



Australian Government

**Australian Pesticides and
Veterinary Medicines Authority**



SODIUM FLUOROACETATE FINAL REVIEW REPORT AND REGULATORY DECISION

The reconsideration of registrations of products containing sodium fluoroacetate and approvals of their associated labels.

January 2008



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Comments and enquiries may be directed to:

Manager Chemical Review
Australian Pesticides & Veterinary Medicines Authority
PO Box 6182
KINGSTON ACT 2604
Australia

Telephone: +61 2 6210 4700
Facsimile: +61 2 6210 4776
Email: chemrev@apvma.gov.au
Web site: <http://www.apvma.gov.au>

FOREWORD

The Australian Pesticides & Veterinary Medicines Authority (APVMA) is an independent statutory authority with responsibility for the regulation of agricultural and veterinary chemicals in Australia. Its statutory powers are provided in the Agricultural and Veterinary Chemicals Code scheduled to the *Agricultural and Veterinary Chemicals Code Act 1994* (Agvet Codes)

The APVMA can reconsider the approval of an active constituent, the registration of a chemical product or the approval of a label for a container for a chemical product at any time. This is outlined in Part 2, Division 4 of the Agvet Codes.

A reconsideration may be initiated when new research or evidence has raised concerns about the effectiveness or safety of a particular chemical, a product or its label.

The reconsideration process includes a call for information from a variety of sources, and a review of that information. The information and technical data required by the APVMA to review the safety of both new and existing chemical products must be derived according to accepted scientific principles, as must the methods of assessment. The APVMA reviews the information and technical data in close collaboration with its advisory agencies including the Office of Chemical Safety (OCS) within the Department of Health and Ageing, the Department of the Environment and Water Resources (DEW¹), and State Departments of Agriculture as well as other expert advisors, as appropriate.

The APVMA has a policy of maintaining transparency in its activities and encouraging community input to the reviews. To this end, the APVMA publishes the preliminary review findings and proposed regulatory decisions and invites public comment. Following a public consultation period, a decision is made about the future use of the chemical and products formulated containing the chemical. The APVMA then publishes the final review report and regulatory decisions.

The APVMA makes these reports available to the regulatory agencies of other countries as part of bilateral agreements. The APVMA recommends that countries receiving these reports should not utilise them for registration purposes unless they are also provided with the original data from the relevant applicant.

In the current review, the APVMA reconsidered whether it can be satisfied that continued use of products containing sodium fluoroacetate (commonly known as '1080') in accordance with the instructions for their use 'would not be likely have an unintended effect that is harmful to animals, plants or things or to the environment' [s34 (1)(a) iii]. The APVMA also reconsidered whether product labels carry adequate instructions and warning statements [s34 (1)(c) i and ii].

For this review, the APVMA obtained expert advice from the DEW who assessed the information submitted to the review and provided advice on measures to avoid or minimise environmental effects. This document sets out the review findings relating to all products containing sodium fluoroacetate that have been reviewed by the APVMA.

This document and the technical reports relating to the reconsideration of registrations of products containing sodium fluoroacetate and approvals of their associated labels are available from the APVMA website <http://www.apvma.gov.au/chemrev/chemrev.shtml>.

1 Formerly the Australian Government Department of the Environment and Heritage. As this review was in the final stages of publication, DEW became the Department of the Environment, Water, Heritage and the Arts (DEWHA). The reference to DEW has not been amended in this report.

OVERVIEW

The Australian Pesticides and Veterinary Medicines Authority (APVMA) has completed a review of the chemical sodium fluoroacetate, commonly known as 1080.

The chemical is used for controlling feral animals. Its use for animal control was first pioneered in Australia as a rabbit poison in the early 1950s. It is now used to control wild dogs, feral pigs, foxes and rabbits, cats, dingoes. It is also used to control native animals in newly established timber plantations and other agricultural/horticultural crops.

In its pure form, 1080 is a white powder. Liquid solutions of 1080 are used to load baits (e.g. carrots, oats, meat, offal).

Use patterns for 1080 vary across Australia. The choice of bait materials, the 1080 dose in the baits and how and where the baits are placed depends on the target animal and what other animals are in the area. Baiting practices endeavour to ensure that baits are taken mainly by the target animals and the likelihood of poisoning of non-target animals is minimised.

The baits may be applied by aerial or ground distribution. Aerial baiting is generally used where ground baiting is impractical, unduly costly or where the terrain is inaccessible for ground vehicles (for example, aerial baiting of pigs in far north Queensland). Generally, aerial baiting is used for the control of foxes, rabbits, wild dogs, dingoes and in Queensland for pigs. Ground baiting is used for rabbits and browsing animals such as wallabies, possums and pademelons, and also for wild dogs, foxes and pigs. In some cases baits are buried or tethered to confine them to the point of application and to minimise taking by non-target species.

The APVMA reviewed the use of 1080 because of concerns over poisoning of non-target animals. The review was started in July 2002. The factors that contribute to potential harmful effects include contamination of the environment by 1080, extent to which target animals consume the baits and thus reduce the likelihood of their ingestion by non-target animals, and secondary poisoning of non-target animals and birds if they consume carcasses of poisoned animals extent of bait uptake by target animals, and fate of 1080 in baits, poisoned animals and environment. The APVMA review examined these various issues. It also examined the labels on 1080 containers to see if they carried sufficient instructions for the chemical to be used safely.

The review found that although poisoning of non-target animals occurs, it is limited to individual animals and does not adversely affect overall populations of the non-target animals. The review also determined that the 1080 container labels do not have adequate instructions on them for the safe use of 1080.

The key outcomes of the review are (i) amendments to the labels and (ii) imposition of new conditions of registration.

The labels now contain adequate instructions for the chemical to be used safely with respect to the environment. As per the label instructions, it is mandatory for the users of 1080 to notify their neighbours of imminent baiting and to observe certain minimum distances from roads, dwellings and water sources while placing baits.

As per the new conditions of registrations, registrants must provide access to the State/ Territory documents referred to on the product label, via their website (e.g. State/Territory codes of practice).

With these changes, the APVMA is satisfied that the continued use of products containing 1080 is unlikely to cause significant harm to non-target animals or to the environment.

From the public submissions made to the review, it was evident that there was strong public concern about the humaneness of 1080, and that the community considered that this issue should be considered by the review. While the APVMA noted the community concerns, it did not base its regulatory decisions on this matter as animal welfare is not a specific criterion under the Agvet Codes that can be taken into account in making decisions about the future use of 1080.

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EXECUTIVE SUMMARY

Introduction

The use of sodium fluoroacetate, commonly known as 1080, was pioneered in Australia in the early 1950s as a rabbit poison in Tasmania. Products containing 1080 are now widely used in Australia for vertebrate pest control in agricultural production as well as biodiversity conservation.

Fluoroacetate is itself not toxic. It is absorbed, activated and metabolised in the mitochondria of cells to fluorocitrate by a process known as a 'lethal synthesis'. It is fluorocitrate that is a potent inhibitor of the enzyme aconitase, a step in the citric acid or Krebs cycle, which is the major energy-producing pathway in the body. When this cycle is blocked, the cell ceases to function through lack of energy and citrate accumulates in the tissues and plasma.

In its pure form, 1080 is a white powder but may be dyed blue. Bait materials (e.g. carrots, oats, meat, offal) loaded with 1080 are used for controlling pests. Aqueous solutions of 1080 are used to load baits.

1080 is approved for the control of vermin, wild dogs, feral pigs, foxes and rabbits. The terminology 'vermin' could actually cover the use of this chemical for a large number of situations. Approved labels do not delineate the complete directions for use for 1080 products nor are they clear in relation to target species for a particular product. Those pests that are known to be controlled using 1080, but which do not appear specifically on approved labels include cats, dingoes, Bennett's wallaby, Tasmanian pademelon, rats and brushtail possums.

Use patterns for 1080 vary across Australia. They are tailored to optimise target specificity and efficacy for the specific ecosystems and region in which 1080 is used. The actual dose rates of 1080 in the baits, and bait distribution density vary according to the pest to be controlled and the ecosystem in which the baits are laid.

The baits may be applied by aerial or ground distribution. Aerial baiting is generally used where ground baiting is impractical, unduly costly or where the terrain is inaccessible for ground vehicles (for example, aerial baiting of pigs in far north Queensland). Generally, aerial baiting is used for the control of foxes, rabbits, wild dogs, dingoes and in Queensland for pigs. Ground baiting is used for rabbits and browsing animals such as wallabies, possums and pademelons, and also for wild dogs, foxes and pigs. In some cases baits are buried or tethered to confine them to the point of application and to minimise taking by non-target species.

When this review commenced, total use of 1080 (the active constituent) across Australia was estimated to be around 200 kg per annum. The total amount varies from year to year depending on pest pressure. Information received in 2002 from State authorities indicated that 25-50 kg 1080 was used annually in Queensland, 25-30 kg in NSW, 5-6 kg in SA, and an average of 17 kg in WA. Tasmania's use declined from 15.15 kg in 1999-2000 to 6.15 kg in 2003-04, followed by an increase to 8.14 kg in 2004-2005. The increase was attributed to seasonal conditions, an increase in plantation establishment and browsing damage on King Island; in 2005-2006, 4.7 kg of 1080 was used.

Across mainland Australia 1080 is used to control rabbits, wild dogs, foxes and feral pigs. In Tasmania it is used to control native mammals (Bennett's wallaby, Tasmanian pademelon and brushtail possum) grazing on crops and tree seedlings. It is also used for rabbit control, and fox control since incursions were detected.

The APVMA reconsiders the registration of agricultural and veterinary chemicals in the marketplace where potential risks to the safety and performance have been identified. Due to concerns over unintended effect on the environment through the poisoning of non-target animals and concerns about whether product labels contained adequate instructions, products containing 1080 and associated labels were put under review in July 2002.

During a period of public consultation at the commencement of the review, the APVMA received submissions that raised several concerns regarding the continuing availability and use 1080. These included:

- The poisoning of non-target animals, both native species and domestic animals
- The potential for secondary impact of sub-lethal doses on eggs and young of non-target species
- Users not following the instructions for use
- Humaneness, i.e. the mechanism whereby 1080 caused death.

The scope of a reconsideration is determined by the specific concerns about the chemical and certain criteria that are set out in the Agvet Code legislation. In the case of 1080 the concerns relate to the legislative criterion that the APVMA must be satisfied that the use of the chemical would not be likely to have an unintended effect that is harmful to animals, plants or things or to the environment (s34 (1)(a) iii). The concerns also relate to the criterion that the APVMA must be satisfied that product labels contain adequate instructions (s34 (1) c).

It should be noted however that humaneness of a pest control agent is not a specific criterion under the Agvet legislation of which the APVMA must be satisfied when registering or reconsidering a registration of a product.

In conducting the review of 1080 the APVMA obtained specialist advice from the Department of the Environment and Water Resources (DEW²). The impact on the non-target species at a population level, rather than the individual animal, was the basis on which DEW provided advice to the APVMA. This basis is consistent with the Environment Protection and Biodiversity Conservation Act³ 1999 (EPBC Act) and principles of conservation science.

DEW assessed all the relevant information and data. This included over 150 scientific studies, which were predominantly from Australia (NSW, WA, VIC, SA, QLD and TAS). A significant number were studies conducted in New Zealand studies while the remainder were mostly US studies. The DEW advised that while poisoning of individual non-target animals may occur, there was no evidence that use of 1080 baits led to an adverse impact on non-target species at a population level. DEW also provided advice on how risks to non-target animals could be mitigated. The APVMA considered and accepted the expert advice provided by the DEW.

Based on the advice provided by DEW, in May 2005 the APVMA released the 1080 Preliminary Review Findings report⁴ which outlined the environmental assessment and proposed findings and regulatory actions from the review. The APVMA invited public comments on the Preliminary Findings report. Over fifty submissions were received in response. The DEW assessed these submissions, revised its Technical Report on 1080 and its recommendations to the APVMA. This Review Findings report reflects the DEW's revised Technical Report and advice to the APVMA, and forms the basis for regulatory actions to be taken by the APVMA.

Review Findings

Environmental assessment

One of the concerns that led to the review of 1080 is the potential for unintended impacts on the environment including effects on non-target animals. The factors that contribute to the unintended effects include environmental contamination by 1080, extent of bait uptake by target animals, and fate of 1080 in baits, poisoned animals and environment. The environmental assessment examined these various factors.

2 formerly the Department of the Environment and Heritage. See more extensive footnote 1.

3 The EPBC Act Policy Statement 1.1 Significant Impact Guidelines (Matters of National Environmental Significance) <http://www.deh.gov.au/epbc/publications/pubs/nes-guidelines.pdf>

4 The Reconsideration of Registrations of Products Containing Sodium Fluoroacetate (1080) and their Associated Labels - Preliminary Review Findings. (http://www.apvma.gov.au/chemrev/1080_prelim_review_findings.pdf)

General environmental exposure to 1080 is low, as overall application rates of 1080 are commonly much less than a gram per hectare, although higher localised exposure is possible where baits are placed. While use of 1080 in this way does not lead to significant contamination of air, soil or water, its dispersal in bait form represents a potential hazard to non-target animals that may take the baits.

1080 is susceptible to microbial degradation, except under arid conditions when microbial activity is low. The ready microbial degradation under moist conditions conducive to microbial activity and the low treatment rates mean that significant leaching through soil is not expected to occur.

Contamination of water is possible, particularly if baits fall directly into watercourses, but any contamination that may occur will be at low levels and rapidly diluted to insignificant concentrations.

Non-target animals which dwell in the same eco-system as the target pest can potentially consume the 1080 baits. There are differences in sensitivity to 1080 between different animal species. The sensitivity of animals to 1080 poisoning can be divided into four broad categories: highly sensitive organisms ($LD_{50} < 2$ mg/kg); moderately sensitive organisms ($LD_{50} = 2 - 10$ mg/kg); relatively tolerant organisms ($LD_{50} = 10 - 40$ mg/kg); and tolerant organisms ($LD_{50} > 40$ mg/kg).

However, the actual level of impact of 1080 on non-target animals cannot be predicted on this basis alone. Other contributing factors are frequency, timing and intensity of baiting, baiting materials, methods of deployment, bait placement (aerial or ground application) and the environment where baiting occurs. There are also some dietary and behavioural differences between different animal species. Therefore, with careful attention to the concentration of 1080 in baits, bait material, size, preparation, placement and timing, target selectivity can be optimised.

To ensure effective control of various target animals, a range of bait types should be available for each target pest and the non-target risks need to be evaluated for each bait type. The baits used for fox control in NSW illustrate how different bait types can be useful. In NSW, fox baits have traditionally been prepared from a range of materials, including chicken heads and wingettes. These would be unsuitable for use in quoll habitat, given the predilection of quolls for chicken.

The amount of available 1080 in baits decreases when it is leached from the baits. For example, 1080 is easily leached from some bait materials such as oats by rain or even dewfall. Whilst other materials such as carrots are more resistant to leaching, they quickly desiccate and become unpalatable under dry conditions. Meat baits are also detoxified by rainfall, and more so by blowfly larvae. If not taken, meat baits are likely to remain lethally toxic to dogs and foxes for up to 8 weeks, depending on rainfall and temperature, and may retain toxicity for up to a year under arid conditions.

The residual 1080 levels in target animal carcasses need to be taken into consideration when devising baiting techniques. Non-target animals can also be at risk if they consume poisoned animals or their carcasses. The metabolism of 1080 in the target pest and the fate of any residual 1080 in their carcasses are contributing factors to the degree of risk to non-target animals.

Most of the 1080 ingested by animals is rapidly metabolised and/or excreted after absorption, with only low levels retained in the carcasses. Measured residues in rabbit carcasses were below 1 mg/kg. Some animals retain higher residues, with up to 9 mg/kg measured in rat carcasses. Stomach contents may also retain high residues, in excess of 50 mg/kg for possums (as measured in poisoned possums in New Zealand; note that possum baits used in New Zealand contain up to six times more 1080 than the possum baits used in Tasmania). Similarly, for pigs the highest residues have been found in stomach contents. Typically 1-5 mg/kg of 1080 can be found in pig vomitus.

From adverse incident reports and field observations, dogs are the most common non-target casualties reported, as may be expected given their high sensitivity to 1080, and broad diet which can result in them consuming baits made of most materials and carcasses. Foxes are also common non-target casualties of rabbit baiting. Some unadapted⁵ native mammals, such as wombats, macropods, possums and some rodents, can be killed by herbivore baits. Some birds may also be killed by 1080 baiting. Scavenging species such as magpies and crows have been recorded as

5 Those that have not co-evolved in the presence of 1080-bearing plants

occasional casualties, together with some introduced species (sparrow, starlings, doves and pigeons). There are also anecdotal reports from the early 1990s of crimson rosella (a highly sensitive species) being killed by carrot baits laid for rabbits.

Correct bait placement, laying baits in the right place at the right time, and using the minimum effective rate of baiting was found to be essential if non-target impacts are to be minimised. The review recommends that preliminary free feeding should be used where appropriate to increase the uptake of poisoned baits by target animals.

The rate of 40 baits/km used in some parts of NSW for aerial control of wild dogs appears to be based on tradition and experience, but does not appear to be supported by any efficacy data from scientific trials. It has been noted (eg. http://www.feral.org.au/feral_documents/00008.pdf) that the number of baits delivered during aerial baiting campaigns is often arbitrarily decided and is almost certainly excessive, particularly in the larger scale aerial operations in rangeland areas of the country. The higher rates used for aerial wild dog baiting likely exceed the minimum effective rate and 4 to 10 baits per km appear to work effectively in controlling wild dogs.

DEW was unable to advise the APVMA that the use of meat baits containing 72 mg 1080 for feral pig control would not be likely to have an unintended effect that is harmful to non-target animals. The sensitivity of some native carnivores to 1080 entails a strong likelihood that they will be killed if they consume baits of such potency. The use pattern for these baits (surface baiting, often from aircraft and across large areas) makes it likely that significant numbers of carnivorous animals other than the target pests will be exposed to them. This use pattern raises particular concerns for birds of prey (see Section 3.4, 'Feral pigs' for more information regarding the use of permit while data is being generated).

With appropriate attention to the controls recommended in this review, the APVMA can accept the advice of DEW that, although poisoning of individual non-target animals may occur, the use of 1080 is not likely to cause widespread or serious impacts on non-target fauna at the population level.

In Tasmania 1080 is used to protect horticultural crops and forestry plantations from damage by native herbivores. Broad scale population monitoring conducted hitherto indicates that target and non-target herbivore populations are stable. Based on the available information for review the DEW concluded that the use of 1080 to control browsing native mammals in Tasmania exerts only a temporary 'knock-down' effect on target animals and does not lead to reductions at the population level.

Effectiveness of 1080 in biodiversity conservation

Rabbits, feral pigs, foxes and wild dogs in Australia cause losses to agricultural production and cause environmental damage by removing native vegetation or preying on native animals.

Increases in native plant growth and return of associated bird life has been reported following rabbit baiting. In WA, the Western Shield fox-baiting program has allowed the recovery of various species including quolls, wallabies, bettongs, possums and numbats. Phascogales⁶ in WA appear to be unharmed by fox baiting. In western NSW, populations of rock wallabies and mallee fowl are increasing following successful fox control, while fox control in coastal regions has contributed to high fledging success in threatened shorebirds. Victorian baiting programs have noted positive effects on populations of bush-stone curlews, possums, dunnarts, phascogales, potoroos and bandicoots.

Adequacy of label instructions

The current 1080 product labels do not contain adequate information and instructions for use. Specific directions for use are often contained in a variety of documents issued by individual state agencies. These include regulations, codes of practices, manuals or standard operating procedures. In general, it is acceptable for the labels to be accompanied by leaflets or to refer to authoritative State documents, as long as they contain risk mitigation measures to address the requirements stipulated by the Agvet Codes. Under section 14 of the Agvet Codes, the labels need to contain instructions such as the circumstances in which the product should be used, how the product

⁶ The Phascogales (members of the genus *Phascogale*), also known as Wambengers, are small carnivorous Australian marsupials of the family *Dasyuridae*. There are two species; the Brush-tailed Phascogale (*Phascogale tapoatafa*) and the Red-tailed Phascogale (*Phascogale calura*).

should be used, the frequency of the use of the product, the safe handling of the product and any other matters prescribed by the regulations. The review finds that most current 1080 labels do not meet these requirements.

Product labels should be amended to include sufficient information to satisfy the labelling requirements of the Agvet Code. Where there are different information requirements, specific to different ecosystems, then that information may be more appropriately included in extension material.

Labels must specify target species and not use broad terms like vermin and vertebrate pests.

Public submissions

A total of 51 responses to the preliminary review findings were received. Most were supportive of the continued use of 1080, although not necessarily of the proposed label variations, but a significant proportion remained opposed, albeit to various degrees.

Supporters of 1080 emphasised its vital importance in protecting the Australian environment and its agricultural industries from introduced vertebrate pests, noting the high effectiveness of 1080 and minimal harmful impact on non-target native animals. The main concern of opponents centred on humaneness issues of using this poison. Concerns were also expressed that 1080 may not be effective, and that its use is harmful to non-target native animals and valued domestic animals.

Where appropriate, the findings and the recommendations outlined in the Preliminary Review Findings document, published in May 2005, have been amended in line with the public comments.

Regulatory actions

After consideration of all data including the submissions received in response to the 1080 Preliminary Review Findings report, the APVMA has taken the following regulatory actions:

(a) variation of label instructions.

To satisfy the requirements for continued registration of products, the labels of products shown in Appendix A, Tables A1 and A2 have been varied as shown below.

- delete the use of general terminology 'vermin' and 'vertebrate pest(s)', and replace with specific target species
- limit the rate of baiting for aerial baiting of wild dog control to a maximum of 10/km transect
- include the following on the labels⁷:
 - requirements for neighbour notification about imminent baiting
 - minimum distance requirement for bait placement
 - requirement of signage in baiting locations
 - Bait materials and size
 - instructions for bait preparation
 - instructions for storage and transportation of baits
 - amount of 1080 in baits
 - bait application rate (number of baits per unit area or distance).
 - Variation of conditions of registrations.

⁷ For details, see Section 8.1 of this volume

To satisfy the requirements for continued registration of products, the conditions of registration have been varied to require the following.

- Registrants must provide access to the State/Territory documents referred to on the product label, via their website.
- Registrants who are State/Territory Government agencies must notify the APVMA of any changes made to their State/Territory documents referred to on the product label, particularly changes made with respect to the following aspects—the amount of 1080 in baits, bait application rates, bait application methods, bait substrate, requirements relating to untaken bait recovery, animal carcass recovery, neighbour notification, signage and distance restrictions

Other matters noted as part of the review

The Review Findings document also reports on a number of matters that are related to the continued use of 1080 but have no direct bearing on the APVMA's reconsideration process. These include alternative non-chemical vertebrate pest control options, government initiatives regarding 1080 use in Tasmania, literature and public submissions on the humaneness of 1080 and government initiatives in relation to animal welfare, as well as the regulatory framework for the supply of 1080 concentrate and baits.

Alternatives to 1080

Several other vertebrate pest control techniques such as fencing, shooting and trapping, tree guards in plantations, repellents, are available as non-chemical alternatives to 1080.

DEW examined the available information submitted to the review on vertebrate pest control techniques. Fences need to be of high quality if vertebrate pests are not to breach them, particularly in rugged and rocky country. Shooting is often used in conjunction with 1080, particularly for control of remnant populations after baiting, but is generally ineffective when used in isolation, particularly where vegetation and/or terrain reduce visibility. Trapping is useful for some species such as dogs but generally needs to be combined with other methods. Shooting and trapping also need to be repeated regularly to be effective. Repellents only seem to be effective when browsing pressure is low, and even then do not protect new foliage.

Guard dogs (and llamas) are used on some properties to protect sheep against attack by foxes and wild dogs. Warren ripping is also used for rabbit control.

Some of these alternative options are often included in vertebrate pest control programs. It is important that all the vertebrate pest control programs thoroughly consider all the available control options.

Government initiatives regarding the use of 1080 in Tasmania

During the conduct of this review, the APVMA noted that the Tasmanian government commenced a phase-out of the use of 1080 through a programme known as *Tasmania Together*, one of its goals being a reduced reliance on chemicals. 1080 was targeted as a chemical the use of which would cease in Tasmania by 2015. An announcement by Premier Paul Lennon in September 2004 indicated that there had been many calls for the government to ban 1080 for the control of browsing animals in forestry plantations. Significant progress was made to reduce the amount of 1080 used in Tasmania. The *Tasmania Together* target of reducing the use of 1080 from 15.15 kg in 1999-2000 to 7.6 kg by 2005 was achieved 12 months ahead of schedule. Use of 1080 was phased out completely in state forests by December 2005 by the Tasmanian government.

The Australian Federal Government made statements during the 2004 election campaign that it would provide assistance in phasing out the use of 1080 in Tasmania. In May 2005, the Prime Minister reiterated his Government's commitment to this, when he announced the agreement between the Australian and Tasmanian Governments that builds on the Tasmanian Regional Forest Agreement. His announcement stated 'use of 1080 on public land will be banned from the end of

2005. Australian Government funds will be used to fast-track development of alternatives to its use on private land'.

Under the Tasmanian Community Forest Agreement, the Australian government provided \$4 million, over two years, to fast track research, set up demonstration sites and encourage greater research into practical alternatives to 1080.

Humaneness

From public submissions to the nominations and the review scope, it was evident that there was strong public concern about the humaneness of 1080, and that the community wanted this issue to be considered by the review.

The APVMA noted the community concerns about humaneness related to the use of 1080, animal welfare is not a specific criterion under the Agvet Codes that can be taken into account in making decisions about the future use of 1080. The Review Findings report provided an overview of available information of 1080 and animal welfare, but it did not formulate any conclusions on this matter.

In the interest of animal welfare, research has been conducted into the use of analgesics and sedatives in 1080 baits. The study report commented that if such methods were to be used more widely, further research would be needed to ensure that the additives have no detrimental effect on non-target animals.

Government initiatives in relation to animal welfare

The National Consultative Committee on Animal Welfare (NCCAW) is a non-statutory body that advises the Federal Government on the national implications of welfare issues affecting animals.

This Committee was established in 1989 by the then Minister for Primary Industries and Energy. The Committee consists of representatives from the Australian Government Department of Agriculture, Fisheries and Forestry, Department of the Environment and Heritage, National Health and Medical Research Council, National Farmers' Federation, Australian Veterinary Association, RSPCA Australia, Animals Australia, a representative from each State/Territory government (drawn from State Animal Welfare Advisory Councils/Committees where they presently exist), and Animal Health Australia.

One of the functions of NCCAW is to assess and advise the Federal Government on the national implications of welfare issues affecting animals. It also advises on the effectiveness and appropriateness of national codes of practice, policies, guidelines and legislation to safeguard or further the welfare of animals and protects the national interest. The Committee receives submissions from animal welfare organisations and agencies, industry or individuals concerning animal welfare issues. It has the power to establish working groups to carry out its functions. It prepares and furnishes written reports to the Minister for Agriculture, Fisheries and Forestry on matters that have been subject to inquiry by the Committee.

In May 2004, the Primary Industries Ministerial Council (PIMC) approved the Australian Animal Welfare Strategy (AAWS), which was developed under the auspices of the National Consultative Committee on Animal Welfare (NCCAW).

The Strategy includes animals used in research and teaching, animals used for the production of food and fibre and other products, companion and guide animals, animals used for recreation, entertainment and display, native and introduced wildlife and feral animals.

In the next phase of the implementation of the AAWS, the Primary Industries Standing Committee (PISC) will work with a DAFF implementation team and co-ordinate the development of an implementation plan in consultation with key stakeholders and will provide advice on how best to address the issue of economic impacts that might arise from implementation of the Strategy.

The Department of the Environment and Water Resources contracted the NSW Department of Primary Industries (DPI) to undertake a Natural Heritage Trust project to develop Codes of Practice and Standard Operating Procedures for the humane capture, handling and destruction of feral

animals. DPI has undertaken public consultation, including with other State and Territory agencies, in preparing these. While the Codes and Procedures have not been adopted nationally, some organisations are adopting them wholly or in part for their own use.

Regulatory framework for 1080 products

Currently registered products for 1080 fall into one of the following three formulation categories:

1. aqueous solutions; these are not used directly to poison the animals, but are loaded into baits. These are only available to authorised personnel of Government agencies, not to private landholders.
2. shelf-stable baits; these last up to 1 year after manufacturing. Semi-dried meat baits and dry oat baits are typical examples of shelf-stable baits. These are supplied to end-users.
3. short-life baits; these are to be used within a day after preparation. Fresh meat baits and carrot baits are two examples of the short-life baits. These are supplied to end-users.

The supply and use of 1080 is regulated by a combination of Commonwealth and State legislation. The APVMA regulates 1080 up to and at the point of retail sale. Once sold or supplied to the end-user, it comes under the regulation of individual State legislation.

As a Schedule 7 poison, 1080 products are available only to specialised or authorised users who have the skills necessary to handle them safely. Products containing 1080 are Restricted Chemical Products under the Agvet Code Regulations. As such, the products can only be supplied to or used by 'authorised person(s)'. Individual States set the authorisation criteria, taking the APVMA's and State regulatory requirements into account. Thus the authorisation criteria vary between States.

When the review commenced, aqueous solutions, shelf-stable baits and short-life baits were subject to registration. However the practicality of registering short-life baits has often been raised as an issue given the nature of the container in which it is supplied (usually a plastic bag) and the fact that the bait medium (chicken heads, offal, carrots etc) is perishable.

The review found that while the three product types (aqueous solutions, shelf-stable baits and short-life baits) fit the Agvet Code definition of agricultural chemical products, a more appropriate regulatory framework for 1080 product supply and use instructions would be as detailed in the following table:

Regulatory framework for 1080 product supply and use instructions

Product	Regulatory status	Information to user
Aqueous solutions	Registered	Label instructions on how to use concentrate in bait medium
Shelf-stable baits	Registered	Label instructions on how to lay baits. Label can include leaflet or reference to State Code of Practice
Short-life baits	Permit	Supply of leaflet containing instructions on how to lay bait and adherence to State Code of Practice is a condition of the permit

Thus, aqueous solutions and shelf-stable baits should be registered as agricultural chemical products. Short-life baits prepared using aqueous solutions need not be registered. Their supply and use will be covered by an APVMA permit. It is important for the APVMA to be satisfied that the end user of the short-life baits receives the label instructions that the APVMA has considered and approved.

1 INTRODUCTION

Sodium fluoroacetate, commonly known as 1080, is used to control vertebrate pests.

The APVMA has reviewed registered products containing sodium fluoroacetate and the label approvals of those registered products. This document summarises the data evaluated, and the findings and recommendations made by the review.

1.1 Regulatory status of 1080 in Australia

The use of 1080 as a vertebrate pest control agent was pioneered in Australia in the early 1950s against rabbits in Tasmania. Products containing 1080 are now widely used in Australia for vertebrate pest control in agricultural production as well as for biodiversity conservation.

Fluoroacetate is not toxic *per se*. It is absorbed, activated and metabolised in the mitochondria of cells to fluorocitrate by a process known as a 'lethal synthesis'. It is fluorocitrate that is a potent inhibitor of the enzyme aconitase, a step in the citric acid or Krebs cycle, which is the major energy-producing pathway in the body. When this cycle is blocked, the cell ceases to function through lack of energy and citrate accumulates in the tissues and plasma.

In its pure form, 1080 is a white powder but may be dyed blue. Bait materials (e.g. carrots, oats, meat, offal) loaded with 1080 are used for controlling pests. Aqueous solutions of 1080 are used to load baits.

As at November 2006, there were 23 registered products containing the active constituent sodium fluoroacetate (Appendix A, Tables A1 and A2). In July 2002, twenty-five products containing 1080 were put under review. Since then, registrations for six of those products (Table A3) lapsed. Four new products (Table A2) were registered since the commencement of the review and were subject to the review outcomes as a condition of registration.

Currently registered products for 1080 fall into one of the three following formulation categories:

- (a) aqueous solutions. These are not used directly to poison the animals, but are loaded into baits. They are only available to authorised personnel of Government agencies, not to private landholders.
- (b) shelf-stable baits, lasting up to 1 year after manufacturing. Semi-dried meat baits and dry oat baits are typical examples of shelf-stable baits. These are supplied to end-users.
- (c) short-life baits, to be used within a day after preparation. Fresh meat baits and carrot baits are two examples of the short-life baits. These are supplied to end-users.

The formulation type of each of the products registered products at the commencement of the review is presented in the following table. Formulations of currently registered 1080 products

Product No.	Nominated Product Name	Substrate	Formulation type
40573	Foxoff Fox Bait	Manufactured meat meal baits	Shelf-stable
42450	1080 Bait for the Control of Rabbits	Oat bait	Shel-stable
42458	1080 Baits	Carrot bait	Short-life
42498	1080 Concentrate (Red)	Aqueous solution	Aqueous solution
42499	1080 Concentrate (Black)	Aqueous solution	Aqueous solution
42500	1080 Impregnated Oats (Wild Dog Control)	Oat	Shelf-stable
	Meat baits prepared from impregnated oats	Meat bait	Short-life
42501	'One Shot' 1080 Impregnated Oats	Oat bait	Shelf-stable
42538	1080 Impregnated Oats (Fox Control)	Oat	Shelf-stable
	Meat baits prepared from impregnated oats	Meat bait	Short-life
42720	1080 Baits for the Control of Foxes	Fresh meat bait	Short-life
46434	Foxoff Econobait	Manufactured meat meal baits	Shelf-stable
49350	1080 Oats Rabbit Bait	Oat bait	Shelf-stable
49351	1080 Carrots Rabbit Bait	Carrot bait	Short-life
49352	1080 Pellets Rabbit and Feral Pig Bait	Cereal pellet	Shelf-stable
49354	1080 Predator Bait	Fresh meat bait	Short-life
49355	1080 Fox Bait	Fresh meat bait	Short-life
49384	Doggone Wild Dog Bait	Manufactured meat meal baits	Shelf-stable
50304	Rabbait 1080 Oat Bait	Oat bait	Shelf-stable
52954	1080 Ready-to-Lay Rabbit Oat Bait	Oat bait	Shelf-stable
54616	1080 Dried Meat Fox Baits	Dried meat bait	Shelf-stable
53187	Pro-bait 1080 fox bait	Dried meat (salami style) bait	Shelf-stable
57743	1080 Dried meat wild dog baits	Dried meat bait	Shelf-stable
57825	1080 Bait for the control of wild dogs	Meat bait	Short-life
57956	ACTA 1080 concentrate	Aqueous solution	Aqueous solution

At the commencement of the review, products containing 1080 were registered for the control of vermin, wild dogs, feral pigs, foxes and rabbits. The terminology 'vermin' could actually cover the use of this chemical for a large number of situations. Approved labels do not delineate the complete directions for use for 1080 products nor are they clear in relation to target species for a particular product. Those pests that are known to be controlled using 1080, but which do not appear specifically on approved labels include cats, dingoes, Bennett's wallaby, Tasmanian pademelon, rats and brushtail possums.

1.2 Reasons for the 1080 Review

In October 1994 the NRA invited the public to nominate agricultural or veterinary chemical active constituents, chemical products or labels which they considered required a review to see if they meet contemporary regulatory standards. Of the 600 chemical nominations received, 80 were prioritised for review, one of which was 1080. Community groups, individual citizens, and one government agency nominated 1080 for review. The potential poisoning of non-target animals, both native species and domestic dogs, from either the direct consumption of 1080 baits (primary) or through the consumption of poisoned animals (secondary) were among the concerns nominated.

The APVMA can reconsider the registration of agricultural and veterinary chemicals in the marketplace when potential concerns about the safety or performance have been identified. Because of concerns about the poisoning of non-target animals and whether product labels contained adequate instructions, products containing 1080 and associated labels were put under review in July 2002.

During public consultation at the commencement of the review, the APVMA received submissions that raised additional concerns regarding the continuing availability and use 1080. These included:

- The potential for a secondary impact of sub-lethal doses on eggs and young of non-target species
- Users not following the instructions for use
- The humaneness i.e. the mechanism by which 1080 caused death.

1.3 Scope of the Review

The scope of any reconsideration is determined by the specific concerns about the chemical and certain criteria that are set out in the agricultural and veterinary chemicals legislation. In the case of 1080 the concerns relate to the legislative criterion that the APVMA must be satisfied that the use of the chemical would not be likely to have an unintended effect that is harmful to animals, plants or things or to the environment (s34 (1)(a) iii). The concerns also relate to the criterion that the APVMA must be satisfied that product labels contain adequate instructions (s34 (1) c).

It should be noted that, although humaneness of the mechanism whereby 1080 causes death of animals was noted in the scope document, the humaneness of a pest control agent is not a specific criterion which the APVMA has the legislative power to consider when registering or reconsidering the registration of a product.

The scope included assessment of product labels and associated State/Territory-based legislation, and extension material (standard operating procedures, codes of practice, user's manuals etc.). The APVMA also considered whether product labels carried adequate instructions and warning statements. According to the Agvet Code, such instructions are to include:

- the circumstances in which the product should be used
- how the product should be used
- times when the product should be used
- frequency of the use of the product
- the withholding period after the use of the product

- disposal of the product and its container
- safe handling of the product.

1.4 Regulatory options

There can be three possible outcomes to the reconsideration of registration of products containing 1080 and all labels. Based on the information reviewed the APVMA may be:

- satisfied that the products and their labels continue to meet the prescribed requirements for registration and approval and therefore affirms the registrations and approvals
- satisfied that the conditions to which the registration or approval is currently subject can be varied in such a way that the requirements for continued registration and approval will be complied with and therefore varies the conditions of registration or approval
- not satisfied that the requirements for continued registration and approval continue to be met and suspends or cancels the registration and/or approval.

1.5 Expert advice from the Department of the Environment and Water Resources

In conducting the review of 1080 the APVMA obtained specialist advice from the Department of the Environment and Water Resources (DEW). The impact on the non-target species at a population level, rather than the individual animal, was the basis on which DEW provided advice to the APVMA. This was consistent with the Environment Protection and Biodiversity Conservation Act⁸ 1999 (EPBC Act) and principles of conservation science.

DEW assessed all the relevant information and data, including over 150 scientific studies, predominantly from Australia (NSW, WA, VIC, SA, QLD and TAS). A significant number were New Zealand studies and the remainder were mostly US studies.

Based on the advice provided by the DEW, in May 2005 the APVMA released the 1080 Preliminary Review Findings report⁹ that outlined the environmental assessment and proposed findings and regulatory actions from the review. The APVMA invited public comments on the Preliminary Review Findings report. Over fifty submissions were received in response. The DEW assessed these submissions, revised its Technical Report on 1080 and its recommendations to the APVMA.

This Review Findings report reflects the DEW's revised Technical Report and advice to the APVMA, and forms the basis for regulatory actions taken by the APVMA.

8 The EPBC Act Administrative guidelines on significance may be viewed at http://www.deh.gov.au/epbc/assessments_approvals/guidelines/administrative/index.html#threatened

9 The Reconsideration of Registrations of Products Containing Sodium Fluoroacetate (1080) and their Associated Labels - Preliminary Review Findings. (http://www.apvma.gov.au/chemrev/1080_prelim_review_findings.pdf)

2 APPLICATION AND USE PATTERN OF 1080 PRODUCTS

Use patterns for 1080 vary between regions. They are tailored to optimise target specificity and efficacy depending on the specific eco-systems for each region. The actual dose rates of 1080 in the baits, and bait distribution rates vary according to the pest to be controlled and the ecosystem in which the baits are laid.

Baits may be applied by aerial or ground distribution. Aerial baiting is generally used where ground baiting is impractical, unduly costly or where the terrain is inaccessible to ground vehicles (e.g. baiting of pigs in far north Queensland). Generally, aerial baiting is used for the control of foxes, rabbits, wild dogs, dingoes and in Queensland for pigs. Ground baiting is used for rabbits and browsing animals such as wallabies, possums and pademelons, and also for wild dogs, foxes and pigs. In some cases baits are buried or tethered to confine them to the point of application and to minimise taking by non-target species.

When this review commenced, total use of 1080 (the active constituent) across Australia was estimated to be around 200 kg per annum. The total amount varies from year to year depending on pest pressure. Information received in 2002 from State authorities indicated that 25–50 kg 1080 was used annually in Queensland, 25–30 kg in NSW, 5–6 kg in SA, and an average of 17 kg in WA. Tasmania's use declined from 15.15 kg in 1999–2000 to 6.15 kg in 2003–04, followed by an increase to 8.14 kg in 2004–2005. The increase was attributed to seasonal conditions, an increase in plantation establishment and browsing damage on King Island; in 2005–2006, 4.7 kg of 1080 was used.

Across mainland Australia 1080 is used to control rabbits, wild dogs, foxes, feral pigs. In Tasmania it is used to control native mammals (Bennett's wallaby, Tasmanian pademelon and brushtail possum) grazing on crops and tree seedlings. It is also used for rabbit control, and since incursions were detected for fox control.

2.1 Rabbits

The European rabbit (*Oryctolagus cuniculus*) was released on the Australian mainland in the second half of the 19th century. Wild rabbit populations are now distributed over a large part of the Australian mainland, in Tasmania and on many offshore islands. It is estimated that rabbits now inhabit an area of some 4.5 million square kilometres, or about 60 percent of Australia. Wild rabbits are a declared pest under relevant legislation in all States and Territories. Landholders are thus obliged to control rabbits on their land and are financially responsible for control.

Queensland

Carrots are the usual bait material for rabbits in Queensland. Pre-feeding (feeding of non-poisoned baits to get the animals accustomed to baits), which normally consists of two exposures, precedes baiting. Baits are laid in furrows at a maximum of 10 kg/km, aiming to provide just sufficient for feeding rabbits based on pre-feed consumption. Application rates may be much less than this as they vary with terrain, rabbit numbers and proximity to warren areas.

Western Australia

Oats are the preferred bait in WA for reasons of cost and practicality (carrot baits tend to dry out under the arid conditions prevailing during the usual baiting season of late summer to early autumn). Baits are usually prepared by mixing 1080-impregnated oats (containing ca. 4.5 mg 1080 per oat grain) with filler oats to achieve a bait mix of 0.5 or 1% (i.e. one poisoned grain in 100 or 200 oats). Assuming an average weight of 40 mg for an individual oat grain, these bait mixes

contain 560 or 1120 mg 1080 /kg of oats. Small amounts of uniformly poisoned oats (400 mg 1080 per 1 kg of oats, or 0.016 mg 1080 per each 40 mg oat) are also prepared from concentrate in WA. Pre-feeding with 1080-free oats is only required with the latter.

The WA Forest Products Commission applies oat baits (mixed from impregnated oats) in trails and bait stations for rabbit control within newly established pine and eucalypt plantations. Baiting only occurs when rain is not expected within 5 days. Bait trails may be laid in furrows, in ribbons directly on the soil surface, or scattered along trails about 5 m in width. Furrow or ribbon methods apply about 6 kg/km, increasing to 10 kg/km for scatter baiting. Bait stations are loaded with around 2 kg bait. Baits and rabbits are left undisturbed for at least 10 days.

Operators in WA target areas of rabbit feeding and endeavour to avoid non-target exposure when laying bait trails. For example, baits are laid within paddocks but not in adjacent bushland or within 10-20 m of rabbit shelter areas. State regulations require that all dead animals found on baited and adjacent properties during baiting, and for 14 days after bait has been removed or eaten, must be disposed of by burial or burning.

South Australia

Oats (containing 375 mg 1080/kg) are the preferred bait material in South Australia because they are easier to handle and store, and are less attractive than carrots to livestock and some native animals. In addition, the husking of oats by cockatoos, parrots and other birds helps reduce the risk of non-target effects as much of the 1080 is discarded with the husk rather than ingested.

Victoria

Victoria uses cereal pellets, carrot and oat baits, which may be laid in trails or broadcast from the ground or from aircraft (up to 15 kg/ha for carrot baits) according to the Victorian Department of Sustainability and Environment (DSE) directions. Rabbit control programs use 1080 to substantially reduce large populations, or where other methods are considered unsuitable. Untaken baits and rabbit carcasses should be collected within 4 days of baiting and incinerated or buried, with carcass collection and disposal to continue for 14 days after baiting.

New South Wales

NSW uses carrots, oats and manufactured rabbit pellets containing 0.18 to 0.46 g/kg 1080. No other bait material can be used. Carrots must be diced into pieces roughly 2 centimetres by 2 centimetres in size or 5 grams in weight. Oats must only be used in trails. Only carrot bait material can be used in aerial applications.

For maximum control and to avoid using an excessive amount of 1080 bait, all rabbits must be encouraged to feed on the 1080 baits. Therefore it is essential to first attract rabbits with a number of free feeds of unpoisoned bait. Three free feeds must be used to provide the greatest chance of success. Two free feeds may only be used when specifically recommended by an Authorised Control Officer. Each free feed must be laid at intervals of not less than two days. The amount of free feed must be adjusted each time until only a small amount of bait is left. Depending on the level of infestation, the first free feed may range from 4 to 20 kg/km but is usually 4 to 8 kg/km for trailing or 4 to 15kg/ha for broadcasting.

Tasmania

In Tasmania, carrot is the only bait material used. It is recommended that baits are laid in furrows across all feeding areas. At least three free feeds are used to attract rabbits, with the first being at a rate of approximately 7.5 kg/km. The rate used in later feeds and the poison feed depends on the amount of the previous feed eaten and may increase to 12 kg/km or more. Carcasses and uneaten bait must be collected and destroyed within 7 days of the operation.

2.2 Wallabies and possums

Wallabies (Tasmanian pademelon and Bennett's wallaby) and other browsing and grazing native mammals (brushtail possums) are controlled using 1080 in Tasmania. Roughly equivalent amounts of 1080 are used for forest and agricultural protection in the State.

The carrot baits (product number 42458, product name 1080 Baits) are prepared on-site by mixing a dyed stock solution with the carrot pieces in a cement mixer or tub until even coverage is achieved. The baits contain 140 mg 1080/kg carrots.

Baits are laid by hand. Trail baiting uses 10-20 kg bait/km. This equates to approximately one gram 1080 per hectare. Baits may also be laid at intervals in piles, ideally of handful size.

The optimum bait size is a 1 cm cube, with small fragments avoided as birds more easily eat them. To further minimise exposure to birds, baits should be laid in the late afternoon. Baits should not be laid until consumption of free feed reaches at least 50%, which may require 2-8 pre-baitings. Frequent repeated 1080 baitings in one area are generally not supported, and no application is permitted within 10 m of any waterway.

2.3 Foxes

In the southern hemisphere foxes (*Vulpes vulpes*) occur only in Australia, where they were introduced by English settlers in the 19th century. The fox is now one of at least 20 exotic mammals that have established a feral population. An adaptable and elusive predator and scavenger, the fox has become well established over most of the southern half of mainland Australia. It has not yet colonised the tropical north, on Kangaroo Island or on many other offshore islands. With our present knowledge of control methods and ecology, the fox must be viewed as a permanent addition to the fauna of the Australian mainland.

Different 1080 application methods are preferred for fox control in Western Australia and the eastern States.

Western Australia

1080 meat baits are widely used for fox control in WA, both in agricultural areas and in large-scale aerial operations over conservation estate¹⁰. Most fox baits are prepared from dry kangaroo meat (3 mg of 1080 per 40 g bait). The Department of Conservation and Land Management of Western Australia has recently developed a shelf stable salami-type bait (product number 53187, product name Pro-bait 1080 fox bait) containing 3 mg 1080 in each 35 g bait. There is also some use of commercial Foxoff products and treated oats for insertion into meat baits. Hens' eggs are sometimes used, but must always be buried.

Large areas of Western Australia are aerielly baited with 1080 up to six times a year for fox control under the Western Shield program¹¹ that was introduced in 1996. Coordinated treatment of large areas in this way retards the immigration of new foxes into baited areas and allows recovery of native animal populations¹².

10 Non-agricultural land where fauna and flora are conserved

11 'Western Shield', a nature conservation program, was launched by the Western Australian government in 1996. It is currently managed by the Western Australia's Department of Conservation and Land Management. The program is aimed at safeguarding native animals and bringing them back from the brink of extinction. For further details see http://www.calm.wa.gov.au/projects/west_shield.html

12 Some plants in Western Australia (most are *Gastrolobium* spp in south-western Australia) produce fluoracetate as a chemically mediated, anti-herbivore defence strategy. As many native animals in Western Australia have co-evolved with 1080-bearing plants, they are quite tolerant to 1080. Although Western Australia has an advantage when using 1080 to control introduced pest species, tolerance of native fauna to 1080 is not essential to minimise impact on non-target animals in other parts of Australia.

Eastern states

Aerial baiting is generally not routinely employed for fox control in the eastern States because of the greater susceptibility of resident native fauna to 1080 poisoning. Fauna recovery or threat abatement operations tend to be of much smaller scale and prioritised to those areas where foxes threaten vulnerable populations of native animals. However, there are some exceptions where large scale baiting is employed for fox control. Aerial baiting with Yathong Fox Bait is carried out in western NSW at sites where additional environmental impact assessment has been conducted. Large areas are baited in South Australia under Operation Bounceback¹³. Large scale ground baiting is used in eastern Victoria under the Southern Ark program¹⁴.

Where non-target risks are identified, baits can be buried or tethered, although burial appears to increase the time required for foxes to take baits. Most baits are taken within a few days, but normal practice is to allow 10 days to 2 weeks for a baiting campaign. Scent trails, prepared by dragging a carcass over the ground, are sometimes used to attract foxes to baits, but care must be taken to avoid laying baits along a continuous scent trail as this may encourage multiple bait takes and possibly bait caching by a single fox. Bait locations should be marked, and untaken baits recovered at the end of a campaign.

To assess non-target risks, baits are often placed by hand. Non-poisoned baits are buried beneath a sand pad, which helps to determine, from the footprints in the sand, which animals visit each bait site. Poison baits are only laid after a period of free feeding, and only at those bait sites with no evidence of visitation by non-target animals. The need to lay baits by hand and check baiting sites periodically greatly increases the expense of deployment and reduces the areas that can be covered. Smaller baited areas are more susceptible to reinvasion by foxes.

In Victoria, fox baits must be buried to a depth of 8-10 cm. Placement along fence lines, ridges and tracks, with a bait spacing of 500-1000 m, is recommended in broad scale agricultural areas. Free feeding with monitoring of bait stations should precede baiting. The exercise should be repeated at weekly intervals if foxes are still being detected. Carcasses should be incinerated or buried. The Department of Sustainability and Environment (DSE) promotes group control programs over several farms and adjoining public land to reduce the rates of reinvasion.

2.4 Wild dogs

The commercial product (Doggone) is registered in NSW, Qld, Vic, SA, WA, ACT and NT. The usual rate of application, based on a dog density of up to 4/km², is about 1 bait per 10 ha. Baits are buried (not usually the case in WA) at a depth of 8-10 cm at minimum 200 m intervals, after free feeding, and replaced as needed. Neighbours are encouraged to participate in coordinated campaigns. Doggone baits should not be used where native marsupial carnivores¹⁵ are active, unless authorised by the relevant government authority.

Western Australia

In WA, most baits for wild dog control are prepared from kangaroo meat. Bait pieces (110 g fresh weight) are injected with a solution of 1080 (6 mg/bait) and sun-dried on racks to lose around 60% of their weight. Dried meat baits are more durable than fresh meat, and more difficult for small native carnivores and other animals to eat. Ground baiting is used in more accessible areas. Baits may be concealed, for example amongst leaves, to reduce potential non-target exposure. Aerial

13 'Operation Bounceback' is a large-scale ecological restoration project in the northern Flinders, Gammon and Olary Ranges that focuses on the restoration of ecological resources principally through the control of feral animals.

14 'Southern Ark' is a new conservation initiative aimed at facilitating the recovery of native mammals, birds and reptiles across approximately one million hectares of public land in far East Gippsland, through the establishment of an integrated, large-scale and on-going fox control program. For further details, visit <http://www.dse.vic.gov.au/dse/nrence.nsf/LinkView/3BBC62CBEDB61A01CA256DCD00023C66A1D235A061D8FC414A256DE90080D13C>.

15 Antechinus, quolls, phascogales, planigales.

application aims to lay baits at watering points and along identifiable routes such as vehicle tracks, major pads, watercourses and gorges. Application rates are not specified but determined by local experience. Baiting has traditionally occurred in autumn (breeding season) and spring (when pups begin to move about) but is mainly restricted to spring and often deferred until later in the season when water becomes less available.

Queensland

Meat baits for wild dog control in Queensland are of two sizes, 125 g (containing 6 or 10 mg 1080) and 250 g (containing 6 mg 1080). Bait size and the amount of 1080 in each bait depend on the location where the baits are used. The higher dose of 1080 is used in western and far northern areas because the lower dose is considered not effective by the Queensland authorities. Larger baits are used where risks to non-target species (e.g. quolls) are identified. Baits are laid along transects on a 200-500 m spacing. The Queensland Department of Natural Resources, Mines and Energy (NRME) Fact Sheet on wild dog control notes that coordination of baiting programs across adjoining properties is essential to increase baiting effectiveness since recolonising animals tend to be more likely to attack livestock than uncontrolled populations. Many graziers bait twice a year, to target adults during peaks in activity associated with breeding (April/May) and then again in August/September to target pups and juveniles.

Victoria

In Victoria, wild dogs occur on public land in the alpine areas of Gippsland and the North East and have recently been reported in the western Mallee. Whilst wild dogs are not known to be a threat to native fauna in Victoria, they are known to affect agricultural enterprises. 1080 Predator Baits (product number 49354) each containing 4.5 mg 1080, must be buried to a minimum depth of 8 cm. Wild dog carcasses must be destroyed by incineration or buried, and reasonable steps should be taken to ensure similar treatment within 14 days of placement for untaken baits. 1080 baits cannot be used in urban and residential areas.

New South Wales

Lambs tongues are a preferred baiting material for some NSW Rural Lands Protection Boards. They are said to be less likely to be taken by non-target animals because they are large, decay rapidly, and are easy to tether. Further details of wild dog baiting in NSW are included in Section 3.4.

Northern Territory

Baiting in the Northern Territory uses fresh meat baits (200-500 g) injected on-site with 6 mg of 1080 in solution and laid by hand under vegetation close to watering points or along fence lines. Untaken baits are seldom recovered, unless placed in areas frequented by the public. Aerial baiting is permitted but rarely used. Baiting is mainly restricted to large pastoral properties and conservation areas.

2.5 Feral pigs

Feral pigs are found on Flinders Island in Bass Strait and the wetter parts of the Australian mainland, from western Victoria, through New South Wales into Queensland, and across northern Australia, from Cape York to the Kimberley region, and southwest WA. They are particularly found in association with wetlands and riparian ecosystems. In SA feral pigs occur on Kangaroo Island and in the Coopers Creek and Diamantina River areas of the far north. Feral pigs appear to be increasing in number and range throughout the better-watered parts of WA, including forested areas in the southwest. They may also be found in arid rangeland environments, such as those of Queensland and northern NSW, anywhere that stock watering points are provided.

Western Australia

Pigs appear to be increasing in number and range in WA, and are known to damage production and conservation areas from the southwest jarrah forests to the northern river systems. Feral pig control in WA is expected to remain heavily reliant on 1080 baiting in the medium to long term. It is generally accepted that the specificity of baiting practices needs to be improved.

New South Wales

The NSW National Parks and Wildlife Service (NPWS) considers baiting using grain laced with 1080 to be the most effective feral pig control option in habitats with dense canopy cover located away from urban areas, and has conducted many successful vehicle based baiting campaigns. In remote and rugged parts of the Blue Mountains area, free feeding is carried out aurally while NPWS staff are transported by helicopter or horseback to bait storage facilities in remote areas.

A Rural Lands Protection Board from central-western NSW reports that pigs can be selectively targeted by ensuring that they are regularly free-fed before poison baits are laid. Laying of baits in the late afternoon and removal of any uneaten baits before sunrise minimises avian exposure.

Victoria

A 1080 bait (product number 49352, product name 1080 Pellets rabbit and feral pig bait) is registered for feral pig baiting in Victoria, but its use is very limited and occurs only on public land.

Queensland

Fact sheets on feral pig control issued by the Queensland NRME note that pigs are the major pest animal in the wet tropics, but that poison baiting is not the primary means of pig control because of the lack of a pig specific bait material. However, through the wise selection and presentation of bait material, landholders can be species selective in their poisoning program. Examples include use of bait material such as fermented grains (very attractive to pigs but not to other animals), burial of baits (feral pigs are one of the few animals that will dig up bait) and establishment of a free feeding routine so that pigs are the only animals feeding (they keep other animals away from the feeding site).

Baits are tailored for local circumstances, with grain baits used where pigs are eating grain and meat baits where they are eating carrion or preying on livestock such as lambs. Baiting is predominantly conducted on an individual property basis, although there are occasional exceptions such as a regional coordinated program at Cunnamulla, organised by the local Land Protection Officer. Bait applications normally use bait stations, although baits may sometimes be laid along transects. Pre-feeding with a non-toxic bait improves bait uptake. All baiting is carried out under the guidance of an accredited and approved State or local government officer.

Meat baiting using 500 g baits injected with 72 mg 1080 remains one of the most efficient means of pig control in the more sparsely populated grazing areas of Queensland, but is not used in other States. It is conducted on properties greater than 40 ha in size. Pre-feeding does not occur, but baits are laid in areas where pigs have been feeding on carcasses or carrion. Baiting occurs towards evening to minimise interference by birds, and only in amounts that the pigs will consume overnight.

Grain is soaked for at least 24 hours in water to ferment it before bait preparation, and vegetable and fruit baits must be cut up. Baits contain high loadings (144 mg/kg in meat and 288 mg/kg in grain/vegetable/fruit).

Grain baiting is conducted only on properties larger than 5 ha, and only after approval by the relevant government officer. Prior soaking of the grain makes it softer and more palatable to pigs, and prevents bait storage by landholders. Baits are laid in trails or bait stations, after pre-feeding for 2-3 nights. The use of partially fermented sorghum as bait material has been shown to increase bait attractiveness to pigs in the grain growing areas of the Darling Downs. Further, addition of creosote in the bait seems to improve target selectivity by deterring uptake by non-target animals.

Baiting with fruit and vegetables is conducted in similar fashion, but requires pre-feeding for up to 5 nights. Grain, fruit and vegetable baits are dyed green to deter interference by birds.

Ground baiting may be conducted using transects or bait stations. Meat baits are placed irregularly at bait points along tracks where there are signs of pig activity. When aerial baiting is needed, as in seasonally inaccessible areas on Cape York Peninsula, placement occurs along areas of recent pig activity. Several bait piles are placed at each bait station in order to allow feeding by several pigs rather than monopolisation by dominant animals.

In some cases where bait-taking by non-target animals needs to be reduced, bait stations may be used. These may be of several designs, but have the common purpose of excluding non-target animals such as livestock, macropods and birds, while allowing access by feral pigs. Feeders are only opened at night. Once pigs enter the bait stations, they will chase off or exclude non-target animals.

Thus target selectivity is optimised by pre-feeding, bait placement where pigs are active, selection of bait substrates to match local pig preferences, dyeing of baits to deter birds, and partial fermentation of grains so that they are unattractive to non-target herbivores. All baiting requires prior approval and is subject to record keeping in relation to locations and timing of baiting and the types and amounts of bait used. Queensland government officers refuse to allow baiting in areas of environmental or public concern unless stringent risk management measures are in place, and certain sensitive locations may not be baited for feral pigs.

A catchment care group from coastal Queensland reports that feral pig populations increased greatly during 2001, with attendant damage to cane crops and semi-aquatic natural areas, but were successfully reduced to a few individuals by 1080 grain baiting. No non-target kills were seen. Poison baiting was preceded by a free feeding campaign in which increasing amounts of grain were placed late in the evening at locations frequented by pigs. Once regular free feeding was established, green-dyed poisoned grain was laid in the same way, with left over grain cleaned up and destroyed.

2.6 Feral cats

The feral cat is common throughout most environments in Australia, including offshore islands. The first recorded instance of cats being brought to Australia is by English settlers in the 18th century, though they may have arrived much earlier via trading routes from South-East Asia, shipwrecks or visits by European ships to the west coast. Cats were also deliberately released into the wild during the 19th century to control rabbits and mice. Their populations are now self-sustaining, but may be augmented by immigration from stray and domestic cat populations.

Predation by feral cats is listed as a key threatening process¹⁶ under the Environment Protection and Biodiversity Conservation Act 1999. In Queensland, feral cats are a declared species under State legislation, and a NRME fact sheet (PA26 dated June 2003) has been issued.

There was only one bait product for cats captured by this review, but its registration lapsed during the course of the review.

16 A process is defined as a key threatening process if it threatens or may threaten the survival, abundance or evolutionary development of a native species or ecological community (for example predation by the European red fox).

3 SUMMARY OF DATA ASSESSMENTS

As stated earlier, the environmental assessment for the review of 1080 was undertaken by the DEW which considered all the environmental data and information submitted for the review. The environmental findings are summarised below.

3.1 Environmental exposure

3.1.1 Naturally occurring 1080 in native plants

About 40 species of endemic Australian plants produce fluoroacetate as a chemically mediated, anti-herbivore defence strategy. Most are *Gastrolobium* spp in south-western Australia, which contain up to 2600 mg 1080 /kg dry weight (up to 6500 mg 1080/kg in seeds). Such plants (two species of *Gastrolobium* and *Acacia georginae*) also occur in northern Australia but are less abundant, patchily distributed and only contain up to 180 mg/kg fluoroacetate.

Where 1080-bearing plants occur, the presence of 1080 in soils and surface waters is negligible. The absence of significant contamination is consistent with its ready degradation in soils and water.

3.1.2 Exposure from use of 1080 as vertebrate pest control agent

As previously noted (Section 2), total annual use of 1080 is approximately 200 kg. It is used to control rabbits, wild dogs, foxes, feral pigs, and in Tasmania, native mammals grazing on crops and tree seedlings.

General environmental exposure to 1080 is low as the total amount used is small and overall application rates are low (generally no more than a few grams per hectare). While the use of 1080 does not lead to significant contamination of air, soil or water, its dispersal in bait form represents a potential hazard to non-target animals that may take the baits.

3.2 Chemistry and fate

As a simple monovalent anion, fluoroacetate would be expected to be mobile in the environment and to be easily degraded. Available data confirm these expectations. Studies of the environmental fate of fluoroacetate have confirmed that it is readily degraded in biologically active systems, such as soils, surface waters and living organisms.

Studies have shown that fluoroacetate is easily leached from some bait materials such as oats by rain or even dew. Other materials, such as carrots, are more resistant to leaching but quickly desiccate and become unpalatable under dry conditions. Meat baits are also detoxified by rainfall, and more so by blowfly larvae. If not taken, meat baits are likely to remain lethally toxic to dogs and foxes for up to 8 weeks, depending on rainfall and temperature, and may retain toxicity for up to a year under arid conditions.

The usual fate of fluoroacetate in baits is to be consumed by the target pests in the days or weeks following baiting.

Most of the fluoroacetate absorbed by animals is rapidly metabolised and/or excreted, with only low levels retained in the carcass. Early reports of relatively high residues in rabbits, particularly in their livers and kidneys, are exaggerated as the analytical method made no allowance for the substantial defluorination of fluoroacetate that occurs in living animals. When analysed using a specific method, the highest residues in rabbits were detected in blood, with very low residues in liver and kidney because of rapid enzymatic detoxification in these organs. Residues in rabbit carcasses were below 1 mg/kg. Some animals retain higher residues, with up to 9 mg/kg measured

in rat carcasses. Stomach contents may also retain high residues, in excess of 50 mg/kg for possums and ground squirrels following use in New Zealand and the USA. Pig vomitus can therefore be expected to contain significant levels. High residues (up to 130 mg/kg) have been recorded in New Zealand invertebrates collected from high potency baits (0.15% active).

Column leaching studies and groundwater monitoring downstream from a landfill confirm that 1080 is mobile in soil. However, use as baits presents minimal concerns with respect to leaching because of the low application rates and ease of degradation in biologically active systems.

3.3 Environmental effects

3.3.1 Symptoms of 1080 poisoning

Symptoms of 1080 poisoning in warm-blooded animals usually begin to appear between 30 minutes and 3 hours after ingestion. This lag phase probably reflects translocation and cell penetration, conversion to fluorocitrate, and disruption of intracellular functions sufficient to induce gross symptoms. Herbivores generally die of cardiac failure, while carnivores experience central nervous system disturbances and convulsions before dying of respiratory failure. In omnivores, death tends to result from disorders of both the heart and central nervous system. Poisoned animals recover from sub-lethal doses as fluoroacetate is readily metabolised (for example by defluorination) and excreted.

3.3.2 Sensitivity of animals to 1080

Native animals, particularly those from the southwest corner of WA that have co-evolved in close association with fluoroacetate-bearing vegetation, tend to have greater tolerance to 1080 than their counterparts from the eastern states of Australia. This tolerance is most pronounced in herbivores but is also present in omnivores and carnivores. Some unadapted Australian omnivores and carnivores (bandicoots and dasyurids¹⁷) also appear to be less sensitive to fluoroacetate than their placental counterparts. For example, spotted-tail quolls (LD₅₀ = 1.85 mg/kg) are less sensitive to 1080 than feral cats (LD₅₀ = 0.4 mg/kg). This probably reflects the lower basal metabolic rate of the native marsupial species.

Extensive toxicity testing has been conducted in a broad range of native and introduced fauna, with much of this work reported in the published scientific literature. Many of these studies predate the development of modern regulatory test guidelines, but their results are generally consistent and considered reliable. The sensitivity of animals to 1080 poisoning can be divided into four broad categories. Highly sensitive organisms are defined as those with LD₅₀s below 2 mg/kg. Moderately sensitive organisms have LD₅₀s between 2 and 10 mg/kg, while relatively tolerant organisms have LD₅₀s between 10 and 40 mg/kg. Organisms with LD₅₀s above 40 mg/kg can be considered tolerant.

When categorised in this way, all target animals are highly sensitive to 1080, as are sheep and native herbivores (possums, macropods and wombats). The LD₅₀ values in these animals are consistently below 1 mg/kg, with the exception of native animals from the southwest corner of WA that have developed a tolerance to the toxin.

Some rodents (plains mouse, bush rat, swamp rat and canefield rat) are highly sensitive to 1080, while others (western chestnut mouse, sandy inland mouse, Mitchell's hopping mouse and Spinifex hopping mouse) are relatively tolerant of 1080. Other rodents (grassland melomys, water rat, long-tail mouse and pale field rat) and bandicoots are moderately sensitive. Dasyurids (stripe-faced dunnart, brown antechinus, spotted-tailed quoll and perhaps the eastern quoll) are also highly sensitive, although LD₅₀ values in these organisms are mostly above 1 mg/kg. Other dasyurids are moderately sensitive.

While most Australian birds are moderately sensitive to 1080, red-browed firetail, crimson rosella and white-winged chough are highly sensitive.

17 A varied group of carnivorous or insectivorous marsupial 'mice', 'cats' and 'devils'.

Native birds and mammals from the southwest corner of WA are relatively tolerant or tolerant of 1080. Ducks, raptors and doves from the eastern States are also relatively tolerant (but ducks from NW Australia are moderately sensitive). Emus, malleefowl, reptiles and frogs are relatively tolerant or tolerant of 1080.

Incident reports and field observations are consistent with the foregoing categorisations. Dogs, mainly domestic dogs, are the most common non-target casualties reported, as may be expected given their sensitivity and broad diet. Foxes are also common non-target casualties of rabbit baiting, but this is not considered to be an adverse effect. Among native mammals, unadapted wombats, macropods, possums and some rodents can be killed by herbivore baits. On rare occasions, some birds may also be killed by 1080 baiting. Scavenging species such as magpies and crows have been recorded as occasional casualties, together with some introduced species (sparrows, starlings, doves and pigeons). There are also anecdotal reports from the early 1990s of crimson omiss (a highly sensitive species) being killed by carrot baits laid for rabbits. Some insectivorous birds have been killed in New Zealand, although it is unclear whether small carrot bait fragments or insects that had fed on baits were the cause. Some insectivorous birds in North America are reported to have been killed when ground squirrels were baited with oat baits.

3.3.3 Impact of 1080 baiting on non-target animals

Potential risks

Non-target birds and mammals are potentially at risk from 1080 baiting if they consume the baits (primary poisoning) or scavenge carcasses (secondary poisoning).

Sensitivity to 1080 is one factor that can contribute to the likelihood that non-target animals will be harmed during 1080 baiting operations. Other factors include frequency, scale, timing and intensity of baiting, materials used for baiting, methods of deployment, bait placement and the environment where baiting occurs.

The potential risks of 1080 to aquatic organisms or to terrestrial organisms drinking from contaminated water in and around baited areas are minimal because of the low application rates needed for effective pest control.

Consideration of the sensitivities of non-target birds and mammals to 1080 indicates a potential risk of primary poisoning to most birds and mammals if oat or pellet baits are consumed. Potential risk is highest for macropods and wombats. Some granivorous birds may also be poisoned, based on their sensitivity. The *One-shot 1080 Impregnated Oats* product (product number 42501) used in Western Australia presents a potential risk to most small birds and mammals if they consume a poisoned oat because of the high toxin loading of 4.5 mg in each poisoned grain. The potential risk is lower for carrot baits because they generally contain a lower concentration of 1080, but some species such as potoroos may be at higher risk from carrot baits because of dietary preferences.

With meat baits for wild dog and fox control, spotted-tailed quolls are the non-target animal of principal concern because of their rarity, sensitivity and dietary preferences. Phascogales may also face a risk of poisoning from wild dog and fox baits, but are probably less sensitive and are primarily arboreal feeders. Meat baits for pig control as used in Queensland are much more hazardous than wild dog and fox baits because of the high toxin loading and represent a potential risk to many scavenging species, extending to raptors and possibly goannas.

Secondary poisoning risks in general are relatively low because of the rapid metabolism of 1080 in living animals and the consequent low level of residues in tissues and organs. Secondary poisoning risks in Australia appear generally to be restricted to cats, dogs and foxes. Sensitive insectivorous birds could possibly be susceptible to secondary poisoning if they consume insects that have fed on baits. Although earlier measurements of residues in rabbits indicated a potential secondary risk to some native animals, these findings are misleading because the analytical method used was non-specific and exaggerated the residues present.

Observed impacts

The actual degree of impact in the field cannot be determined from the sensitivities of non-target animals to 1080. The actual impact is usually lower than that predicted on the basis of sensitivity alone.

Bait uptake studies, carcass searching and radio tracking provide greater insight into the likely non-target impact of baiting. The ultimate measure is population monitoring, although interpretation of population changes can be difficult for highly mobile species, and population monitoring can be challenging for rare or hard-to-detect species (e.g. spotted-tail quoll, feral pigs; they take cover at the first sign of humans).

Observations of bait uptake indicate that a range of scavenging birds (currawongs, corvids, raptors) are likely to take meat baits under open field conditions, while some granivorous birds may feed on grain baits laid for herbivores. In forest situations, baits are more likely to be taken by mammals, such as bandicoots, rats, antechinus and quolls, with some interference by forest birds such as lyrebirds also recorded.

Very few non-target carcasses have been recovered following 1080 baiting campaigns. Where radio tracking has been used to facilitate recovery, carcasses have been found in burrows or under cover rather than in open situations, and tend not to be found near water. Carcass recoveries indicate that a range of non-target animals may be poisoned by 1080 baits under field conditions, although confirmatory residue analyses are usually not available.

The most likely avian casualties based on carcass recovery appear to be introduced species such as sparrows, starlings and pigeons, scavengers such as currawongs, corvids and kookaburras, and occasional raptors in pig poisoning campaigns. Among mammals, dogs are the most common non-target casualty; usually following consumption of meat baits or contaminated carcasses. Macropods, possums, wombats and rodents may be killed by grain or carrot baits.

3.3.4 Impact of 1080 baiting of foxes and wild dogs on quolls

Quolls have been shown to consume non-toxic meat baits in the laboratory and to interfere with meat baits at bait stations in the field, but the actual level of consumption of poison baits appears to be relatively low.

Radio tracking has been particularly useful for measuring the response of quolls to baiting. Northern quolls and western quolls have been shown to be unharmed by baiting. Tiger quolls in New South Wales and Queensland also appear to be unharmed by baiting for foxes and wild dogs based on radio tracking, in contrast to earlier trapping studies that found significant population reductions following aerial wild dog baiting.

3.3.5 Impact of 1080 baiting on native animal populations in Tasmania

Even for the target species in Tasmania, monitoring has shown no adverse population effects on Tasmanian pademelon, Bennett's wallaby or brushtail possum populations. Wombats, eastern quolls and Tasmanian devils also maintain stable or increasing populations in the face of baiting. However, the population of Tasmanian devils is currently in decline due to the effects of Devil Facial Tumour Disease. Isolated populations of bettongs have been impacted by inappropriate baiting in their habitat, as demonstrated in one incident in the mid-'90s. It should be noted that these were isolated and historical incidents, and did not harm populations in general.

3.3.6 Benefits of 1080 baiting to biodiversity

Rabbits, feral pigs, foxes and wild dogs in Australia cause losses to agricultural production and cause environmental damage by removing native vegetation and/or preying on native animals. Population responses to 1080 baiting integrate the possible negative effects of poisoning with the benefits that accrue from removal of predatory and/or competitive species.

A marked increase in native plant growth and return of associated bird life has been reported following rabbit baiting. In Western Australia, the Western Shield fox-baiting program has allowed

the recovery of various species including quolls, wallabies, bettongs, possums and numbats. Phascogales in WA appear to be unharmed by fox baiting.

In western NSW, populations of rock wallabies and malleefowl are increasing following successful fox control, while fox control in coastal regions has contributed to high fledging success in threatened shorebirds. Victorian baiting programs are beginning to return results, with favourable responses seen in bush-stone curlews, possums, dunnarts, phascogales, potoroos and bandicoots.

3.4 Optimising target selectivity and minimising impact on non-target animals

While there are differences in sensitivity to 1080 between different animal species, 1080 is potentially lethal to a wide range of native birds and animals. Therefore, the main concern with the use of 1080 is the risk of non-target poisoning from consumption of baits and, to a lesser extent, poisoned animals. The review found that with careful attention to bait preparation, placement, timing, and minimum effective rate of bait-lay, target selectivity could be optimised.

To ensure effective control of various target animals, a range of bait types should be available for each target pest and the non-target risks need to be evaluated for each bait type. In NSW, fox baits have traditionally been prepared from a range of materials, including chicken heads and wingettes. These would be unsuitable for use in quoll habitat given the predilection of quolls for chicken.

Rabbits

The main concern with the baits used for rabbit control is the potential effect on granivorous birds, particularly sensitive species such as parrots and ducks. The review found that a preliminary free feeding (feeding of non-poisoned baits) phase will assist in determining whether birds are likely to be attracted to poison baits. Bait stations are another option where significant avian exposure is likely to occur. Where practical, baiting should occur late in the day, so that rabbits consume the baits overnight and minimise the amounts left available for birds. For carrot baits, it is important that baits are of a uniform size, to avoid small fragments that would contain proportionally more 1080 and may therefore lead to higher exposure of birds.

Because of their dietary preferences, carrot baits are likely to be dangerous for potoroos, and the review found that they should not be laid in areas where the presence of these animals raises concerns.

Where rabbits have a tendency to dehusk oats and eat only the kernel this reduces the effectiveness and selectivity of oat baits. This dehusking by rabbits can lead to sublethal dosing. Non-target animals that consume the whole grain, including the husk, are likely to ingest more 1080 than the target pest. While the dehusking of oats by rabbits may reduce the efficacy of the baits, the review found that it is unlikely to present significant poisoning risks to non-target animals as they are unlikely to consume the discarded husk.

Wallabies and possums

In case of wallabies and possums, options for achieving target selectivity are much more limited as a broad range of native fauna share their high sensitivity to 1080. Target selectivity can be improved by free feeding to encourage consumption by target pests, the placement of baits away from bush edges where non-target animals such as bettongs are more likely to be active, and avoidance of baiting in or near their known habitat.

Foxes

In order to maximise the efficiency of fox control, operators should consider switching bait types, particularly where there is evidence that foxes are present but not taking baits. Non-target risks may be increased with different bait types, and this needs to be factored into bait campaigns where non-target exposures are of concern, for example in quoll or phascogale habitat.

Burial of baits can improve target selectivity as foxes are one of the few animals that will excavate buried baits. However, burial is resource intensive, which can reduce the area that can be treated, and may reduce the rate of uptake by target animals. Bait burial and free feeding can improve the selectivity of fox baiting, but is only warranted where there are concerns for non-target exposure.

Feral pigs

Target selectivity with feral pigs is more difficult to achieve because of their large size and lower sensitivity to 1080 compared with other target pests. Grain baiting would appear generally to be the preferred method for baiting pigs. Prior establishment of regular free feeding would seem essential. Where the main non-target concerns are for herbivores such as macropods, meat baits should be preferred. Where practical, baits should be laid late in the day and unconsumed baits should be recovered before birds begin to feed the next day. Use of fermented grain appears to improve target selectivity, but extra care is required when applying the water-soluble toxin to wet grain.

Selectivity appears especially problematic with meat baits for pigs as they contain high loadings that are likely to be hazardous to birds of prey and possibly to goannas. Meat baits may be preferred in pastoral areas because they are more likely to be taken by pigs that have been preying on livestock, and are probably less likely to be eaten by goannas in such situations. However, the baits need to be covered to minimise uptake by birds of prey, or laid in the evening and recovered the next morning in order to avoid exposure of these diurnal feeders. These requirements preclude aerial application of baits. Pig carcasses should be recovered to the extent possible, and burned or buried.

DEW was unable to advise the APVMA that the use of meat baits containing 72 mg 1080 for feral pig control would not be likely to have an unintended effect that is harmful to nontarget animals. The sensitivity of some native carnivores to 1080 entails a strong likelihood that they will be killed if they consume baits of such potency. The use pattern for these baits (surface baiting, often from aircraft and across large areas) makes it likely that significant numbers of carnivorous animals other than the target pests will be exposed to them. This use pattern raises particular concerns for birds of prey.

Currently this use pattern is practised only in Queensland. This practice was originally authorised through a Queensland Board permit before the advent of the national registration scheme when pesticides were regulated by individual States/Territories. After the national registration scheme came into existence, the Queensland Board permit has been transferred to the APVMA. Thus, the use of meat baits containing 72 mg for feral pig control in Queensland is now carried out under an APVMA permit.

Biosecurity Queensland, within the Queensland Department of Primary Industries and Fisheries has indicated to the APVMA that it has commenced research to generate data to assess non-target effects. The continuation of the APVMA permit is subject to satisfactory progress and the results of the on-going research project.

Wild dogs

A number of methods can be used for laying wild dog baits. Simple ground baiting entails distribution of baits along access tracks from the back of a vehicle, and differs little in reality from aerial baiting. Strategic ground baiting involves placement of baits at sites selected to maximise their uptake by dogs and minimise non-target disturbance. Another method, referred to as replacement baiting involves monitoring of bait stations used in strategic ground baiting and replacement of taken baits. The need to revisit bait stations increases costs, particularly in rugged terrain. In mound baiting, baits are covered with a mound of sand or raked soil to facilitate the identification of animals that visit the baits. Mound baiting offers further improvements over the previously described methods and was believed to be the most target-specific method, but again increases costs because of the need to revisit bait stations periodically. Non-toxic baits are used initially, and followed up with toxic baits only at those locations where dog activity has been recorded. Although dogs that visit bait stations can be specifically targeted in this way, the effectiveness of this method in reducing indices of wild dog abundance and their impact on livestock on adjacent properties has not been scientifically assessed. Mound baiting may not be suitable in some areas. For example, in some baiting campaigns conducted by the New South Wales RLPB, it was noted that mound baiting can be compromised when pigs rapidly take baits from mounds, and that some areas are too rugged to allow regular access for mound baiting.

Aerial baiting is generally regarded as an efficient and cost-effective wild dog control technique, although success depends largely on the type of bait used and the age and social status of the dogs. The level of control may also depend on timing of baiting in relation to breeding season and seasonal changes in water distribution, leaching of toxin from baits by rain, availability of food, and the number and distribution of baits dropped. Western Australian research found that aerial baiting killed all of 18 radio-collared dingoes in one trial, and 62 and 63% in two others. Baits were dropped at high density (up to 50 baits/km) along major watercourses, roads and animal pads.

Given that dogs are intelligent and wary animals, baiting programs should consider switching bait types, particularly where there is evidence that dogs are present but not taking baits. Non-target risks may be increased with different bait types, and this needs to be factored into bait campaigns where non-target exposures are of concern, for example in quoll or phascogale habitat.

Whichever method is used, baiting for wild dogs often needs to be followed up by trapping or shooting to remove individual animals.

Effective wild dog control requires an integrated approach, as exemplified in north east Victoria where wild dogs have been effectively controlled in some areas but continue to cause significant stock losses in others. To achieve success, wild dog control programs need to be planned in advance and implemented year round using a strategic mix of control options such as trapping, baiting and fencing.

Similarly, an evaluation of wild dog control in Western Australia concluded that landholder complacency, a scaling down in the amount of ground control work and a gradual over-reliance on aerial baiting, have all contributed significantly to the progressive build-up of wild dog numbers in that jurisdiction. The evaluation concluded that medium to long term management of wild dog numbers in Western Australia will require a move away from the present over-reliance on aerial baiting, with a return to the sustained and widespread deployment of all available control techniques in combination (ground baiting, aerial baiting, trapping and shooting). It is important to note that this evaluation continued to support aerial baiting. Monitoring and measuring its effectiveness reliably can be difficult because of the general lack of good information on dog numbers, movements and livestock impacts.

Wild dog control in Western Australia has relied on a single bait type. An increase in the range of bait types available may help improve wild dog control.

The New South Wales Parks and Wildlife Service commissioned an investigation in late 1990s into the use of 1080 for the control of wild dogs in Kosciuszko and Northern Tablelands. The investigation's report suggested that the commonly used methods for wild dog control were not highly specific for dogs, and questioned their efficacy citing research results indicating 20-50% reduction in dog numbers or signs of the dogs. It must be noted that the findings of this investigation may be less applicable to other parts of Australia because of differing ecosystems and the occurrence of adapted native animals in Western Australia.

Based on the report's recommendations, pending further research, the New South Wales National Parks and Wildlife Service suspended the use of aerial baiting in Kosciuszko National Park in 1999. However, because of on-going stock losses, resumption of aerial baiting was approved by NSW government in August 2004 for the Adaminaby and Yaouk areas in the north of Kosciuszko National Park. It has since been resumed elsewhere in Kosciuszko National Park and in other areas of New South Wales. State Forests has also discontinued aerial baiting as a general policy although some still occurs in the northern tablelands where it is integrated with Rural Lands Protection Board (RLPB) operations.

New results from the studies on the impact of 1080 baiting on wild dogs and foxes have become available since the publication of the Preliminary Review Findings document in May 2005. These studies, conducted in Kosciuszko National Park and the New England area of New South Wales, show that the impact of 1080 baiting on quolls is minimal, and that the baiting does not impact adversely on the quoll populations.

To maximise selectivity, a different approach to baiting of wild dogs has been used in the South Coast region of New South Wales. Aerial baiting and simple ground baiting from vehicles are not conducted because it is not feasible to monitor which animals are taking the baits. In addition, toxic baits are only present on the ground for a short time after aerial delivery, while with mound

baiting they can be present for up to 150 days per year. Aerial baiting was discontinued in the early 1990s in favour of the replacement mound-baiting program, which continues to be updated.

When conducting baiting programs, special precautions are often exercised where there is potential risk to native animals. For example, in Queensland, in a baiting program conducted in the Conondale Range in Queensland, ground baiting, not aerial baiting, was used within 4 km of any locations where quolls had been detected since 1980, with baits buried and pre-feeding conducted. The rest of the range was aerially baited.

Where found to be present, quolls were monitored by trapping and radio tracking during and after baiting. These methods were used to investigate whether baiting may be beneficial to quoll populations in areas where continued wild dog activity necessitates further baiting. The Queensland Parks and Wildlife Service noted that other large scale State government 1080 baiting operations generally occur outside the range where quolls have been found, and that habitat has been assessed as being of low suitability for quolls where baiting has occurred within the former range of these animals.

3.5 Label instructions for 1080 products

Current 1080 product labels do not contain adequate information and instructions for use. Historically much of the supporting information for 1080 use has been provided by state departments of agriculture. Specific directions for use are often contained in a variety of documents issued by individual departments.

These include regulations, codes of practices, manuals or standard operating procedures. In general, it is acceptable for the labels to be accompanied by leaflets or refer to authoritative State documents, so long as they contain risk mitigation measures to address the requirements stipulated by the Agvet Codes. Under section 14 the Agvet Codes, the labels need to contain instructions such as the circumstances in which the product should be used, how the product should be used, the frequency of the use of the product, the safe handling of the product and any other matters prescribed by the regulations. The review finds that most current 1080 labels do not meet these requirements.

Product labels should be amended to include sufficient information to satisfy the labelling requirements of the Agvet Code. Where there are different information requirements, specific to different ecosystems, then that information may be more appropriately included in extension material. However, it is a condition of registration that the information provided in supporting material (e.g. Code of Practice for the Use of 1080) must not be changed without notifying the APVMA to ensure they do not negate the necessary risk mitigation measures, or the labelling requirements stipulated by the Agvet Codes.

Some labels specify 'vermin' as the target pest. However, 'vermin' is not defined. Labels must specify target species.

3.5.1 Grain and vegetable baits

Baits used for rabbit control are likely to be toxic to a range of non-target native birds and mammals. Even in south-western WA, the main rabbit bait used is likely to be toxic to many birds and small to medium native mammals because of the high loading of 4.5 mg 1080 on individual poisoned oats. There is some recognition of this risk on current labels, which may advise users to place baits in locations that are inaccessible to non-target animals or to time baiting for when non-target species are not active. These warnings could be better expressed as the following specific instruction: 'This product may be toxic to some birds and other native wildlife. Baits should not be laid at times when, or in locations where, birds or other non-target wildlife are likely to be harmed by them. Similar restraints are appropriate for feral pig baits based on grain, fruit or vegetables.

The carrot baits used in Tasmania for control of native herbivores present similar hazards. Labels need to specify the target species, and include a similar restraint with particular reference to bettongs and potoroos.

The herbivore and feral pig baits may be dyed blue or green. This may minimise uptake by birds.

As the secondary poisoning risk to native species scavenging pig, rabbit (and native herbivore) carcasses appears relatively low, there is no need from the perspective of biodiversity conservation for a label requirement that carcasses be collected. However, such a label requirement would help reduce risks to domestic dogs and avoid attracting scavenging feral species.

3.5.2 Meat baits

Labels of some 1080 products used for fox and wild dog control advise users to bury them to a depth of 8-10 cm, particularly if they are likely to be taken by non-target or domestic animals, but burial does not appear to be a legal requirement. Although burial should generally be preferred, to make this a legal requirement would be impractical and counterproductive, given recent research indicating that some kinds of fox baits need not be buried in quoll habitat, and that to require this would reduce the efficiency of baiting.

The meat baits used for canid control are likely to be toxic to native carnivores such as quolls if they consume the baits, particularly if more than one bait is taken. However, recent research as described earlier has shown that consumption by and harm to the spotted-tailed quoll is relatively low. All labels should therefore contain the following instruction: 'This product may be toxic to some marsupial carnivores. Where appropriate, potential risks can be reduced by careful bait placement, selection of the minimum effective rate, and avoidance of baiting during the main breeding season'.

The rate of 40 baits/km used in some parts of NSW for aerial control of wild dogs appears to be based on tradition and experience, but does not appear to be supported by any efficacy data from scientific trials. It has been noted (eg. http://www.feral.org.au/feral_documents/00008.pdf) that the number of baits delivered during aerial baiting campaigns is often arbitrarily decided and is almost certainly excessive, particularly in the larger scale aerial operations in rangeland areas of the country. The higher rates used for aerial wild dog baiting likely exceed the minimum effective rate and 4 to 10 baits per km appear to work effectively in controlling wild dogs. Accordingly, labels must specify a maximum rate of 10 baits/km transect for aerial control of wild dogs.

As baits lose toxicity in the field, baits that are not recovered at the end of a campaign may deliver a sublethal dose to foxes. Labels should therefore advise users where appropriate to mark bait stations to facilitate the recovery of baits and their destruction by burning or burial according to State requirements at the end of a campaign.

3.5.3 Instructions related to human and domestic animal safety

The users of products containing 1080 are required to notify their neighbours of the impending 1080 baiting, erect warning signs and advise of potential dangers to domestic dogs. The review finds that product labels should contain specific instruction on neighbour notification and display of warning signs.

3.5.4 Adequacy of label instructions

The review finds that labels for 1080 products do not contain adequate instructions to ensure the safe use of the products. Labels should be amended to include sufficient information to satisfy the labelling requirements of the Agvet Code. Where there are different information requirements, specific to different ecosystems, then that information may be more appropriately included in extension material (codes of practice, manuals, standard operating procedures etc.).

Label instructions can be varied to contain adequate instructions so that the products can be used without undue risk. The product labels need to be updated, as shown below, to reflect current specifications and standards.

- Delete the use of general terminology 'vermin' and 'vertebrate pest(s)', and replace with specific target species.
- Limit the rate of baits for aerial baiting for wild dog control to a maximum of 10/km transect.

- Include the following on the labels¹⁸:
 - requirements for neighbour notification about imminent baiting
 - minimum distance requirement for bait placement
 - requirement of signage in baiting locations
 - Bait materials and size
 - instructions for bait preparation
 - instructions for storage and transportation of baits
 - amount of 1080 in baits
 - bait application rate (number of baits per unit area)

To satisfy the requirements for continued registration of products, the conditions of registration need to be varied to require the following.

- Registrants must provide access to the State/Territory documents referred to on the product label, via their website.
- Registrants who are State/Territory Government agencies must notify the APVMA of any changes made to their State/Territory documents referred to on the product label, particularly changes made with respect to the following aspects—the amount of 1080 in baits, bait application rates, bait application methods, bait substrate, requirements relating to untaken bait recovery, animal carcass recovery, neighbour notification, signage and distance restrictions

3.6 Conclusions

Correct bait placement, or laying baits in the right place at the right time, is essential if non-target impacts are to be avoided. Baits should preferably be laid in the evening in order to minimise interference by birds, after preliminary free feeding to ensure that target animals will quickly consume the poison baits. Baiting should generally be avoided in and around important native habitat as herbivore baits in particular can exert severe impacts on sensitive local populations, as exemplified by anecdotal reports of local extinctions of Tasmanian bettongs and rodents. Similarly, meat baits need to be placed with great care in spotted-tailed quoll habitat as these animals are sensitive to 1080 and individuals may be negatively impacted by poisoning, although successful fox control is likely to benefit their populations in the longer term.

With careful attention to bait preparation, placement, timing, and minimum effective rate of bait-lay, target selectivity can be optimised. Although many species are sensitive to 1080, the use of the toxin can be managed so that it does not give rise to widespread or serious impacts on non-target fauna.

Baiting practices vary across Australia and even within States because of differing environmental conditions and sensitivities. This makes it difficult to standardise labels for 1080 products. Nevertheless, current labels contain limited information regarding the minimisation of non-target risks. The review finds that labels need to be varied to provide clear advice on optimal baiting practices to suit local environmental requirements.

18 For details, see Section 9 of this volume.

4 SUMMARY OF REVIEW FINDINGS

4.1 Environmental contamination

- Application rates of 1080 are low, a few grams per hectare for herbivore control and a gram or less for carnivore control. Although the application rates for feral pigs are higher than those for other vertebrates, they are still low. As such, significant contamination of air, soil or water by 1080 is not expected to occur from these uses as the toxin is susceptible to microbial degradation, except under arid conditions when microbial activity is low.
- The ready microbial degradation of 1080 under moist conditions conducive to microbial activity, and the low treatment rates mean that significant leaching through soil is not expected to occur.
- Low level 1080 contamination of water is possible, particularly if baits fall directly into watercourses, but any contamination that may occur will be at low levels and rapidly diluted to insignificant concentrations.

4.2 Poisoning of non-target animals

- While poisoning of individual non-target animals may occur from consumption of baits, and to a lesser extent, poisoned animals, there is no evidence that use of 1080 baits leads to an adverse impact on non-target species at a population level.
- There are differences in sensitivity to 1080 between different animal species. In some cases, the higher sensitivity of target species helps avoid lethal impact on non-target animals. For example the 1080 dose (3 mg/bait) used in fox baits is unlikely to be harmful to birds of prey. The LD50 for foxes is 0.1 mg/kg and the LD50 for wedge-tailed eagles is 9.6 mg/kg.

4.3 Optimising efficacy

- With careful attention to bait preparation, placement, timing, and minimum effective rate of bait-lay, target selectivity can be optimised.
- To ensure effective control of various target animals, a range of bait types should be available for each target pest and the non-target risks need to be evaluated for each bait type.

4.4 Label instructions

- The labels for 1080 products do not contain adequate instructions to ensure the safe use of the products. However, the label instructions can be varied to contain adequate instructions so that the products can be used without being likely to have an unintended effect that is harmful to animals, plants or things, or to the environment. The product labels need to be updated to reflect current regulatory standards.

5 PROTECTED DATA

At the commencement of the review, registrants were required under s32 of the Agvet Code, to provide data and information to the APVMA that was relevant to the reconsideration. The Agvet Codes provide that a person who supplied protected information for use by the APVMA in conducting the review, may be eligible to receive compensation from any other party which uses that information. Protected information remains protected for a period of time determined by the regulations to the Agvet Codes. The APVMA must not use protected information to support the approval (or the continued approval) of another, active constituent for a proposed or existing chemical product or registration (or the continued registration) of another chemical product, unless the two parties have agreed to the terms of compensation to be paid by the registrant of that other chemical product to the owner of the protected information. However, no protected data was relied upon in making regulatory decisions in the current review.

6 OVERSEAS REGULATORY STATUS

Development and use of 1080 as a predacide and rodenticide occurred in the USA in the 1940s, but all registrations were cancelled in 1972 together with those for other predator control agents containing strychnine and sodium cyanide. Registration of livestock protection collars containing 1080 was restored in 1985 and remains the only approved use in the USA.

1080 is also used in Mexico and Israel, but the bulk of world usage occurs in New Zealand and, to a lesser extent, Australia. 1080 has been registered in New Zealand since 1964. New Zealand authorities recently reviewed all aspects of the registration of 1080.

In August 2007, the Environmental Risk Management Authority (ERMA) of New Zealand announced that it had imposed a new management regime on the use of 1080 in New Zealand. Tighter mandatory controls had been placed on the pesticide, with all aerial operations to be actively monitored by ERMA from 1 January 2008. ERMA also recommended that the government undertake more research into some areas of continuing concern to the public. It was emphasised that the decision was not intended to be for all time, with further reassessment likely at some point in the future. The timing for any reassessment would depend on how well the new management regime is implemented, and on the response to the recommendations from the reassessment.

7 PUBLIC CONSULTATION TO DETERMINE THE SCOPE OF THE REVIEW

Before formally initiating the 1080 review, the APVMA investigated the issues associated with the use of 1080 in order to define the scope of the review and to establish the data requirements for the review. In December 2001 the APVMA announced (APVMA Gazette and a media release) its intention to review the chemical 1080 in 2002 and sought information from product registrants, users, industry groups and interested parties on chemical application, accidental poisonings and possible measures to minimise these risks.

Approximately 250 submissions were received from local, state and federal government agencies, environmental organisations and conservation groups, rural lands protection boards, animal welfare groups, industry organisations, community groups, landholders, media groups, and the general public. The nature of the submissions varied from short testimonials through to comprehensive data packages addressing all aspects associated with the use of the chemical. A number of these submissions included copies of key papers relevant to the use of 1080 in Australia, as well as research directions already being planned and implemented. Information and data contained in those submissions was used in determining the scope of the review, and also in the review evaluation. Below is a summary of the submissions.

1080 is a naturally occurring compound that does not persist in the environment nor accumulate in wildlife. Its availability and use are tightly controlled by State authorities. Differences in sensitivity (carnivores and especially canids most sensitive, native species more tolerant than introduced) and feeding preferences allow target selectivity, while greater tolerance in WA makes target selectivity easier to achieve. There are biodiversity conservation benefits from the use of 1080, such as successful fauna reintroductions in WA and elsewhere in Australia.

Use of 1080 to control browsing mammals in Tasmania exerts a temporary 'knock-down' effect on target animals and sometimes kills a few non-target animals, but spotlight surveys indicate that baiting is not reducing populations of target or non-target animals. 1080 is seen as an essential tool for private sector forestry plantation establishment in Tasmania, although not the complete answer.

More broadly, 1080 is a vital tool for agriculture that also protects flora and fauna; its removal or restriction would lead to increased use of illegal alternatives which are more damaging to the environment, and to increased predation and competition for resources with native animal populations.

Coordinated area campaigns are most effective for canid control, but may be difficult to achieve in some areas due to opposition by some landholders, mainly because of concerns for dogs. 1080 is known to kill domestic dogs, but many respondents consider that dogs should be under closer supervision. Rare species such as quolls are sensitive but continue to be seen in previously baited areas, sometimes after not being sighted for many years.

Agricultural interests expressed a view that the review should focus on labelling and related control of use aspects, and analysis of alternatives with a focus on efficacy.

A number of respondents while recognising the benefits of 1080, considered that various aspects of its use needed to be further explored and refined.

The issue of bait uptake was a prominent theme. Further research is needed into bait movement, including caching of baits by foxes, as this may increase non-target risks. The lower palatability and consequent increased rate of caching for commercial baits was identified as a potential shortcoming. There is a general need for specific data on bait uptake by target and non-target species.

Evidence that 1080 impacts on quolls was presented, and the following issues were identified: bait specificity (whether dried meat baits are less attractive to quolls), mound baiting (optimal depth for bait burial) and possible secondary poisoning during rabbit baiting operations. It was argued that aerial baiting should not occur in quoll habitat as the impact is likely to be significant and could be a major factor in the ongoing decline of mainland quoll species. It was noted that aerial

baiting for wild dogs has ceased in Kosciuszko National Park because of these concerns, but that adjacent landholders didn't believe that the current ground baiting operation was as effective, even though this occurs throughout the year whereas the former aerial operations were conducted annually. Further research was underway to try and resolve this issue. Note that some of this work has been published as described later in this report.

A number of respondents argued that the humaneness of 1080 was a crucial aspect that had to be addressed. Research into alternative methods, such as use of the prolactin inhibitor cabergoline or the M44 ejector (a poison delivery device for foxes and wild dogs), was highlighted.

A minority of respondents to the review were concerned about the use of 1080, with some favouring a ban or tighter restrictions. Issues raised included that distribution to landholders should be banned because of risks to domestic dogs. Some contended that 1080 should be banned completely because of impacts on native fauna. These views were more prevalent in Tasmania, where many people are opposed to the use of 1080 to control native fauna, particularly during the establishment of forestry plantations. They argued that decisions should be based on the precautionary principle.

8 SUBMISSIONS IN RESPONSE TO PRELIMINARY REVIEW FINDINGS (PRF) DOCUMENT

The APVMA has a policy of maintaining transparency in its activities and encouraging community involvement in conducting reviews. As a part of implementing this policy, the APVMA published the 1080 Preliminary Review Findings document in May 2005 and invited public comments. In response, fifty-one submissions were received. Most were supportive of the continued use of 1080, although not necessarily of the proposed label variations, but a significant proportion remained opposed to various degrees.

Supporters of 1080 emphasised its vital importance in protecting the Australian environment and its agricultural industries from introduced vertebrate pests, noting the high effectiveness of 1080 and minimal harmful impact on non-target native animals. The main concern of opponents centred around the humaneness issues involved in the use of this poison. Concerns were also expressed that 1080 may not be effective, and that its use is harmful to non-target native animals and valued domestic animals.

The major issues raised in the responses to the preliminary review findings are discussed in more detail below. As well as these major issues, many smaller points of a more technical nature were raised. Where appropriate, the technical report has been amended in line with these comments, and with the broader arguments that are presented below.

8.1 Bait shyness and free feeding

Summary of submissions to the APVMA

Several respondents argued that the review findings were based on the false premise that substantial bait shyness occurs in Australia with 1080 use. A registrant argued that bait shyness is not well supported by fact and was often used as a scapegoat for other failures. For example, dogs may refuse a bait unless the bait matrix matches the food source on which they are relying in a particular area, or may fail to locate a bait because it has been taken by foxes or another non-target species, particularly birds for surface laid baits.

APVMA response

Although bait shyness, a conditioned food aversion, is less likely to occur with 1080 use than with other acute poisons because of the lag phase that precedes the onset of symptoms, bait shyness has been reported in the eastern States, particularly in canids. It is acknowledged that there are many reasons why a dog may refuse a bait, and that failure to take a bait does not necessarily indicate bait shyness. Because bait shyness has a precise definition based on sublethal bait exposure, this term will be removed from the technical report, except where mentioned in references.

Summary of submissions to the APVMA

The single dose baits used for dogs and foxes can be consumed rapidly by the target animals, while more time will usually elapse before a lethal amount of the laced grain and carrot baits is ingested by herbivores and feral pigs. The uptake of grain and carrot baits is usually encouraged by free feeding with non-toxic bait. Several respondents affirmed their use of free feeding as a technique for ensuring bait uptake by the target pests, although there was a general preference for this to be a recommendation rather than a requirement. A registrant cautioned that there was little need for free feeding in fox or wild dog operations unless there was a concern about quolls or other high risk animals being able to access the baits. NSW Rural Land Protection Board, Cooma, expressed the view that pre-poison monitoring, correct bait type and bait location by experienced personnel were a more effective alternative to free feeding when baiting for wild dogs.

Some respondents suggested that free feeding may be counterproductive in that it could encourage non-target species to feed on the bait.

APVMA response

It is acknowledged that free feeding is not intended to address problems of bait shyness, but rather is a technique for overcoming neophobia, or the natural reluctance of some target animals to take a bait. It is also useful to determine how much toxic bait to lay. Free feeding on sand pads can assist in determining where baiting should not occur because of the risk of non-target uptake. Free feeding is not particularly useful for wild dogs and foxes, except where required to address non-target risks, and is obviously impractical where baits are aerially deployed. Free feeding appears most advantageous with the ground baiting of pigs, and is also important for rabbits and other herbivores, except when using the one-shot product.

Note that free feeding feral pigs with meat is illegal, because of the risk of disease transmission. Although this does not apply to poison baiting, users should be mindful that meat baits could be a means of spreading exotic disease if the meat is sourced from outside the property where baiting is conducted.

8.2 Risk to non-target native animals

Summary of submissions to the APVMA

Several respondents argued that the review findings were based on the false premise that there is a substantial risk to native Australian non-target animals with 1080 use.

APVMA response

It is true that there is a substantial risk of harm to individual non-target animals if they consume certain baits. However, with careful use, the risk to native non-target populations is low, while benefits may be expected from the removal of feral predators and competitors. The review findings are based on an acceptance of the need to protect populations, including locally isolated populations of sensitive species such as Tasmanian bettongs and potoroos, but with recognition that avoidance of harm to individual non-target animals is also desirable provided that it does not compromise effective control of the target pests.

Summary of submissions to the APVMA

Some respondents criticised the review for concentrating on preventing harm to populations rather than individual animals.

APVMA response

The approach taken in the report is consistent with that generally adopted for environmental risk assessment, that is, environmental risk assessment differs from human health risk assessment in that the aim is to protect populations or ecosystems rather than individuals. The US EPA's working definition of risk assessment is, 'A process in which information is analysed to determine if an environmental hazard might cause harm to exposed persons and ecosystems'.

Summary of submissions to the APVMA

The focus on populations rather than individual animals was also criticised on the basis that data are inadequate to demonstrate that the use of 1080 does not harm non-target populations. It was argued that the technical report contains numerous unsupported assertions regarding the efficacy of 1080 baiting and the supposed benefit of bait-targeting techniques. Furthermore, it was contended that DEW has a conflict of interest in providing advice to the APVMA regarding the

environmental risks of 1080 baiting given the large scale use of 1080 as a part of conservation and pest animal control programmes.

APVMA response

There is no conflict of interest in DEW advising the APVMA of the likelihood of environmental harm from the use of 1080. The DEW assessment was conducted by the Chemical Assessment Section, which is separate from the areas that oversee wildlife management issues. The assessment followed a weight-of-evidence approach based on scientific knowledge and practical experience of how 1080 behaves in the environment and its effects on living organisms. If there was evidence that the use of 1080 was causing harm to the Australian environment, DEW would have advised the APVMA of this without hesitation and insisted that action be taken to prevent or minimise the harm.

Summary of submissions to the APVMA

Similarly, Animals Australia, the peak body representing various animal advocacy organisations, argued that the review has no scientific basis for concluding that mortality in individual non-target animals will not harm their populations, and that the killing of target animals by 1080 will assist in the conservation of biodiversity. According to Animals Australia, 1080 baiting should be discontinued because of the precautionary principle.

APVMA response

Principle 15 of the Rio declaration (UN Conference on Environment and Development, 1992) states that a lack of full scientific certainty should not be used as a reason for postponing a measure to prevent degradation of the environment where there are threats of serious or irreversible environmental damage. Contrary to the Animals Australia position, preventing the use of 1080 baiting to protect threatened native species from introduced animals could be an action in conflict with the Principle, where such a restriction would threaten serious or irreversible damage to those native species. The view held by many wildlife biologists is that the risks posed to some native species by unchecked populations of introduced animals are much larger than the risks posed by current control methods, including 1080 baiting which is well researched and tightly regulated by the States.

8.3 Efficacy

Summary of submissions to the APVMA

RSPCA Australia asked where the relevant scientific analyses are relating to efficacy (particularly in terms of impacts at the population level for the pest species and impacts in predation and stock losses). Particular concern was expressed regarding the very limited data available regarding the effect of baiting on dog numbers or signs. Scientific evidence regarding the efficacy of aerial baiting and other techniques for dingoes was requested. RSPCA Australia contended that the effectiveness of 1080 has never been adequately determined.

APVMA response

Under national registration, the APVMA's efficacy evaluation of pest control chemicals is generally outsourced to State agriculture departments and external reviewers. The efficacy of 1080 in controlling the target pests was not raised as a concern to be included in the scope of the review.

The environmental assessment did not evaluate the efficacy of 1080, except to the extent that the effectiveness of 1080 in biodiversity conservation was considered. This consideration is discussed in section 7.2.4 of the Technical Report. Note that wild dogs are primarily a problem for agricultural production rather than biodiversity conservation; although it is logical to assume that they can also harm native species, and there are high profile examples of such threats, such as to

the northern hairy-nosed wombat. State agricultural authorities and other respondents affirmed in their responses to the review that 1080 is effective at controlling the target pests, including wild dogs.

Summary of submissions to the APVMA

Several respondents endorsed the view that scale is an important consideration when evaluating the suitability of a control method. While warren ripping is useful in broad scale rabbit control operations, most of the alternative techniques to 1080 baiting are not practical or suitable for broad scale control of vertebrate pests, although they may be viable for small areas. Because of the broad distribution of feral animals and their capacity to repopulate, particularly into small areas, broad scale methods are often needed for control of feral animals in Australia. Aerial application is advantageous when conducting broad scale baiting programs as it enables treatment of large areas within a short timeframe, including rugged terrain where ground baiting would be difficult. The Australian Dingo Control Association asked that no large scale baiting including aerial baiting be permitted, particularly in remote regions, arguing that there is no justification for such activity except that it is the easy option. RSPCA Australia noted that no data are provided to support the assertion that smaller baited areas are more susceptible to reinvasion by foxes.

APVMA response

It is difficult to understand why the advantages of broad scale baiting would be questioned. An area from which foxes have been removed will more easily be recolonised by them if a source of recolonisation is located nearby, as tends to be the case when only small areas are baited. The success of large-scale programs such as Western Shield provides strong evidence for the advantages of treating large areas. Experts in wildlife management were unanimous in their support for the benefits of 1080 for biodiversity. For example, the Australian Mammal Society emphasised the critical importance of broad scale 1080 baiting programs to the conservation of Australia's mammalian fauna.

8.4 Biodiversity conservation

Summary of submissions to the APVMA

As noted above, Animals Australia argued that negligible evidence had been presented to demonstrate that lethal control of feral animals assisted in the conservation of biodiversity.

APVMA response

This group has argued elsewhere that feral animals with established populations in Australia must be permitted to settle into their new niches and stabilise their populations with a minimum of human interference, even if this entails the extinction of some native species. This peak body has correctly identified that some native species would face a serious risk of extinction if 1080 baiting of feral animals were to be curtailed.

Strong evidence exists to demonstrate that feral animal control using 1080 is likely to assist in the conservation of biodiversity. It appears contradictory to argue in favour of the precautionary approach while insisting that human interference with feral animal populations be minimised, given the serious and irreversible environmental damage that can be expected from uncontrolled feral populations. Competition and land degradation by feral rabbits, predation by the European red fox, predation, habitat degradation, competition and disease transmission by feral pigs and predation by feral cats are listed as key threatening processes under the Environment Protection and Biodiversity Conservation Act 1999. Poison (1080) baiting is the most effective way of reducing numbers of these pests, particularly for rabbits and foxes.

Summary of submissions to the APVMA

Concerns regarding the scientific evidence supporting the importance of 1080 for biodiversity conservation were also expressed by RSPCA Australia. The technical report was criticised for its reliance on unsupported assertions regarding the efficacy of 1080 baiting and the supposed benefit of bait-targeting techniques.

APVMA response

It is true that the evidence for the benefits of 1080 in protecting native species is largely observational in nature, rather than being based on replicated trials in which the effects of baiting are determined by comparison of treatment and control sites. A recent survey of pest animal control operations conducted mainly for biodiversity conservation concluded that because of poor experimental design there is 'almost no reliable knowledge concerning the consequences of pest animal control, including benefits or otherwise to native species'. Although the benefits of fox control have been demonstrated experimentally for several native species, largely in the Western Shield program in Western Australia, the benefits of feral rabbit and feral pig control are largely derived from observational studies, while no information is available on the benefits of wild dog control to the maintenance of biodiversity. Standard protocols are needed for estimating kill rates and absolute or relative abundances of pest animals and native species. Unless studies are carefully designed, with the results of baiting evaluated over treatment and control sites, it will be difficult to determine whether any benefits that may arise are due solely to baiting or include other factors such as habitat change, climate or disease.

A recent review of progress on invasive species has identified some of the reasons why there are few hard scientific data to underpin the use of 1080. Information on the abundance of established animal pests tends to be patchy and inconsistent, with interpretation difficult because of seasonal variability, and trends not easy to identify. Assessing and quantifying impacts is difficult as knowledge of the precise contribution of an invasive species to the impact on native species or the wider ecosystem is generally not particularly well understood or described.

Notwithstanding the lack of hard scientific data, there is a widespread understanding that feral animals are a major threat to the conservation of biodiversity and agricultural production. It is reasonable to expect that threatened species will benefit when the threats posed to those species are controlled, particularly given the outstanding results from flagship programs such as Western Shield. While it is true that the benefits of 1080 for biodiversity conservation are often not known with full scientific certainty, the cessation of 1080 use would entail a strong likelihood of serious or irreversible damage to some native species.

Summary of submissions to the APVMA

The dangers of foxes in particular to Australia's native mammals are well illustrated by one respondent who recalled the killing of more than a hundred bettongs by a single fox in a period of days before it was eliminated.

APVMA response

Shortcomings in the data supporting the benefits to native species of feral animal control measures are not unique to 1080. The field of wildlife management has been strongly criticised for its heavy reliance on information generated from descriptive studies and its slow adoption of experimental designs to examine the effects of management actions. That does not mean that wildlife management should be discontinued until such time as complete data are available, particularly as such data may often best be derived from wildlife management programs (including 1080 baiting) conducted in an adaptive management framework.

8.5 Humaneness

Summary of submissions to the APVMA

A number of respondents were opposed to the use of 1080 because of their strong belief that it is cruel and inhumane. Another argued that 1080 may be inhumane, and that the APVMA should amend its legislation so that the humaneness of a pest control agent becomes a specific criterion which the APVMA must consider.

RSPCA Australia provided detailed scientific argument to support the contention that 1080 is inhumane, including evidence from human exposures. These cases have identified symptoms of pain or distress, such as anxiety, irritability, agitation, hyperactivity, epigastric pain, headache, nausea and vomiting, faecal incontinence, respiratory distress, hyperaesthesia, muscular pain and tetanic spasms.

APVMA response

It is important to note that the technical report considered issues related to the humanness or otherwise of 1080. It did not make any regulatory findings with respect to this issue. The review noted that some pain and distress is always likely to occur in poisoned animals, but there is conflicting argument in the literature on whether pain from 1080 poisoning is severe. Although not explicitly stated in the review, there is a general understanding that some alternative poisons such as strychnine do cause severe pain and should not be used where more specific and humane alternatives such as 1080 are available.

Summary of submissions to the APVMA

RSPCA Australia argued that it would be better to remove any discussion of animal welfare from the review report rather than presenting allegedly false and misleading information based almost entirely on a highly biased conference proceeding, the author of which set out with the stated intention of demonstrating 1080 baiting to be humane. Several respondents endorsed the view that all reference to animal welfare should be deleted except for the statement that humaneness of a pest control agent is not a specific criterion under the Agvet legislation. These respondents contended that the current presentation of the animal welfare issue is biased as only the 'opponents to 1080-use' view is included in the executive summary.

APVMA response

It is restated that humaneness is not a criterion that can be considered by the APVMA when determining the acceptability of vertebrate pest control agents. The issue of humaneness is contentious, as illustrated by accusations of bias from groups opposed to and supportive of the use of 1080, and is unlikely to be resolved through scientific investigation alone.

Accordingly, the discussion of animal welfare issues in the technical report has been amended to focus on the scientific information available. The information presented has been more clearly referenced, and has been expanded to include certain findings which should have been included but were overlooked in the draft that was released for public consultation.

8.6 Secondary poisoning

Summary of submissions to the APVMA

A key finding of the review was that the risks of secondary poisoning with 1080 are lower than has previously been believed, with native species considered unlikely to be secondarily poisoned by 1080 residues, except for the dingo. Older residue data were obtained by a non-specific analytical method that did not allow for the detoxification of fluoroacetate to fluoride in living animals. Newer data obtained using an analytical method that detects only fluoroacetate indicate that

residue levels in rabbits and rats are low, although the stomach and contents may retain higher residues.

This finding has been criticised by RSPCA Australia on the basis that it is impossible to determine the extent to which the older analytical method overestimated the actual residues present. Furthermore, it is claimed that the carcasses analysed with the more specific method were in some cases weeks or even months old.

APVMA response

While the former criticism is correct, the more recent analyses clearly indicate that the older data substantially exaggerate the residues present. Thus mean residues measured in muscle samples from rabbit carcasses recovered from the field were determined to be 23 mg/kg using the non-specific method but only 0.35 mg/kg using the specific method. The criticism that the more recent data were obtained on old carcasses is unfounded. The carcasses were collected 2 days after death, based on radio-telemetry, and within 6 days of bait laying. Samples were kept frozen until analysis. The review also noted that, in contrast to living animals, fluoroacetate residues tend to be persistent in carcasses. Studies on rabbits poisoned in the laboratory have confirmed that tissue residues of 1080 are low, even though the doses administered were high enough to kill most of the rabbits within 3 hours.

Recently published residue data for free-ranging pigs recovered after baiting in northern rangeland and agricultural areas of WA confirm the low risk of secondary poisoning for native animals even where bait concentrations are high. The pigs were baited with grain (wheat or malted barley) laced with 670 mg/kg 1080. Fluoroacetate residues were determined by gas chromatographic analysis of the dichloroanilide (a chemical derivative of 1080 that can be analysed by gas chromatography). Most pig carcasses were recovered within 24 hours of baiting. The maximum residues recorded in muscle and liver were 2.42 and 4.28 mg/kg, with mean residues of 0.70 ± 0.54 and 0.64 ± 1.09 mg/kg, respectively. Carcasses were scavenged by birds of prey with no apparent lethal effects, but the gut contents were infrequently consumed. Only dogs, cats and foxes were predicted to be at risk of secondary poisoning from consumption of pig meat or liver (15% of body weight) contaminated at the highest recorded levels. Although 1080 residues are usually stable in carcasses, they appeared to decline in the pig carcasses, as mean residues were close to 1 mg/kg in 41 carcasses discovered within 24 hours from the rangeland sites but fell to around 0.5 mg/kg in 13 carcasses sampled 24-48 hours after death, and further to 0.2 mg/kg in 3 carcasses discovered at 48-72 hours. Residues were much lower (0.38 ± 0.22 mg/kg) in 17 carcasses recovered from the agricultural site, all within 24 hours of death.

These authors also found a very low incidence of vomiting, suggesting that this may reflect differences between the natural diet in the field and the laboratory diet in earlier studies in which pigs vomited frequently.

Summary of submissions to the APVMA

As well as criticising the interpretation of residue data, RSPCA Australia argues that secondary poisoning should be given an appropriate weighting as the technical report demonstrates that secondary poisoning does occur.

APVMA response

It is true that the technical report included reports of secondary poisoning in Australia and elsewhere. However, the species involved in Australia (dogs, foxes and perhaps cats) and New Zealand (ferrets and cats) are introduced, and more sensitive to 1080 than are Australian native carnivores (with the exception of dingoes). Similarly, the North American species (coyotes, bobcats, skunks and kit foxes) reported to have died of secondary poisoning in the USA are more sensitive than native Australian carnivores (except dingoes). Given the focus of the review on Australian native fauna, it is considered that adequate weight has been given to the available reports of secondary poisoning in determining the environmental safety of 1080.

Summary of submissions to the APVMA

The Conservation Council of Western Australia noted that the secondary poisoning of foxes during rabbit baiting programs should be seen as value adding rather than a risk. Another respondent from WA advised that rabbit baiting programs are set up to intentionally increase the secondary poisoning of foxes.

One respondent maintained that Tasmanian devils are common victims of secondary poisoning through lethal and sublethal ingestion of poisoned carcasses.

APVMA response

This assertion is unfounded. The sensitivity of Tasmanian devils to 1080 has been determined. Tasmanian devils are much less sensitive to 1080 than are the target animals, and unlikely to suffer secondary poisoning even if it is assumed that 1080 is not metabolised in the target animal.

8.7 Spotted-tailed quolls

Summary of submissions to the APVMA

The Managing Ranger for the Cooma RLPB noted that studies conducted in 2005 in Kosciuszko National Park had shown that aerial baiting at 10 baits/km does not impact on quolls, and that similar results had been obtained from trials in the New England area of New South Wales (2004 and 2005). The Managing Ranger recommended that this work be considered in recommendations. The NSW Department of Environment and Conservation (DEC) also referred to this research, and confirmed that no aerial baiting would be conducted by them without site-specific risk assessments, because of potential impacts on individual quolls and other native animals.

APVMA response

The above trial results, which are described on the website for the NSW DEC, were considered when reformulating the review recommendations. Information on quoll impacts was limited when the Preliminary Review Findings document was circulated for public comment.

Published work from the New England area of New South Wales had shown low uptake of Foxoff baits by spotted-tailed quolls, although unpublished research results from Queensland included the recovery of two quoll carcasses testing positive for 1080 within seven days of laying fresh meat baits on a 500 m spacing for wild dog control. The two deaths in Queensland were recorded over three baiting campaigns during which 56 quolls had been radio-tracked, and were consistent with earlier reports that a quoll carcass had been recovered following baiting for wild dogs in SE NSW, with residue analysis confirming that it was killed by 1080 poisoning.

The above trials conducted in NSW since the release of the PRF document, were conducted with fresh meat baits, dried overnight before injection with 6 mg 1080 and the bait marker Rhodamine B. This marker temporarily stains the mouth and digestive tract of an animal that eats bait, and is subsequently incorporated into the animal's whiskers as a fluorescent band, provided that the animal survives. Quolls in the study area were trapped, equipped with identity transponders and radio-transmitters, and radio-tracked from the ground and from helicopters for several weeks after baiting.

The first trial was conducted on the Northern Tablelands of NSW in an area with a continuous history of aerial baiting for 30 years. Results have been published. Seven quolls died from the 31 animals that were monitored after baiting at 40 baits/km. Only one of these quolls tested positive to 1080 (0.85 mg/kg in stomach and contents, and 0.28 mg/kg in the liver). This animal died 23 days after baiting, when bait toxicity would have dropped to sublethal levels, but had also suffered severe external physical injuries (unrelated to 1080 poisoning) before death. Whisker analysis indicated that a further five quolls from the 35 animals sampled after baiting had eaten bait and survived. The relatively low rate of bait consumption compared with trials using non-toxic baits raised questions as to whether the quolls in this regularly baited area may have developed an

aversion to baits. Based on the absence of 1080 residues in the carcasses, the authors of the trial concluded that 'only one quoll mortality, that of an injured adult male, might have been caused by 1080'

To address the question of possible bait aversion, further studies were conducted at sites on the Northern Tablelands and in Kosciuszko National Park where aerial baiting had not been used for some years.

On the Northern Tablelands of New South Wales, two mortalities were recorded from the 14 radio-collared quolls that were monitored. These deaths occurred 29 and 34 days after baiting at 40 baits/km. Neither tested positive for 1080. The first appeared to have been killed by a large predator, probably a dog, while the second possibly succumbed to exposure during a prolonged cold and wet period. Exposure to baits was high in this study, with 13 quolls (including the two dead males) having eaten 1080 baits and survived based on markings in the whiskers sampled from 19 trapped quolls. Most whiskers displayed more than two bands, with six bands in one female, although the markings were faint.

In Kosciuszko National Park, a single quoll died from the 16 that were equipped with radio-collars, but it did not test positive for 1080. Six of eighteen whisker samples collected from live quolls after baiting were positive for rhodamine B, but as single bands except for one animal with two bands. Again, the markings were faint. Note that this trial used a lower application rate of 10 baits/km because it was conducted in a National Park.

The results of these trials indicate that aerial baiting at 40 baits/km, or 10 baits/km in a National Park, had a minimal impact on the quoll populations studied, irrespective of whether the areas studied had a recent history of aerial baiting.

Preliminary work in a known (trappable) population of spotted-tailed quolls in Kosciusko National Park using non-toxic baits provides some insights into the likely risks to quolls associated with increased bait density along transects. Because of their territorial nature, not all animals within a population will have ranges that overlap with bait transects. There may be a high availability of alternative and preferred food for quolls in some baited areas. Not all quolls will be behaviourally inclined to eat carrion. Other animals (dogs, foxes, cats and various forest-dwelling birds) are also likely to encounter and consume baits. This means that increasing the bait density along a transect should not be assumed to lead to a higher incidence of exposure in a quoll population, but would increase the likelihood of multiple bait encounters by individual quolls that are inclined to take baits and have ranges that overlap with the bait transect. Thus the encounter rates for non-toxic baits in earlier work and in these investigations were very similar at 63%, 67% and 47%, respectively, at rates of 40, 4 and 10 baits/km. Whisker samples, where positive for the biomarker in the bait, contained only a single band at the lowest rate, but some contained multiple bands at the higher bait placement density.

These authors caution that the encounter rates in non-toxic bait trials only assess extreme risk, rather than actual mortality. The use of toxic baits would not necessarily lead to the same level of bait consumption since some native animals appear to be able to detect the presence of 1080 in baits and reduce their consumption in response. Bait toxicity is likely to decline before quolls discover a bait, and questions remain as to how much 1080 is absorbed following consumption of a meat bait. Furthermore, any losses from toxic baiting may be fewer than would occur due to direct or exploitation competition by canids in the absence of baiting. The relationship between theoretical risk and actual mortality needs to be evaluated during aerial baiting in the field, as has been done in the toxic bait studies described above.

It is considered that this research conducted since the release of the Preliminary Review Findings document in May 2005 confirms that the risks to spotted-tailed quolls from 1080 wild dog baiting are lower than had previously been suspected. This largely reflects the relatively low levels of consumption of toxic baits by quolls. Although some quolls may be killed by 1080 wild dog baits, most quolls are likely to die of other causes. The low level of mortality is not likely to harm populations, particularly when considered against the likely benefits from canid removal.

8.8 Dingoes

Summary of submissions to the APVMA

The Australian Dingo Control Association is opposed to the use of 1080 as a means of eradicating wild dogs and dingoes, noting that the dingo was listed in 2004 by the IUCN as a vulnerable species, with 1080 poison baiting and interbreeding identified as the key threatening processes. This group asked that dingoes be listed as a non-target species on all wild dog labels, arguing that the killing of dingoes tends to exacerbate interbreeding by allowing introgression by feral dogs. Similarly, Wildlife Advocate Inc called for the deregistration of 1080 for dingo control, noting that pure dingoes are rare in southern and north-eastern regions and probably extinct in the south-eastern and south-western regions, although they remain common in northern, north-western and central regions of Australia.

APVMA response

One issue that was not discussed in detail in the technical report is the need to discriminate between wild dogs and dingoes, as the latter are usually regarded as native mammals. This is generally a minor consideration for pastoral enterprises, as the dogs that are targeted in order to protect sheep tend to be feral or hybrid animals, but is a significant issue for the NT.

It is thought that over 90% of wild dogs in the NT are pure dingoes, with hybrid and feral domestic dogs occurring mainly in the vicinity of human habitation. This differs from eastern and southern Australia where over half the wild dog population are hybrids. The relatively undisturbed status of NT dingoes reflects in part the less intensive wild dog control measures that have been conducted in that jurisdiction, largely because livestock production mainly involves cattle which are less susceptible to dingo predation than are sheep. The dingo is classified as protected wildlife under the Territory Parks and Wildlife Conservation Act 2000, and of cultural significance to indigenous people in the NT. Access to 1080 baits and control of the use of concentrate is therefore restricted in the NT.

The need to find a balance between protecting stock and native wildlife from wild dog predation while meeting expectations that the dingo will be conserved because it arrived in Australia prior to European settlement is recognised in the southern States. In addition, it is recognised that wild dogs may play an important ecological role in preventing some fauna from becoming over abundant. For example, the NSW DEC established a wild dog policy in 1997, and updated it in May 2005, which recognised this role.

The policy notes that populations of wild dogs in NSW, including dingoes, mainly occur along the great dividing range and coastal hinterlands, and in Sturt National Park in the far north-west, but that the proportion of pure dingoes among these populations is unknown. It is often difficult to distinguish a pure dingo from a dingo-like wild dog, and available control methods generally do not discriminate between them. The DEC does not have the means to prevent further dilution of the dingo gene pool by domestic dogs.

Under the policy, the New South Wales DEC will only undertake wild dog control on its lands where the impact on the dingo population will not threaten the viability of that population within certain lands identified under the Pesticide Control Order for Wild Dogs (<http://www.environment.nsw.gov.au/resources/2002wilddogbait.pdf>). Wherever possible, wild dog control will focus on the perimeter of lands acquired or reserved under the National Parks and Wildlife Act 1974. Wild dog control will only be conducted as part of a coordinated and strategic campaign, albeit with provision for swift control responses. A conservation risk assessment must be conducted for all wild dog control programs. Aerial baiting is restricted to rotary winged aircraft.

As noted above, pressures on dingoes are not restricted to 1080 but include interbreeding. Control activities on the perimeter of conservation estate are likely to affect hybrid animals rather than pure dingoes as they are unlikely to occur close to the perimeter.

8.9 Domestic dogs

Summary of submissions to the APVMA

A number of respondents criticised the review for not paying more attention to the risks of 1080 for domestic dogs. Some were concerned for the safety of their own domestic animals, noting the lack of an effective antidote. It was suggested that 1080 fox baits are simply too potent and dangerous to be made available to landholders.

APVMA response

The focus of the technical report was on non-target native rather than domestic animals. Concerns had been expressed regarding the effects of 1080 on native species such as the spotted-tailed quoll. Although the death of any domestic animal from 1080 poisoning is undesirable, there are no suggestions that such incidents have any adverse consequences for biodiversity conservation, except to the extent that they engender opposition to the use of 1080.

Summary of submissions to the APVMA

Some respondents expressed strong opposition to any restriction on 1080 baits based on the risks to domestic dogs, noting that domestic dogs impact on biodiversity by killing native species such as bandicoots, shingleback lizards and waterfowl. It was suggested that closer attention to warning signs would reduce the incidence of dogs being poisoned on private or government owned land.

8.10 Human safety

Summary of submissions to the APVMA

RSPCA Australia criticised the review for not addressing human safety issues. Concerns were expressed by others for the possible poisoning of young children. One respondent advised in relation to fox baiting on Ballina Beach that 'a child only has to touch a bait and lick its hands and you know the consequences', that such usage 'could have a devastating effect on non-target animals and human beings - especially children', and that 'local communities are not made aware that any unrecovered baits are still able to kill animals, birds or human beings'. Some other respondents argued that 1080 should be banned because of its dangers to humans.

APVMA response

Human health issues were not nominated for inclusion in the scope of the review. Although 1080 is clearly too dangerous to be made generally available in its pure form, it has a very good human safety record because of the tight restrictions on its supply. This was specifically noted by one respondent.

There is far too little 1080 in a fox bait to be harmful to humans, including small children. Suggestions that children may be harmed by 1080 if they touch a fox bait and lick their hands are unfounded.

8.11 South Ballina beaches

Summary of submissions to the APVMA

Several respondents raised specific concerns regarding the use of 1080 baits to control foxes on beaches in the Ballina region of New South Wales. A Ballina Shire Councillor called for 1080 to be

banned on public beaches and public land, noting the Tasmanian policy that use of 1080 on public land would cease at the end of 2005.

APVMA response

The South Ballina beaches are known as one of the most important breeding areas for pied oystercatchers in NSW, but are facing increasing human pressures. Fox baiting has been conducted in this area since 1997 in order to protect threatened shorebirds, particularly pied oystercatchers, that nest on the beach. Baiting is regarded as the most effective means of controlling foxes. Chicken heads are injected with 1080 and buried in the sand.

This issue is the responsibility of the State of NSW. It is noted that the baiting program has significantly improved fledgling success rates of threatened shorebirds. Dogs are at high risk of poisoning if they consume a bait that has been laid for foxes. Signs are posted to warn visitors of this risk. The risk to native wildlife is low because the baits only contain 3 mg 1080, and are buried to improve selectivity for the target pest. Ballina residents can assist this program by restraining dogs on beaches so that they do not disturb nesting shorebirds.

Off-lead dog exercise areas are proposed to be tightly restricted with dogs prohibited from other beach areas under the Draft Threatened Species (Pied Oystercatcher) Management Strategy that was developed in early 2003 by an interagency group, led by the NSW Department of Lands and including the Ballina Shire Council.

It is noted that the Ballina Shire Council considered the Draft Strategy on 23 March 2006. It was recommended that Council inform the Department of Lands that it does not object to those aspects of the draft strategy that apply exclusively to public land.

8.12 Tasmania

Summary of submissions to the APVMA

Specific concerns were also raised regarding the use of 1080 in Tasmania. The Tasmanian Conservation Trust disagreed with the review finding that use of 1080 in Australia does not give rise to widespread or serious impacts on native fauna and expressed disappointment that the review did not recommend reducing or terminating the use of 1080 in Tasmania for control of native herbivores. This group asked why the APVMA applied different standards to Tasmania and to the mainland, where the poisoning of marsupials with 1080 is regarded as unacceptable.

APVMA response

The suggestion that Tasmania has been treated differently under the review is unfounded. The objective of the 1080 review was to ensure that its use does not threaten non-target native animals at the population level, including locally isolated sub-populations. The review examined only the registered uses of 1080. The use of 1080 for control of native herbivores has been phased out from mainland Australia, where pest pressures are different and involve less abundant species such as swamp wallabies. Common criteria were used for Tasmania and mainland Australia, namely that use according to label would not be likely to have an unintended effect that is harmful to animals. The scientific evidence presented for review indicated that overall populations of target and non-target wildlife in Tasmania were not harmed by the use of 1080 to reduce local populations. Harmful effects had been recorded for local sub-populations of Tasmanian bettongs, but not for ten years. The review proposed label warnings to minimise the risk that such incidents would be repeated.

It is true that the use of 1080 to control native animals is unacceptable to broad sections of Australian society, including in Tasmania. However, social acceptability is not a criterion that can be considered under the national registration scheme. The APVMA must base its decision on scientific evidence. Social acceptability is a separate matter to be considered by governments. Under the Tasmanian Community Forest Agreement, the Australian government has provided

\$4 million to fast track research, set up demonstration sites and encourage greater research into practical alternatives to 1080.

8.13 Recommendations proposed in the PRF document

Summary of submissions to the APVMA

The NSW DEC commented that the terminology in the proposed label statement that only authorised personnel can have access to baits is ambiguous. It suggested that the statement be rephrased to read 'Only personnel authorised under State/Territory legislation can have access to baits'. The NSW Department of Primary Industries (DPI) noted that it is necessary to distinguish between authorised persons, who are allowed to access the concentrate and prepare baits, and approved end-users, who are usually different people.

The Agriculture Protection Board of Western Australia noted that the authorised persons who can access 1080 solutions in Western Australia are not limited to staff from Government agencies, but include licensed pest control officers who, after suitable training, are licensed by the Commissioner for Health.

Comments on the proposed review recommendations were mainly provided by State authorities in WA, SA, Tas, SA, NSW and Qld, with support from community conservation organisations.

There was a general view that mandatory label statements were too inflexible, given the wide range of situations in which 1080 is used. For example, it may be desirable to relax some conditions, such as distance restrictions, provided that the decision is made by an authorised person after first determining that risks would not be increased. One option suggested for addressing this was to qualify label statements with the phrase, 'Unless otherwise approved by State authorities.'

APVMA response

Most of the proposed label variations relate to human sensitivities, including risks to domestic dogs, rather than environmental protection. The variations are largely based on the findings of the VPC review, but nevertheless encountered widespread criticism. DEW, as the Federal government agency which undertook the environmental assessment of 1080, confined any specific comments on the proposed label variations to those intended for environmental protection, but noted that the views expressed by respondents generally appear to be reasonable, and that flexibility in label instructions was desirable as it allowed precautions to be tailored to local circumstances by local pest control groups who are best placed to understand and manage the risks for a particular area. While local groups should be encouraged to consider whether relaxation of particular requirements may improve the effectiveness of baiting without increasing the risks, this should be considered and endorsed by State authorities before any implementation.

New label wording is presented in Section 9 of this document.

8.13.1 Neighbour notification

Summary of submissions to the APVMA

The requirements that all adjacent landholders be notified in writing at least 72 hours in advance of a baiting operation, unless other arrangements such as media notices were in place for large scale projects, and that baiting occur within 7 days of notifying neighbours, were criticised as too restrictive, particularly for broad scale operations. It was suggested that notification not be limited to written notices, particularly as local community newspapers may only be printed once or twice a month, and that the 7-day period be extended to 10 days to allow for delays such as those caused by adverse weather. Telephone or personal contacts were preferred for initial approaches to neighbours in NSW. The requirement to notify all adjoining landholders was

criticised, with the suggestion that this be limited to those whose property boundaries were within 1 km of where baits are to be laid.

APVMA response

Timely notification of adjoining neighbours is necessary to enable them to take necessary actions to protect their animals. The neighbour notification requirements proposed in the Preliminary Review Findings report are similar to those recommended by the Vertebrate Pests Committee¹⁹, a national body of experts in the management of vertebrate pests.

8.13.2 Signage

Summary of submissions to the APVMA

Clarification was sought regarding the proposed label instruction that signage be placed at every entry to the property where baiting is to occur. Western Australia suggested that this be restricted to designated road entrances. The NSW DEC raised concerns in relation to the placement of 1080 notices at every entrance to a national park or other conservation area, noting that baiting in reserves is usually restricted to small areas, and that cats and dogs are prohibited from entering national parks in NSW. It was suggested that 1080 notices are only required at the entrance to any access road or formal walking track through the baiting area. The NSW DEC also suggested that ambiguity regarding the length of time for which 1080 notices should be retained can be resolved by requiring them to remain posted for at least 4 weeks after the last bait is laid.

APVMA response

Signage in the area where 1080 baits have been laid is necessary to inform people using or entering the land of the potential risk. The signage requirements proposed in the Preliminary Review Findings report are similar to those recommended by the Vertebrate Pests Committee.

8.13.3 Distance restrictions

Summary of submissions to the APVMA

The requirement that baits be placed at least 5 m from the edge of formed public roadways was widely criticised, on the basis that bait placement along tracks rather than in fringing vegetation maximises their uptake by the target canids that use these tracks. The NSW DEC suggested that this requirement be restricted to sealed public roadways, and expressed strong opposition to any intention to introduce such requirements for unsealed roads and tracks.

Western Australia recommended that the 20 m restriction for water courses and water bodies be limited to permanent or flowing water bodies. Canid baits are often laid along dry watercourses in order to target the dogs that travel along them.

APVMA response

DEW reaffirmed the finding of the review that the risks of 1080 to the aquatic environment are low because of the low application rates and low toxicity to aquatic life. While best practice use of 1080 includes the avoidance of aquatic contamination, the concentrations of 1080 that may occur in water are too low to harm aquatic life, or birds or mammals that may drink the water, even if baits fall directly into a water body. Therefore, the review accepts that the 20 m restriction for water courses and water bodies be limited to permanent or flowing water bodies.

19 Report to vertebrate pests committee - *1080 policies, practices and procedures*. Unpublished report made available to the APVMA review.

8.13.4 Bait storage

Summary of submissions to the APVMA

The requirement that baits not be stored was widely criticised on the basis that bait storage is necessary where baiting programs are ongoing or where emergency baiting situations are likely to arise. It was suggested that the label statement proposed in the Preliminary Review Findings document be modified to require that end-users must not store baits once a baiting campaign is complete. The Queensland Department of Natural Resources and Mines (NR&M) supported the prohibition on bait storage, but only for short-life baits.

APVMA response

Storage of all types of baits by landholders continues to be regulated under the restrictions/legislation of each of the State and Territory agencies. The recommendation proposed in the Preliminary Review Findings report reflects the State/Territory restrictions/legislation.

8.13.5 Use of baits in-crop

Summary of submissions to the APVMA

The prohibition on baiting in-crop was widely criticised. For example, the Australian Wildlife Conservancy noted that aerial baiting for broad scale fox control is often conducted on agricultural lands to provide a baited buffer zone to minimise reinvasion of conservation estate. Western Australia recommended that the statement be restricted to crops in mid to late developmental stages. The Qld NR&M noted that control of pigs may require the placement of bait stations within sugarcane crops where the pigs are feeding, and suggested that prohibition on the contamination of foodstuffs by baits was sufficient.

APVMA response

These comments are valid. The APVMA has modified the proposed label instructions accordingly.

8.13.6 Bait and carcass recovery

Summary of submissions to the APVMA

The apparent requirement for bait and carcass recovery was criticised as impractical for many operations, particularly where baits are dropped from aircraft.

APVMA response

As the secondary poisoning risks of 1080 for native wildlife (except dingoes) are low, it is agreed that these activities should not be mandatory, noting that the concerns with unrecovered carcasses relate mainly to their attractiveness to other feral predators or scavengers. The statement has been modified accordingly, with the word 'must' replaced by 'should'.

Untaken baits can continue to present a potential risk to some non-target animals. However, this report has shown that the actual level of harmful impact on native animals from current use patterns, with the possible exception of meat baiting for pigs, is low and restricted to a few individuals rather than populations. There is no pressing need from the environmental perspective to make bait recovery mandatory, but State authorities may wish to retain this option in situations where domestic animals and livestock are otherwise likely to be exposed.

8.13.7 Disposal

Summary of submissions to the APVMA

The requirement that empty containers be destroyed was criticised as not reflecting best practice waste management. Reuse of the same clearly labelled container was preferred over disposal and replacement.

APVMA response

The suggestion that dedicated bait containers be reused for the same purpose rather than disposed of and replaced is sound. Disposal is only warranted for containers that are no longer to be used for their original purpose.

Burning continues to be a recommended disposal method in some jurisdictions. For example, up to 10 kg of bait packaging may be burnt by open fire in NSW without written approval, subject to fire regulations and distance restrictions from human habitation. Note that recovered and unused baits can only be disposed of by burial in NSW (or by return to the point of supply for untaken Doggone baits). Although burning of farm chemicals and their containers is generally undesirable because of the risk of harmful exposures to volatilised residues, such considerations do not pertain to 1080 because it is a salt that is unstable above 110 °C and decomposes at 200 °C.

8.13.8 Laying of herbivore baits

Summary of submissions to the APVMA

The proposed requirement that baits be laid late in the day was criticised as impractical for large properties, given the travelling times involved, and likely to be ineffective in many situations given the crepuscular habits²⁰ of many birds. Similarly, the statement that these baits are toxic to birds and other wildlife was criticised on the basis that many native species are relatively tolerant of 1080 and unlikely to be harmed by baiting.

APVMA response

These criticisms are considered to be valid, and to justify modification of the statement along the following lines:

This product may be toxic to some birds and other native wildlife. Baits should not be laid at times when, or in locations where, birds or other non-target wildlife are likely to be harmed by them.

8.13.9 Laying of native herbivore baits

Summary of submissions to the APVMA

Tasmanian authorities advised that the proposed instruction that bait not be laid in areas likely to contain isolated populations of bettongs or potoroos is supported in principle, but that it should be noted that the identification of such likely habitat may be difficult and impose unrealistic demands on landholders or Tasmanian authorities in some circumstances.

20 Being primarily active during dawn and dusk

APVMA response

There is no intention to place unrealistic demands on landholders or State authorities. The word 'likely' means that the presence of such isolated populations is a realistic and not a remote possibility. Consistent with the statement for rabbit baits on the mainland, the statement could be modified along the following lines:

This product may be toxic to some birds and other native wildlife. Baits should not be laid at times when, or in locations where, birds or other non-target wildlife are likely to be harmed by them. Avoid baiting in areas likely to contain isolated populations of bettongs or potoroos.

8.13.10 Laying of non-meat baits for pig control

Summary of submissions to the APVMA

The proposed requirement that pig baits be laid late in the day was criticised by Western Australia as impractical for large properties, given the travelling times involved, and likely to be ineffective in reducing avian exposure in many situations given the crepuscular habits of many birds. Bait recovery the next morning was also rejected as unsuitable, in that human presence can reduce visitation rates to baits. In addition, the advice to bury baits in order to restrict non-target access was criticised on the basis that 1080 is less stable in buried baits, particularly if the baits are buried in the moist soils that are favoured by feral pigs. It was noted that other options exist for restricting non-target access to pig baits, and that burial is impractical for aerial baiting. Similarly, free feeding is impractical for aerial baiting, although there was widespread support for it as a means of maximising bait uptake by rabbits and pigs when ground baiting. Although aerial baiting is currently limited to meat baits in Queensland, non-meat baits for pigs that would be suitable for aerial deployment are currently under development.

APVMA response

These criticisms are considered to be valid, and to justify modification of the statement along the following lines:

This product may be toxic to some birds and other native wildlife. Bait placement and/or bait station design should be such that non-target access is minimised. Ground baiting for pigs should always be preceded by free feeding to maximise bait uptake.

8.13.11 Laying of carnivore baits

Summary of submissions to the APVMA

There was strong disagreement with the initially proposed restriction in the PRF of 2 baits/km for wild dog and fox baits when laid in areas where carnivorous native mammals are active, with numerous respondents asking that the reasons for this restriction be more clearly explained. Western Australia advised that this limit would need to be changed to 5 baits/km² as that is the rate used for the Western Shield program, which drops baits on a 200 m spacing along linear transects separated by 1 km. Changing to lower bait densities may result in ineffective fox control and a reversal of the outstanding successes achieved by Western Shield. The NSW DEC considered that a limit of 10 baits/km would be more appropriate, noting that recent research had shown that quoll populations are not harmed by baiting at this intensity. Similarly, the NSW DPI recommended that the maximum rate should be at least 10 baits/km. The Cooma RLPB recommended an upper limit of 40 baits/km, reducing to 20 baits/km where carnivorous native mammals are active. The latter condition was criticised as operationally impractical by the Old NR&M because the locations where carnivorous native mammals are active are often unknown. An upper limit of 4 baits/km was suggested in locations where baits cannot be recovered.

APVMA response

It is agreed that the reasoning behind this recommendation of 2 baits/km was poorly articulated in the Preliminary Review Findings report, and that there is now more information available to support a less conservative approach. Although not clearly stated in the technical report, the proposal was a precautionary measure intended to protect the spotted-tailed quoll, the south-east mainland population of which was uplisted from vulnerable to endangered in May 2004. In its listing advice to the Minister for the Environment and Heritage, the Threatened Species Scientific Committee identified habitat loss and degradation and competition with introduced predators as the key threats to the SE mainland population, noting that inappropriate application of 1080 baits may also be contributing to declines. As noted above, dead quolls had been recovered following 1080 baiting operations with evidence that they had been killed by 1080, but the extent to which this may have compromised populations was not known. More recent research has confirmed that some quolls may be killed by 1080 baiting for wild dogs, but that bait consumption does not generally appear to be fatal for quolls. Most quolls die from other causes, with these occasional poisonings considered unlikely to harm populations.

It is acknowledged that concerns for the spotted-tailed quoll have no bearing on the use of 1080 in Western Australia. As noted in the technical report, field studies in Western Australia have shown that 1080 baiting for foxes and wild dogs does not harm populations of the two quoll species in that State, the western quoll (chuditch) and the northern quoll, while laboratory testing suggests that these two quoll species are less sensitive to 1080 than is the spotted-tailed quoll.

Summary of submissions to the APVMA

Western Australia noted in its response to the preliminary review findings that populations of chuditch are clearly benefiting from 1080-based fox control programs.

Western Australia also advised that restricting bait density to 2 baits/km would make 1080 totally ineffective for cat control. Cats generally only consume their food when hungry. Bait density, distribution and intensity therefore need to ensure that cats will encounter baits at such times. Research to date has shown that efficacy against cats is poor at 10 baits/km² but successful at 50 or 100 baits/km², with further trials to be conducted in order to determine optimal bait density.

APVMA response

The review of 1080 examined only the products that were registered when the review was announced. There are no 1080 products registered for feral cat control. The safety of 1080 for use against feral cats will be considered when a registration application is received for a feral cat product. There is no intention to foreclose options for feral cat control. The research conducted to date and its implications for likely baiting densities have been noted.

These criticisms are considered to be valid, and to justify modification of the label statement along the following lines: 'This product may be toxic to some marsupial carnivores. Where appropriate, potential risks can be reduced by careful bait placement, selection of the minimum effective rate, and avoidance of baiting during the main breeding season'. The term marsupial carnivores is preferred as these baits are clearly toxic to dingoes.

As 4 to 10 baits per km are understood to work effectively in controlling wild dogs, any rates over 10 baits would appear to be excessive.

As the risk of 1080 carnivore baits to quolls appears to be low based on research, and as burial may reduce their efficacy, there is no need from an environmental perspective to require this precaution. However, State authorities may wish to make burial mandatory in some situations, as domestic dogs are likely to be killed if they access baits.

8.13.12 Short-life baits

Summary of submissions to the APVMA

There was general confusion regarding the proposal that short-life baits be authorised by permit. Western Australia argued that short-life baits prepared from registered concentrates should be outside the jurisdiction of the APVMA, which regulates 1080 up to the point of retail sale.

APVMA response

The short-life permit proposal is a mechanism to authorise the use of short-life baits when they are supplied for use by others, and is regarded as a legal requirement. Where baits are prepared and used by the same person, as occurs in WA, no permit would be required.

Summary of submissions to the APVMA

The NSW DEC queried the distinction between shelf-stable baits and short-life baits, noting that pellet baits for rabbits and pigs would fall in either category depending on whether they were manufactured or prepared from aqueous concentrate for immediate use. It was suggested that the definitions be refined, noting that landholders may store short-life meat baits for several days in special refrigerators where replacement baiting is used or where time and property size preclude the laying of all baits on the one day. WA also asked for clarification as to which baits are considered to be short-life, specifically mentioning rhodamine oats for canid control, injected eggs for fox control, and grain based baits for controlling feral pigs.

APVMA response

Injected eggs are considered to be short-life baits.

8.13.13 Dosage issues

Summary of submissions to the APVMA

As noted in the technical report standardisation of bait dosage rates across Australia has yet to occur. In particular, Queensland uses 10 mg 1080 in dog baits in western and far northern areas. The Qld NR&M advised in its response to the preliminary review findings that the purpose of this higher dose rate is to minimise sublethal dosing in consideration of factors such as bioavailability, degradation, binding and target animal weight range. The aim is to ensure that the fresh meat baits will deliver a toxic dose to the target animal for the amount of time that the bait is available to it in the field. The NR&M is reluctant to reduce the dose used in these areas to the standard 6 mg unless there are well-documented non-target impacts that can not be mitigated by other means.

APVMA response

The NR&M is correct that there are no well documented non-target impacts from the use of wild dog baits containing 10 mg 1080. There remains a theoretical risk to the northern quoll from such practices. However, field studies in WA have shown that northern quoll populations are not harmed by wild dog baits containing 6 mg 1080, while studies in eastern Australia indicate that the more sensitive spotted-tailed quoll is similarly unharmed at the population level and apparently able to moderate bait consumption at the individual level where 1080 is present. National uniformity remains desirable and problems of degradation may to some extent be alleviated by using a more stable bait medium. However, it does not appear likely based on current evidence that the dosing of dog baits at 10 mg 1080 in western and far northern areas of Queensland would be harmful to non-target populations, particularly given the rapid degradation of 1080 that is to be expected in the demanding tropical environment of these areas.

8.13.14 Meat baits for feral pigs

Summary of submissions to the APVMA

The question of bait medium may also solve the ongoing disagreement regarding the aerial deployment of fresh meat baits containing 72 mg 1080 for control of feral pigs in northern Queensland. This issue remains the greatest concern that the Qld NR&M has with the 1080 review.

APVMA response

As noted in the technical report, the sensitivity of some native carnivores to 1080 entails a strong likelihood that they will be killed if they consume baits of such potency. The use pattern for these baits (surface baiting, often from aircraft and across large areas) makes it likely that significant numbers of carnivorous animals other than the target pests will be exposed to them.

Unlike the canid baits, the meat baits for feral pigs are likely to be toxic to predatory and scavenging birds as well as to mammalian carnivores because of their much higher loading, and may even be toxic to goannas. Although the NR&M has reaffirmed that it has not received reports of wildlife deaths despite laying some 100000 to 200000 baits annually, the nature of the deployment (dropped from the air into remote areas) and the mobility of birds makes it unlikely that such reports would be received even if avian mortality were widespread. Similarly, mortality in mammalian carnivores such as the northern quoll or the yarri (north Queensland subspecies of the spotted-tailed quoll) would be unlikely to be reported in these circumstances, particularly as quolls are rare and cryptic. It is noted, however, that recent marked declines in these two quoll species are more likely to reflect the effects of cane toads than of 1080 baiting, and that recent research in SE Australia suggests that these baits may not be consumed in significant quantities by quolls.

Informal advice from Queensland is that 1080-laced meat is often scavenged by magpies and corvids during bait preparation, but that little appears to be consumed and no harm appears to result in these species. Anecdotal recollections that birds of prey, such as wedge-tailed eagles, were common and visible casualties of this form of baiting during its developmental phase when much higher bait loadings were employed, have been contrasted with the absence of such observations when using the 72 mg baits.

As noted in the technical report, applications to register such products would face significant issues in respect of non-target animals. Data would be needed to demonstrate target specificity and/or a lack of impact on native carnivores, particularly birds of prey, in order to be satisfied that use of these baits would not be likely to have an unintended effect that is harmful to animals. In reporting on the sensitivity of feral pigs to 1080, McIlroy²¹ (see the Technical Report for more information) listed numerous species of raptor feeding on meat baits (poisoned or non-poisoned) or pig carcasses and noted that two black kites were found dead after baiting. Field studies were recommended to determine the actual impact of different pig-poisoning campaigns on non-target animal populations.

If new studies are to be undertaken to demonstrate the environmental safety of meat baits containing 72 mg 1080 for feral pig control, birds should be given higher priority than mammals. Although it is acknowledged that pig baits contain an order of magnitude more 1080 than the dog baits, previous research showing low or minimal impact on various quoll species from wild dog baiting suggests that similar outcomes are likely with the pig baits. In contrast, there is no information to suggest that birds of prey are able to moderate their food consumption when the food contains 1080. Available data as described in the technical report indicate that wedge-tailed eagles are more sensitive to 1080 than other birds of prey, with an LD50 of about 10 mg/kg. Furthermore, as this endpoint was determined in birds from Western Australia that have evolved in the presence of 1080 bearing plants, it is possible that wedge-tailed eagles from other parts of Australia may be more sensitive, notwithstanding that such tolerance is less pronounced in

21 JC McIlroy(a), 'The sensitivity of Australian animals to 1080 poison V. The sensitivity of feral pigs, *Sus scrofa*, to 1080 and its implications for poisoning campaigns.' *Aust Wildl Res*, vol.10, 1983, pp. 139-48.

carnivores than in herbivores. A large wedge-tailed eagle could easily consume a 500 g meat bait containing 72 mg 1080 (much more than the LD50).

Summary of submissions to the APVMA

The NR&M has reaffirmed that the aerial distribution of meat baits for feral pig control is an important Queensland management practice in terms of pest management and biodiversity conservation. The NR&M further advises that aerial baiting remains an important contingency for controlling exotic disease outbreaks. The NR&M is adamant that the use of meat baits containing 1080 needs to be maintained until alternatives are available.

APVMA response

Alternative 1080 pig baits that can be deployed from aircraft and that are unlikely to be taken by carnivorous birds and mammals are under development. The better target selectivity makes it more likely that these baits would satisfy registration requirements from the environmental perspective. Such baits would be preferred, provided that they are effective.

The shortage of data to demonstrate the environmental safety of the meat baits, and the likely difficulty and expense of obtaining such data, makes it difficult for meat baits for feral pigs to meet legislative requirements for national registration.

Currently this use pattern is practised only in Queensland. This practice was originally authorised through a Queensland Board permit before the advent of the national registration scheme when pesticides were regulated by individual States/Territories. After the national registration scheme came into existence, the Queensland Board permit has been transferred to the APVMA. Thus, the use of meat baits containing 72 mg for feral pig control in Queensland is now carried out under the APVMA permit.

Biosecurity Queensland, within the Department of Primary Industries has indicated to the APVMA that it has commenced research to generate data to assess non-target effects. The continuation of the APVMA permit is subject to satisfactory progress and the results of the on-going research project.

Note that meat baits have also been used in South Australia (Kangaroo Island) under APVMA permit to control feral pigs that were preying on livestock. In this case, meat baits were preferred over grain because of potential risks to macropods. Carnivorous native mammals are not an issue on Kangaroo Island. Potential risks to native birds were manageable as the baits were laid from the ground, which allowed them to be buried. Potential risks to reptiles were managed by baiting in winter when reptiles are not active at these southern latitudes. These management options are not available for the broad scale control of feral pigs in northern Queensland.

Recent research^{22 23} (see the Technical Report for more information) has shown that use of grain baits with free feeding provides very good control of feral pigs at the landscape level in tropical Australia. In addition, early results with 1080 pig baits in a new matrix, deployed aerially in Queensland without free feeding, are promising (See Cowled et al, 2006 in the Technical Report).

8.13.15 Rate of bait laying for aerial control of wild dogs

Summary of submissions to the APVMA

Some individual landholders, the NSW Farmers Association and some Rural

Lands Protection Boards expressed concern about the reduction of the bait rate used in some parts of NSW. The rate has been reduced from 40 to 10/km transect.

22 LE Twigg, T Lowe & G Martin, 'Sodium fluoroacetate residues and carcass degradation of free-ranging feral pigs poisoned with 1080.' *Wildlife Research*, vol. 32, 2005, pp. 573-580.

23 LE Twigg, T Lowe, M Everett & G Martin 'Feral pigs in north-western Australia: population recovery after 1080 baiting and further control.' *Wildlife Research*, vol. 33, 2006, pp. 417-425.

These stakeholders were concerned that 10 baits/km will not provide effective control of wild dogs and will result in increased stock losses.

APVMA response

The reason for reduction of the rate is explained in Section 3.5.2. The APVMA issued a temporary permit to allow continued use of the 40 baits/km rate in specific areas of NSW. Scientific studies are necessary to demonstrate if there are conditions in certain areas of NSW which require more than 10 baits/km for effective wild dog control, without significant adverse effects on any non-target animals and birds.

The NSW Department of Primary Industries has indicated to the APVMA that it will seek funding to conduct the necessary research. Such research may take up to three years to produce the data. The APVMA will continue the transitional permit while the research is conducted and the results assessed. Based on the research results, the APVMA will revise the label instructions for baiting density if necessary.

9 REGULATORY DECISIONS

On the basis of the evaluation of the submitted data and information, including the public submissions received in response to the Preliminary Review Findings report, the following regulatory actions are required for the continued registrations of products containing 1080.

9.1 Label variations

The APVMA was NOT SATISFIED that labels for products in Tables A1 and A2 contain adequate instructions in relation to the criteria set out in s.14 (3)(g) of the Agvet Codes.

However the APVMA was SATISFIED that the conditions of label approval could be VARIED, in accordance with s.34 (5) of the Agvet Codes, in such a way that the requirements prescribed by the regulations for continued approval will be complied with. Accordingly, the APVMA varied the product labels. The label variations are detailed below.

9.1.1 All products (Tables A1 and A2)

The following instructions must be included on the labels.

Not to be used for any purpose, or in any manner, contrary to this label unless authorised by appropriate legislation.

Restricted Chemical Product—only to be supplied to or used by an authorised person

This product must be used in accordance with the label instructions and any relevant documentation issued with the State/Territory authorisation to use 1080 products.

9.1.2 Aqueous solutions

The products must carry instructions in relation to bait preparation

9.1.3 Aqueous solutions and oat formulations

Unless approved by the relevant State/Territory authority, users must not store this product after a baiting campaign is complete.

9.1.4 All products (Tables A1 and A2)

The products must carry information and instructions relating to target pest species, bait materials, amount of 1080 in baits, bait deployment, bait placement, rate of bait-lay, precautions, safety directions and a reference to all the State/Territory documents (e.g. codes of practice, user manuals etc.) and legislation relevant to the use of 1080. The rates of bait-lay specified on currently approved labels (i.e. before the variations described in this report are incorporated) are acceptable with the exception of the higher rates used for wild dog control in some jurisdictions. The rate of bait-lay for wild dog control must not exceed ten baits per kilometre transect.

9.1.5 Neighbour notification

Timely notification of adjoining neighbours is essential to allow them to take any actions deemed necessary in the circumstances. This may include moving stock from adjacent areas, and restraining or muzzling dogs. The labels must include the following instructions:

Neighbours must be notified to allow them to take appropriate action. The notification must advise that steps (e.g. restraint, muzzling) need to be taken to ensure that domestic dogs do

not gain access to 1080 baits or poisoned animals. The notification must specify the dates between which baiting will occur. This notification should be in writing and should be given to all adjoining landholders at least 72 hours in advance except where alternative communication arrangements have been made that meet State/Territory requirements and overall safety criteria.

A record of the notifications must be kept.

Baiting must commence within ten days of notification or else another 72 hours notice of intent to lay baits is required.

9.1.6 Signage

Signage in the area where 1080 baits have been laid is necessary to inform people using or entering the land of the potential risk. As this risk to domestic dogs in particular will continue, signs should be maintained for a period post poisoning. The following instructions must be included on the label:

Signage is compulsory for all lands where baiting occurs.

Users must ensure that signs are put up immediately before 1080 poisoning operations commence on the property, placed according to requirements specified by the relevant State/Territory.

Signage must include the following: date baits laid, contact telephone number, toxin name, target animal(s) and a warning that domestic animals and pets can be affected.

Signs must be maintained for at least 4 weeks after the authorised period of bait lay has expired or after all untaken baits have been collected.

9.1.7 Storage and transportation of baits

Baits should be stored and transported in a secure and safe manner and access to baits should be restricted to approved personnel. Storage of baits by landholders, other than manufactured baits, is not recommended. All the labels must contain the following instructions.

Only authorised personnel can have access to baits. Baits must be transported and stored in such a way that unauthorised personnel cannot have access to baits.

Unless approved by the relevant State/Territory authority, users must not store baits after a baiting campaign is complete. Do not store the bait in a position accessible to children, livestock or domestic pets.

The pesticide is only to be kept or stored in the container, and bearing the label, as supplied the manufacturer.

Do not allow baits to contaminate foodstuffs, or feed, for human or non-target animal consumption.

Containers which have held product are not to be used for any other purpose and must be disposed of by burning or deep burial.

9.1.8 Restraints

Do not feed baits to non-target animals including birds.

Do not apply baits to, or in, crops which are in mid to late developmental stages.

Do not apply baits to, or in, crops if contamination of produce is likely to occur.

Do not contaminate dams, rivers, streams, waterways or drains with the product or used containers.

9.1.9 Distance restrictions

The minimum distance 1080 baits can be laid from residences, watercourses, boundary fences and roadways will depend on the relative risk to residents, the general public and domestic animals. All labels must carry an instruction which conveys the following information.

Baits must be placed at least 150 m from a dwelling; 20 m from permanent or flowing water bodies; 5 m from boundary fences; and 5 m from the edge of formed public roadways; or as specified by State/Territory.

9.1.10 Protection of domestic and farm dogs

The following instruction must be included for the protection of domestic and farm dogs.

Steps (e.g. restraint, muzzling) need to be taken to ensure that domestic dogs do not gain access to 1080 baits or poisoned animals

9.1.11 Bait and carcass recovery

As baits lose toxicity in the field, baits that are not recovered at the end of a campaign may deliver a sublethal dose. Labels for all 1080 products must contain the following instructions:

To the extent possible, untaken baits should be recovered at the end of a baiting campaign and be destroyed by burning or burial according to the requirements of the State or Territory in which use has occurred.

Although the secondary poisoning hazard of 1080 for native species appears low, carcasses can remain toxic to domestic dogs, and may attract feral scavengers to baited areas if not recovered. Labels for all 1080 products must contain the following instructions:

To the extent possible, animal carcasses should be recovered during and for 14 days after a baiting campaign and be destroyed by burning or burial according to the requirements of the State or Territory in which use has occurred.

Any incidents where it is suspected that non-target animals may have been poisoned by 1080 should be notified to State authorities.

9.1.12 Aqueous solutions, short-life and shelf-stable baits used for herbivore pest control

To reduce the potential for harm to non-target wildlife, labels for rabbit bait products must include the following instructions:

This product may be toxic to some birds and other native wildlife. Baits should not be laid at times when, or in locations where, birds or other non-target wildlife are likely to be harmed by them.

To reduce the potential for harm to non-target wildlife, the labels of products used in Tasmania must also include the following instructions:

This product may be toxic to some birds and other native wildlife. Avoid baiting in areas likely to contain isolated populations of bettongs or potoroos. Baits should not be laid at times when, or in locations where, birds or other non-target wildlife are likely to be harmed by them.

9.1.13 Aqueous solutions, short-life and shelf-stable baits used for fox and wild dog control

The meat baits used for canid control are likely to be toxic to native carnivores such as quolls, particularly if more than one bait is taken. The labels for these products must contain the following instructions:

This product may be toxic to some marsupial carnivores. Where appropriate, potential risks should be reduced, by correct bait placement, selection of the minimum effective rate, and avoidance of baiting during the main breeding season.

For ground baiting, unless placement is otherwise specified by State/Territory requirements, individual baits should be buried in holes of approximately 8-10cm depth, at marked sites.

The application of baits by air is subject to State/Territory approval.

9.1.14 Aqueous solutions and non-meat short-life and shelf-stable baits used for feral pig control

The labels for non-meat feral-pig bait products must include the following instructions:

This product may be toxic to some birds and other native wildlife. Bait placement and/or bait station design should be such that non-target access is minimised. Ground baiting for pigs should always be preceded by free feeding to maximise bait uptake.

9.2 Conditions of Registration

The APVMA was NOT SATISFIED that the continued registration of products in Tables A1 and A2, subject to the current conditions of registration would not be likely to have an unintended effect that is harmful to animals, plants or things or to the environment.

However, the APVMA was SATISFIED that the conditions of registration could be varied in such a way that the requirements prescribed by the regulations for continued registration will be complied with. Accordingly, the APVMA imposed the following conditions of registration.

Registrants must provide access to the State/Territory documents referred to on the product label, via their website.

Registrants who are State/Territory Government agencies must notify the APVMA of any changes made to their State/Territory documents referred to on the product label, particularly changes made with respect to the following aspects - the amount of 1080 in baits, bait application rates, bait application methods, bait substrate, requirements relating to untaken bait recovery, animal carcass recovery, neighbour notification, signage and distance restrictions

9.3 Cancellation of all but the most recently approved label

The APVMA is NOT SATISFIED that old previously approved product labels for currently registered products contain adequate instructions in relation to the criteria set out in s.14 (3)(g) of the Agvet Codes.

On this basis previously approved labels are to be cancelled.

9.4 Lapsed registrations before the completion of the review

The registration of products shown in Appendix A, Table A3 lapsed since the commencement of the review. Hence, reconsideration of those products is no longer required.

10 REGULATORY OUTCOMES

The APVMA has amended the product labels and imposed new conditions on the registration of products. With these changes, the APVMA is satisfied that the continued use of products containing 1080 is unlikely to cause significant harm to non-target animals or to the environment.

11 THE VERTEBRATE PESTS COMMITTEE

The Vertebrate Pests Committee (VPC) is a sub-committee of the Land and Water Biodiversity Committee, which advises the Natural Resources Management Standing Committee of the National Resources Management Ministerial Council, chaired jointly by Commonwealth Ministers for Agriculture, Fisheries and Forestry, and Environment and Heritage. The VPC called for a review of the policies, practices and procedures for the use of 1080 (sodium monofluoroacetate) within Australia and New Zealand. The review was conducted by a Working Group of VPC, which was made up of representatives from across Australia and New Zealand with expertise in vertebrate pest control.

The objectives of the working group were to conduct a review of a number of recent documents available on 1080 and to produce consistent recommendations on the use of 1080 across Australia. It also reviewed existing legislation relevant to both how 1080 is used and controlled and to other associated issues involved in pesticide use. This review was to also consider the public perception of 1080.

The terms of reference for the review were:

1. document and review the current information, policies, practices and procedures for the use of 1080 in Australia and New Zealand
2. evaluate the role and importance of 1080 in vertebrate pest management in Australia and New Zealand
3. recommend policies, practices and procedures necessary to ensure the future availability and effectiveness of 1080 in Australia and New Zealand.

Two of the key objectives of this review were to provide information on the role that 1080 plays in vertebrate pest control in Australia and New Zealand and to highlight areas where improvements can be made in its use. These improvements will not only allow for more efficient, safe and economical use to be made of 1080 as a vertebrate pesticide, but will also provide balanced information to parties interested in the general issue of the use of 1080.

11.1 Vertebrate Pests Committee's Recommendations

The following recommendations (unpublished to date; a copy was kindly provided to the APVMA for the purpose of the review) were developed by the VPC. It has to be recognised that there are inherent differences in target species, circumstances, local native fauna, legislation and landholder expectations across the various jurisdictions making the feasibility of national standards difficult but where possible this would be preferred.

1. Neighbours should be notified in writing of an impending 1080 baiting program in sufficient time to allow them to take appropriate action. In general, this notification should be in writing and should be given to all adjoining landholders at least 72 hours in advance.
2. The minimum distance for bait laying should be 150m from a dwelling, 20m from specified watercourses, 5m from boundary fences and at least 5m from formed public roadways.
3. Signage should be compulsory for all lands where baiting occurs and should remain for a minimum period of 28 days after baiting.
4. As a general principle a single bait should contain sufficient toxin to be lethal to a target animal. Specific recommendations of dose rates for target species are recommended.
5. Bait size, placement, 1080 concentration and delivery should take into account the behaviour and the presence of target species, and behaviour and susceptibility of non-target species. A range of bait materials is recommended for various species.

6. Techniques used should maximise the probability of control of target species while minimising effects on non-target species. In particular, techniques should maximise the delivery of baits of a consistent quality and standard. Some modifications to current practices are recommended.
7. Baits should be stored and transported in a secure and safe manner, and access to baits should be restricted to approved personnel.
8. As there is a need to control native species in some circumstances, current practices need to continue. As a priority however, there is a need to develop alternative control techniques to 1080.
9. General recommendations:
 - (a) Each State and Territory should adopt and resource a Quality Assurance approach to 1080 usage.
 - (b) There should be development of a 1080 information kit that outlines facts concerning 1080 and which has a consistent message across agencies and States and Territories.
 - (c) The existing data in relation to 1080 dose rates used throughout Australia and New Zealand should be reviewed by the States in line with the principles outlined in this document.
 - (d) The research requirements detailed in Appendix 2 of the VPC report be considered as high priority for continued and improved use of 1080.

11.2 Vertebrate Pests Committee's Conclusions

VPC recognises the need for appropriate restrictions on the use of 1080 to protect the environment and human health. The committee asked that the APVMA take account not only of the need to manage the risks associated with 1080 use, but also of the broader outcomes that would follow any removal or excessive restriction on 1080 use. These would include a substantial reduction in the effectiveness of vertebrate pest control with correspondingly adverse impacts on agriculture, trade (in the event of an exotic disease outbreak) and the environment (including survival of threatened species).

11.3 Vertebrate Pests Committee's work in the context of APVMA's review

The APVMA wishes to highlight the importance of the work of the VPC in investigating the issues associated with the use of 1080 in Australia and New Zealand.

The APVMA has utilised the information contained in this report, particularly with reference to the summary of use practices across Australia, in conjunction with new advice presented for the review from registrants and States authorities that deal with 1080.

The recommendations from the VPC have not merely been adopted without any consideration. Where recommendations have been utilised from this report the APVMA has carefully considered the implications of such action, particularly in relation to whether those recommendations can be enforced either by the APVMA or by the relevant State authorities which control the use of chemicals.

12 OTHER MATTERS NOTED AS PART OF THE REVIEW

The review noted a number of matters that are related to the continuing use of 1080, but have no direct bearing on the reconsideration process. These include alternative non-chemical vertebrate pest control options, government initiatives regarding 1080 use in Tasmania, literature and public submissions on the humaneness of 1080, government initiatives in relation to animal welfare as well as the regulatory framework for the supply of 1080 concentrate and baits.

12.1 Alternatives to 1080

Several other vertebrate pest control techniques- such as fencing, shooting and trapping, tree guards in plantations, repellents, are available as non-chemical alternatives to 1080.

DEW has examined the currently available information submitted to the review on vertebrate pest control techniques. Fences need to be of high quality if vertebrate pests are not to breach them, particularly in rugged and rocky country. Shooting is often used in conjunction with 1080, particularly for control of remnant populations after baiting, but is generally ineffective when used in isolation, particularly where vegetation and/or terrain reduce visibility. Trapping is useful for some species such as dogs but generally needs to be combined with other methods. Shooting and trapping also need to be repeated regularly to be effective. Repellents only seem to be effective when browsing pressure is low, and even then do not protect new foliage.

Guard dogs (and llamas) are used on some properties to protect sheep against attack by foxes and wild dogs. Warren ripping is an important part of rabbit control.

Some of these alternative options are often included in vertebrate pest control programs. It is important that all the vertebrate pest control programs thoroughly consider all the available control options.

12.2 Issues relating to the humaneness of 1080

From public submissions during the nomination and the review scope stages, it was evident that there was strong public concern about the humaneness of using 1080, and that the community considered that this issue should be considered by the review. Although the APVMA noted these concerns about animal humaneness, animal welfare is not a specific criterion in the Agvet Codes that can be taken into account in determining the regulatory outcomes of the review. Animal welfare in relation to the use of pesticides is a broader government policy matter that goes beyond the legislated responsibilities of the APVMA.

The symptoms of 1080 poisoning can be distressing to observe, but it is scientifically difficult to determine if poisoned animals are experiencing pain or whether the symptoms reflect central nervous system disturbances. Gregory²⁴ attempted to elucidate the relationship between 1080 intoxication and pain by reviewing the relevant literature. It was noted that dogs normally respond to pain by becoming quiet, less alert, still, or by adopting abnormal positions when pain is severe; spontaneous barking is unlikely. This contrasts with the hyperexcitability, aimless movements and barking that typically occur during 1080 intoxication. Therefore Gregory argued that the convulsions seen in 1080 poisoned dogs were unlikely to be associated with pain. Irrespective of this, some would argue that causing an animal to suffer symptoms not necessarily involving pain is also inhumane.

Although the measurement of pain in animals must always be a subjective exercise, some insight into the degree of suffering experienced by 1080 poisoned animals may be obtained from humans

24 G Gregory, 'Perception of pain associated with 1080 poisoning.' PM Fisher & CA Marks (Eds) Seminar Proceedings (27 March 1996): Humaneness and vertebrate pest control, Report Series No 2, Victorian Department of Natural Resources and Environment, 1996, pp. 62-64.

who have been poisoned with this compound. Chi et al²⁵ reported that the most common symptoms in cases of fluoroacetate poisoning presenting to hospital were nausea and vomiting, diarrhoea, agitation, subjective respiratory distress and abdominal pain. Sherley²⁶ presented detailed scientific argument, including evidence from human exposures, to support the contention that 1080 is 'inhumane'. These human case reports included symptoms of pain or distress, such as anxiety, irritability, agitation, hyperactivity, epigastric pain, headache, nausea and vomiting, faecal incontinence, respiratory distress, hyperaesthesia, muscular pain and tetanic spasms.

The RSPCA convened a scientific seminar entitled *Solutions for achieving humane vertebrate pest control* in Canberra in February 2003 where it gave a presentation entitled 'Integrating animal welfare into vertebrate pest management'. The RSPCA believes that the available evidence indicates that, in general, the effect of 1080 on animals is not humane and is opposed to its continued use for the control of populations of introduced or native species.

As this review was in the final stages of publication, a review of available literature was published²⁷ in the journal *Animal Welfare*; it concluded that 1080 should not be considered to be a humane poison.

Research has been conducted into the inclusion of analgesics and sedatives in 1080 baits²⁸. Baits containing an analgesic in combination with 1080 have been used at two Victorian field sites²⁹. If such methods were to be used, further research would be needed to ensure that the additives had no detrimental effect on non-target animals.

12.3 Government initiatives regarding the use of 1080 in Tasmania

In Tasmania, control of native herbivores is considered essential for the protection of horticultural crops and newly planted forestry plantations. Broad scale population monitoring conducted hitherto indicates that target and non-target herbivore populations are stable. The review finds that the use of 1080 to control browsing native mammals in Tasmania exerts only a temporary 'knock-down' effect on target animals and that it does not lead to reductions at population level.

The APVMA notes that the Tasmania government has already commenced phasing out the use of 1080 through the programme known as *Tasmania Together*, one of the goals being the reduced reliance on chemicals. 1080 was targeted as a chemical whose use would cease in Tasmania by 2015.

Tasmania Together is a community owned 20 year Social, Environmental and Economic Plan that was launched in September 2001 following an extensive public consultation phase. It contains 212 benchmarks grouped under 24 goals, the last of which is to 'ensure our natural resources are managed in a sustainable way now and for future generations'. This goal encompasses a range of standards, including to 'reduce reliance on chemical use by primary, secondary and tertiary industry and the domestic sector'. Usage of 1080 has been selected as an interim indicator, and is to show a reduction of 50% from 1999/2000 levels (around 15 kg/annum) by 2005 and 75% by 2010 with cessation of use by 2015.

25 CH Chi, KW Chen, SH Chan, MH Wu & JJ Huang, 'Clinical presentation and prognostic factors in sodium monofluoroacetate intoxication.' *Clinical Toxicology*, vol. 34 1996, pp. 707-712.

26 M Sherley, 'The traditional categories of fluoroacetate poisoning signs and symptoms belie substantial underlying similarities.' *Toxicology Letters*, vol. 151, 2004, pp. 399-406.

27 M Sherley, 'Is sodium fluoroacetate (1080) a humane poison?' *Animal Welfare* 2007, vol. 16, 2007, pp. 449-458.

28 CA Marks, C Hackman, F Busana & F Gigliotti, 'Assuring that 1080 toxicosis in the red fox (*Vulpes vulpes*) is humane: fluoroacetic acid (1080) and drug combinations.' *Wildlife Research*, vol. 27, 2000, pp. 483-494.

29 CA Marks, What is possible to ensure that existing control methods are more humane? RSPCA Australia Scientific Seminar: Solutions for Achieving Humane Vertebrate Pest Control, 2003.

The following rationale is provided:

'The continued use of 1080 is not acceptable. However, time is needed to develop viable alternatives to 1080 and phase it out in a non-disruptive way. In choosing the level of use of 1080 as an indicator against this standard, the benchmarking committee did not consider it the most relevant, but one for which data was readily available'.

In an announcement made in September 2004, the Tasmanian Premier Paul Lennon indicated that there had been many calls for the State Government to ban 1080, used to control browsing animals in forestry plantations. Significant progress was made to reduce the amount of 1080 used in Tasmania. The *Tasmania Together* target of reducing the use of 1080 to 7.6 kg by 2005 was achieved 12 months ahead of schedule. Use of 1080 was phased out completely in state forests in December 2005 by the Tasmanian government.

The APVMA also notes that the Australian Government made statements during the 2004 election campaign that it would provide assistance in phasing out the use of 1080 in Tasmania. In May 2005, the Prime Minister reiterated the Government's commitment while announcing the agreement between the Australian and Tasmanian Governments that builds on the Tasmanian Regional Forest Agreement. Australian Government funds will be used to fast-track development of alternatives to its use on private land'. Under the Tasmanian Community Forest Agreement, the Australian government has provided \$4 million to fast track research, set up demonstration sites and encourage greater research into practical alternatives to 1080.

These initiatives are not inconsistent with the review outcomes possible under the Agvet Codes. However, the regulatory measures outlined by the APVMA in this review are based on the independent scientific evaluation conducted by the Department of the Environment and Heritage, in accordance with the Agvet Codes. The APVMA cannot consider the Tasmanian and Commonwealth government initiatives in determining its findings.

12.4 Inquiry into the impact of pest animals on agriculture by the House of Representatives' Standing Committee on Agriculture, Fisheries and Forestry.

The House of Representatives Standing Committee on Agriculture, Fisheries and Forestry conducted an inquiry into the impact of pest animals on agriculture at the request of the then Federal Minister for Agriculture, Fisheries and Forestry, the Hon Warren Truss MP. The inquiry started in April 2004 and the report entitled *Taking Control: a national approach to pest animals. Inquiry into the impact on agriculture of pest animals*, was released on 28 November 2005. The report is available for download from <http://www.aph.gov.au/house/committee/primind/pestanimals/report.htm>

The inquiry examined:

- linking Commonwealth and State government processes for more coordinated management of significant pest animal issues across state boundaries
- the approaches to pest animal issues across all relevant jurisdictions, including:
 - prevention of new pest animals becoming established
 - detection and reporting systems for new and established pest animals
 - eradication of infestations (particularly newly established species or 'sleeper'
 - populations of species which are considered to be high risk) where feasible and appropriate
 - reduction of the impact of established pest animal populations.
- the adequacy of State Government expenditure on pest animal control in the context of other conservation and natural resource management priorities, with particular reference to National Parks

- the scope for industry groups and R&D Corporations to improve their response to landholder concerns about pest animals
- ways to promote community understanding of and involvement in pest animals and their management.

A summary of the use of the vertebrate poison 1080 and the review of this poison that was being conducted by the APVMA as contained in the report is presented below.

The committee had regard to the preliminary findings of the APVMA review of the use of 1080 poison. The review found that, although 1080 can have an impact on individual non-target animals, it does not have an impact at the population level. The review also indicated that 1080 is readily degraded in surface soil, waters and living organisms, and therefore significant contamination of air, soil and water is not an issue. Animal welfare was not considered as part of the review.

The committee noted that the APVMA's preliminary findings include a number of recommendations for improvements in the labelling of 1080 products to reduce the potential for non-target effects and the general safety of 1080 use. The committee took the view that implementation of these changes to labelling of 1080 products would enhance the safety and effectiveness of the poison, which constitutes an important tool for landholders as part of their overall pest animal management strategies.

The committee agreed that the administration of 1080 according to recognised best practice should be a priority.

The committee acknowledged that research in relation to 1080 points to opposing conclusions both in relation to the humaneness of 1080 and its impact on non-target native species. The committee noted that research into the impact of 1080 on non-target species was continuing and considered that is important in resolving the issue. The committee considered, however, that until such research is conducted, 1080 must remain available to landholders to control pest animal problems on their properties.

The committee took particular note of preliminary findings that have emerged from research in Queensland and New South Wales on the impacts of 1080 baiting on spotted-tailed quolls. Although final analyses were still outstanding, the results of this research indicated that quoll mortality rates from 1080 are much lower than previously thought. The Steering Committee involved in the research had agreed that aerial baiting should be used as an additional control technique where appropriate. The committee hoped that state governments that currently place restrictions on the use of 1080 would take this research into account and formulate appropriate policy changes to enable the more effective use of this poison.

The committee noted that the Tasmanian Government had resolved to end the use of 1080 on Crown land by the end of 2005, and that the federal government made a commitment to phasing out the use of 1080 poison on both government and private land in Tasmania as part of its 2004 election policy.

It was of great concern to the committee that the Tasmanian Government planned to phase out the use of 1080 on government-owned lands, despite the absence of any cost-effective alternative for use in baiting programs. The committee believed that this may well lead to problems in relation to the Tasmanian Government, and in particular state forests, fulfilling their obligations to control pest animal problems on their land. The committee was also of the view that the federal government should reconsider its expressed commitment to phasing out the use of 1080 in Tasmania.

The committee noted that differences in bait composition requirements between states and territories may have a scientific rationale, for example, a higher dosage rate in Western Australia due to natural resistance to 1080 in native species in that state. To the extent possible, however, the committee considered that it would be useful if requirements for bait composition across states and territories could be standardised.

The committee received evidence that aerial baiting is necessary to control dog populations in some areas because dogs learn to avoid baits left at bait stations. Aerial baiting also enables the baiting of areas that would otherwise be inaccessible for ground baiting, or where ground baiting would not be practical or economically viable.

Because of concerns in relation to the effect of aerial baiting on non-target species, aerial baiting had been stopped in some areas in New South Wales and Victoria. The committee was aware that aerial baiting in Kosciuszko National Park was resumed in late 2004. The committee was hopeful that an effective aerial baiting campaign would resume following the release of research showing that dog baits do not harm native wildlife.

As with the use of 1080 generally, the committee considered that it is important not to withdraw a method of control that is effective in reducing pest animal populations where there is no solid evidence to support the need for withdrawal. Although the committee understood the rationale behind adopting a precautionary approach, the committee noted that native species populations are already being adversely affected by wild dogs. Aerial baiting should accordingly be available as a control method in all states and territories, with local pest animal groups responsible for determining on an individual basis whether aerial baiting should be used in a particular area. The potential for non-target impacts could be taken into account at the local or regional level in deciding whether or not to conduct aerial baiting campaigns.

Some concern was expressed to the committee about the impacts of aerial baiting with 1080 on non-target species. Other, conflicting evidence was provided that aerial baiting *increases* the population of native wildlife. The committee was informed at Cooma about recent research indicating that aerial baiting has a minimal impact on spotted-tailed quolls. The committee believes that the Australasian Invasive Animals CRC should consolidate existing research and conduct further research if necessary to determine the impacts of aerial baiting on non-target species, but in the meantime that aerial baiting should remain as an option for pest animal control where it is needed.

The committee recommended that the Australian Government:

- reconsider its commitment to phasing out the use of 1080 poison and facilitate discussions with state and territory governments to encourage the continued availability of 1080 poison and the removal of unnecessary restrictions and administrative red-tape where that is hindering access by landholders to 1080
- encourage the New South Wales and Victorian Governments to remove prohibitions on aerial baiting
- encourage state and territory governments to make local pest animal control groups responsible for decisions about whether aerial baiting should be conducted.

The committee recommended that the Australasian Invasive Animals Cooperative Research Centre:

- consider ways to provide support to Nocturnal Wildlife Research and other companies investigating the use of anxiety-reducing agents in conjunction with 1080 and other poisons
- consolidate existing research and conduct further research if required to determine the comparative advantages and disadvantages of aerial baiting in remote areas where that is the only feasible alternative for feral animal control.

The committee recommended that the proposed National Pest Animals and Weeds Committee:

- take steps to ensure that the final recommendations of the Australian Pesticides and Veterinary Medicines Authority in relation to use of 1080, when released, are implemented and that best practice for 1080 use is followed in all 1080 baiting campaigns
- coordinate with state and territory representatives to achieve standardised baiting composition requirements across jurisdictions.

12.5 Government initiatives in relation to animal welfare

12.5.1 The National Consultative Committee on Animal Welfare

The National Consultative Committee on Animal Welfare (NCCAW) is a non-statutory body that advises the Federal Government on the national implications of welfare issues affecting animals.

This Committee was established in 1989 by the then Minister for Primary Industries and Energy. The Committee consists of representatives from the Australian Government Department of Agriculture, Fisheries and Forestry, Department of the Environment and Heritage, National Health and Medical Research Council, National Farmers' Federation, Australian Veterinary Association, RSPCA Australia, Animals Australia, a representative from each State/Territory government (drawn from State Animal Welfare Advisory Councils/Committees where they presently exist), and Animal Health Australia.

One of the functions of NCCAW is to assess and advise the Federal Government on the national implications of welfare issues affecting animals. It also advises on the effectiveness and appropriateness of national codes of practice, policies, guidelines and legislation to safeguard or further the welfare of animals and protects the national interest. The Committee receives submissions from animal welfare organisations and agencies, industry or individuals concerning animal welfare issues. It has the power to establish working groups to carry out its functions. It prepares and furnishes written reports to the Minister for Agriculture, Fisheries and Forestry on matters that have been subject to inquiry by the Committee.

12.5.2 Australian Animal Welfare Strategy

In May 2004, the Primary Industries Ministerial Council (PIMC) approved the Australian Animal Welfare Strategy (AAWS), which was developed under the auspices of the National Consultative Committee on Animal Welfare (NCCAW).

The Strategy includes animals used in research and teaching, animals used for the production of food and fibre and other products, companion and guide animals, animals used for recreation, entertainment and display, native and introduced wildlife and feral animals.

In the next phase of the implementation of the AAWS, the Primary Industries Standing Committee (PISC) will work with a DAFF implementation team and co-ordinate the development of an implementation plan in consultation with key stakeholders and will provide advice on how best to address the issue of economic impacts that might arise from implementation of the Strategy.

12.5.3 Codes of Practice and Standard Operating Procedures

The Department of the Environment and Heritage contracted the NSW Department of Primary Industries (DPI) to undertake a Natural Heritage Trust project to develop Codes of Practice and Standard Operating Procedures for the humane capture, handling and destruction of feral animals. DPI has undertaken public consultation, including with other State and Territory agencies, in preparing these. While the Codes and Procedures have not been adopted nationally, some organisations are adopting them wholly or in part for their own use.

12.6 Regulatory framework for 1080 products

Currently registered products for 1080 fall into one of the three following formulation categories:

- (a) aqueous solutions. These are not used directly to poison the animals, but are loaded into baits. They are only available to authorised personnel of Government agencies, not to private landholders.
- (b) shelf-stable baits, lasting up to 1 year after manufacturing. Semi-dried meat baits and dry oat baits are typical examples of shelf-stable baits. These are supplied to the end-users.
- (c) short-life baits, to be used within a day after preparation. Fresh meat baits and carrot baits are two examples of the short-life baits. These are supplied to the end-users.

The supply and use of 1080 is regulated by a combination of Commonwealth and State legislation. The APVMA regulates 1080 up to and at the point of retail sale. Once sold or supplied to the end-user, it comes under the regulation of individual State legislation.

As a schedule 7 poison 1080 products are available only to specialised or authorised users who have the skills necessary to handle them safely. Products containing 1080 are declared 'Restricted Chemical Products' under the Agvet Code Regulations. As such, the products can only be supplied to or used by 'authorised person(s)'. Individual States set the authorisation criteria taking the APVMA's and State regulatory requirements in to account. Thus the authorisation criteria vary between States.

Currently aqueous solutions, shelf-stable baits and short-life baits are subject to registration. However the practicality of registering short-life baits has often been raised as an issue given the nature of the container in which it is supplied (usually a plastic bag) and the fact that the bait medium (chicken heads, animal offal, carrots etc) is perishable.

While the three product types (aqueous solutions, shelf-stable baits and short-life baits) are agricultural chemical products a more appropriate regulatory framework for 1080 product supply and use instructions would be as detailed in the following table:

Regulatory framework for 1080 product supply and use instructions

Product	Regulatory status	Information to user
Aqueous solution	Registered	Label instructions on how to use concentrate in bait medium
Shelf-stable baits	Registered	Label instructions on how to lay baits. Label can include leaflet or reference to State Code of Practice
Short-life baits	Permit	Supply of leaflet on how to lay bait and adherence to State Code of Practice is a condition of the permit

Thus, aqueous solutions and shelf-stable baits must be registered as agricultural chemical products. Short-life baits prepared using registered aqueous solutions need not be registered. Their supply and use will be covered by an APVMA permit. It is important for the APVMA to be satisfied that the end user of the short-life baits receives the label instructions that the APVMA has considered and approved for the use of the product.

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APPENDIX A: PRODUCTS INCLUDED IN THE REVIEW

Table A1: Products with continuing registration from the commencement of the review

Product No.	Nominated Product Name	Formulation/substrate	States registered
40573	Foxoff Fox Bait	Manufactured meat meal baits	NSW, QLD, VIC, SA, WA, NT
42450	1080 Bait for the Control of Rabbits	Oat bait	SA
42458	1080 Baits	Carrot bait	TAS
42498	1080 Concentrate (Red)	Aqueous solution	WA
42499	1080 Concentrate (Black)	Aqueous solution	WA
42500	1080 Impregnated Oats (Wild Dog Control)	Oat bait	WA
42501	'One Shot' 1080 Impregnated Oats	Oat bait	WA
42538	1080 Impregnated Oats (Fox Control)	Oat bait	WA
42720	1080 Baits for the Control of Foxes	Fresh meat bait	SA
46434	Foxoff Econobait	Manufactured meat meal baits	NSW, QLD, VIC, SA, WA, NT
49350	1080 Oats Rabbit Bait	Oat bait	VIC
49351	1080 Carrots Rabbit Bait	Carrot bait	VIC
49352	1080 Pellets Rabbit and Feral Pig Bait	Cereal pellet	VIC
49354	1080 Predator Bait	Fresh meat bait	VIC
49355	1080 Fox Bait	Fresh meat bait	VIC
49384	Doggone Wild Dog Bait	Manufactured meat meal baits	ACT, NSW, QLD, VIC, SA, WA, NT
50304	Rabbit 1080 Oat Bait	Oat bait	NSW, VIC, SA, WA, TAS
52954	1080 Ready-to-Lay Rabbit Oat Bait	Oat bait	NSW, QLD, VIC, SA, WA, TAS
54616	1080 Dried Meat Fox Baits	Dried meat bait	WA

Table A2: Products registered after the review commenced¹.

Product No.	Nominated Product Name	Formulation/substrate	States registered
53187	Pro-bait 1080 fox bait	Dried meat (salami style) bait	WA
57743	1080 Dried meat wild dog baits	Dried meat bait	WA
57825	1080 Bait for the control of wild dogs	Meat bait	SA
57956	ACTA 1080 concentrate	Aqueous solution	NSW, ACT, NT, SA, TAS, VIC, WA
58999	Paks De-fox 1080 fox bait	Manufactured meat meal baits	NSW, NT, QLD, SA, VIC, WA
60308	Paks De-K9 wild dog bait	Manufactured meat meal baits	NSW, ACT, NT, QLD, SA, TAS, VIC, WA
60736	Paks 1080 oats rabbit bait	Oat bait	VIC
61299	Paks 1080 Concentrate	Aqueous solution	NSW, ACT, NT, QLD, SA, TAS, VIC, WA

¹These products are subject to the review outcomes as per the condition of registration

Table A3: Registered products at the commencement of the review, whose registrations lapsed during the review².

Product No.	Nominated Product Name	Formulation/substrate	States registered
33890	Rentokil AF Sodium Monofluoroacetate Tenate (1080) Brand Vermin Destroyer	Powder	-
42384	Agile Wallaby Bait	Cereal	-
42497	Feral Cat Baits	Dry meat	-
42534	Dried Meat 1080 Fox Baits	Dried meat bait	-
42624	Special Fox Baits	Manufactured meat bait	-
42720 ³	1080 Baits for the Control of Foxes	Fresh meat bait	SA
49352	1080 Pellets Rabbit and Feral Pig Bait	Cereal	VIC
50911	Yathong Fox Bait	Fresh meat bait	NSW

²Reconsideration of these products is no longer required.

³The registrant applied for voluntary cancellation of the product in the concluding stages of the review