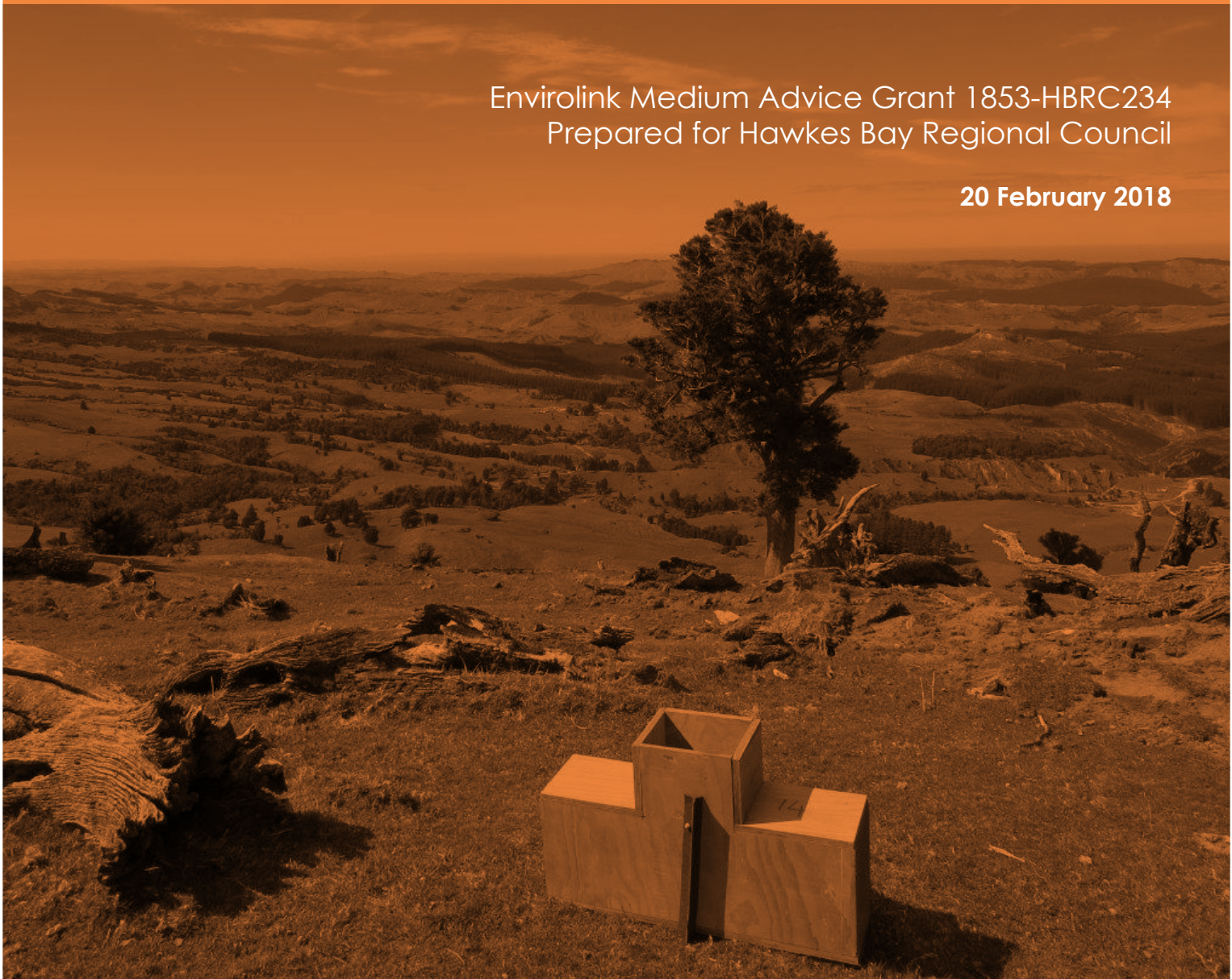


Best practice guidelines for the use of PredaSTOP™ for feral cat control

Envirolink Medium Advice Grant 1853-HBRC234
Prepared for Hawkes Bay Regional Council

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1. Foreword

PredaSTOP™ has the potential to be an effective and affordable tool for reducing feral cat densities in large-scale predator control (Glenn & Dickson 2017), however, since its registration this tool has not been widely used for feral cat or stoat control and this is partly due to the lack of best practice guidance for end-users.

It is essential that the research and development of new tools and technologies for invasive pest control is supported and that this support extends to the development of best practice guidelines. Hawkes Bay Regional Council have recognised the potential of PredaSTOP™ as a feral cat control tool and have supported the drafting of these best practice guidelines through an Envirolink Medium Advice Grant.

This document therefore serves as a best practice manual for anyone involved in the planning, and use of, PredaSTOP™ for feral cat control in New Zealand. It provides end-users with detailed instructions from the planning phase through to monitoring results to ensure the operation is compliant with legal requirements, as well as maximising the chances of success. The learnings and outcomes from two recent feral cat control operations, the field trials undertaken for the registration of PredaSTOP™ for feral cats, and the legal requirements for this toxin have all been used to develop these best practice guidelines.

It is intended that this document will be disseminated to regional councils, community groups, the Department of Conservation (DOC) and any other potential end-users. As with all new tools and technologies, best practice guidelines are developed to ensure their uptake is encouraged. However, it's expected that over time these guidelines will be updated and refined with the experience gained from the repeated use of PredaSTOP™ by end-users. The vast array of habitat types and terrain found in New Zealand mean that the methods outlined in this document may require fine-tuning for control operations carried out at different locations.



2. Background

The lethal control of pest animals requires a clear definition of the issue and pest species being targeted as well as a consideration of animal welfare and the humanness of the control method. The New Zealand National Cat Management Strategy (NZCMS 2017) categorises feral cats as those that are unowned, unsocialised, and have no relationship with or dependence on humans. This categorisation is important for the purpose of managing feral cats. Feral cats live in a wide range of terrestrial habitats but generally do not live around centres of human habitation (Gillies et al. 2005; Webb 2008; Alberthsen 2014).

Feral cats are considered significant predators of native wildlife in New Zealand (Gillies 2001). They are known predators of native birds, reptiles, bats and insects (Alterio and Moller 1997; Veitch 2001; Sanders & Maloney 2002; Scrimgeour et al. 2012). Cats are also vectors for disease. The protozoal disease toxoplasmosis (*Toxoplasma gondii*) is widespread throughout New Zealand and cats are the only definitive hosts of the protozoa and may shed millions of infectious oocysts in their faeces into the environment (NZCMS 2017). Since the 1950s, toxoplasmosis has been recognised as a significant cause of abortion in sheep, goats and pigs (Tompkins 2014) and it results in substantial economic and welfare impacts (NZCMS 2017). The cost of toxoplasmosis to the sheep industry just in the Hawke's Bay region of New Zealand was estimated at approximately \$18 million in 2014, (Walker 2014).

Feral cat control options are limited to labour intensive shooting, trapping or poisoning directly using sodium fluoroacetate (1080) or PredaSTOP™, or through secondary poisoning of feral cats that scavenge rats or other animals that have been killed with baits containing 1080 or brodifacoum (Gillies et al. 2003). However, direct control of feral cats with PredaSTOP™ is far more effective and targeted in its delivery than relying on the secondary poisoning of feral cats from brodifacoum and 1080 and it will not always be convenient to wait for 1080 or brodifacoum control events.”

In New Zealand, the management of feral cats is an emotive topic and although classified as a pest species, under Regional Pest Management Plans throughout much of the country, feral cats are covered by the same declaration of sentence under the Animal Welfare Act 1999 as companion cats, therefore it is of great importance that feral cats are treated and killed humanely (NZCMS 2017).



3. PredaSTOP™ for feral cat control

PredaSTOP™ for feral cats is currently one of only two registered toxins for feral cat control in New Zealand, the other being 0.1% 1080 feral cat bait (Orillion). The active ingredient in PredaSTOP™ is para-aminopropiophenone or PAPP for short.

PAPP is a low residue vertebrate toxic agent (VTA) registered in New Zealand in 2011 under the trade name PredaSTOP™ for the control of feral cats and stoats. Registration field trials achieved 81% mortality of feral cats radio collared as part of the trial. PredaSTOP™ is a green paste and is used in a bait that consists of a meat bolus of fresh minced meat (dyed green) formed around either 200 mg (feral cats) or 35 mg (stoats) of the PredaSTOP™ paste. PAPP is absorbed into the blood stream via the stomach after the bait is eaten. It causes a condition called methaemoglobinaemia, which means it acts by rapidly forming methaemoglobin (the ferric state of haemoglobin), which is the form of haemoglobin that is unable to release bound oxygen and as such oxygen is unable to be transported to the vital organs. This creates a lethal deficit of oxygen in cardiac muscle and the brain. When delivered at a lethal dose, rapid induction of high levels of methaemoglobin quickly induces death with minimal symptoms of distress (Eason et al 2010). Death in feral cats and stoats usually occurs within 90 minutes after ingesting a lethal dose (Fisher et al. 2005; Eason et al. 2014).

PAPP has been investigated in the USA as a tool for coyote (*Canis latrans*) control and was registered in Australia in 2016 for the field control of foxes (*Vulpes vulpes*) and wild dogs. PAPP was originally trialled in the 1960s as an antidote for human radiation poisoning. During toxicology assessments, PAPP was found to be specifically much more toxic to carnivores than to birds and humans (Eason et al. 2014), demonstrating that it has some form of target specificity.

PredaSTOP™ may be useful both for initial 'knock-down' control of cat populations, and as a maintenance 'spot control' tool if cat densities were to increase within a controlled area (Glen et al. 2017). The effective control of invasive mammals in New Zealand relies on the use of a range of techniques and tools. Feral cats are no different and PredaSTOP™ should not be seen as a stand alone tool for feral cat control but rather an effective tool to complement other control methods (e.g. trapping and shooting).

3.1 Developing Best Practice

The utility and uptake of any new tool or technology is reliant on the development of clear and concise best practice advice for practitioners. Well-developed best practice advice will enable practitioners to understand the potential efficacy and limitations of new tools or technology, and how these fit with their goals and aspirations for biodiversity protection and disease vector control.

In New Zealand, monitoring protocols for most key invasive mammalian species (e.g. possums, rats and stoats), are well established. However, this is not the case for feral cats. Motion-activated camera traps have long been used for monitoring large ungulate species, and in the last 5 years many research and restoration groups have started using these cameras for monitoring smaller mammalian species. In particular, camera traps have become more widely used as a tool for monitoring feral cat densities. Landcare Research, alongside the Hawkes Bay Regional Council (HBRC) are currently developing a standardised protocol for monitoring feral cats with camera traps and this methodology is outlined in Appendix 3. However, for many groups undertaking feral cat control, the use of camera traps to monitor the relative abundance of cats will not be cost effective, and other methods may be used including tracking cards or a simple measure of bait take.

A control operation using PredaSTOP™ for feral cats will require a range of considerations. However, for the purpose of this document this type of operation has been divided into two distinct phases, a planning phase followed by an operational phase. Cost is often one of the main considerations when looking at control methods or comparing different methods. The time and resources required to set up and undertake a feral cat operation are outlined to enable end-users to evaluate the cost-effectiveness and suitability of PredaSTOP™ for feral cat control.



4. Planning a feral cat control operation with PredaSTOP™

4.1 Suitability of toxic baiting and risks

PAPP is humane in action, is not persistent in the environment and is unlikely to cause secondary poisoning, although care is needed to minimise the risks to dogs and other domestic animals due to primary poisoning by eating baits directly. All VTAs have advantages and disadvantages that should be considered when deciding the appropriate control method to use. Table 1 (below), outlines some of these for the VTA PAPP.

The efficacy of PredaSTOP™ meat baits for feral cat control relies in part on the freshness of toxic baits. In warmer parts of New Zealand winter temperatures may remain relatively high and the field life of fresh meat baits may not be more than several days. Under this scenario toxic baits would potentially need to be checked and replaced more frequently than as recommended in Section 6.1.4.

Table 1: Advantages and disadvantages of the toxin PAPP for feral cat control (adapted from Eason et al. 2014)

ADVANTAGES	DISADVANTAGES
Simple antidote – an antidote is available in the form of methylene blue	At present only available in a paste that has to be added to a fresh meat bait
Humane (very rapid action) – time to death for feral cats is usually within 90 minutes of consuming a toxic bait	Potential primary poisoning risks to dogs
Low environmental impact secondary poisoning risk – the rapid metabolism and clearance PAPP and metabolites means the risks of bioaccumulation in the food chain or secondary poisoning are significantly reduced	Not broad spectrum – not toxic to rats and possums
More targeted than 1080, PAPP has been shown to be generally less toxic to birds than to mammalian carnivores	Must use bait stations that exclude non-target species
Effective – control operations with PredaSTOP™ have achieved 73% to 81% reductions in feral cat abundance (Murphy et al. 2011)	



4.2 Legal requirements - licences, notifications and permissions

4.2.1 Licences

PredaSTOP™ for feral cats can only be purchased and used by persons who are Approved Handlers and hold a Controlled Substance License (CSL) with an endorsement for PAPP. As outlined by the National Pest Control Agencies (NPCA) (2015a), a person who does not hold the required Approved Handler Certificate or Controlled Substance Licence for PAPP may work under the direct supervision of a properly certified person when:

- The person is physically and mentally suitable to carry out the work.
- The supervisor is available at all times to provide assistance to the person by being physically present (i.e. within sight and earshot).
- The person has received guidance on how to use the VTA, and a health and safety briefing from an Approved Handler.

The requirements for use of VTAs including PredaSTOP™ for feral cats are outlined by the NPCA (2015a) as follows:

AT ALL TIMES, PEST CONTROL OPERATORS IN CONTROL OF A VTA MUST;

- 1. Hold licences or certificates as required (or be under the direct supervision of a licence holder).**
- 2. Comply with product label directions.**
- 3. Have the relevant Safety Data Sheet (SDS) available**

4.2.2 Notifications

No person may apply, or engage to apply, PredaSTOP™ for the purpose of feral cat control unless that person has given notice of the proposed application to occupiers and, as far as practicable owners, of land, dwellings or buildings **within 3 km of any intended bait station site**¹. Notice must be given with sufficient prior notification, no less than 24 hours, but no more than 2 months, before the proposed application and, if requested by the person notified, shall be repeated at a mutually agreed time before the proposed application; and specify the following:

- i. the approximate date on which the substance will be applied;
- ii. the name and nature of the substance;
- iii. the risks to companion animals and details of antidotes;
- iv. a description of the area within which the substance will be applied, including:
 - A. the boundaries of the area; and
 - B. districts, roads and other commonly known feature that may identify the place;
- v. the name, address and contact details of the person responsible for the application of the substance.

¹. An application was filed in 2018 with the EPA to reduce this notification distance to 500m. Refer to the EPA controls for the most up-to-date notification requirement.



4.2.3 Permissions

No formal permission is required to undertake a feral cat control operation with PredaSTOP™ apart from when the control operation is on land administered or managed by the Department of Conservation. However, it is advisable to first contact your local council and discuss the control operation so they are aware of what is planned. No person may apply or otherwise use PredaSTOP™ on land administered or managed by the Department of Conservation unless the person first obtains a permission from the Department of Conservation. If you plan to undertake a feral cat control operation with PredaSTOP™ on land administered or managed by the Department of Conservation, then the first step is to contact the local DOC office to discuss your proposed operation.

4.3 Label requirements

When purchasing PredaSTOP™ for feral cats the product will have a label (Appendix 1) attached to it that has been approved by the Agricultural Compounds and Veterinary Medicines (ACVM) group within the Ministry for Primary Industries (MPI). It is a legal requirement that PredaSTOP™ for feral cats must only be used in accordance with this label.

4.4 Storage and handling

All persons in possession of PredaSTOP™ must have a CSL endorsed for PAPP and as such should understand the legal responsibilities around transporting, storing and handling PredaSTOP™.

4.5 Signage

Warning signs must be erected at prominent places around the perimeter of the treated area prior to the placement of toxic baits. Warning signs must remain in place at least one month after any remaining toxic baits are retrieved from bait stations or from the end date of the control operation if all toxic baits have been consumed during the operation. Warning signs must be visible from 10 metres away and an example sign (Figure x) below illustrates the required information which includes a picture of the bait, the dates when toxic baits will be present at the site and the contact details of the person responsible for undertaking the operation. At the end of the operation any remaining toxic baits must be removed and disposed of in accordance with the product label.

The control area should be treated with caution for one month after toxic PredaSTOP™ baits are removed or from the end date of the control operation if all toxic baits have been consumed during the operation.



Warning PAPP Poison

4-aminopropiophenone

will be present in bait stations from :

- **DO NOT touch bait**
- **WATCH CHILDREN at all times**
- **DO NOT EAT animals from this area**
- **Poison baits or carcasses are DEADLY to DOGS**

For more information contact:

Unauthorised removal of signs or baits is an offence



4.6 Antidote

When undertaking a feral cat control operation with PredaSTOP™ it is good practice to notify the nearest veterinary clinic (to the operation site) prior to undertaking control to ensure they have the relevant information on this toxin, they are aware of the signs of poisoning and that they have methylene blue available to enable the treatment of accidentally poisoned non-target animals. The product label (Appendix 1) outlines the symptoms of poisoning as including skin colour changes (pale or blue-ish) lethargy and lack of co-ordination.

In the event of poisoning or suspected poisoning act immediately. Have the product label or Safety Data Sheet available. For humans, seek help from the nearest medical centre and for advice contact the National Poisons Centre on 0800 POISON (0800 764 766). For animals, consult a veterinarian immediately. Methaemoglobinaemia (caused by PAPP the active ingredient in PredaSTOP™) can be treated with oxygen and methylene blue. A 1 - 2% solution (1 – 2 gm/100 ml) can be administered at 1 to 2 mg/kg intravenously slowly over five minutes followed by an intravenous flush with normal saline. This may need to be repeated in severe cases. Methylene blue restores the iron in haemoglobin to its normal oxygen-carrying state.

4.7 Timing of control operations

PredaSTOP™ for feral cat control is required to be used in a meat bolus of fresh minced meat, meat with no preservatives or stabilisers has a limited field life and will begin to degrade and become fly-blown in warmer weather. To optimise the effectiveness of feral cat control using PredaSTOP™, operations should ideally occur during winter months (June-September), when limited food and colder conditions make feral cats more likely to consume toxic baits. Control operations during colder months will also lengthen the potential field life of pre-feed and toxic baits. The limited field life of fresh meat baits is further offset by pre-feeding with non-toxic baits prior to toxic baiting as this will increase the likelihood of feral cats finding and consuming toxic baits faster. Control operations can be undertaken outside of winter months, however, control undertaken outside this time are possible but will likely need more frequent checking/replenishing of baits (than outlined in section 6.1.4) to ensure they remain fresh.

A single annual control operation with PredaSTOP™ should be sufficient to reduce feral cat numbers and control with other tools (e.g. traps) alongside these operations will give an increased chance of maintaining low numbers of feral cats over time. Long term management of feral cats should be undertaken using a range of control tools and PredaSTOP™ can be used alongside existing control tools once every year or every second year to rapidly reduce numbers.



5. Control operation phase

The control phase of an operation to target feral cats using PredaSTOP™ requires the necessary equipment to be acquired, the set-up of infrastructure, pre-monitoring (if being conducted), pre-feeding and toxic baiting, clean-up and then post-monitoring (if being conducted).

5.1 Equipment required for control operations

5.1.1 PredaSTOP™ toxin

The first step in setting up a control operation for feral cats is to purchase the PredaSTOP™ which comes in either 2.2 g syringes or a 4.0 g pottle, containing the equivalent of 11 and 20 doses respectively. A single dose of PredaSTOP™ is required for each toxic meat bait. It is recommended that two toxic baits are placed in each bait station (see Section 5.6) and that toxic baiting should include two pulses of toxic baits. Therefore, when planning a control operation, it is advisable to ensure you have the equivalent of at least four toxic doses of PredaSTOP™ per bait station deployed. PredaSTOP™ and the green food dye required to colour toxic baits can be ordered from Connovation Ltd in East Tamaki, Auckland www.connovation.co.nz.



5.1.2 Chimney bait stations

To minimise risks to non-target species, PredaSTOP™ baits for feral cats must always be used in bait stations. Chimney or submarine bait stations (referred to as chimney bait stations in this report, Figure 1) have previously been used in trapping operations and successful PredaSTOP™ operations for controlling feral cats. Chimney bait stations are a wooden construction with mesh on either end and an opening at the top, they manage non-target risk by limiting access to non-target species. Chimney bait stations are also very effective at minimising access to other mammalian predators (including rats, hedgehogs and ferrets) that may potentially interfere with baits. When used in areas where livestock are present it is important that bait stations are well secured, through the use of waratah stakes (Figure 2), or by being screwed to fence posts (Figure 3).

Chimney bait stations are relatively easy to construct and the dimensions and materials are outlined in Appendix 2, alternatively these bait stations can be made to order by The Napier Pallet Co, Napier. Cats can readily access these stations and they can be used for on-going feral cat control by fitting a Timms trap inside the tunnel at one end (it should be noted that for Timms traps the opening of the trap needs to be widened slightly to ensure large cats can access the trap).



Figure 1: Chimney bait station (Photo Rod Dickson HBRC)
Figures 2a & b: Chimney bait stations secured to the ground with a waratah and to a fencepost (Photos Helen Blackie BML and Rod Dickson HBRC).



Figure 4: Plastic container for storing toxic baits.

5.1.3 Miscellaneous equipment

- Mincemeat (ideally rabbit but beef can be used). Pre feeding will require at least two rounds of two to four non-toxic baits per bait station (eight baits total per bait station) and two toxic bait pulses of two baits per pulse (four baits total per bait station). This equates to a total of 12 meatballs per bait station with each meatball weighing 15 g, overall this will require approximately 180 g of mincemeat per bait station to complete a control operation as a minimum and this will be higher if more than two pre-feeds are planned.
- Latex gloves to make toxic baits and a plastic bin/tray/plastic sheet to use as a preparation area.
- A container with individual compartments is useful for storing toxic baits to ensure they are not damaged when moving between bait station sites (Figure 4).
- A pair of tongs to extract baits from the storage container and place in the bait station.
- GPS to record bait station sites locations of dead cats that may be located during the toxic stage of the operation.
- IPAD, notebook, phone app (such as TrapNZ) or other means for recording pre-feed and toxic bait-take.
- Monitoring tools such as ink tracking cards can be used.



5.1.4 Bait station spacing and placement

Bait stations should be spaced in an approximate grid pattern at 500m intervals (spacing can be altered if topographic features or other site requirements prevent placement). Bait stations should have a GPS location taken to ensure an accurate log of where baits are to ensure they can be retrieved. Where possible, bait stations should be located in preferred habitat for feral cats which includes bush-pasture margins, along river banks, tracks, fence lines and isolated patches of cover. Bait stations should be secured to the ground or a fence post to ensure that they cannot be knocked over or accessed by feral pigs, livestock or other non-target species (Figures 5a -5d).



Figures 5a - 5d: Well secured chimney bait stations will exclude non-target species access (Photos Rod Dickson HBRC).

5.2 Monitoring feral cats

Accurately estimating the abundance of wide ranging invasive mammals like feral cats and stoats is difficult. Methods currently used to monitor feral cat populations include spotlighting, track counts (footprints monitored using sand plots or tracking cards), DNA sampling and capture-mark-recapture. These methods can be both costly in terms of labour and analysis as well as having limitations around the ability to accurately estimate feral cat abundance at low densities and feral cats being weary of recapture.

The advent of motion-detecting camera traps has provided a fairly low-cost passive monitoring option for feral cats but requires a standardised approach to ensure meaningful data is collected. A monitoring method using motion-detecting camera traps has been developed by Nichols et al. (In Press), and the relative abundance of feral cats has been estimated using this methodology in two recent feral cat control operations using PredaSTOP™. Operational details and results of these two control operations are outlined in Section 6.0 and the method used to monitor feral cats using camera traps is outlined in Appendix 3.

It is important to note that the motion-activated camera monitoring method used is only an estimate of abundance of feral cats within the site and like other monitoring techniques used for estimating feral cat relative abundance camera traps have a number of limitations. The most problematic is the difficulty that occurs in attempting to identify individual feral cats and differentiate between similarly coloured/patterned individuals from pictures or video taken at night that are often black and white.



Figure 6: Feral cat eating pre-feed baits captured on motion-activated camera trap (Photo Rod Dickson HBRC).

Figure 7: Non-toxic pre-feed baits placed at either end of the chimney bait station.

5.3 Pre-feeding

Pre-feeding cats with non-toxic meatballs to acclimatise them (to consuming baits) is a label requirement for PredaSTOP™ as well as best practice for ensuring optimal uptake of toxic baits. Pre-feeding should be continued until bait acceptance has been established (which will depend on the amount of other food available to feral cats). Provided that the control operation is undertaken during winter months (June-September) when food is limited then typically it should take 2 to 3 weeks for feral cats to be routinely feeding on non-toxic meat baits. Control operations undertaken outside of this time may require more frequent replenishing of baits. Most other carnivores are not able to access submarine style bait stations and therefore bait take alone is generally a good indication of feral cat bait acceptance. Nevertheless, it is also possible to use ink tracking cards (attached to the floor of the bait stations) to verify feral cat activity. Whilst camera traps can potentially be used for pre and post-control monitoring of abundance recent research, Meek et al. (2015 & 2016) have suggested that camera traps can actually deter feral cats. It is possible that monitoring chimney bait stations with camera traps may impact bait take by feral cats.

If possible bait stations should be installed and left to weather for at least three weeks prior to pre-feeding but this is not always possible or practical. Once bait stations have been left to weather for three weeks or when they're installed (if it is not possible to weather bait stations prior to pre-feeding), pre-feeding should commence as follows:

- Each bait station should be loaded with two to four non-toxic meatballs each weighing approximately 15 g.
- Meatballs should be rabbit or beef mince. To ensure good uptake the meat should be fresh or defrosted within 24 hrs of use.
- Meatballs should be placed inside the submarine bait station at either end (approximately 5 cm from the mesh cover) to ensure feral cats can easily see and smell the baits from the outside of the stations and are enticed to enter via the open top section (Figures 6 and 7).
- Bait stations should be replenished with non-toxic baits every 5 to 7 days at which point any uneaten baits should be replaced with fresh baits. The interval between replenishing baits will depend somewhat on the temperature with a five-day interval being more effective in warmer weather.
- At least two rounds of pre-feeding will likely be required to ensure bait acceptance occurs within 2 to 3 weeks.
- At the conclusion of pre-feeding all remaining non-toxic baits should be removed and replaced with toxic baits.
- Warning signs should be set up (as outlined in Section 4.4) prior to deploying toxic baits.



5.4 Toxic bait preparation instructions

PredaSTOP™ for feral cats is a smooth green paste containing 410 g/kg of para-aminopropiophenone (referred to as PAPP) packaged in a syringe. The bait is a meat bolus of fresh minced meat formed around 200 mg of PredaSTOP™ paste.

Instructions for bait preparation are provided below. It is recommended this page is printed out and kept available during bait preparation.



Fig1: Mince with dye mixed evenly throughout.



Fig2: Meat pattie with line of paste in centre dimple.



Fig3: Meat pattie with ball of paste in centre dimple



Fig 4: Completed meat bait

MANDATORY DIRECTIONS

Each syringe of PredaSTOP™ for feral cats contains sufficient paste to prepare 11 baits.

Baits must be made by forming a 15 g (3 tsp) bolus of green dyed fresh minced meat around 200mg of PredaSTOP™ for Feral Cats paste.

This is equivalent to approx. 50 mm of paste dispensed from the plastic syringe supplied, or about a 7 -10 mm diameter ball of paste.

- Do not mix the paste through the minced meat.
- Do not prepare baits in food preparation areas.
- Wear rubber gloves when preparing baits.
- Ensure bait containers are labelled and include bait preparation date.
- A Connovation Safety Data Sheet for the prepared meat bolus bait is available on the company web-site.
- Store prepared baits in a closed container and in a cool place.
- Clean preparation equipment by washing with plenty of warm soapy water.
- Unused dyed (non-toxic) minced meat and contaminated materials (e.g. gloves) can be disposed of in normal rubbish collection.
- Use baits within 48 hours after preparation.

RECOMMENDED PREPARATION STEPS

1. Use a plastic bin/tray/plastic sheet as a preparation area.
2. Place minced meat (rabbit mince is ideal) in a bowl, tray or on plastic sheet.
3. Add green dye to the mince and evenly mix/blend. 20 drops of liquid green dye per 100 g mince is recommended.
4. Flatten enough meat to make one bait into a 'pattie' with a hollow on top in the centre.
5. Add the PredaSTOP™ paste to the centre of each minced meat pattie and form the meat around the paste to make a meat bolus ball.
6. Place the green meat bait bolus into a plastic lined container, or individual pottles. Clingwrap is an ideal liner as this can be used to cover baits to keep moist. If more than one layer of baits is placed in a container, use plastic cling film to separate each layer.
7. Take precautions to avoid contamination of outside of bait container. Change or wash gloves following minced meat bolus preparation and the wrapping of baits & closing of containers.



5.5 Toxic baiting

Once toxic baits have been prepared following the mandatory directions in Section 5.5 then baits can be deployed and toxic baiting should commence as follows:

- Wear rubber gloves when handling toxic baits
- Place two toxic baits in each bait station, ensuring all non-toxic baits have been removed.
- Each toxic bait contains a lethal dose for an adult feral cat. However, due to the small size of toxic baits an individual cat will likely eat both baits from a bait station.
- Toxic baits should be left for between five to seven days, at which point they should be checked and either replenished where baits have been eaten or replaced where baits have not been eaten.
- Each round of baiting is referred to as a single pulse of toxic baiting.
- During two recent control operations two pulses of toxic baiting resulted in a larger reduction in feral cat abundance compared to a single pulse (53% reduction for a single pulse versus 73% when two pulses were used).
- The length of time between toxic bait pulses also has the potential to influence efficacy as bait freshness and palatability is influenced by the weather. Although five days between pulses is recommended, between five and seven days can be used. If the timeframe between toxic pulses extends beyond this, further pre-feeding would be required.

During toxic baiting there is a small possibility that unconscious or incapacitated poisoned feral cats may be observed. In the interests of minimising the time to death for poisoned feral cats these animals should be euthanased. The Department of Conservation (DOC 2016) and NPCA (2015b) suggested method of killing feral cats caught (but not killed) involves a blow to the head with a solid object or a head shot with a firearm. Death should be confirmed by touching the eye to check for a corneal reflex (NZCMS 2017)



5.6 Clean up

- Clean preparation equipment by washing with plenty of warm soapy water.
- Unused dyed non-toxic minced meat and contaminated materials (e.g. gloves) can be disposed of in normal rubbish collection.

Any remaining toxic baits must be collected from bait stations at the conclusion of the control operation and disposed of by burying under at least 60cm of damp biologically active soil or transferred to an approved disposal facility. Warning signs must remain in place at least one month after any remaining toxic baits are retrieved from bait stations or from the end date of the control operation if all toxic baits have been consumed during the operation. The treatment area should be treated with caution for one month after toxic PredaSTOP™ baits are removed.

5.7 Post-monitoring

Once all toxic baits have been removed from the control operation then post-monitoring can commence following the same technique (if any was used) used in the pre-monitor. The method for camera trap monitoring is outlined in Section 5.2 and should be carried out as per the pre-monitoring methodology.

Alternatively, a simple bait-take analysis can be used to estimate the number of cats which consumed toxic baits. Due to the small size of toxic baits (approximately 15 g) feral cats are likely to consume both baits when they encounter toxic baits. There is a small chance of a feral cat consuming one bait and then another individual consuming the remaining bait at a later stage, however, this is not representative of what was observed in registration field trials and the camera trap monitoring that occurred during control operations reported in Section 6.0.

The simple bait-take analysis is based on previous observed PredaSTOP™ toxic bait take behaviour for feral cats. The bait take analysis relies on the assumption that when one or both toxic baits have been consumed in a bait station that these were consumed by a single feral cat. Therefore, the number of bait stations that record bait take is recorded as the number of feral cats lethally controlled during the operation. This analysis gives an estimate of the knock-down but not a before and after in terms of the potential reduction in abundance. As it is possible for a single feral cat to visit multiple bait stations during pre-feeding, just using bait take during pre-feeding is not a reliable estimate of pre-control abundance. It is also worth noting that PAPP is fast acting and given the recommended spacing of bait stations (500m apart) it would be unlikely for a single cat to access toxic baits from more than one bait station.



6. CASE STUDIES

In 2009 registration field trials were undertaken to determine the efficacy of PredaSTOP™ baits on feral cats. For one of these trials 16 individual feral cats were radio-collared at a Central North Island trial site to accurately determine mortality as a result of toxic baiting. Toxic baiting during registration trials used the same methodology outlined in this document and resulted in 81% (13/16) mortality of collared feral cats, as well as at least three uncollared feral cats that were found near bait stations

Two feral cat control operations were undertaken on separate properties in Northern Hawkes Bay in 2016/2017 using PredaSTOP™. The methods used for these two operations followed those recommended in Sections 4.0 and 5.0 described in this document, however, the first operation at Toronui Station only carried out one toxic pulse (due to weather constraints), whilst the second operation at Ngatapa Station carried out two toxic pulses. The other difference between these control operations being that two non-toxic baits were placed in each bait station on both pre-feeding occasions at Toronui Station compared to four non-toxic baits per bait station at Ngatapa Station. The results of these two control operations are included here as a reference point for end-users in terms of the efficacy that can be achieved when control is carried out following the methodology outlined in this document.

The estimated reduction in abundance from these two control operations is based on the use of camera trap monitoring and is likely to be more conservative than radio-collaring animals as per registration trials. The use of two-pulses has been shown to result in a larger reduction of abundance than a single pulse. Reductions in feral cat abundance following the methods outlined here and using two toxic pulses can realistically expect to achieve an 80% reduction in feral cat abundance within a control area.

Case Study 01 TORONUI

6.1 Toronui Station feral cat control operation 2017

A feral cat control operation with PredaSTOP™ was undertaken at Toronui Station in September 2016 due to concerns from the landowner around feral cats transferring toxoplasmosis to livestock. Toronui Station is a 1600 ha pastoral property located in northern Hawkes Bay. Previous monitoring on the property showed that feral cats were common on Toronui Station (Glenn et al. 2017).

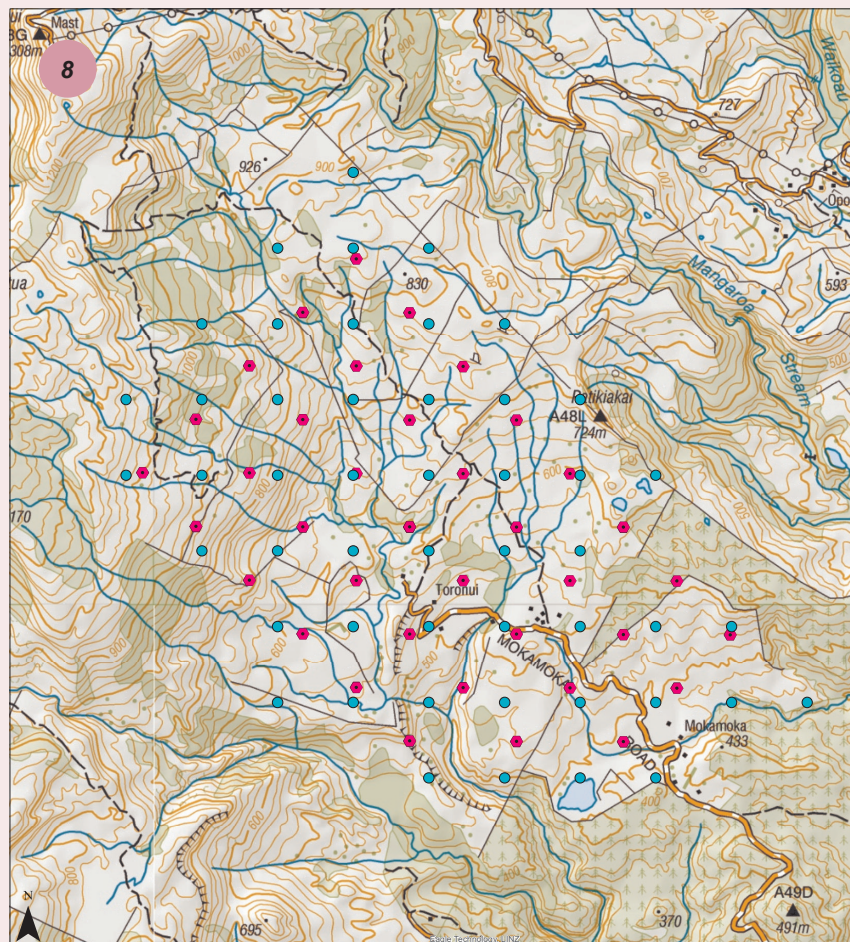
6.1.1 Methods and set-up

A total of 48 chimney bait stations were set out at Toronui Station a month prior to pre-feeding, to allow time for acclimatisation and were spaced approximately 500 m apart in a grid formation (Figure 8).

6.1.2 Monitoring

Pre and post-monitoring of feral cats was undertaken with motion-activated camera traps set out in a grid formation across the site. A total of 38 cameras were set up spaced at 500 m intervals (Figure 9), each with a lure several metres in front of it and left in-situ to record still photographs for three weeks. This was then repeated for the post-monitor carried out immediately after the toxic control.

The camera trap rate was used to estimate feral cat abundance. The camera trap rate (CTR) = number of independent photographs of feral cats per 100 camera trap days. The operation used 40 camera traps and 21 nights of camera trapping pre and post-monitoring giving a total of 840 camera trap days so the CTR = number of independent photographs of feral cats /8.4.





Case Study 01 TORONUI

9



6.1.3 Pre-feeding

Two pre-feeds were carried out one week apart, the first pre-feed was carried out two weeks prior to the toxin deployment, and the second pre-feed one week prior. Two non-toxic pre-feed baits consisting of 15 g of rabbit mince were placed in each bait station during the first pre-feed and these were replenished with two fresh pre-feed baits seven days later during the second pre-feed. These baits were left in place for a further seven days before being replaced with toxic baits. The suggested timings for deploying pre-feed and toxic baits and other relevant information is attached in a calendar in Appendix 4.

6.1.4 Toxic baiting

Two toxic baits were placed in each bait station and left for five days after which time any remaining baits were removed. Only a single pulse of toxin was used in this control operation.



Case Study 01 TORONUI

6.1.5 Results

Pre-feeding

During the first pre-feed all non-toxic baits were eaten from 11 of the 48 bait stations and during the second pre-feed all non-toxic baits were eaten from 13 of the 48 bait stations.

Toxic bait pulse one

Both toxic baits were taken from 17 bait stations, a total of 34 baits (Figure 8). Each toxic bait contains a lethal dose for an adult feral cat. However, due to the small size of toxic baits an individual cat will likely eat both baits from a bait station. It was therefore assumed that 17 cats had been killed.

Camera trap pre-monitoring

Cats were detected on 42 occasions at 22 cameras (Figures 10a, b and c) and this equates to a relative abundance of feral cats of 5.0%.

Camera trap post-monitoring

Cats were detected on 21 occasions at 14 cameras and this equates to a relative abundance of feral cats of 2.5%.

Relative abundance of feral cats

Based on the camera trap monitoring, the PredaSTOP™ feral cat control operation at Toronui Station achieved a 50.0% reduction in the relative abundance of feral cats within the monitored area.



Figure 6: Feral cats accessing chimney bait stations and toxic baits at Toronui Station.



Case Study 02 **NGATAPA**

6.2 Ngatapa Station feral cat control operation 2017

A feral cat control operation with PredaSTOP™ was undertaken at Ngatapa Station, Hawkes Bay in July 2017. Feral cats were frequently seen on site and control was initiated in order to protect the threatened species present (particularly whio and North Island Brown Kiwi).

6.2.1 Methods and set-up

A total of 32 chimney bait stations were set out at Ngatapa Station a month prior to pre-feeding, to allow time to weather and were spaced approximately 500 m apart in a grid formation (Figure 11) (as topography and farming operations allowed).

6.2.2 Monitoring

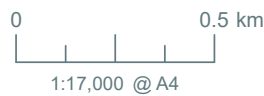
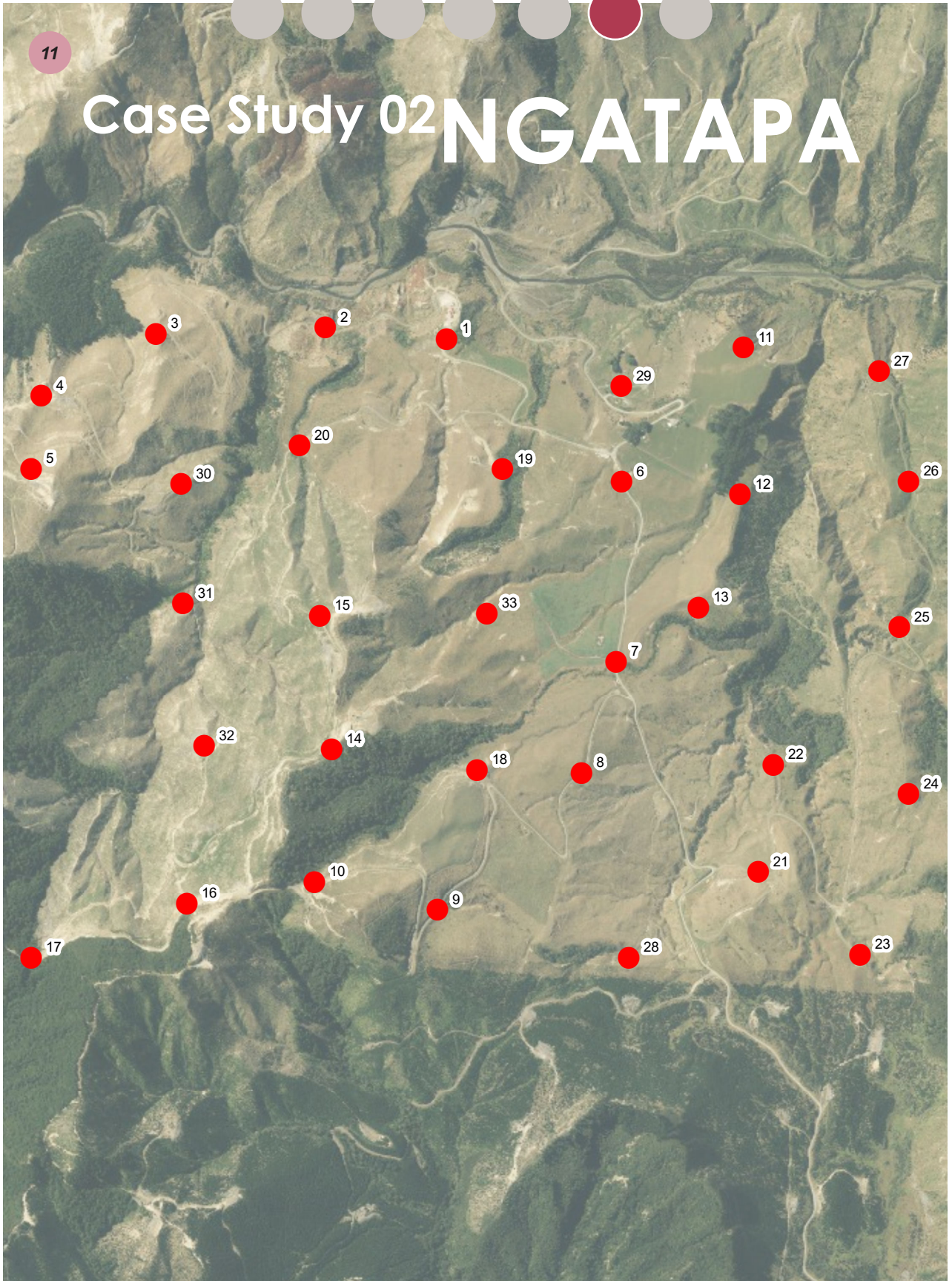
Hawkes Bay Regional Council assisted with the provision of resources to undertake a pre and post-monitor of feral cat abundance at Ngatapa within the feral cat control area using the same methodology as used in the previous case study. This was undertaken with motion-activated camera traps set out in a grid formation across the site. Thirty cameras were set up spaced at 500 m intervals, each with a lure several metres in front of it and left in-situ to record still photographs for three weeks. This was then repeated for the post-monitor carried out immediately after the toxic control. Camera traps were initially set up on the 3rd – 24th July, the toxin operation commenced on the 26th July with a first pulse of toxic baits and then a second pulse of toxic baits five days later. The post-control camera monitor ran from the 5th – 26th August.

The operation used 30 camera traps and 21 nights of camera trapping pre and post-monitoring giving a total of 630 camera trap days so the CTR = number of independent photographs of feral cats /6.3.

6.2.3 Pre-feeding

Two pre-feeds were carried out one week apart, the first pre-feed was carried out two weeks prior to the toxin deployment, and the second pre-feed one week prior. Four non-toxic pre-feed baits consisting of 15 g of rabbit mince were placed in each bait station during the first pre-feed and these were replenished with four fresh pre-feed baits seven days later during the second pre-feed. These baits were left in place for a further 7 days before being replaced with toxic baits. The decision to use four pre-feed baits was made based on the high numbers of feral cats observed at the site.

Case Study 02 NGATAPA



Data Sources: Boffa Miskell Ltd., LINZ and Eagle Technology Aerials.
 Projection: NZGD 2000 New Zealand Transverse

Legend

Chimney Bait Stations

A17188 HBRC FERAL CAT CONTROL
Bait Station Locations

Date: 11 April 2018 | Revision: 0

Plan prepared for Hawkes Bay Regional Council by Boffa Miskell Limited
 Project Manager: Helen.Blackie@boffamiskell.co.nz | Drawn: GCu | Checked: LSh



Case Study 02 **NGATAPA**



6.2.4 Toxic baiting

Two toxic baits were placed in each bait station (Figure 12), and seven days' later baits were checked and either replenished where baits had been eaten or replaced where baits have not been eaten.

6.2.5 Results

Pre-feeding

During both pre-feeds all non-toxic baits were eaten from 27 of the 32 tunnels, a total of 54 pre-feed baits for both pre-feeds.

Toxic bait pulse one

Both toxic baits were taken from 14 bait stations, a total of 28 baits.

Toxic bait pulse two

Both toxic baits were taken from 9 bait stations, a total of 18 baits.

Camera trap pre-monitoring

Cats were detected on 15 occasions at 11 cameras and this equates to a relative abundance of feral cats of 2.54%.

Camera trap post-monitoring

Cats were detected on four occasions at three cameras and this equates to a relative abundance of feral cats of 0.63%.

Relative abundance of feral cats

Based on the camera trap monitoring, the PredaSTOP™ feral cat control operation at Ngatapa Station achieved a 73.5% reduction in the relative abundance of feral cats within the monitored area. Several deceased cats were found on site within 48 hours of first toxic pulse of PredaSTOP™.






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Appendix 1:

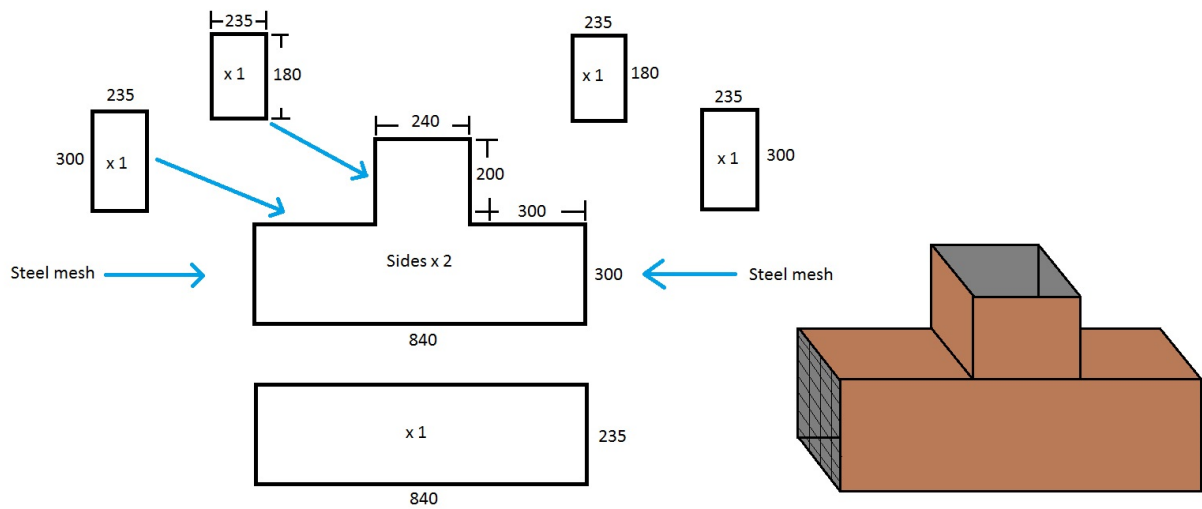
PredaSTOP™ for feral cats product label registered by the Agricultural Compounds and Veterinary Medicines Group (Ministry for Primary Industries).

   <p>EPA REGISTER HSR 100494 HSNO Classifications 6.1B (oral), 6.9A, 9.3A, 9.1 D</p> <p>Registered pursuant to the ACVM Act 1997 No. V9571 See https://eatsafe.nzfsa.govt.nz for registration conditions.</p> <p>BATCH NO. MANUFACTURED DATE: EXPIRY DATE:</p> <p>NET CONTENTS: 22g as 10 syringes each containing 2.2g.</p> <p>BAR CODE</p>	<p style="text-align: center;">DANGER</p> <p style="text-align: center;">Keep out of reach of children Read label before use</p> <p style="text-align: center;"><i>PredaSTOP™ for Feral Cats</i></p> <p style="text-align: center;"><i>A single feed bait for the control of feral cats (Felis catus)</i></p> <p>Contains 410 g/kg para-aminopropiophenone in the form of a paste.</p> <p>WARNING: May be fatal if swallowed in large quantities. Reduces affinity of red blood cells for oxygen Very toxic to some terrestrial vertebrates.</p> <p>PRECAUTIONS: To be under control of Approved Handler and holder of Controlled Substance Licence (CSL). Wash hands thoroughly after handling. Do not eat, drink or smoke when using this product. Prevent access to bait by non-target domestic animals, wildlife and livestock. Particular care should be taken if non-target animals that are likely to be attracted to mince baits may have access to the area being targeted (e.g. domestic cats, dogs, kiwi and weka).</p> <p>DIRECTIONS FOR USE: Use only in bait stations. Pre- feeding before laying bait must be undertaken. Pre- feeding should be continued until bait acceptance has been established. Remove all pre-feed when laying toxic bait. Follow Bait Preparation Instructions (enclosed and available from (www.connovation.co.nz)). Meat baits should be used within 48 hours of preparation and kept as cool as possible prior to placing in stations. Remove all pre-feed when laying toxic bait. Bait take from pre-feeding should be used to determine how many toxic mince baits to place in each station. Where practical, ensuring that baits remain fresh may maximise feral cat control.</p> <p>On completion of the control operation, recover and bury all remaining baits.</p> <p>SYMPTOMS OF POISONING: Symptoms skin colour changes (pale or blue-ish) lethargy and lack of co- ordination.</p>
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Appendix 2:

Chimney bait station dimensions (Pouri Rakete-Stones)



Appendix 3:

Methodology developed by Nichols et al. 2018 for estimating feral cat abundance using motion activated cameras.

In both control operations, the relative abundance of feral cats was monitored using camera traps for 3 weeks before the PredaSTOP™ operation, and again for three weeks immediately after baiting finished (Glen et al. 2017). The use of camera traps in the first of these two control operations has been well documented by Glen et al. 2017 and is summarised below:

- Cameras should be deployed approximately 500 m apart in a grid formation
- Cameras should be mounted on a tree or wooden post, facing south, with the base of the camera 10 cm above the ground.
- A plastic vial containing a scent lure (ferret body odour; Garvey et al. 2017) should be pegged to the ground 1.5 m in front of the camera.
- Cameras should be set to take three photographs each time they're triggered, with no delay between successive triggers.
- Following the methods developed by Garvey et al. (2017) camera data was analysed using the following assumptions:
 - Photographs of cats captured on the same camera < 30 minutes apart are assumed to represent a single encounter, unless they clearly showed different individuals (e.g. based on coat pattern).
 - Photographs captured > 30 minutes apart are assumed to represent independent encounters.

The relative abundance of cats can be estimated before and after a control operation using the camera trap rate (CTR), which is calculated as the number of independent photographs per 100 camera trap days (Rovero & Marshall 2009). Camera trap days = number of camera traps deployed × number of days deployed (recommended 3 weeks or 21 days) (Glen et al. 2017). It is important to note that the motion-activated camera monitoring method used is only an estimate of abundance of feral cats within the site

Appendix 4:

Timetable for a typical feral cat control operation with PredaSTOP™.

Where possible Chimney bait stations should be deployed three weeks prior to pre-feeding for the first control operation.

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Non-toxic pre-feed Round 1						
Day 8	Day 9	Day 10	Day 11	Day 12	Day 13	Day 14
Non-toxic pre-feed Round 2					Install warning signs at prominent places around the perimeter	Prepare toxic baits
Day 15	Day 16	Day 17	Day 18	Day 19	Day 20	Day 21
Remove any remaining non-toxic baits and deploy toxic baits 1st pulse				Prepare toxic baits	Remove any remaining toxic baits and deploy toxic baits 2nd pulse	
Day 22	Day 23	Day 24	Day 25	Day 26	Day 27	Day 28
			Remove any remaining toxic baits			
Day 29	Day 30	Day 31	Day 32	Day 33	Day 34	Day 35
Day 36	Day 37	Day 38	Day 39	Day 40	Day 41	Day 42
Day 43	Day 44	Day 45	Day 46	Day 47	Day 48	Day 49
Day 50	Day 51	Day 52	Day 53	Day 54	Day 55	Day 56
						Earliest date that warning signage can be removed



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