Draft National Feral Action Plan

Natural Resource Management Ministerial Council

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Camels around waterhole at Docker River - R. Bugg, NT

Draft National Feral Camel Action Plan

Executive summary

There are currently over one million camels in the rangelands of Australia and this population will double in the next 8-10 years. At this population level feral camels are having significant negative impacts across their extensive range and are expanding into new areas. The impacts are environmental, social, cultural and economic.

Management of camels across the rangelands is a complex issue that has two significant challenges:

- the rapid reduction of the currently over-abundant feral camel population, and
- building a legacy that will sustain on-going protection of assets and values of the rangelands.

In order to achieve significant reduction of the negative impacts of the camel population all governments, landowners and holders, communities and individuals will have to work together towards a common goal. That goal is:

> ***comprehensive, coordinated management of camels and their impacts that maintains and promotes the biodiversity, agricultural assets and social values of the rangelands for all Australians.***

The national Feral Camel Action Plan has been developed to meet this need by providing a strategic and risk based approach upon which local, regional and state based management can be undertaken. The substantial number of stakeholders who will need to be involved in the implementation of the Action Plan may have some conflicting interests, especially when seeking to generate economic returns from removing camels from the landscape where markets to help do so are limited.

Aboriginal communities are concerned about religious as well as aesthetic, practical and physical dimensions of camel impacts. Attitudes to camels are not homogenous even within communities and many Aboriginal people value the potential they believe camels might provide for meaningful and productive activity.

The four key outcomes identified for this plan are the:

- development of the Australian and international community's understanding of and support for the management of feral camels and their impacts
- amelioration of the negative impacts of feral camels by addressing the current over-abundance of feral camels through the immediate and substantial reduction in their numbers across the rangelands
- adoption of a platform for the on-going long-term management of camels, and
- development of partnerships and social capacities for camel management into the future.

Detailed actions are summarised on page 20 and detailed in the following section.

This Action Plan has been developed as a plan for an Existing Pest Animal of National Significance (EPANS) under the Australian Pest Animal Strategy (APAS). The Action Plan has been based on the APAS principles and will be implemented by the Feral Camel Working Group of the Vertebrate Pest Committee.

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1. Vision

This Feral Camel Action Plan (the Action Plan) has been developed in response to the increasing number of camels, their increasing damage to the Australian rangelands and the need for a nationally coordinated approach to dealing with these issues. The vision for the plan is:

> ***Comprehensive, coordinated management of camels and their impacts that maintains and promotes the biodiversity, agricultural assets and social values of our rangelands for all Australians.***

2. Challenge

Management of feral camels across the Australian rangelands is a complex issue. There are currently over one million camels and this population will double in the next 8-10 years and beyond. At this population level feral camels are having significant negative impacts across their extensive range and are expanding into new areas. These impacts are environmental, social, cultural and economic. The overarching challenges for this Action Plan are to set a framework that will:

- enable rapid reduction of the currently over-abundant feral camel population to a level where it does not threaten the integrity of assets and social values and where jurisdictions and landowners can readily undertake on-going management to protect these assets and values, and
- ensure there is a legacy or platform in place that will sustain on-going protection of these assets and values from feral camels.

These central challenges are complicated by the array of other challenges that the implementation of the Action Plan faces.

The camel range extends across three states (Western Australia, South Australia, Queensland) and the Northern Territory. Each jurisdiction has legislative and regulatory frameworks for the management of all pest animals including feral camels. However, the detailed requirements of these frameworks have not been harmonised across jurisdictional boundaries. To date there has been little cooperative, cross-jurisdictional feral camel management except on a small scale ad hoc basis. This limited cross-jurisdictional effort has had little impact on feral camel populations overall, nor has it been effective in mitigating their impacts. The jurisdictions are facing a considerable challenge to:

- harmonise legislative and regulatory requirements for feral camel control, and/or
- develop appropriate protocols to both allow and encourage cross jurisdictional feral camel management, and
- implement mechanisms to deal with the management of feral camels across different land tenures (pastoral, governments and aboriginal) when the approach required needs to access all tenures.

The values that are held by individuals and stakeholder groups about feral camels vary considerably. For some groups the negative impacts that feral camels have on environmental, social and cultural values are highly significant. Similarly, the economic costs associated with damage to infrastructure, such as fences, caused by feral camels and expenditure required to manage feral camels is a significant impost to land managers. Alternatively some communities and individuals see that camels are a potential economic resource that could be harvested providing local employment and income. Further, the value of camels as a protein resource that could contribute towards a need in the world context is also valued by some individuals and groups. The challenges faced by the jurisdictions given this broad array of values include the:

- engagement of the different interest groups/stakeholders in the need for, and to undertake, action to manage the negative impacts of feral camels
- development via partnerships of appropriate capacities amongst stakeholders to manage feral camels and their impacts in a variety of settings and through a variety of control mechanisms
- minimisation of inaccurate and misrepresentative domestic and international condemnation/interference with the implementation of this Action Plan, and
- identification and implementation of processes to address regulatory barriers to the development of commercial camel use, enterprises and/or industries.

A great deal of research has been undertaken on the ecology of feral camels and this has been synthesised by the Desert Knowledge Cooperative Research Centre (DKCRC) in recent years. This has provided a significant base of knowledge upon which sound management decisions can be based. Nevertheless, there are gaps in this knowledge in respect of impacts, potential control methods and in capacities to predict changes in population distribution and densities. Significant research challenges for feral camel management include the:

- development of publicly available feral camel data, and population dynamics modelling to help focus feral camel management efforts
- development of alternative control methods (such as fertility control, use of toxins and other complementary broad scale methods)
- investigation of physical management techniques that could be used to protect assets, and
- exploration of Aboriginal attitudes and views on feral camels.

However, waiting for research to address these knowledge gaps is not a justifiable reason to stop immediate action towards the management of feral camel impacts.

The Action Plan has been developed using the 12 principles of the Australian Pest Animal Strategy (see Attachment 1) in order to bring together an agenda of short, medium and long term actions and those responsible for undertaking them. The actions, goals and objectives listed are of an aspirational nature and the Action Plan is dependent upon the jurisdictions involved adopting and pursuing the actions for which they are responsible. The Action Plan does not have a statutory basis.

2.1 Why a national plan?

The current management of camels is largely ad hoc and is fragmented by jurisdictional and tenure boundaries. Consequently, camel management to date has

failed to provide a strategic and risk-based approach upon which local, regional and state based management can be undertaken.

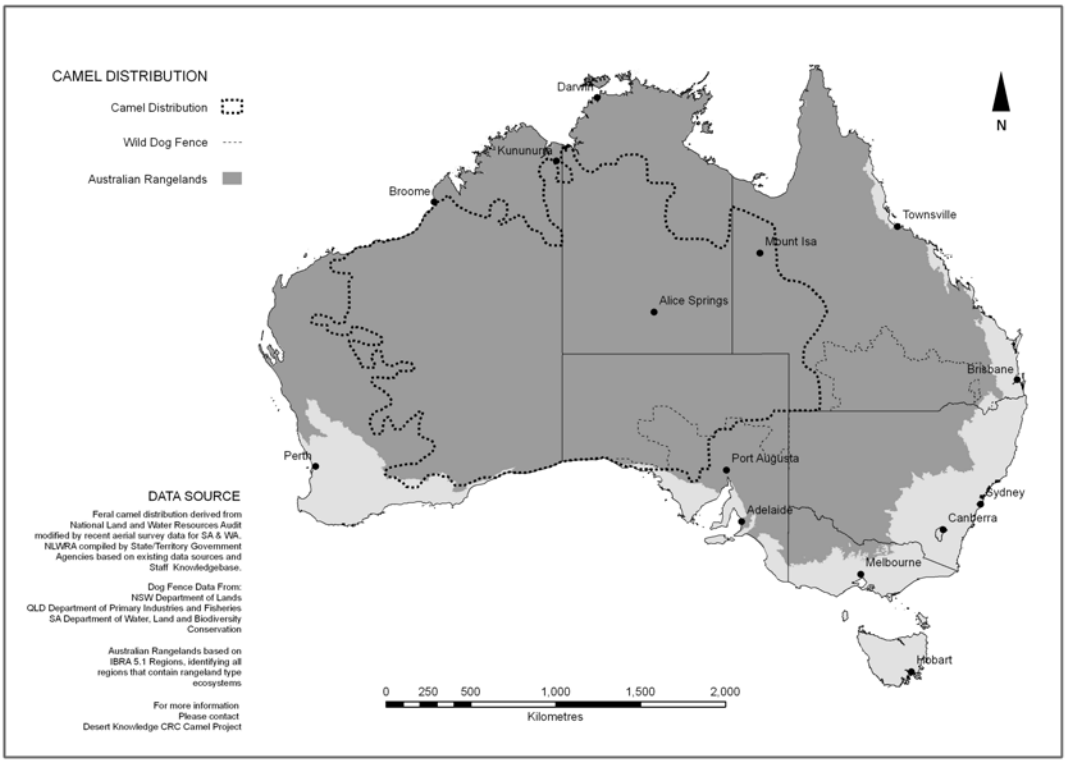
In order to develop a strategic and risk-based approach to camel management, an overarching emphasis has to be placed on the mitigation of the impacts of camels at appropriate scales rather than simply reducing camel numbers. However, as there is a positive relationship between camel density and degree of damage, reducing camel numbers is an important strategy in achieving damage mitigation. Further, management of the current feral camel population requires immediate effort by all - governments, industries, land managers and the various stakeholder communities.

This can only be achieved by providing a framework at a national level as:

- the current large population of camels occurs over a very large range
- camels are highly mobile and are able to move over large distances in relatively short time periods
- camels occur in very remote areas that are sparsely populated by humans
- there are differing perceptions on feral camels and their impacts, and
- camels are considered to be both a pest and a resource and on occasion an 'icon'.

The current distribution of the camel covers much of arid Australia – see **Figure 1.** Camels are present in up to 50 per cent of Australia's rangelands which includes most of the arid regions of Western Australia, South Australia, the Northern Territory and parts of Queensland

Figure 1. Australian rangelands showing estimated distribution of feral camels in 2008 and the location of the dog fence.



2.2 What are the impacts of feral camels?

The key landholders across the camel range are conservation agencies (10 per cent), Aboriginal landholders (23.5 per cent) and pastoral landholders (42 per cent). Much of the rest is unallocated crown land. While the impacts of camels are generally the same, perceptions vary about the loss of value to the rangelands, the importance of the different impacts and the subsequent costs to mitigate those impacts between tenures.

The overarching impacts of feral camels as vertebrate pests are:

- **Environmental** – broad landscape damage including damage to vegetation through foraging behaviour and trampling, suppression of recruitment of some plant species, selective browsing on rare and threatened flora, damage to wetlands through fouling trampling and sedimentation, and competition with native animals for food and shelter

- **Economic** – direct control and management costs, damage to infrastructure (fences, yards, grazing lands, water sources), competition for food and water, cattle escapes due to fencing damage, destruction of bush tucker resources, damage to outstations, damage to community infrastructure, community costs associated with traffic accidents

- **Social** – damage to culturally significant sites including religious sites, burial sites, ceremonial grounds, water places (e.g. water holes, rockholes, soaks, springs), places of birth, places (including trees) where spirits of dead people are said to dwell and resource points (food, ochre, flints), destruction of bush tucker resources, changes in patterns of exploitation and customary use of country and loss of opportunities to teach younger generations, reduction of people's enjoyment of natural areas, interference with native animals or hunting of native animals, creation of dangerous driving conditions, cause of general nuisance in residential areas, safety concerned with camels on airstrips.

In addition to the general impacts listed above, drought, which occurs regularly across much of the current camel range, forces camels on to a reducing number of water (drought) refuges. This accelerates the loss of these refuges with many camels bogging and dying in these waters. There are consequent serious implications both for the welfare of the camels and the other species which depend on the same scarce water resources as drought refuge.

Further information on impacts and estimates of the cost they engender can be found in the section below on stakeholders.

2.3. Primary stakeholders

There are a wide variety of individuals, groups and institutions that would consider themselves to be stakeholders in the implementation of the Action Plan. An initial listing, not necessarily exhaustive, of stakeholders is at **Appendix A1**.

State and territory governments are major stakeholders in the management of feral camels as responsibility for the regulation of feral animals lies with them.

Jurisdictions are responsible for the management of feral animals on lands under their direct management, and have a further responsibility to lead management of feral animal impacts for the benefit of the whole community. In many cases state and territory governments take on a role of facilitating the control of feral animals by private landholders (e.g. through education programs, extension services, by undertaking research and development). Those who own or occupy land are responsible for its stewardship and have statutory responsibility for managing feral animals. These are the primary stakeholders in the implementation of the Feral Camel Action Plan.

2.3.1 State and territory governments

State and territory governments are major stakeholders in the management of feral camels. Table 1 below shows each of the jurisdictions where camels are present and the percentage of the total camel range that is in each jurisdiction.

Table 1. Jurisdictions across the feral camel range

Jurisdiction	Area within camel distribution (km^2)	Percentage camel range in jurisdiction
Western Australia	1,534,000	46
Northern Territory	875,000	26.3
South Australia	589,000	17.7
Queensland	331,000	10
Total	3,329,000	100

These states and territories have a direct and on-going commitment to managing the impacts of feral camels on various forms of crown land (e.g. conservation areas). Similarly, each landowner or leasehold manager has responsibility for feral camel management on their lands. Table 2 shows the major tenure classifications across the camel range.

Table 2. Major tenures across the feral camel range

Tenure classification	Area within camel distribution	Percentage tenure in camel range
Aboriginal	783,000	23.5
Pastoral	1,399,000	42
Vacant Crown Land	813,000	24.5
Conservation/other	335,000	10
Total	3,330,000	100

2.3.2 Natural resource management regions

Most of the jurisdictions have formally declared natural resource management regions that have to varying degrees responsibilities for undertaking natural resource management (primary industry and conservation management) across significant areas of the camel range. The key natural resource management regions are:

Table 3. Natural resource management regions across the camel range

State	Natural resource management board	Area within camel range (per cent)
Western Australia	Avon Rangelands South Coast	3.4 70.1 7.2
Northern Territory	Natural Resource Management Board NT Inc	66
South Australia	Alinytjara Wilurara Natural Resource Management Board Southern Australian Arid Lands Natural Resource Management Board	100 40
Queensland	Desert Channels Natural Resource Management Group	30

While the natural resource management boards have not been directly surveyed, by virtue of their investments in the issue over the past four years, it is expected that their concerns about feral camels and their impacts would be similar to those of conservation managers and pastoralists.

The Alinytjara Wilurara and Southern Australian Arid Lands Natural Resource Management Boards have conducted risk assessments that are incorporated into regional pest management strategies that highlight the threat from feral camels.

2.3.3 Conservation managers

Managers report that the majority of impacts of feral camels are on environmental and cultural values, the very values that reserves are endeavouring to protect. Negative impacts associated with feral camels include problems in the broad landscape context such as:

- damage to vegetation
- damage to water sources
- increased risks to biodiversity
- competition with native animals
- damage to cultural sites
- damage to infrastructure, and
- traffic hazards.

The annual monetary values of positive and negative impacts of camels on conservation lands within the camel range have been estimated to be $0.03 million annually for positive impacts (sale and consumption of feral camels) and $0.18 million for negative impacts (infrastructure damage and management actions).

However, no monetary values have been developed to express the negative impacts on environmental assets.

2.3.4 Aboriginal landholders

Aboriginal people's concerns about camel impacts are multi-faceted and encompass aesthetic, practical and physical dimensions, as well as religious issues. In areas of high camel density many Aboriginal people have indicated that feral camels negatively impact the broader landscape environment. However, camel impacts on natural and cultural resources are of greatest concern. Major concerns include the following:

- high camel densities near water sources making camping difficult
- camels trampling, eating and/or otherwise destroying types of bush tucker forcing changes to the patterns of customary use of country
- camels disturbing game species or getting in the way of hunters
- destruction and other impacts (e.g. loss of opportunity to teach younger generations) on cultural and sacred sites including rockholes
- the risk camels pose to people's safety including road safety and safety at airstrips
- loss of amenity/enjoyment of the country
- competition with native animals for food and water, and
- camel damage to community infrastructure including fences and water supply.

Aboriginal attitudes to camels and their impacts are not homogenous. Many Aboriginal people value the opportunity they believe camels may provide for meaningful and productive activity. A large number of Aboriginal people perceive that feral camels are a resource that could be used. Potentially they could provide jobs in mustering, pet meat operations, along with income from the sale of camels, tourism enterprises such as camel farms and safaris, meat for human consumption and products such as camel wool. However, to date, the number of Aboriginal communities that have benefited economically are few.

There are some ongoing, if small-scale, local suppliers of cheap camel meat. Although the number of Aboriginal people eating camel meat is increasing, this is not consistent across communities.

2.3.5 Pastoralists

Pastoralists in the rangelands have indicated the following negative impacts associated with camels:

- problems in the broader landscape context including environmental impacts, such as damage to vegetation, damage to water sources, soil trampling, biodiversity loss and environmental degradation, and
- negative impacts on pastoral properties such as damage to fences, competition for and damage to water sources, damage to grazing lands, competition for food and water, disturbance or injury of livestock and cattle escaping.

The monetary value of this damage and management to mitigate it has recently been estimated to be $7.15 million annually across all pastoral properties within the margins of the camel range.

However, a small minority of pastoralists report that they benefit from feral camels including:

- deriving some income from selling camels
- consumption of camel meat, and
- other economic benefits (e.g. some pastoralists in Queensland are using feral camels for woody weed control).

The monetary value of the benefit that pastoralists realised from feral camels has been recently estimated to be about $0.58 million annually across all pastoral properties within or on the margins of the camel range.

It should be noted that the monetary values shown in the previous sections have been developed by the DKCRC. While there may be areas of contention in regard to the specific figures, the ratios of cost to benefit are appropriate to justify investment in control and the net benefit of undertaking feral camel management over 20 years would be extremely high. The 'do nothing' option is likely to increase the costs of impacts across all tenures exponentially.

2.4 Secondary stakeholders

Secondary stakeholders are those who, while not having a day-to-day responsibility for feral camel management, have an overarching interest in the financing of major feral camel management actions, or are involved in the processes for undertaking such management.

2.4.1 Australian Government

The Australian Government, while not responsible for feral camel management other than on lands under its direct control, has a secondary stakeholder role as it has an overarching concern to maintain or improve biodiversity outcomes across Australia. The current degradation that is occurring as a consequence of feral camel impacts is of concern and the Australian Government has announced that it will provide $19 million over four years commencing in 2009-2010 towards a major feral camel management project under its Caring for our Country initiative. The purpose of the project is to bring about a significant drop in the number of feral camels in the Australian rangelands so as to protect key biodiversity and other values. This funding and the outcomes that it is to provide are the subject of negotiations between the Australian Government and Ninti 1, the commercial arm of the DKCRC and are not discussed further in this Action Plan.

2.4.2 Ninti 1

Ninti 1 is the proponent for a major project to be funded under the Caring for our Country initiative. Ninti 1 represent 19 partners in the proposal, including the Western Australian, Northern Territory, South Australian and Queensland governments. While the state and territory governments were signatories to the Ninti 1 Expression of Interest, their commitment to the revised project as covered by the

Australian Government's offer of $19 million for camel management has yet to be confirmed.

The goals and the actions delineated in Section 6 of the Action Plan will help to set the implementation of the Caring for our Country project and the on-going management of feral camels after the project has been completed.

2.4.3 Animal welfare groups

Animal welfare is central to the implementation of feral camel management. Standard Operating Procedures (SOPs) and Codes of Practice (COPs) are either in place or being developed across the range of issues (e.g. transport, humane culling) relevant to the management of feral camels. It will be critical to maintain a high level of interaction with animal welfare groups over the life of the Action Plan.

2.4.4 Research institutes

The DKCRC, amongst others, has been involved in undertaking a variety of research around feral camel biology, economics, social and cultural values and management approaches over recent years. This Action Plan is based on the research that has been undertaken by the DKCRC, the Invasives Animals CRC, other research organisations and jurisdictions. There is an ongoing need for research associated with camels and the Action Plan will help to prioritise research that is critical to camel management.

3. Key outcomes

Four key outcomes have been identified for this Action Plan.

1. Development of the Australian and international community's understanding of and support for the management of feral camels and their impacts
2. Amelioration of the negative impacts of feral camels by addressing the current over-abundance of feral camels through the immediate and substantial reduction in their numbers across the rangelands
3. Adoption of a platform for the on-going long-term management of camels, and
4. The development of partnerships and social capacities for camel management into the future.

4. Process to be followed

4.1 Draft plan endorsement

This Action Plan was requested by the National Resource Management Ministerial Council (NRMMC) and has been developed by a working group of the Vertebrate Pests Committee (VPC). It will be provided to the NRMMC for their consideration late in 2009.

The Feral Camel Action Plan is the first to be developed as a plan for an Existing Pest Animal of National Significance (EPANS) under the Australian Pest Animal Strategy (APAS). The Action Plan has been based on the APAS principles (see **Appendix A2**) and may serve as a model for other EPANS.

4.2 Public comment

The draft Action Plan will be released (on NRMMC authority) for comment for a period of three months. Public comments will then be assessed by the VPC Feral Camel Working Group and the Action Plan modified as appropriate before being returned to the NRMMC for endorsement.

4.3 Implementation

The implementation of the Action Plan will be overseen by the VPC with the responsibility for undertaking the actions under each goal being the responsibility of the parties identified in the plan. The VPC will provide annual updates of the progress against the Action Plan to the NRMMC.

A significant number of the actions will involve the Caring for our Country feral camel project partners. In order to ensure the implementation of the Action Plan and the project work in tandem, it is proposed that the Chair of the VPC Feral Camel Working Group represent the VPC and the Action Plan on the project steering committee.

5. Background

5.1 Camel ecology/biology

5.1.1 Biology

Although some preferences in habitat selection have been observed, camels are capable of using almost all available habitat types within the arid and semi-arid areas of Australia. Usage is seasonally variable with the exception of open bushland which is the preferred habitat all year round due to the rich and varied food sources it supplies regardless of season, the open vegetation which provides good observational awareness and the presence of shade trees. Dense bushland is not a preferred habitat except to mothers with new calves who use it to provide cover.

5.1.2 Food requirements

Over 80 per cent of plant species available to camels are used by them as food sources. However, nearly 70 per cent of the actual food intake consists of only seven per cent of the species available. Forbs and small lignified plants comprise 63 per cent of the species eaten, with 19 per cent being shrubs and trees and 18 per cent grasses and ferns. While trees and shrubs comprise only 19 per cent of the range of food species consumed they make up almost 53 per cent of the volume, with forbs comprising 42.5 per cent of the remaining volume and grasses less than five per cent. Camels use almost the entire available food supply.

5.1.3 Water requirements

Camels can survive for considerable periods without access to free/surface water. This is the result of morphological and physiological adaptations that maximise water conservation and facilitate them in obtaining sufficient water from ingested food at those times of the year when food is plentiful and/or high in moisture content. Camels are observed to drink at intervals of two to eight days in summer and up to several months in winter in central Australia.

5.1.4 Movement

Camels, when not constrained, have the ability to move over areas of thousands to tens of thousands of square kilometres. There is a strong correlation between long-term annual rainfall and the size of areas used by female camels related to habitat productivity, with camels choosing to move over greater areas to obtain preferred or sufficient forage as aridity increases. It is unclear whether patterns of movement are nomadic, migratory, or movement within a home range. Camels need access to sources of water, which are more likely to be widely dispersed in arid areas. Overall the areas used are large and management to mitigate negative impacts will need to address the capacity of camel populations to use extensive areas of habitat covering many thousands of square kilometres.

5.1.5 Social organisation and behaviour

Social organisation of camels in central Australia is characterised by non-territoriality and group formation, with formation of cow groups that are temporarily herded by a bull during rut and bachelor groups comprised of younger bulls. Older bulls tend to live solitarily. Cow groups are the basis of 'core groups' that are formed by the joining together of cows with same aged calves. The core group is stable for one and a half to two years, corresponding to the nursing phase of the calves, and stability is dependent on the presence of a herding bull.

Adult bulls compete for access to the cows when in rut. In central Australia, rut is highly seasonal with nearly all adult bulls capable of coming into rut at the start of winter. Bulls in rut take over a core group and herd it for three to five months.

5.1.6 Reproduction

Female cows reach sexual maturity at three to four years of age. Gestation is variable but within the range of 336-405 days. The reproductive lifespan for female camels is around twenty five years. The calving interval is slightly less than two years. While births take place throughout the year there is a distinct increase in the six month period from June to November and particularly during late August early September.

5.1.7 Diseases and parasites

Diseases and parasites do not have a major impact on feral camels in Australia. Diseases that can affect camels such as Brucellosis and Tuberculosis, camel pox or camel Trypanosomiasis are not present in Australian camel populations. Similarly, parasitic impacts on Australian camels appear to be minimal. Scabies (sarcoptic mange) is reported as having a major impact on camel health in their natural range and reportedly affects large numbers of animals in central Australia, particularly during wet periods. The near disease free status greatly enhances the suitability of Australian camel populations for commercial use, particularly domestic but also live export.

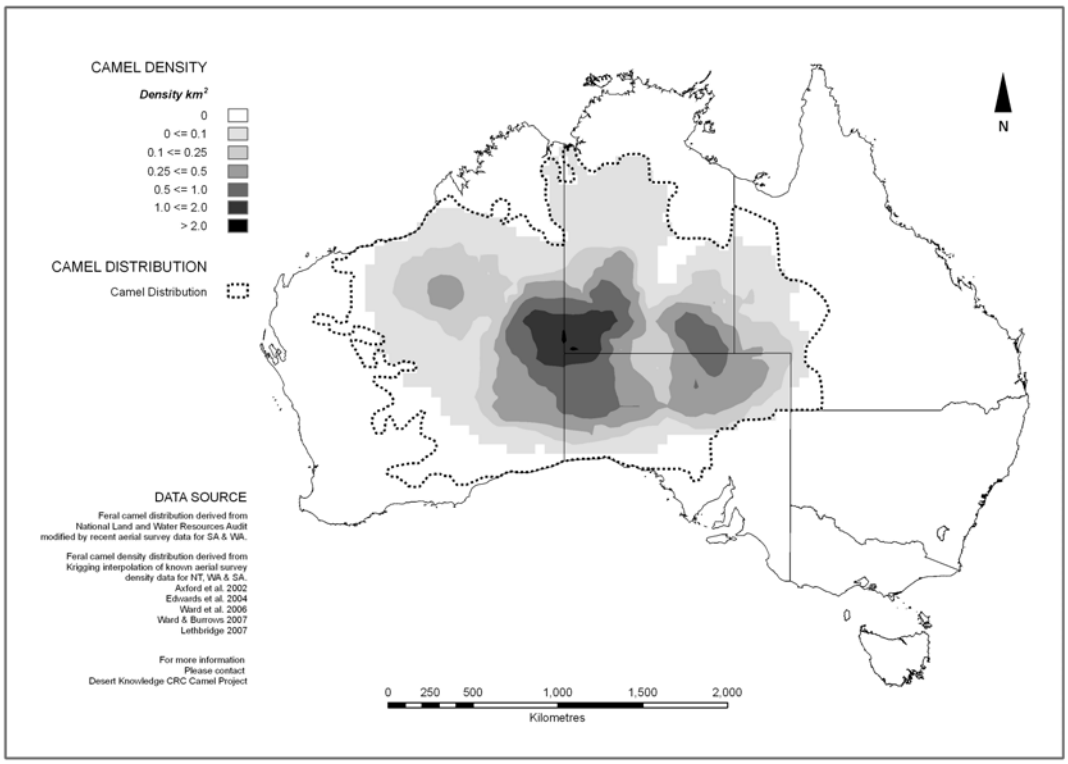
5.1.8 Predators

Camels in Australia do not have any predators other than humans. The dingo is the only potential predator, though only on newborns and calves.

5.1.9 Population parameters

The average lifespan within free camel populations is between 25 and 40 years. Mortality rates have been calculated to be six – nine per cent per year. The current population estimated to be about one million camels is doubling every 8-10 years. Current camel distribution is shown on **Figure 1**. Camels are distributed broadly across the Australian rangelands, occupying almost 50 per cent of their expanse and covering a minimum area of 3.3 million square kilometres. It is currently estimated that there are over one million camels in the rangelands. **Figure 2** shows the density of feral camels across their range. It should be noted that the densities have been calculated on best available but patchy information and may be inaccurate for Western Australia and the Simpson Desert.

Figure 2. Density distribution of camels across the estimated 2008 range of the camel in Australia derived from Kriging interpolation of known aerial survey densities extrapolated forward to 2008.



5.2 History of spread

The one-humped dromedary (*Camelus dromedarius*) was first introduced into Australia in 1840. Between 1866 and 1907 up to 20,000 camels were imported into Australia. Camels were well suited to working in remote dry areas and were used for riding, carting goods and as draught animals in the early development of the arid interior of the continent. From 1920 onwards the numbers of captive domestic camels declined as the use of motor vehicles for freight haulage increased. The widespread establishment of feral camel populations can be attributed to the wholesale abandonment of domestic camels during the 1920s and 1930s.

In 1969 the first systematic attempt was made to assess the number of feral camels across outback Australia. It provided an estimate of 15,000-20,000 camels. By 1988 it was estimated that the minimum Australian camel population was 43,000 camels in a broad belt-like distribution through central Australia from Broome in Western Australia to western Queensland. By 2001 the minimum population had increased to 300,000 and risen to 730,000 by 2006. Camels are now broadly distributed across the Australia rangelands with the population currently being estimated at one million.

5.3 Annotated bibliography of camel-related research in Australia

McKnight (1969) provided a comprehensive review of the history of the camel in Australia. The first broad-scale quantitative assessment of the number and distribution of feral camels in Australia was undertaken by Short *et al*. (1988). Since then, a series of independent aerial surveys has been conducted at various locations to determine camel population size and distribution at sub-regional to regional scales. On the basis of existing surveys, Saalfeld and Edwards (2008) generated a density distribution for feral camels in Australia with a population estimate of approximately one million animals.

Studies into the movement patterns of feral camels have been conducted by Dörges and Heucke (1995), Grigg *et al*. (1995), Edwards *et al*. (2001) and Lethbridge (2007).

Food selection by camels in Australia has been described by Barker (1964), McKnight (1967, 1976), Newman (1975), Dörges and Heucke (1995, 2003) and Peeters *et al* (2005).

Social organisation of the camel in central Australia was studied extensively by Dörges and Heucke (1995).

Zeng and McGregor (2008) and Saalfeld and Zeng (2008) respectively reviewed commercial and non-commercial approaches to management. Lapidge *et al*. (2008) reviewed potential chemical, biological and fertility control options for the feral camel in Australia.

5.4 Control methods

Current management of feral camels falls short of an integrated management approach, with limited integration of different control methods or across jurisdictions. To date it has had little to no effect on population growth or in mitigating camel impacts except [perhaps in the Simpson Desert area. Non-commercial feral camel control methods currently used are aerial culling, ground culling and exclusion fencing. (See **Appendix A3**).

Effective management of camels and their impacts will involve a variety of control methods and the development of scale-dependent, multiple outcome management plans integrated under this national framework.

There is some potential to develop new and innovative control methods including chemical and biological culling and fertility control, although the feasibility for these methods is currently considered to be low. These will require medium to long-term development periods.

There are commercial options for feral camel management. These include the use of camels for meat, medicine and other products. A camel industry has been emerging in Australia but it remains very small and has struggled to gain momentum because it has not developed a dedicated export accredited processing facility, it has been based on ad hoc harvest of a feral herd that is located in very remote areas, and targeted price sensitive international markets. It is estimated that the camel industry harvests around 5,000 to 6,000 camels each year: 3600-4,000 for pet meat, fewer than 400 for live export and 1,000 annually for human consumption.

Although the current number of camels removed is small, commercial capture and sale could potentially remove enough animals to have a significant localised impact on the levels of damage currently being caused and may form part of an integrated management approach. However, establishment of a long term sustainable camel industry will need to be based on farmed camels, not the opportunistic harvest of a free-ranging feral herd.

The South Australian Arid Lands Natural Resource Management and Alinytara Wilurara Natural Resource Management Boards evaluated market based methods to allow efficient allocation of incentives for camel management to encourage competing interests (including landholders, mustering contractors, shooters, pet-meaters etc) to submit proposals. Where a market exists for camels, financial returns can offset control costs providing incentive for consumptive use rather than culling. Competing interests for feral camels include abattoirs, pet meat and contract harvest, however, their role is limited by financial and logistical constraints. The costs to access, transport and process feral camels can exceed their value and create a financial loss market failure of approximately $20-$60 per head depending on location. Any market based approach for management will have to address this gap.

5.5 Socio-economic factors affecting management decisions

Because they occur in sparsely populated areas, feral camels are only noticed when their activities intersect with remote Aboriginal people, pastoralists and the tourism and mining industries. The significant damage that camels have done, and are currently doing, to the fragile ecosystems, cultural sites, isolated communities and pastoral enterprises of desert Australia has gone largely unnoticed by the bulk of Australia's population. The development of solutions to the current feral camel crisis in the Australian rangelands and the ongoing management of feral camels will require an understanding of the complex nature of social and economic factors in this area.

Feral camel management will be coordinated under the framework provided by this Action Plan. Management actions will need to be developed at appropriate scales among all levels of government in partnership with communities, land managers and industry.

It must be acknowledged that the potential for feral camel management activities to provide significant economic and social outcomes to Aboriginal communities will vary. The ability to gain economic outcomes will be a matter of the suitability of the area for commercial enterprises in the short and long-term. This will be affected by access and remoteness, the willingness of communities to participate in camel enterprises and market conditions for camel products.

It is not the place of this Action Plan to analyse or develop commercial enterprises or the factors that could potentially contribute to their success.

6. Action Plan

The Feral Camel Action Plan has been developed to address the current crisis in camel numbers in the Australian rangelands and the impacts that this is having on the biodiversity and other assets of this area. It is predicated on scientific assessments that show:

- the numbers of feral camels have reached a crisis point in regard to their impacts on the Australian rangelands
- the number of camels will double in the next 8 to 10 years and beyond
- while there are gaps in our knowledge, these are insufficient to justify slowing or halting the active management of camel numbers in the landscape, and
- that solutions to the management of feral camels will need to be approached on a national level, though many solutions will be implemented at landscape and local levels.

The Action Plan acknowledges that animal welfare is paramount to the success of feral camel impact management.

The current over-abundance of feral camels can only be addressed by acknowledging that this is a shared responsibility. While management of pest animals is a landholder responsibility under state/territory legislation, the crisis brought about by feral camel numbers requires government intervention to help support the landholders. However, the long-term goal is for landholders to have the capacity to deal with feral camel impacts, with the ongoing role for governments being to manage feral camels on their own lands and to look after the public good (e.g. by providing appropriate legislative and regulatory support to landowners).

The management of feral camels and their impacts is a complex issue with many stakeholders. This Action Plan recognises actions taken to mitigate the damage caused by camels, especially the removal of camels from the landscape via culling, may be confronting to some stakeholders and communities and that there is a need to engage with these groups directly. In particular the Action Plan recognises that appropriate strategies and resources need to be developed in order to help Aboriginal communities protect their sacred and cultural sites and bush food resources.

Further, the actions set out in **Table 6** address both the current crisis and the development of a platform for ongoing management of both positive and negative impacts of feral camels. It sets the priorities for on-going management and takes a holistic approach to managing the impacts of feral camels across the entire area of the Australian rangelands.

The Action Plan acknowledges that the management of feral camels will only be successful if capacities and partnerships are developed within and between stakeholders. In effect, the management of the current feral camel crisis will require a ‘nil tenure’ approach, even while acknowledging that there are different capacities to undertake the management actions on different tenures.

The Action Plan does not deal explicitly with the development of a camel industry. The exploration and development of markets for camel products and by-products is a matter for the camel industry and individual entrepreneurs. Governments are not responsible for developing the underlying infrastructure that would be required to support a camel-based industry. Government responsibilities lie in ensuring that there are no unnecessary regulatory impediments to the development of an industry. Risks associated with the commercial use of camels are a matter for those that wish to enter into or develop a camel industry.

The Action Plan is a general accord between the states and territories and the Australian Government to manage the impacts of feral camels. In that the plan is agreed at this level, it is supported at state, not agency levels. The Action Plan acknowledges that some actions may be undertaken within existing budgets and that some will require additional funding. It also acknowledges that there are a variety of avenues for the funding of further research and hence does not directly address research funding issues.

The four goals that have been delineated for the Feral Camel Action Plan are:

Goal 1
The Australian public and international community understands and supports the management of feral camels.

Goal 2
The negative impacts of the overabundance of feral camels have been mitigated.

Goal 3
Adoption of a platform for on-going long-term management of camels.

Goal 4
Partnerships and social capacity for camel management are in place.

The objectives and actions that need to be met in order to fulfil these goals are detailed in the following tables.

It should be noted that the life of the Feral Camel Action Plan is envisaged as being considerably longer than the time allocated for the Caring for our Country project. While the two are intrinsically linked, the varying time lines and the need for states and territories to continue to oversee feral camel management beyond the life of the Caring for our Country project means that at times the parties responsible for actions under the Action Plan will vary over time. The success of both the Action Plan and the Caring for our Country project is dependant upon the willingness of all stakeholders to work together to achieve the on-going management of feral camels at sustainable levels.

GOALS	**The Australian and international community understand and supports the management of feral camels.**	**Partnerships and social capacity for camel management are in place.**
The negative impacts of the overabundance of feral camels have been mitigated.	Engagement and communication strategy in place. Priority target areas for control are identified and agreed between jurisdictions, Feral camel management is undertaken in these areas. Crisis management is reviewed to help delineate long term management platform.	Stakeholders well defined and engaged. A consistent understanding has been established with partners and stakeholders on the need for and methods to manage feral camels and their impacts. Practitioners are appropriately trained. Stakeholders are managing feral camels and their impacts in a variety of settings and using a variety of control mechanisms.
Adoption of a platform for on-going long-term management of camels	Processes of feral camel management are transparent and meet appropriate standards of accountability (safe, humane and efficient). Cross jurisdictional camel management processes, regulation and practices are in place. Priorities for long term asset protection have been determined along with monitoring and evaluation methods. Feral camel population changes and impacts are monitored and resources applied strategically to feral camel management. Key knowledge gaps are identified and addressed via scientific research.	Information about feral camel management outcomes is available to all stakeholders. Risks associated with social and cultural assets are identified and appropriate response and mitigation methods are in place. Commercial camel harvesting is developed within the overall context of reducing camel impacts. Barriers to the development of commercial camel use enterprises and/or industries are identified and where appropriate revised. New and complementary management techniques are investigated.

Table 6.1 Goals and objectives

Goal 1: The Australian public and international community understands and supports the management of feral camels

Objective	Actions	Outcomes	Priority	Responsible party
Maximise public and community support for camel management within Australia	Develop an engagement and communication strategy (a two way process). Critical messages should include: - camel numbers have built over time to an unsustainable level - the negative impacts of camels are affecting the environment, pastoral capacities, and Indigenous communities and cultural values - the need to achieve a significant reduction in camel numbers (i.e. beyond recruitment numbers) before the problem becomes insurmountable - the need to reduce feral camel numbers so that a lower level of on-going management	Widespread understanding of the impacts of camels in the rangelands. Widespread understanding of the need for camel management, in particular the need for significant reduction of the camel population at this time. Community ownership of the issue	High and urgent	Overarching steering committee and Ninti 1 and partners. Affected states and territory

Objective	Actions	Outcomes	Priority	Responsible party
	can maintain control of impacts - the processes are in place to ensure camels are managed in a safe, humane and efficient manner - the processes in place to investigate any complaints and the reporting of subsequent investigations.			
	Delineate stakeholder groups.	Detailed understanding of stakeholders and their needs, responsibilities and perceptions in regard to camel management.	High and urgent.	Overarching steering committee and Ninti 1 and partners.
	Develop communications material for pro active and reactive situations.	Targeted material available to address issues either before or as raised by stakeholders over the life of the action plan.	High and urgent.	Overarching steering committee and Ninti 1 and partners.
	Engage with media in the development of appropriate material before, during and after major culls.	Greater acceptance that the action plan and its implementation are providing appropriate outcomes for the environment, pastoral	High and urgent	Australian Government and affected state and territory Ministers. Overarching steering committee and Ninti 1 and partners.

Objective	Actions	Outcomes	Priority	Responsible party
		concerns, Indigenous communities and their cultural and social welfare. Greater acceptance that the removal of feral camels from the landscape is being undertaken in a humane way.		
	Maintain communication with all stakeholders on camel management.	No surprises amongst stakeholders about the goals, management methods and outcomes of the camel action plan.	High and on-going across the life of the Action Plan.	Overarching steering committee and Ninti 1 and partners.
Minimise international condemnation/interference with implementation of the feral camel management plan	Develop an engagement and communications strategy to address potential international issues. Critical messages would be the same as those in the national communications/ engagement strategy.	Increased understanding of the impacts of camels on the Australian rangelands. International understanding of the need for camel management, in particular the need for significant reduction in the feral camel population at this time.	High and urgent.	Overarching steering committee and Ninti 1 and partners.
	Identify major international stakeholders including: - national governments - conservation NGOs - animal welfare NGOs - Indigenous forums	Detailed understanding of stakeholders and their needs, responsibilities and perceptions about camel impacts and management in the Australian rangelands.	High and urgent.	Overarching steering committee and Ninti 1 and partners.

	- Scientific camelid community - Countries where the camel is considered a valuable resource			
	Develop communications material for pro active and reactive situations	Targeted material available to all to address issues either before or as raised by stakeholders over the life of the Action Plan	High and urgent.	Overarching steering committee and Ninti 1 and partners.
	Develop key media releases on feral camel management with (where possible) endorsement from international conservation groups and industry groups including: - announcement of the problem and action plan - definition of loss of environmental and cultural values, and the action to be taken,		High and medium term.	Overarching steering committee and Ninti 1 and partners.
	Engage with international media.	Processes seen as open, based on scientific assessment, an urgent environmental imperative and in response to loss of environmental, pastoral and Indigenous values.	High and medium term.	Australian Government Ministers. Affected state and territory Ministers. Ninti 1.

	Maintain communications with targeted international stakeholders, in particular those who are supportive of the Action Plan.	On-going support for the Action Plan and implementation by international groups.	High and ongoing across the life of the Action Plan.	Overarching steering committee and Ninti 1 and partners.
	Develop and maintain communication between national governments on the impact of feral camels, the need for camel management including extensive removal of feral camels from the landscape and the Action Plan.	Acceptance by foreign governments of the need for and the professional management of the feral camel issue in the Australian rangelands	High and ongoing through the life of the Action Plan.	Australian Government
Ensure practitioners of and camel management meets appropriate standards	Practitioners are appropriately trained and operating under clear predetermined standards.	Widespread Australian and international community acceptance that the Action Plan is being implemented appropriately.	High and ongoing over the life of the Action Plan.	Affected state and territory governments (compliance). Ninti 1 and partners in regard to contracted operatives.
The processes of feral camel management are transparent and undertaken in a safe, humane and efficient manner	Transparent process for investigating complaints and reporting of results are determined and operating across the life of the Action Plan.	Widespread Australian and international community acceptance that the Action Plan is being implemented appropriately.	High and ongoing over the life of the Action Plan.	Overarching steering committee and Ninti 1 and partners. After the four year project the process will need to be maintained by affected state and territory governments.
Appropriate open governance structures are in place including processes and responsibilities for	Roles and responsibilities of all involved in the implementation of the Action Plan are defined and agreed, including primary	Transparent accountability for implementation of the Action Plan. Coordinated action when needed.	High and on-going over the life of the Action Plan.	Affected state and territory governments, overarching steering committee and Ninti 1 and partners. Where third parties are

managing any repercussions of the Action Plan and to spread the knowledge gained prior to and through the life of the Action Plan.	response roles for different stakeholders.			involved in the delivery of outcomes it will be the responsibility of the contracting authority to ensure appropriate delivery.
	Governance of and access to any intellectual property, (including data bases, mapping) to be negotiated and agreed. Intellectual property of commercial value to be agreed by all partners in the action.	Transparent accountability for implementation of the Action Plan.	High and on-going over and beyond the life of the Action Plan.	Overarching steering committee and Ninti 1 and partners. Affected state and territory governments to actively store and share information.

Goal 2: The negative impacts of the overabundance of feral camels have been mitigated

Objective	Actions	Outcomes	Priority	Responsible party
National adoption of COPs and SOPs	Review relevant existing COPs and SOPs (transport, humane management, capture and handling)	Consistent and humane camel management	High and urgent.	Affected state and Territory governments via the Vertebrate including the Animal Welfare Technical Group.
	Determine and implement appropriate mechanisms to ensure harmonisation of COPs and SOPs as appropriate	Consistent and humane feral camel management. Removal of regulatory impediments to cross-jurisdictional management through agreements or other processes.	High and urgent.	Affected state and Territory Governments, overarching steering committee and Ninti 1 and partners.
Harmonisation of processes/regulations to allow efficient work across jurisdictions	Ministerial endorsement of the Camel Action Plan.	Inter-jurisdiction endorsement of and cooperation to achieve the vision, goals and objectives of the Action Plan.	High and urgent.	Australian Government, affected state and territory governments via the National Resource Management Ministerial Council.
	Targeted review of actions and mechanisms needed to allow consistent approaches across jurisdictional boundaries for work undertaken under the Action Plan.	Delineation of cross jurisdictional camel management issues (e.g the requirements to use different firearms) and possible ways to address them.	High and urgent.	Affected state and territory governments, overarching steering.
	Develop MOUs or other appropriate mechanism and processes that help to	Feral camel governance arrangements (including processes/mechanisms) in	High and urgent.	Affected state and territory governments.

Objective	Actions	Outcomes	Priority	Responsible party
	provide for efficient and effective camel management across jurisdictional boundaries.	place that allow cross jurisdictional work to be undertaken (including by contractors) with the greatest efficiency.		
	Establish one "feral camel management steering committee" or another appropriate governance mechanism, with high level jurisdictional and appropriate stakeholder representation, to oversee the implementation of the Action Plan and the Caring for our Country camel management project.	Overarching and active coordination of the Action Plan and the Caring for our Country camel management project. A "one-stop-shop" for information about policy issues and participant responsibilities under the Action Plan and the Caring for our Country camel management project.	High and urgent.	Australian Government, affected state and territory governments, Ninti 1.
Priority target areas for control are identified	Using existing information (scientific and landholder/expert knowledge), review and reconcile stakeholder perceptions of priority target areas and identify and define management units for priority control activity. Note: as camels are nomadic a process to quickly re-evaluate areas to be targeted may be required.	Priorities for locational culling/ feral camel removal determined. Stakeholder acceptance and support for the priority target areas.	High and urgent	Ninti 1 and partners, affected state and territory governments.

Objective	Actions	Outcomes	Priority	Responsible party
	Interjurisdictional agreement on the priority areas.	Intergovernmental agreement and support for the priority target areas.	High and urgent	Ninti 1 and partners, affected state and territory governments, Australian Government.
	Designation of acceptable camel densities (either landscape or spot densities) in priority areas.	Target camel densities and reduction requirements at target localities.	High and urgent	Ninti 1 and partners, affected state and territory governments, Australian Government.
Identify methods of removal to be used in priority target areas including monitoring	Identify all existing feral camel management methods (direct and indirect, commercial and non-commercial) and define parameters (biological, ecological, welfare, efficacy issues and social acceptability) for appropriate use.	A menu of agreed camel management methods along with defined parameters for their appropriate use is available for any landholder, community group or government agency to use,	High and urgent	Australian Government, affected state and territory governments, via the VPC.
	Using parameters defined above identify appropriate methods, including a mix of methods, to be applied in each priority target area.	Methods for control identified for each priority target area.	High and urgent	Ninti 1 and partners. Commercial approaches to be developed by industry groups and individuals.
	Identify monitoring and evaluation approaches at appropriate scales (national, regional and local).	Monitoring and evaluation methods agreed and procedures and processes in place before active camel population reduction commences. (See VPC guidelines on monitoring and evaluation).	High and important	Ninti 1 and partners.

Objective	Actions	Outcomes	Priority	Responsible party
	Identify possible risks associated with non-target organisms/cultural assets in each priority target area and consider appropriate responses/mitigation processes e.g. increased numbers of predators associated with carcass scavenging potential new disease risks, animal health and welfare.	Risk assessment completed and mitigation actions incorporated into the methods for each priority target area.	High and important	Ninti 1 and partners, affected state and territory governments, landholders and other stakeholders.
Strategic allocation of resources to manage camels	Identify a process and develop a capacity to undertake rapid targeting and removal of feral camel aggregations on an opportunistic basis determined by national monitoring and/or field reports.	National monitoring in place. Capacity for rapid opportunistic removal of camels in place.	High and important	Ninti 1 and partners, affected state and territory governments, landholders.
	Develop policies on a variety of market approaches that could be used to aid in the management of feral camels.	Market based approaches available and used where appropriate to the goal of reducing the impacts of the overabundance of feral camels.	Medium and important	Affected state and territory governments, Ninti 1.

Objective	Actions	Outcomes	Priority	Responsible party
Non-commercial management (aerial culling, ground culling and fencing)	Identify parameters for and designate assets requiring direct protection (e.g. fencing) from feral camels.	Priority assets requiring direct protection identified.	High and important	Ninti 1, affected state and territory governments, Aboriginal groups, other stakeholders.
	Conduct aerial and ground shooting activities in accordance with COPs and SOPs endorsed by VPC and other Standing Committees.	Safe, efficient and humane control of feral camels in line with community expectations. Operators are trained and competent to an exacting standard outlined by COPs and SOPs.	High and important	Affected state and territory governments, Aboriginal groups, other stakeholders.
	Allocate resources to the direct protection of priority assets.	Funding provided from a variety of sources for protection of priority assets	Medium and important.	Australian Government (through Heritage and Indigenous Programs), affected state and territory governments, landowners and community groups.
	Identify national scale parameters/priorities for removing feral camels from the landscape	A set of priority areas for action and associated methods for removal designated.	High and urgent	Ninti 1 and stakeholders
Feral camel removal through commercial camel harvesting for sale and slaughter to be developed within overall context of reducing impacts	Develop and publicise a statement on the roles and responsibilities of governments and (potential) commercial enterprises in the development of managed camel based industries or opportunistic feral camel	Clear acknowledgement of the potential role of commercial enterprises in the management of feral camels without a concomitant expectation of government subsidies/support.	High, and urgent.	Australian Government, affected state and territory governments.

Objective	Actions	Outcomes	Priority	Responsible party
	harvest activities.			
	Commercial entities seeking to remove feral camels from the landscape with methods supported in principle by the Feral Camel Action Plan acknowledge their responsibilities for their economic viability and to ensure that their activities do not contravene the goals and objectives of the Feral Camel Action Plan of their proposals before seeking permission to remove feral camels.	Commercial enterprises are assisting the feral camel management effort with no expectations that Government will support and/or subsidise the development of commercial camel industry enterprises.	Medium and on-going across the life of the Action Plan.	Commercial entities, affected state and territory governments (approval processes).
	Investigate parameters for use of commercial harvesting to offset management costs on government controlled lands.	Where offsets are available, these are considered amongst the methods that could be used for selected priority target areas and asset protection.	Medium and on-going across the life of the Action Plan.	Affected state and territory governments, Ninti 1 and partners.
Review success of crisis management and delineate transition to long-term platform	Evaluate progress on implementation of Action Plan on an annual basis.	Development of an adaptive management approach (i.e. change the plans according to changes in circumstances) to the implementation of the Action Plan and the Caring for our Country project	High and ongoing across the life of the Action Plan.	Ninti 1, affected state and territory governments, VPC.

Goal 3: Adoption of platform for ongoing long-term management of camels

Objective	Actions	Outcomes	Priority	Responsible party
Investigate potential new and complementary management techniques.	Investigate fertility control, use of toxins and other new and complementary broad scale methods including delivery mechanisms that could be used to manage feral camel population size.	New and complementary methods for broad scale control of feral camels either established or dismissed.	Medium and on-going across the life of the Action Plan.	Affected state and territory governments, research organisations.
	Investigate physical management techniques that could be used to protect assets and reduce or mitigate the impacts of feral camels on priority assets and the landscape generally.	New and complementary physical management techniques to reduce or mitigate the impacts of feral camels either established or dismissed.	Medium and on-going across the life of the Action Plan.	Affected state and territory governments, research organisations.
Develop priorities for government action/intervention based on protection of priority assets.	Develop an inventory of significant assets of all varieties potentially and actually affected by feral camels and their condition across the feral camel range.	Base line against which early detection of changes in assets brought about by feral camels and feral camel management can be assessed.	High and urgent	Affected state and territory governments, landholders, Aboriginal groups, research groups.
	Undertake periodic auditing of asset condition and feedback into management decision making.	Capacity to reprioritise camel management resources on the basis of changes in priority asset condition.	Medium and on-going across the life of the Action Plan.	Affected state and territory governments, landholders, Aboriginal groups.

Objective	Actions	Outcomes	Priority	Responsible party
Monitor camel population changes and impacts to target local and regional effort	Continue to improve the coverage and accuracy of camel population monitoring across the rangelands.	Improved targeting of camel management resources over time.	High and on-going across the life of the Action Plan.	Affected state and territory governments, the Desert Knowledge CRC, land holders.
	Develop camel population models that help to delineate appropriate sub-groups (e.g. by age, size, sex) for management control.	Targeting of camel population reduction that provides the most efficient return periods against asset protection needs.	Medium and important.	Affected state and territory governments, the Desert Knowledge CRC.
	Develop a process by which landholders and land mangers can record their feral camel management actions for incorporation into broader scale management assessment and targeting framework.	An on-going record of camel management actions, including the protection of assets.	Medium and important	Affected state and territory governments, landholders, community groups and Aboriginal groups.
Identify barriers to the development of commercial camel use enterprises and/or industries.	Identify legislative and regulatory processes and procedures and impediments associated with: - feral camel harvesting - use of camel meat - use of camel hides - use of other camel body parts (e.g. bones, wool, oil) - camel farming	Readily accessible information on regulation and processes to be met by commercial enterprises/individuals interested in development of camel enterprises. This information to be made available with the cross-government statement on roles and responsibilities for commercial development of camel enterprises.	Medium and on-going across the life of the Action Plan.	Affected state and territory governments, the camel industry.

Objective	Actions	Outcomes	Priority	Responsible party
	Identified legislative and regulatory processes and procedures to be streamlined where possible and amended where they create an unacceptable impost on the development of commercial enterprises associated with the use of domesticated camels and the capture and removal of feral camels.	Government is seen to have taken action within its roles and responsibilities to help commercial development of camel use enterprises.	Medium and on-going across the life of the Action Plan.	Affected state and territory governments, camel industry.
	Commercial ventures to seek relevant approvals as appropriate within jurisdictions	Development of commercial camel enterprises/industry is managed by governments within the appropriate regulatory frameworks.	Medium and on-going across the life of the Action Plan.	Commercial interests

Goal 4: Partnerships and social capacity for camel management are in place

Objective	Actions	Outcomes	Priority	Responsible party
To develop, via partnerships, appropriate capacities amongst stakeholders to manage feral camels and their impacts in a variety of setting and through a variety of control mechanisms.	Identify existing feral camel management opportunities, capacities and gaps across the different land tenures and within the variety of stakeholder groups (including lack of appropriate infrastructure).	A review of capacities for ongoing feral camel management.	High and urgent	Affected state and territory governments.
	Develop and resource a plan to overcome camel management deficiencies that addresses: - training needs for a variety of purposes - delineates the areas in which national or cross jurisdictional agreements are needed (e.g. for aerial shooting) - cultural sensitivities - infrastructure needs, including web-based access to information and for reporting of camel management actions	Development of appropriate capacities over time to meet the ongoing challenge of feral camel management.	High and urgent	Affected state and territory governments, Australian Government (in particular in regard to Indigenous Ranger development), Ninti 1.

To encourage the development of appropriate feral camel management capacities amongst Aboriginal people on Aboriginal controlled lands.	Provide Aboriginal communities with information about feral camel impacts and management techniques in appropriate languages.	Informed communities empowered prioritise and undertake management of feral camels	High and urgent.	Affected state and territory governments, Ninti 1 and partners, Aboriginal groups
	Develop monitoring and evaluation processes to document camel impacts and the recovery of key assets as the result of camel management.	Aboriginal communities have relevant evaluation processes and use them to inform and prioritise camel management and promote the success of management between communities.	High and urgent.	Affected state and territory governments, Aboriginal groups and other stakeholders.
	Empower Aboriginal communities to manage feral camels impacts via negotiated actions.	Informed communities negotiating within and between communities and external stakeholders on feral camel management issues	High	Affected state and territory governments, Aboriginal communities and leaders, other stakeholders.
	Investigate the degree to which feral camel management can be incorporated into Indigenous rangers- work programs and agreements.	Local groups empowered to undertake management of feral camel impacts via a variety of methods.	High and on-going across the life of the Action Plan	Australian Government, Aboriginal groups
	Develop appropriate courses for training Indigenous rangers in the management of feral camels.	Local groups able to respond appropriately to changes in feral camel impacts and population dynamics.	High and on-going across the life of the Action Plan.	Australian Government, affected state and territory governments, Aboriginal groups

	Where priority target areas coincide with Aboriginal controlled lands, early and extensive consultation on control methods, timing of control events, disposal of carcasses are to be undertaken to the satisfaction of the Aboriginal community.	A partnership approach to the management of camels on Aboriginal controlled lands is developed and implemented. There is widespread agreement between the Ninti 1 partners and the Aboriginal communities about the implementation of the Feral Camel Action Plan and the Caring for our Country project.	High and on-going across the life of the Action Plan.	Ninti 1, affected state and territory governments, Aboriginal groups.
	Develop and implement local access agreements for the management of camels (e.g. removal from the landscape, protective infrastructure)	Access for management of feral camels is undertaken within a collaborative partnership for the mutual benefit of Aboriginal communities and the wider Australian community.	High and ongoing across the life of the Action Plan.	Ninti 1 and partners, affected state and territory governments, Australian Government, Aboriginal groups
	Develop appropriate monitoring protocols for land managers to use to inform their feral camel management action	Criteria for interventions well developed and in use.	High and important.	Ninti 1 and partners
	Develop an intergovernmental agreement to share IP gained through implementing the camel action plan for the public good.	A central source of information that can be used within a MERI model of adaptive management (i.e. using current information to guide future management.	High and important.	Affected state and territory governments, Ninti 1 and partners.

Address key knowledge gaps using good science	Prioritise gaps in knowledge and seek placement of appropriate research in research funding processes	Continual improvement in capacities to undertake successful feral camel management.	Medium and on-going across the life of the Action Plan.	Australian government, affected state and territory governments, research institutions.
Establish a consistent understanding within landholding communities on need for and methods to manage feral camels	Development of an engagement and communication strategy for landholders within the camel range.	Landholders empowered to meet their on-going responsibilities to manage feral camels.	High and on-going.	Affected state and territory governments, all stakeholders.

ANNEX A

Appendices

Appendix A1

Camel management stakeholders

This list is indicative and may not provide an exhaustive list of all groups and individuals who believe they are stakeholders in the management of feral camels in Australia.

1. Primary

This group has direct responsibility for undertaking feral camel management. It includes:

- State and territory governments and their agencies
- Natural resource management boards
- Conservation managers (government and non-government)
- Aboriginal communities and associated land management units
- Pastoralists
- Mining leases
- Defence lands

2. Secondary

This group does not have an on-going role in the direct management of feral camels, but do have an overarching interest in the financing of a major feral camel management action, or the procedures and processes for undertaking feral camel management. It includes:

- Australian Government (as a funder of the Caring for our Country project)
- Ninti 1 and partners (as the proponent for the Caring for our Country project)
- Camel industry interests including peak industry bodies, helicopter pilots, shooters, pet and human meat enterprises and enterprises that domesticate/farm camels
- Animal welfare groups
- RSPCA
- WWF
- Animal rights groups, and
- Research institutions

3. Tertiary

This group is substantially removed from the direct management of feral camels, but is either:

- undertaking business that could be affected by either feral camels and their impacts or by a major feral camel management action, or
- concerned with the humanness of feral camel management methods and/or wildlife conservation.

This group includes:

- National groups
    - Tourism associations and operators
    - Camel owners

- Australian public
- International groups such as the World Wildlife Fund
- International communities
- International camelid scientific community

Australian Pest Animal Strategy – Key principles

The Australian Pest Animal Strategy is based on the following 12 key principles:

1. Pest animal management is an integral part of the sustainable management of natural resources for the benefit of the economy, the environment, human health and amenity.

2. Combating pest animal problems is a shared responsibility that requires all parties to have a clear understanding of their roles and responsibilities.

3. The development, monitoring and review of integrated pest animal management strategies need to be underpinned by good science.

4. Setting priorities for, and investment in, pest animal management must be informed by a risk management approach.

5. Prevention and early intervention are the most cost-effective techniques for managing pest animals.

6. Pest animal management requires coordination among all levels of government in partnership with industry, land and water managers and the community, regardless of land tenure.

7. Effective pest animal management requires capacity-building across government, industry, land and water managers and the community.

8. Management of established pests should aim to address actual rather than perceived problems, and to reduce impacts rather than simply pest animal numbers.

9. Management should be strategic in terms of determining where management should occur, timing of management, being proactive and using appropriate techniques.

10. Where there is a choice of methods, there needs to be a balance between efficacy, humaneness, community perception, feasibility and emergency needs.

11. The benefits of management should exceed the costs of implementing control.

12. As part of an integrated pest animal management program, commercial harvesting may offset management costs.

Feral camel control methods

There are a range of control methods, both commercial and non-commercial that can be used to mage feral camels and mitigate their impacts. Non-commercial methods are shown in Table A3.1 below.

Table A3.1 Non-commercial feral camel control methods

Method	Advantages	Disadvantages	Development required	Community perceptions
Aerial Culling	Effective control action to achieve large population density reductions over broad-scale areas, particularly in short time frames and in very remote or inaccessible areas. A humane and quick technique that results in instant death. Clearly defined COPs and SOPs.	Usually associated with shooting 'to waste.' There is substantial and widespread opposition to shooting 'to waste' in Aboriginal communities with the emphasis of the opposition on the 'waste'. Outcomes are highly dependent on the density of camels and the requirement for seasonally influenced aggregation to occur for cost efficiency but Judas techniques can overcome cost inefficiencies to some degree. Will be expensive in remote areas, particularly if aggregations have not occurred. Potential issues if carcasses are left on ground.	Judas technique. Acceptance by the community of standards of reporting on aerial shooting.	Significant opposition to aerial culling amongst world wide based animal welfare organisations on the perception that it is cruel and inhumane.
Ground culling	Primarily used for long-term maintenance of low density populations through opportunistic shooting integrated with other activities. Optimal and only	Has limited applicability for broad-scale population-based reduction. Generally undertaken on an uncoordinated and opportunistic basis. Can be time consuming		Carcasses are usually near access points and consequently they are visible. This can create issues, particularly for Aboriginal communities if carcasses are

	possible when there is easy road access.	and labour intensive. Is impractical in rugged or inaccessible terrain.		near sites of cultural value.
Exclusion Fencing	Most effective when applied at the local scale to protect high value assets. Costs depend on specific designs but are very dependent on terrain and remoteness.	Not a broad-scale level management tool. No impact on feral camel population size and population pressures on fencing can result in unacceptable levels of damage and maintenance costs. Requires on-going maintenance.	A number of designs for exclusion fencing exist but have not all been field tested.	Exclusion fencing can detract from the natural aesthetic appeal of an asset. Fencing may give some people a sense that the problem is solved and that removal of camels from the landscape is unnecessary.
Chemical control	Has the potential for broad-scale control of camel numbers.	No chemicals currently registered for use. The humane action of any chemical would need to be considered. Delivery mechanism may be difficult to design, distribute and manage.	Requires further investigation including into potential poisons and poison combinations, means of making the delivery camel specific and enhancing attractiveness to camels.	Like all chemical means of controlling pest animals, welfare issues will need to be considered.
Biological control	Has the potential for broad-scale control of camels.	No biological agents currently exist in a modified form that does not represent a biohazard to Australia. The humane action of the biological agents would need to be considered.	Requires further investigation. Camel pox has been noted as a disease that may merit further investigation.	Concerns about humanness, the potential for camel pox to spread and public perceptions about biological control of wild animals make it unlikely that such a technique would be available even in the medium to long term.
Fertility control	Has only limited potential for broad-scale control of camels in the short to medium term.	No chemicals currently exist that can be applied at a landscape scale in remote areas. Delivery mechanism issues are significant.	Requires further investigation. An immunocontraceptive vaccine technology that is orally active and has a species-specific immunogen is favoured for fertility control. Could have long term potential.	Damage to the rangelands would continue until the animals die of old age. Community perception is that it is considered humane.

Of the above methods, only the first three are in current use. The determination of which methods or combination of methods of control are to be used are best addressed at the level of specific management programs or management of specific areas. They depend on a range of factors including feral camel density, the level and speed of reduction required, land tenure and perceptions/requirements of the landholder, access to the camels, access to infrastructure to support the control methods and the conservation/natural resource/cultural values impacted by the feral camels.

Commercial control of feral camels

The commercial use of feral camels can help to remove feral camels from the landscape, and consequently help to lessen the impact they have on the environmental and social values of the rangelands. To date commercial use has only been profitable for small scale enterprises operating during periods when there a high camel numbers. It should be noted that camel industry development has been spasmodic, small and not of high value to date.

It is not the intention of this Action Plan to provide a pathway for the development of commercial enterprises. That is the responsibility of those individuals or companies that believe they can undertake a profitable enterprise based on feral camels. Governments are responsible for removing unnecessary or unjustifiable regulations that could impede the development of a camel industry but the delineation of these is not a matter for this plan.

Commercial uses of camels include are shown in the table below.

Table A3.2 Potential commercial uses of camels

Commercial Use	Constraints	Potential to contribute to feral camel control
Human meat consumption including live export	Under developed domestic market. Hal Al butchering required for export market is difficult to undertake with harvesting of wild camels. Would require significant investment in an export level abattoir. Significant costs for transport of live animals to processing facility. Logistic difficulties in guaranteeing a supply line for an export market (this could improve if some camels were farmed). Distances, hence costs, of remoteness from domestic and expert markets.	Low in the short to medium term. There are currently few commercial enterprises. Such enterprises rely on there being relatively high camel numbers for ready location and removal of animals. The number of animals that could be used by commercial enterprises in the short to medium term would be low (35,000 in 2009) and insufficient on their own to effect the changes required to protect the environment and social and cultural values. Seed stock for farmed camels would be sources from the feral herd, with approximately 40 per cent of the females being suitable. Some Queensland

		pastoralists have indicated a relatively strong interest in the transfer of feral cows into a managed domestic pastoral environment.
Pet meat	The market is relatively small. Pet meat shooters move through areas collecting those animals that are most readily available and there may be a temptation to target the largest animals only.. Toxins in meat due to consumption of indigofera sp may cause poisoning in dogs.	Localised impacts only. Highly dependant on their being high numbers of camels available unless they are droved or transported from distant locations.
Milk and dairy products	Cannot milk feral herds. No supply mechanism. Currently international markets only.	Some interest in camel milk products as these are low in lactose and high in vitamin C. Camel milk contains insulin like proteins which could potentially be useful in helping to control diabetes within isolated Aboriginal communities. Would require placement of selected feral cow camels into managed herds for production.
Leather	Industry not geared to handle the number of feral camels that need to be removed.	Potential for some off take of camel skins for leather, potentially to increase commercial returns for commercial mustering and removal activities. The leather is versatile, has exceptional tensile strength and attractive grain. Potential for Aboriginal communities to develop local agreements for use of camel by-products.
Camel oil	Industry not geared to handle the number of feral camels that need to be removed. Low commercial use to date.	Lower in cholesterol than other animal cooking fats, also suitable for the manufacture of soap and cosmetics. Potential for Aboriginal communities to convert hump fat into alternative fuel for power supply systems.
Wool	Low level commercial production only to date. Primarily a resource value attributed to Bactrian (two humped) camels only.	Technology for improving the fibre is being researched. The wool has unique characteristics of conductivity, softness and strength.
Weed control	Minor use in western Queensland only.	Not considered a useful adjunct to removing camels from the landscape unless the numbers and their movements are managed.

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