatively, identify and inspect other areas of land that could be used. Obtain formal approvals from other owners, and interim approval from environment protection agencies and local councils to use such areas in an emergency.

Consider whether disposal of some or all pigs through an abattoir is feasible. Discuss with abattoir management and draw up a formal MOU covering all aspects of disposal so that no time is lost should it be necessary to implement this arrangement.

Decontamination

Ensure that the piggery has sufficient water available for cleaning and disinfection of the entire site, and consider whether the additional run-off will require control.

²¹ www.animalhealthaustralia.com.au/wp-content/uploads/2011/04/vac11final.pdf

Sentinel animals

Depending on the disease and whether restocking is a desired option by the owner, sentinel pigs may be placed back into the piggery after a defined period has elapsed following decontamination. If this occurs, arrangements for the feeding, monitoring and management of these animals should be prepared.

Appendix 3 Valuation and compensation

Policy of the EAD Response Agreement

The *Government and Livestock Industry Cost Sharing Deed in Respect of Emergency Animal Disease Responses (2001)*²² establishes a mechanism to facilitate rapid responses to certain emergency animal diseases (EADs), and their control and eradication or containment. The agreement provides a cost-sharing framework and stipulates that:

- An EAD Response Plan developed by the affected jurisdiction must conform to the AUSVETPLAN disease strategies and management manuals, including the **Valuation and Compensation Manual**.
- Cost sharing will apply in respect of compensation determined in accordance with the following principles:
 - Compensation is paid to the owner of any livestock or property that dies or is destroyed for the purpose of eradication or prevention of the spread of an EAD.
 - In the case of livestock, a second payment may become due on the date the property becomes eligible to be restocked, provided the total value of livestock is greater on that date than the initial amount of compensation paid for the livestock.
 - In determining the amount of compensation to be paid, no allowance shall be made for loss of profit, loss occasioned by breach of contract, loss of production or any other consequential loss whatsoever.

²² www.animalhealthaustralia.com.au/programs/emergency-animal-disease-preparedness/ead-response-agreement/

Glossary

Adult pig	Any pig over the age of 9 months.
Animal byproducts	Products of animal origin that are not for consumption but are destined for industrial use (eg hides and skins, fur, wool, hair, feathers, hooves, bones, fertiliser).
Animal Health Committee	A committee comprising the CVOs of Australia and New Zealand, Australian state and territory CVOs, and representatives of Animal Health Australia and CSIRO. The committee provides advice to PIMC on animal health matters, focusing on technical issues and regulatory policy (formerly called the Veterinary Committee). <i>See also</i> Chief veterinary officer (CVO), Primary Industries Ministerial Council (PIMC)
Animal products	Meat, meat products and other products of animal origin (eg eggs, milk) for human consumption or for use in animal feedstuff.
Assessed negative (AN)	A qualifier applied to a premises previously defined as a dangerous contact premises, suspect premises, trace premises or at-risk premises that has been cleared of suspicion at the time of designation, and is subject to the procedures and restrictions appropriate to the area in which it is located. (Note: AN is a qualifier to document progress in the response and in the proof-of-freedom phase. It is not to be used at the same level as the other premises classifications.)
At-risk premises (ARP)	A premises in a restricted area that contains a susceptible animal(s) but is not considered at the time of designation to be a suspect premises, dangerous contact premises, infected premises or trace premises.
Australian chief veterinary officer	The nominated senior veterinarian in the Australian Government Department of Agriculture, Fisheries and Forestry who manages international animal health commitments and the Australian Government's response to an animal disease outbreak. <i>See also</i> Chief veterinary officer
AUSVETPLAN	<i>Australian Veterinary Emergency Plan</i> . A series of technical response plans that describe the proposed Australian approach to an emergency animal disease incident. The documents provide guidance based on sound analysis, linking policy, strategies, implementation, coordination and emergency-management plans.
Authorised valuer	Experienced and trained person(s) appointed by the state disease control headquarters to carry out the valuation of stock and property.
Boar	An uncastrated male pig.

Chief veterinary officer (CVO)	The senior veterinarian of the animal health authority in each jurisdiction (national, state or territory) who has responsibility for animal disease control in that jurisdiction. <i>See also</i> Australian chief veterinary officer
Compartmentalisation	The process of defining, implementing and maintaining one or more disease-free establishments under a common biosecurity management system in accordance with World Organisation for Animal Health (OIE) guidelines, based on applied biosecurity measures and surveillance, in order to facilitate disease control and/or trade.
Compensation	The sum of money paid by government to an owner for stock that are destroyed and property that is compulsorily destroyed because of an emergency animal disease. <i>See also</i> Cost-sharing arrangements, Emergency Animal Disease Response Agreement
Consultative Committee on Emergency Animal Diseases (CCEAD)	A committee of state and territory CVOs, representatives of CSIRO Livestock Industries and the relevant industries, and chaired by the Australian CVO. CCEAD convenes and consults when there is an animal disease emergency due to the introduction of an emergency animal disease of livestock, or other serious epizootic of Australian origin.
Control area (CA)	A declared area in which the conditions applying are of lesser intensity than those in a restricted area (the limits of a control area and the conditions applying to it can be varied during an outbreak according to need).
Cost-sharing arrangements	Arrangements agreed between governments (national and state/territory) and livestock industries for sharing the costs of emergency animal disease responses. <i>See also</i> Compensation, Emergency Animal Disease Response Agreement
Crate	Pieces of equipment that are designed for confining pigs for a number of husbandry functions, including weighing, handling for veterinary interventions, farrowing and assisting with other reproductive processes.
Dangerous contact animal	A susceptible animal that has been designated as being exposed to other infected animals or potentially infectious products following tracing and epidemiological investigation.
Dangerous contact premises (DCP)	A premises that may or may not contain a susceptible animal(s), including those not showing clinical signs, but, following a risk assessment, is considered highly likely to contain an infected animal(s) or contaminated animal products, wastes or things, which present an unacceptable risk to the response if the risk is not addressed.
Declared area	A defined tract of land that is subjected to disease control restrictions under emergency animal disease legislation. Types of declared areas include restricted area, control area, infected premises, dangerous contact premises and suspect premises.

Decontamination	Includes all stages of cleaning and disinfection.
Deep-litter housing	A type of group housing system in which pigs are kept on a deep layer of bedding material, usually straw or sawdust.
Depopulation	The removal of a host population from a particular area to control or prevent the spread of disease.
Destroy (animals)	To kill animals humanely.
Disease agent	A general term for a transmissible organism or other factor that causes an infectious disease.
Disease Watch Hotline	24-hour freecall service for reporting suspected incidences of emergency diseases – 1800 675 888 .
Disinfectant	A chemical used to destroy disease agents outside a living animal.
Disinfection	The application, after thorough cleansing, of procedures intended to destroy the infectious or parasitic agents of animal diseases, including zoonoses; applies to premises, vehicles and different objects that may have been directly or indirectly contaminated.
Disposal	Sanitary removal of animal carcasses, animal products, materials and wastes by burial, burning or some other process so as to prevent the spread of disease.
Dry sow	A sow that has been weaned and not yet mated, or a sow that has been mated but has not yet farrowed.
Dry sow stall (or gestation stall)	An enclosure in which gilts and sows are kept individually.
Ecoshed	Outdoor deep-litter housing for pigs.
Emergency animal disease (EAD)	A disease that is (a) exotic to Australia or (b) a variant of an endemic disease or (c) a serious infectious disease of unknown or uncertain cause or (d) a severe outbreak of a known endemic disease, and that is considered to be of national significance with serious social or trade implications. <i>See also</i> Endemic animal disease, Exotic animal disease
Emergency Animal Disease (EAD) Response Agreement	Agreement between the Australian and state/territory governments and livestock industries on the management of emergency animal disease responses. Provisions include funding mechanisms, the use of appropriately trained personnel and existing standards such as AUSVETPLAN. <i>See also</i> Compensation, Cost-sharing arrangements
Endemic animal disease	A disease affecting animals (which may include humans) that is known to occur in Australia. <i>See also</i> Emergency animal disease, Exotic animal disease
Epidemiological investigation	An investigation to identify and qualify the risk factors associated with the disease. <i>See also</i> Veterinary investigation

Exotic animal disease	A disease affecting animals (which may include humans) that does not normally occur in Australia. <i>See also</i> Emergency animal disease, Endemic animal disease
Exotic fauna/feral animals	<i>See</i> Wild animals
Farrowing	Giving birth to piglets.
Farrowing crate	An enclosure closely related to a sow's body size, in which sows are kept individually during and after farrowing.
Farrowing pen	An enclosure for confining individual sows and their litters during and after farrowing, containing a creep area and a farrowing crate.
Finisher/finishing pig	Pigs generally above 50 kg live weight until they are sold or retained for breeding.
Gestation	The period when the sow is pregnant.
Gilt	A young female pig, selected for reproductive purposes, before she has been mated and farrowed.
Grower	Pigs generally with live weights between 20 kg and 60 kg.
Growing pigs	Weaners, growers and finishers.
Husbandry	Care and management practices in pig keeping.
In-contact animals	Animals that have had close contact with infected animals, such as noninfected animals in the same group as infected animals.
Incubation period	The period that elapses between the introduction of the pathogen into the animal and the first clinical signs of the disease.
Index case	The first or original case of the disease to be diagnosed in a disease outbreak on the index property.
Index property	The property on which the first or original case (index case) in a disease outbreak is found to have occurred.
Infected premises (IP)	A defined area (which may be all or part of a property) in which an emergency disease meeting the case definition exists or is believed to exist, or in which the causative agent of that emergency disease exists or is believed to exist.
Infected premises operations team (IPOT)	A specially trained group of officials responsible for all disease control activity on a property.
Lactating sow	A sow that has given birth, and is producing milk to feed piglets.
Litter	Material used on the floor of deep-litter sheds to absorb waste. Straw, sawdust or rice hulls are commonly used.
Litter	A group of piglets on a sow.

Local disease control centre (LDCC)	An emergency operations centre responsible for the command and control of field operations in a defined area.
Mated gilt	A young female pig that has been mated but has not yet had a first litter.
Modified stamping out	Any variation to stamping out.
Monitoring	Routine collection of data for assessing the health status of a population. <i>See also</i> Surveillance
Movement control	Restrictions placed on the movement of animals, people and other things to prevent the spread of disease.
National management group (NMG)	A group established to direct and coordinate an animal disease emergency. An NMG may include the chief executive officers of the Australian Government and state or territory governments where the emergency occurs, industry representatives, the Australian chief veterinary officer (and chief medical officer, if applicable) and the chairman of Animal Health Australia.
Native wildlife	<i>See</i> Wild animals
OIE Terrestrial Code	OIE <i>Terrestrial Animal Health Code</i> . Reviewed annually at the OIE General Meeting in May and published on the internet at: www.oie.int/international-standard-setting/terrestrial-code/access-online/
Operational procedures	Detailed instructions for carrying out specific disease control activities, such as disposal, destruction, decontamination and valuation.
Owner	A person responsible for a premises (includes an agent of the owner, such as a manager or other controlling officer).
Pen	An enclosure for confining pigs in groups.
Piglet	A pig from birth up to the time that it is weaned from the sow.
Premises	A tract of land including its buildings, or a separate farm or facility that is maintained by a single set of services and personnel.
Premises of relevance (POR)	A premises in a control area that contains a susceptible animal(s) but is considered at the time of designation not to be an infected premises, dangerous contact premises, suspect premises or trace premises. The animal(s) on such premise(s) is/are subject to procedures applicable in the control area, such as heightened surveillance and movement restrictions.
Prevalence	The proportion (or percentage) of animals in a particular population affected by a particular disease (or infection or positive antibody titre) at a given point in time.

Primary Industries Ministerial Council (PIMC)	The council of Australian national, state and territory and New Zealand ministers of agriculture that sets Australian and New Zealand agricultural policy (formerly the Agriculture and Resource Management Council of Australia and New Zealand). <i>See also</i> Animal Health Committee, Primary Industries Standing Committee
Primary Industries Standing Committee	The standing committee that supports the Primary Industries Ministerial Council. Members are the heads of Australian national, state and territory and New Zealand government agencies responsible for agriculture, food, fibre, forestry, fisheries and aquaculture industries and production, and rural adjustment policy issues. <i>See also</i> Animal Health Committee, Primary Industries Ministerial Council (PIMC)
Quarantine	Legal restrictions imposed on a place or a tract of land by the serving of a notice limiting access or egress of specified animals, persons or things.
Rehabilitation	The process of adjustment to circumstances prevailing in the aftermath of an emergency disease outbreak.
Resolved premises	An infected premises that has completed the required control measures, and is subject to the procedures and restrictions appropriate to the area in which it is located.
Restricted area (RA)	A relatively small declared area (compared with a control area) around an infected premises that is subject to intense surveillance and movement controls.
Risk enterprise	A defined livestock or related enterprise, which is potentially a major source of infection for many other premises. Includes intensive piggeries, feedlots, abattoirs, knackeries, saleyards, calf scales, milk factories, tanneries, skin sheds, game meat establishments, cold stores, artificial insemination centres, veterinary laboratories and hospitals, road and rail freight depots, showgrounds, field days, weighbridges, garbage depots.
Sensitivity	The proportion of affected individuals in the tested population that are correctly identified as positive by a diagnostic test. <i>See also</i> Specificity
Sentinel animal	An animal of known health status that is monitored to detect the presence of a specific disease agent.
Serotype	A subgroup of microorganisms identified by the antigens carried (as determined by a serology test).
Sow	An adult female pig that has had one or more litters.
Specificity	The proportion of nonaffected individuals in the tested population that are correctly identified as negative by a diagnostic test. <i>See also</i> Sensitivity

Stamping out	The strategy of eliminating infection from premises through the destruction of animals in accordance with the particular AUSVETPLAN manual, and in a manner that permits appropriate disposal of carcasses and decontamination of the site.
State disease control headquarters (SDCHQ)	The emergency operations centre that directs the disease control operations to be undertaken in that state or territory.
Suckling pig	A piglet between birth and weaning (ie an unweaned piglet).
Surveillance	A systematic program of investigation designed to establish the presence, extent or absence of a disease, or of infection or contamination with the causative organism. It includes the examination of animals for clinical signs, antibodies or the causative organism.
Susceptible animals	Animals that can be infected with a particular disease.
Suspect animal	An animal that may have been exposed to an emergency disease such that its quarantine and intensive surveillance, but not pre-emptive slaughter, is warranted. <i>or</i> An animal not known to have been exposed to a disease agent but showing clinical signs requiring differential diagnosis.
Suspect premises (SP)	Temporary classification of a premises that contains a susceptible animal(s) not known to have been exposed to the disease agent but showing clinical signs that require investigation.
Trace premises (TP)	Temporary classification of a premises that contains a susceptible animal(s) that tracing indicates may have been exposed to an infected animal(s), or contaminated animal products, wastes or things, and that requires investigation.
Tracing	The process of locating animals, persons or other items that may be implicated in the spread of disease, so that appropriate action can be taken.
Unknown status premises (UP)	A premises that has been identified as having an unknown animal status.
Vaccination	Inoculation of healthy individuals with weakened or attenuated strains of disease-causing agents to provide protection from disease.
Vaccine	Modified strains of disease-causing agents that, when inoculated, stimulate an immune response and provide protection from disease.
- attenuated	A vaccine prepared from infective or 'live' microbes that have lost their virulence but have retained their ability to induce protective immunity.
- gene deleted	An attenuated or inactivated vaccine in which genes for nonessential surface glycoproteins have been removed by genetic engineering. This provides a useful immunological marker for the vaccine virus compared to the wild virus.

Vector	A living organism (frequently an arthropod) that transmits an infectious agent from one host to another. A <i>biological</i> vector is one in which the infectious agent must develop or multiply before becoming infective to a recipient host. A <i>mechanical</i> vector is one that transmits an infectious agent from one host to another but is not essential to the life cycle of the agent.
Veterinary investigation	An investigation of the diagnosis, pathology and epidemiology of the disease. <i>See also</i> Epidemiological investigation
Weaner	A pig after it has been weaned from the sow up to approximately 30 kg live weight.
Weaning	The act of permanently separating the piglets from the sow.
Wild animals	
- native wildlife	Animals that are indigenous to Australia and may be susceptible to emergency animal diseases (eg bats, dingoes, marsupials).
- feral animals	Animals of domestic species that are not confined or under control (eg cats, horses, pigs).
- exotic fauna	Nondomestic animal species that are not indigenous to Australia (eg foxes).
Zero susceptible stock premises (ZP)	A premises that contains no susceptible animals.
Zoning	The process of defining, implementing and maintaining a disease-free or infected area in accordance with World Organisation for Animal Health (OIE) guidelines, based on geopolitical and/or physical boundaries and surveillance, in order to facilitate disease control and/or trade.
Zoonosis	A disease of animals that can be transmitted to humans.

Abbreviations

APIQ [✓] [®]	Australian Pork Industry Quality Assurance Program
APL	Australian Pork Limited
AUSVETPLAN	Australian Veterinary Emergency Plan
CA	control area
CCEAD	Consultative Committee on Emergency Animal Diseases
CVO	chief veterinary officer
DCP	dangerous contact premises
EAD	emergency animal disease
EADRA	Emergency Animal Disease Response Agreement
FMD	foot-and-mouth disease
ILO	industry liaison officer
IP	infected premises
IPOT	infected premises operations team
JE	Japanese encephalitis
LDCC	local disease control centre
MOU	memorandum of understanding
NLIS	National Livestock Identification System
NMG	National Management Group
OH&S	occupational health and safety
OIE	World Organisation for Animal Health
PIC	property identification code
PPNVD	PigPass National Vendor Declaration
PRRS	porcine reproductive and respiratory syndrome
QA	quality assurance
RA	restricted area
SDCHQ	state disease control headquarters
SP	suspect premises
SVD	swine vesicular disease
TGE	transmissible gastroenteritis
TP	trace premises

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