



# *Karori Wildlife Sanctuary*

## **Key Native Ecosystem Management Area (KNEMA)**



## **Possum Eradication Operation Report N° 25**

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Biosecurity Department

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## 1. Executive Summary

The Wellington Regional Council conducted a possum eradication programme in Karori Wildlife Sanctuary, Wellington, New Zealand between March 1999 and February 2000. The possum eradication was part of a larger project to eradicate all introduced mammals in a 250ha bush-clad valley 5km south-west from Wellington City. The Sanctuary, managed by the Karori Wildlife Sanctuary Trust, is surrounded by a 2m high fence that is capable of excluding all terrestrial and arboreal animal pests.

The majority of possums were reduced using leg-hold traps between 12 July and 3 September. The pre-control trap-catch was 37.1% and the post-trapping trap-catch was 9.7%, indicating a 74% reduction in possum numbers. On 30 August 1999, 210 bait-stations spaced on a 100x150m grid were each filled with approximately 760g of 50mg/kg brodifacoum cereal bait. The bait-stations were filled a second time on 4 November 1999 with 200g of 50mg/kg brodifacoum bait, and a third time with 100g on 22 February 2000. Three weeks after the bait-stations were first filled, a monitoring survey resulted in a trap-catch of 2.0%. Given the slow acting nature of brodifacoum, it is likely that this result would have been even lower 1-2 weeks later.

Two aerial applications of 20mg/kg brodifacoum bait were conducted on 23 and 30 September 1999. While rodents and hedgehogs were the main target of the aerial applications, it was hoped that any remaining possums would also be poisoned. In November 1999 Sanctuary staff detected possum tracks in four tracking tunnels. Two possums were poisoned using cyanide pellets, and no possums have been detected since.

## 2. Recommendations

### 2.1 For Wellington Regional Council

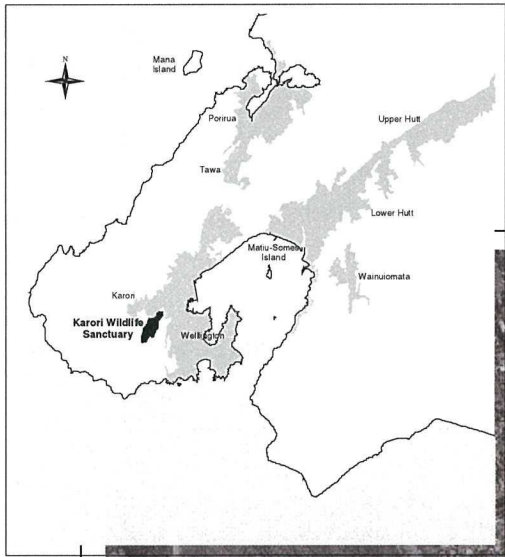
- For similar operational scenarios, prepare bait-station access lines following a straight compass bearing traversing the main slopes rather than following natural contours.
- In urban reserves, follow-up acute toxins or trapping control methods with 50mg/kg brodifacoum once 70% of the possum population has been removed. Provided there is adequate access to bait-stations, the remaining possum population will acquire a lethal dose using 50mg/kg brodifacoum in a relatively short time period, thereby reducing the amount of bait and environmental exposure.
- In future joint venture contracts, WRC should clearly outline their publicity and promotional requirements and arrange for permanent positioning of KNE signage. This particular project, to which the Biosecurity Division contributed \$97,000, had a high media profile. However, Council's financial and physical commitment could have been better recognised through onsite advertising and greater media coverage.

## 2.2 For Karori Wildlife Sanctuary

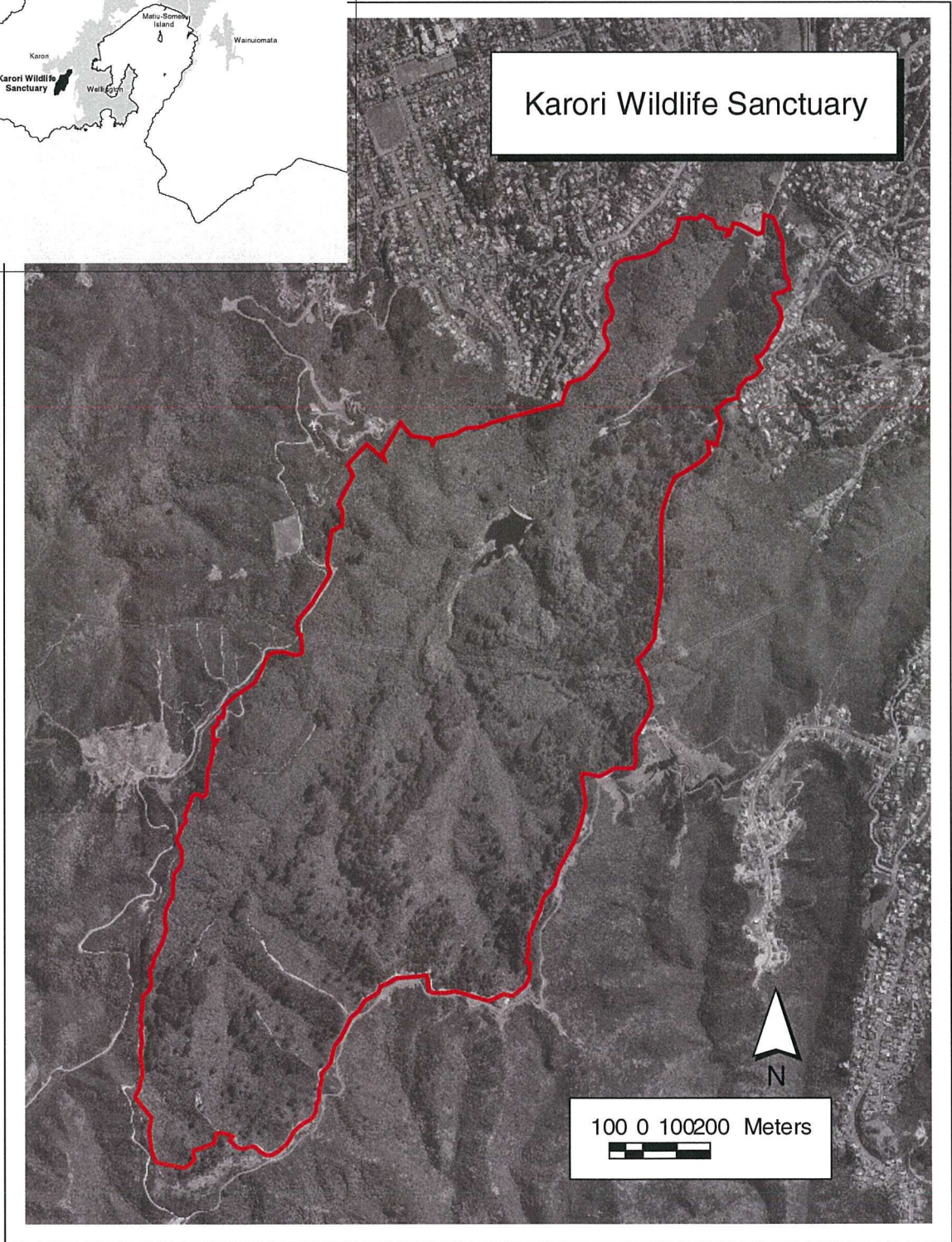
- Allow WRC to measure the canopy assessment plots in March 2002 set up by Landcare Research in March 1995. This survey will provide Sanctuary staff and WRC with valuable information on vegetation recovery following possum control.

## 3. Objective

To eradicate all possums in Karori Wildlife Sanctuary and maintain a possum-free status. Rodent numbers were also reduced as part of the possum poisoning operation.



**Figure 1.** Aerial map of Karori Wildlife Sanctuary showing the boundary of the predator-proof fence.



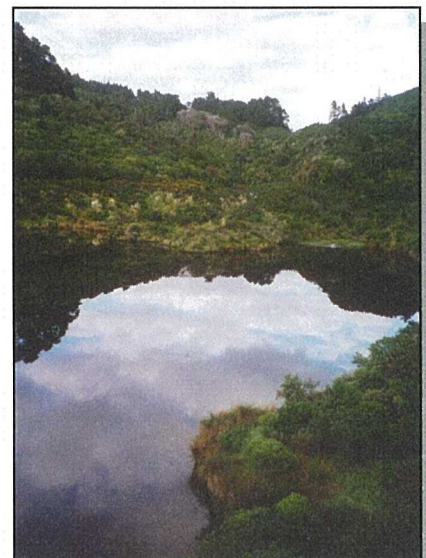
#### 4. Operational Area

Karori Wildlife Sanctuary is a 250 ha bush clad valley approximately 5km south-west from Wellington City and 7km from the south coast (fig.1). The operational area within the Sanctuary was 210ha in size and is surrounded by a 2.2m high predator-proof fence. The valley is strongly influenced by the Wellington faultline and has an altitude range of 160m to 356m above sea level (Empson and Fuller 1999). The Sanctuary lies immediately south of the suburb of Karori. Residential properties border the northern perimeter with rural and reserve land adjoining the majority of the area.

The Sanctuary encompasses the headwaters of the Kaiwharawhara Stream, which bisects the valley and feeds into two artificial lakes (fig. 2). The lakes, known as the Upper and Lower Dams, were previously used as water supply reservoirs for Wellington City. Combined, the lakes cover an area of 4.5 ha and have high potential wetland values (fig. 3&4) (Empson and Fuller 1999).



*Figure 2. A 1960s aerial photograph of Karori Wildlife Sanctuary looking north to south showing the Lower Dam (foreground) and Upper Dam (background).*



*Figure 3& 4. Upper Dam looking south from the dam wall.*



The vegetation consists of a mix of exotic and native forest types. The native vegetation has been regenerating since the early 1900s and consists predominantly of low mahoe-five finger forest with scattered emergent pines (fig. 5). Planted exotic forest contributes to approximately 25% of the area (Empson and Fuller 1999). The far north-western hillside near the lower dam is predominantly tawa, hinau, kohekohe, titoki and rewarewa while the exposed tops of the southern hillside contains large areas of flax and tussock.



*Figure 5. The main gully looking north, which bisects the Sanctuary.*

Prior to the eradication operation there were only eight native or self-introduced bird species resident in the valley including silvereye, grey warbler, fantail, morepork, tui, welcome swallow, kingfisher, shining cuckoo (Empson and Fuller 1999). Thirteen introduced bird species such as blackbirds, starlings, finches and magpies were also known to be present. New Zealand falcon and pigeon are occasional visitors to the area, and three species of shag use a roost site near the lower dam in autumn-winter (*ibid.*). Nine North Island weka and twenty little spotted kiwi were released into the Sanctuary in June/July 2000.

The Wellington green gecko, forest gecko and the common skink have been recorded in the Sanctuary, while the copper skink, brown skink and ornate skink have been recorded nearby and may be present in low densities (*ibid.*).

The Wellington City Council owns the Sanctuary land, and under the Reserves Act (1977) are legally responsible for the protection of flora and fauna values in land they administer. The land is leased to, and managed by an independent registered Charitable Trust known as the Karori Wildlife Sanctuary Trust (Inc.). The Sanctuary is to be managed as a Local Purpose Reserve (for the purpose of a wildlife sanctuary and conservation area) under the Reserve Act (1977).

## 5. History

### 5.1 Project Initiative

The Wellington Regional Council identified the Karori Reservoir as a priority site for protection as it is one of the best forested areas on the western side of Wellington City (Wellington Regional Council 1984). The potential for the site to be restored and used as a wildlife Sanctuary was recognised by the Wellington Branch of the Royal Forest and Bird Society, and in 1992 the restoration project was conceived (Empson and Fuller 1999). The Karori Wildlife Sanctuary Trust (Inc.) was registered in April 1995 and has a membership of approximately 3500 members, of which approximately 400 donate their time to volunteer work at the Sanctuary (*ibid.*).

A Key Native Ecosystem (KNE) survey was conducted by Wellington Regional Council's Biosecurity staff in April 1997. The site received a Regional Priority Score of 6.5 (appendix 6). The high conservation values, protection status, predator-proof fence and the community involvement in the project all contributed to the site being accepted into the Key Native Ecosystem programme. As a KNE, the Wellington Regional Council agreed to undertake possum eradication in the area on a cost-share basis with the Karori Wildlife Sanctuary Trust. Altogether there were 14 vertebrate pest species present in the Sanctuary targeted for eradication. The Wellington Regional Council's main involvement and this report relate to the possum eradication only.

### 5.2 Social and Ecological History

Prior to European colonisation, the Karori Valley was covered with continuous, closed and tall native forest (Boffa Miskell 1998). Early accounts have recorded massive examples of maire, matai, rimu, kahikatea, totara, rata, tawa and rewarewa (Smedley 1980, cited Boffa Miskell 1998). Large rata are still present in the Sanctuary today. The name 'Karori' translates as "snares ropes", suggesting the area was an important bird-trapping site for Maori (Boffa Miskell 1998).

Although the Sanctuary is a significant feature of Wellington's landscape, there is very little information to be found on the very early history of the area. From 1857 to 1869 the Karori Valley became a popular site for gold mining despite poor returns. At one stage 20-30 diggers were prospecting the Kaiwharawhara stream and tents, huts and alluvial workings were studded up the valley (Kereru 1995). By the early 1870s gold mining activity in the valley had diminished, and ceased altogether when construction of the lower dam began in 1873. Four mines dating back to this time have been located in the Sanctuary (Empson and Fuller 1999).

Construction of the lower reservoir was completed in February 1874. During this time the land surrounding the reservoir was privately owned and farmed until its purchase by the Town Board in 1904. Photographs taken in the late 1870s show the eastern side of the valley and the land around the lower dam clear of vegetation with the exception of sparsely dotted pine trees (Bowman 1995). During the 1930s approximately 180,000 *Pinus ponderosa* trees were planted and the area was afforested and milled for several decades thereafter.

Construction of the lower dam was a major part of the first comprehensive water supply scheme in Wellington City and is possibly the first use of concrete for dam construction in New Zealand (Bowman, 1995). Within five years of its completion, the lower dam was failing to meet the demand of a rapidly growing population and in 1908 construction of the upper dam was completed (Bowman 1995). The upper dam, a curved concrete gravity dam, was considered to be a major New Zealand engineering accomplishment (Offer 1997).

At the time the upper dam was built, the significance of water pressure resulting from lake water seeping through the bedrock and the dam's alignment across the Wellington Fault was not taken into account. The upper lake was lowered in 1992 and decommissioned in 1993 following a report that identified the upper dam as a serious earthquake risk. The lower lake was retained for emergency water supply until it was decommissioned in 1998. To protect the quality of the drinking water, the Karori Reservoir valley was closed to the public from 1904 until 1993 when the upper lake was decommissioned. Restricted access remained around the lower lake until it was decommissioned in 1998. Since 1993 until the closure of the predator proof fence the valley was a popular mountain-biking and bush-walking recreational area.

### **5.3 Operational History**

- |                             |   |
|-----------------------------|---|
| <b>18 September 1995</b>    | Karori Wildlife Sanctuary closed for two months to conduct possum poisoning operation using cyanide paste and leg-hold traps. Wellington Regional Council worked the lower dam area and a private contractor worked the upper valley. A poor result was achieved in the upper valley. |
| <b>19-20 September 1995</b> | Pre-control monitoring resulted in 22.5% Residual Trap-Catch (RTC) in upper dam area and 25.0% RTC in lower dam area.   |
| <b>4-11 November 1995</b>   | Post-control monitoring resulted in 26.7% RTC in upper dam area and 6.25% RTC in lower dam area. Overall RTC was 16.5%.   |
| <b>1 July 1997</b>          | Karori Wildlife Sanctuary Trust (Inc.) formally approached Wellington Regional Council to become a partner in the pest eradication programme.   |
| <b>23-27 November 1998</b>  | Pre-possum eradication monitoring conducted (see section 7.0).  |
| <b>December 1998</b>        | Construction of the 8.6km predator-proof fence began.   |
| <b>5 April 1999</b>         | Biosecurity staff began preparation of bait-station lines.  |
| <b>14 July 1999</b>         | Possum eradication operation began.   |
| <b>August 1999</b>          | Predator-proof fence was completed at a cost of \$2.1 million and Sanctuary was closed to the public.   |

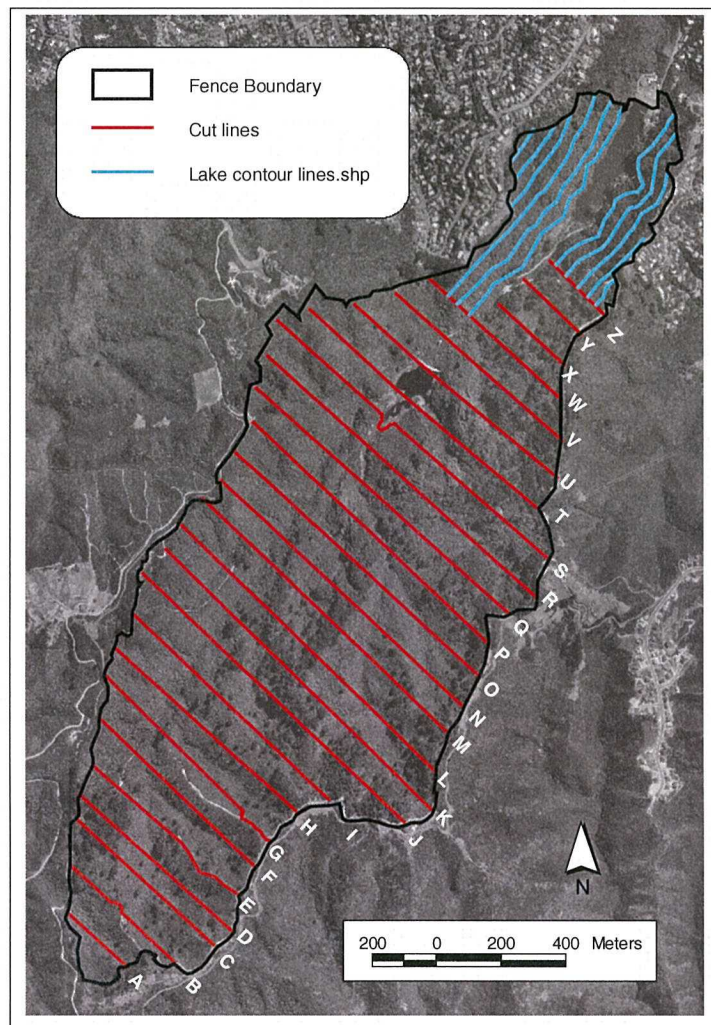
## 6.0 Operational Procedures

### 6.1 Operational Plan

Victor N<sup>o</sup> 1 leg-hold traps and cyanide capsules were used to kill the majority of possums. It was essential to remove 70-80% of the possum carcasses from the area to ensure the success of the mustelid and feral cat control operation (see section 6.3). Slow acting poisons distributed from bait-stations and two aerial bait applications were used to kill the remaining population.

### 6.2 Line Preparation

Line preparation began in March 1999 when 26 lines were marked on an aerial map at a bearing of 270° M. The lines, spaced at 100m intervals and labelled A to Z, traversed across the valley from the southern boundary to south of the lower lake (fig. 6). In April 1999, wooden posts were placed at the start of each line just inside the fence on the eastern side. An aerial map, compass and hip-chain was used to determine where each line began. Karori Wildlife Sanctuary staff cut 11 contour lines at 25m intervals around the lower lake in July 1999.



*Figure 6. Position of the 26 transverse and 11 contour access lines cut in the Sanctuary.*

Two Biosecurity staff began cutting the lines at the southern end of the valley. However, gaining road access past the fencing contractors who were also working at the southern end of the valley made line cutting difficult. After cutting line A, Biosecurity staff returned to the northern end of the valley and continued cutting the lines working towards the southern end of the valley.

On 10 May 1999 two temporary staff were employed to help with the line cutting. The lines were cut using forestry loppers and handsaws. A small amount of scarlet 'Dazzle' spray paint was used to mark the lines at regular intervals. Spray paint was used instead of pink tape to distinguish the lines from other tracks in the area marked with tape.



As well as using the road around the perimeter of the Sanctuary, access through the middle of the valley was also possible by using the main track that ran the length of the valley next to the gully stream. In order to use the four-wheel bike on the main gully track, Biosecurity staff spent 10 staff days widening some sections (fig. 7).

*Figure 7. Wellington Regional Council staff altering the gully track to provide four-wheel bike access.*

Having quad access through the centre of the valley proved to be very valuable for Wellington Regional Council and Karori Wildlife Sanctuary staff for transporting equipment easily and quickly around the site. Motor bikes were also used, particularly inside the fence-perimeter once the fence was closed (fig 8).

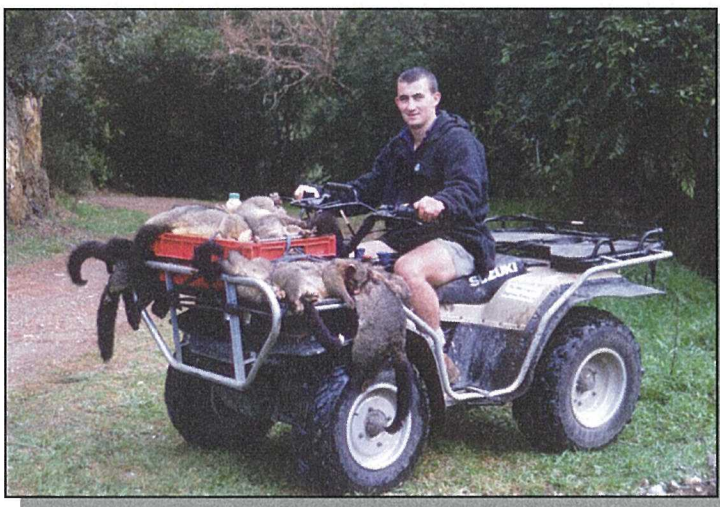
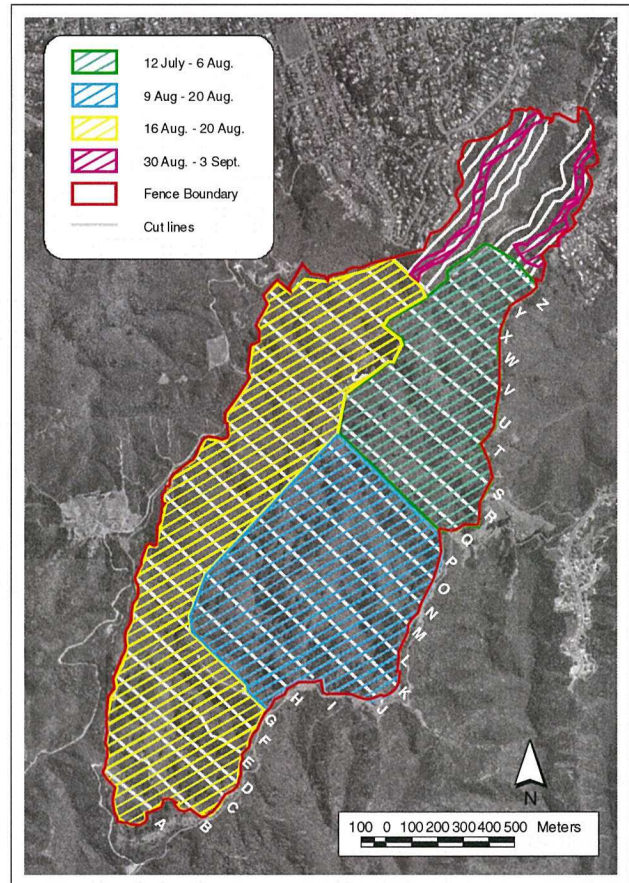


*Figure 8. Biosecurity Officers Glen Falconer and Chris Hoddinott near the lower dam*

### 6.3 Trapping

Before the leg-hold trapping began, a three-month permit was obtained from the Wellington City Council pursuant to section 3.13 (Animal Traps) of the Wellington City Bylaw. A review of the WCC trapping permit condition (setting traps within 200m of residential housing) was requested and granted (appendix 2). The trapping phase of the operation began on 12 July 1999 (fig. 9). A delay in the completion of the fence meant that public still had access to the Sanctuary at this time. For this reason, trapping was restricted to the cut lines, well away from the public walking tracks. The public continued to have access to the area until 6 August 1999, after which time the ridge tops and main valley were also trapped. Possums were trapped using Victor N<sup>o</sup> 1 leg-hold traps and a flour lure laced with cinnamon and icing sugar. At times, other lures such as lemon essence and raspberry crystals were used to avoid trap shyness. Trapping was conducted by two Biosecurity Officers, with the assistance of a third Officer for one week. The trapping phase was completed on 3 September 1999.

*Figure 9. The areas and dates that sections of the Sanctuary were trapped for possums*



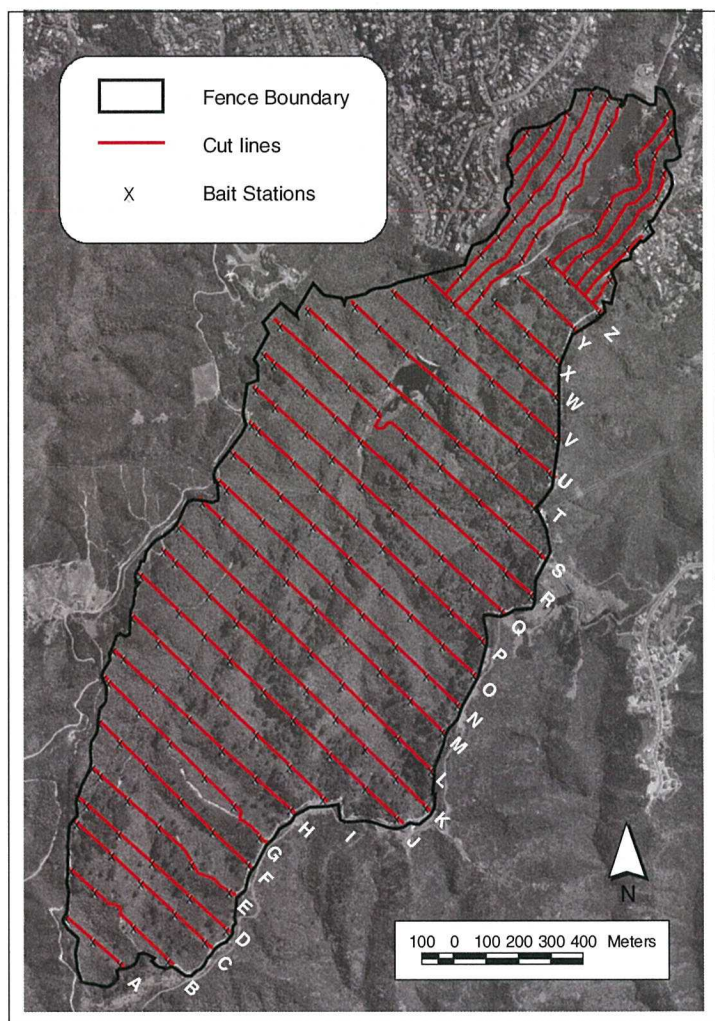
*Figure 10. Biosecurity officer Glen Falconer taking another load of possums to the 'possum pit'.*

As possums were only one of 14 species targeted for eradication in the Sanctuary, it was important the possum control was conducted in such a way that assisted the mustelid and feral cat eradication. The aim was to eradicate these species through secondary poisoning after scavenging poisoned possum carcasses. For this to be successful, the majority of possums had to

be removed from the area, thereby limiting the amount of food available to mustelids and cats. Initially, Biosecurity staff were required to carry the possum carcasses through the bush as they went until they reached a main track where volunteer workers would collect them. As a result there were some occasions where staff had to carry maximum loads for up to one kilometre. Carrying such heavy loads of dead possums and leg-hold traps back to the walking tracks was considered too hazardous and time consuming for the trappers, so after a few weeks the possums were left in smaller heaps along the cut lines instead. The possums were buried in a large pit near the lower lake (fig. 10).

#### 6.4 Brodifacoum Poison in Bait-Stations

On 16 June 1999 Biosecurity staff began setting out bait-stations throughout the Sanctuary. A total of 210 (177 on the transverse lines and 33 on the lake contour lines) black Mini Philproof® bait-stations were positioned along the cut lines (fig. 11). The stations were positioned around knee height at 150m intervals. Occasionally a station would have to be placed a few meters away from the 150m mark in order to utilise a suitable tree. In addition to the bait-stations, Biosecurity staff also nailed triangular orange markers to trees at 50m intervals. Karori Wildlife Sanctuary staff used these markers for positioning rodent monitoring tunnels. A record was kept of what tree species the markers and bait-stations were on and how far they were from creeks, gullies and each other (appendix 3). All bait-stations and markers were numbered according to what line they were on.



*Figure 11. Position of bait-stations on the access lines.*

The bait-stations were filled on 30 August 1999. An experimental licence was issued by the Pesticides Board to use 50 mg/kg brodifacoum cereal pellets. Each station was filled with approximately 760 grams of bait and a total of 160 kg of brodifacoum bait was used.

The stations were filled a second time on 4 November 1999 with 200 grams of 50 mg/kg brodifacoum cereal pellets. All old bait remaining in the stations was removed before refilling with fresh bait. On 22 February 2000 the bait-stations were filled for the third and last time with 100 grams of 50 mg/kg brodifacoum pellets (fig. 12). Any old bait remaining was collected into individual bags and weighed to determine bait consumption since the second fill (appendix 4).



*Figure 12. Biosecurity Officers in front of the predator-proof fence before heading off to fill the bait-stations for the last time. From left: Ray Clarey, Rachel Helson, Glen Falconer, Kim Broad and Ken Wright.*

### **6.3 Aerial Operation using Brodifacoum Poison**

A Notified Wellington Regional Council Resource Consent application (appendix 2) was required to aerially discharge a toxin onto land and water. The application was prepared by Karori Wildlife Sanctuary Trust. Animal Control Products Ltd. obtained a permit from the Pesticides Board to apply brodifacoum pellets on land from a helicopter. Brodifacoum is normally registered for use in bait-stations only. Before the helicopter began flying, a Global Positioning System base-station was set up on Wright's Hill parade ground to differentially correct the in-flight GPS tracking system.

The first of the two aerial applications using 20 mg/kg brodifacoum cereal pellets was conducted on 23 September 1999. The aerial operation began at 7.30 am and was completed by 9.00 am that day. Wanganui Aero Works conducted the operation with the assistance of Wellington Regional Council Biosecurity staff (fig. 13).



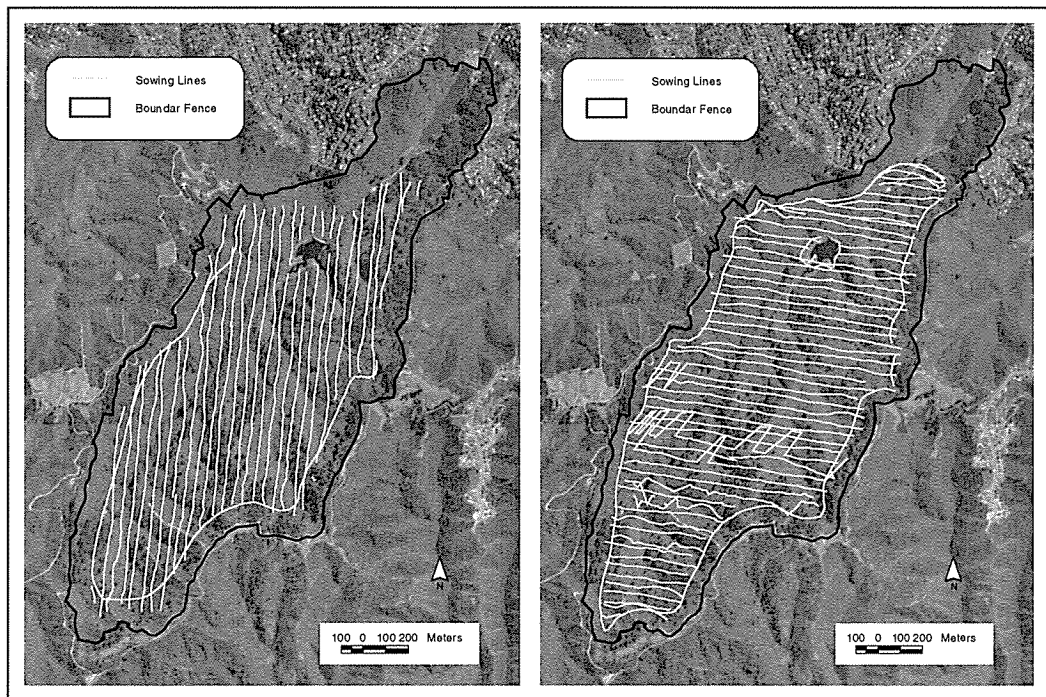


*Figure 13. Wellington Regional Council Biosecurity staff filling the bucket with 20mg/kg brodifacoum pellets while Charlie Anderson of Wanganui Aero Works hovers overhead.*



The helicopter flew to within 50 metres of the boundary and as far north as the southern end of the lower dam, covering an approximate area of 143 ha (fig. 14). The lower dam was not flown with the helicopter as houses adjoined at the top of the slopes and it was perceived that residents would be upset at the sight of a helicopter sowing baits in close proximity to their properties. The bucket was loaded with a maximum of 250 kg each load and a total of 1500 kg bait was used, equating to a sowing rate of approximately 10 kg/ha.

Volunteer workers hand sowed a total of 1,175kg 20 mg/kg brodifacoum bait in the 50 m buffer around the perimeter, the area around the lower dam and a couple of places the helicopter missed because of pylons. Volunteers hand distributed the bait at 25m intervals along two contour lines 25m apart in the exclusion zones up to 50m from the fence and lake edges. A second aerial application using 20 mg/kg brodifacoum cereal pellets was conducted seven days later on 30 September 1999. This operation also started at 7.30 am and was completed by 9.00 am. The helicopter flew at right angles to the first aerial operation to ensure an even coverage over the whole area (fig. 14). A total of 1,275 kg of bait was sown at an approximate rate of 8.5 kg/ha. The volunteers distributed 550 kg of bait in the exclusion zones.



**Figure 14.** Flight paths of the helicopter during the first aerial (left) and the second aerial (right) applications of 20mg/kg brodifacoum cereal pellets. The flight paths were recorded by an on-board GPS navigational unit. The large deviations seen in the second application are the result of the unit momentarily losing contact with the base-station on Wright's Hill.

## 7. Operational Results

### 7.1 Pre-Control Monitoring

The Wellington Regional Council Monitoring and Investigations Section carried out a pre-control trap-catch monitoring survey on 23-27 November 1998 to determine the possum population status before the start of the eradication operation. The average residual trap-catch (RTC) rate was 37.1% (95%CI  $\pm 7.4$ ), indicating high possum densities typical of areas that have not received recent possum control.

### 7.2 Post-Trapping Monitoring

A second trap-catch monitoring survey was conducted on 6-9 September 1999 one week after the trapping phase of the operation. The average RTC was 9.7% (95%CI  $\pm 3.9$ ), indicating that the trapping phase had achieved 74% reduction in the possum population. There was considerable variation between the five monitoring lines.

A total of 1018 possums were trapped and removed from the valley before the poisoning operation began. A further 69 possums were trapped by Karori Wildlife Sanctuary staff. A 74% reduction in the possum population would indicate that there were approximately 1500 possums residing in Karori Wildlife Sanctuary before the start of the eradication operation. This equates to approximately 6 possums per hectare. It is likely that some possums left the area once the fence was closed and were unable to return.

### 7.3 Post-Poisoning Monitoring

Three weeks after the bait-stations were filled with 50mg/kg brodifacoum pellets a third trap-catch monitoring survey was conducted. The average RTC was 2% (95%CI  $\pm 1.24$ ), indicating that only 5.4% of the original population remained. Given the slow acting nature of the poison it is likely that a lower RTC would have been achieved 1-2 weeks later. A RTC of 2% was ideal for the aerial application to successfully eradicate the remaining possums.

### 7.4 Bait-Take from Bait-Stations

Approximately 125 kg of 50 mg/kg brodifacoum bait was consumed between the time the bait-stations were first filled on 30 August 1999 and the second time on 4 November 1999 (table 1). Seventy percent of the bait-stations were completely emptied.

Only 11 of the 210 bait stations had bait removed following the second fill of 50mg/kg brodifacoum bait (table 2). Nine of the 11 bait stations were in the same location where four possums had been detected in tracking tunnels by Karori Wildlife Sanctuary staff. Two possums that were killed on 22 November 1999 using cyanide were both killed within 50m of an empty bait-station.

*Table 1. Estimation of bait consumed in 210 bait stations 67 days after first filled with approximately 760g of 50mg/kg brodifacoum.*

Bait Remaining	Full	¾ Full	½ Full	¼ Full	Empty
N <sup>o</sup> of Bait Stations	28	11	13	12	146
Approximate Bait Consumed/Station (g)	0	190	380	570	760
Approximate Bait Consumed – Total (kg)	0	2.09	4.94	6.84	111.0

*Table 2. Estimation of bait consumed in 210 bait stations 110 days after the second fill with 200g of 50mg/kg brodifacoum.*

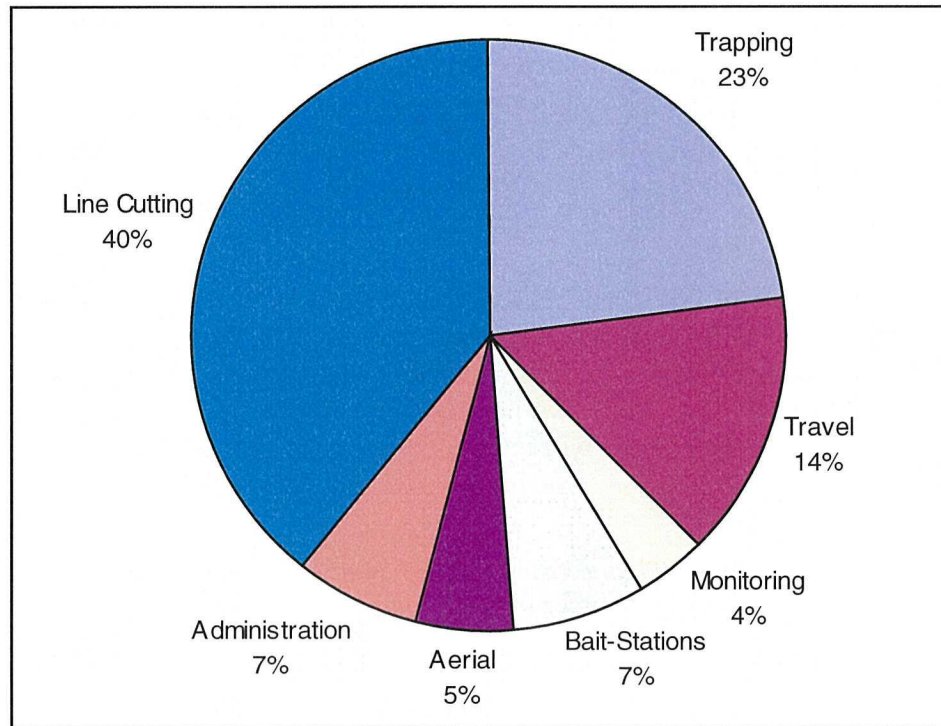
	Number Recorded	Bait Consumed Per Station (g)*	Total Bait Consumed (g)*
Full Bait Stations*	199	0	0
Partially Consumed	1	7	7
	1	9	9
	2	11	22
	1	19	19
	1	53	53
	1	135	135
	1	173	173
Empty Bait Stations	4	200	800

\* The bait consumed is an estimation only, derived from the amount of bait remaining in each station. The remaining bait could vary as much as  $\pm 20$  g due to variations in moisture absorption and desiccation. Stations with  $\geq 180$ g were considered full.

## 8. Resources

### 8.1 Labour

A total of 2,109 hours were spent by Wellington Regional Council Biosecurity staff on the possum eradication operation in the Sanctuary (fig. 16).



*Figure 16. Breakdown of hours spent on various activities by Wellington Regional Council staff on the possum eradication in Karori Wildlife Sanctuary.*

### 8.2 Materials

*Table 3. Materials consumed to complete the possum eradication in Karori Wildlife Sanctuary.*

Material	Quantity
Pelifeed Bait-Stations	210
Pestoff 50mg/kg Brodifacoum Pellets (kg)	223
Pestoff 20mg/kg Brodifacoum Pellets (kg)	4500
A2 Printed Warning Signs	50
Flour (kg)	50
Lure (ml)	200
Dazzle Paint (spray cans)	12

### 8.3 Costs

*Table 4. Breakdown of the costs associated with various activities in Karori Wildlife Sanctuary.*

<b>Activity</b>	<b>Total Cost</b>
<b>Field Labour</b>	\$71,466.30
<b>Non-Field Labour</b>	\$4,279.30
<b>Materials</b>	\$9,932.96
<b>Travel and Transport</b>	\$ 5,851.74
<b>Helicopter Hire</b>	\$5,445.00
<b>Total</b>	<b>\$96,975.30</b>

## 9. Discussion

### 9.1 Line Cutting and Vehicle Access

Preparing the bait-station access lines and vehicle tracks in Karori Wildlife Sanctuary was the most time-consuming and expensive part of the operation. Wellington Regional Council staff stressed at the start of the operation that motorbike and quad access to the top of each line would be necessary for preparing the lines and filling the bait-stations. Unfortunately, the opportunity to use machinery available at the time to widen the track on the inside of the fence was not taken. In some instances dirt was removed from the inside of the fence to use on the outside, undermining what little track was left in places. The value of having quad access around the inside of the fence was not fully realised until the fence was completed.

Having quad access through the centre of the valley also proved to be invaluable to both Wellington Regional Council and Karori Wildlife Sanctuary staff. However, it took four Regional Council workers staff 10 days to widen the track and added considerably to Wellington Regional Council's costs. Widening the gully track would have been a task more appropriate for volunteers or prison workers. Prison workers completed another track that was suitable for quad access during the trapping phase of the operation.

At one stage while cutting lines in Karori Sanctuary, a logging operation was being conducted in nearby Wright's Hill Reserve. A helicopter was used to fly the 2-3 tonne logs out of the reserve, and the flight path was directly overhead of the area the Biosecurity Officers were working in. The Officers frequently saw branches drop off the logs that would have caused injury if they had landed on them. Not surprisingly, they chose not to work in those areas during this time.

On reflection, the lines cut in the upper valley that traverse across the valley following a compass bearing were a better option than those lines cut around the lower dam that follow the contour of the land. The transverse lines were easier to cut, locate and follow when filling the stations.

## **9.2 Trapping and Possum Removal**

There were some concerns towards the end of the trapping operation that not enough possums had been removed from the area before the poison was distributed. The intention was to leave approximately 20% of the possum population behind so there would be a limited amount of food available for mustelids. With a shortage of possums available as prey, it was hoped the mustelids would be forced to scavenge any poisoned carcasses left in the area and take bait from the traps. However, the post-trapping monitor indicated that the possum population had been reduced by approximately 74% before the bait-stations were filled. Initially, the possum density was estimated at more than 2000 possums, which in hindsight appears to have been an overestimation and led to the concerns regarding how many possums were left.

The Biosecurity Officers involved felt that the trapping operation would have been more successful if they hadn't been limited to working in certain areas due to the delay in the fence completion. While the Sanctuary was still open to the public, the trappers had to keep clear of the walking tracks and the fence line. Unfortunately, the public tracks followed ridgelines where possum numbers were the greatest and these areas could not be as intensively trapped as they should have been. The delay in the fence completion meant that there was insufficient time left to intensively trap these areas before the poison operation began. In addition, the officers constantly felt under pressure to keep moving the traps before the traps went quiet in order to provide the volunteers with lots of possums to carry out. Considering the circumstances WRC staff felt that a 74% reduction was close enough to the required trapping target for the eradication operation to be successful, and were happy with the results of the trapping operation.

It was noted that the possum numbers were heaviest in the eastern slopes from south of the Lower Dam. This was probably due to the mature pine trees on that side which were heavy in catkins at the time.

## **9.3 Aerial Operation**

One obstacle of the aerial operation was the high probability of strong winds in the Karori Valley. The close proximity to Cook Strait and its influence on wind speeds in Wellington City are well known. Positioned on the Wellington fault, winds normally blow up or down the valley. A second obstacle to overcome was the scarce amount of flat land available that could be used as a helicopter landing and bait-loading site. The best position available within the Sanctuary was located at the top end of the Lower Dam next to the weka enclosure. Spoil had been dumped on the site, but once levelled a suitable landing area was created.

When awaiting the ideal weather conditions, consideration had to be given to both wind speed and the predicted rainfall in the following days. On both of the aerial operation days, northerlies rising to 15-20 knots were forecasted. Flying commenced at 7.30 am and was completed by 9.00 am on both days to take advantage of the time before the wind speeds increased.



*Figure 17. The Wellington Regional Council Biosecurity team at the helicopter landing site during the aerial operation. From left: Mark McAlpine, Ken Wright, Kim Broad, Rachel Helson and Glen Falconer.*

The time lapse between the first and second aerial was only seven days. Originally the plan was to have a gap of two weeks between the aerial applications but a decision was made to go sooner to take advantage of an unusual period of fine weather. There was a concern that rats were beginning their breeding season and any delays due to bad weather could jeopardise the rodent eradication operation. Sufficient bait was ordered a week in advance for the first aerial application, but in order to avoid any bait deterioration through lengthy storage the second load of bait was not ordered until the Monday following the first aerial. Consequently, the timing was tight for Animal Control Products Ltd. to manufacture the bait before the second aerial on the following Thursday. Biosecurity Officer Glen Falconer drove to Wanganui and back on Wednesday 29 September to pick up the bait ready for the second aerial application the next day. While loading the bait onto his vehicle, Glen noted the bags were still warm. Wellington Regional Council is very grateful to Animal Control Products Ltd. for manufacturing the bait under such a tight time constraint.

The bait was sown from the helicopter at 90m wide swaths using a spinning aperture. The second swath overlapped half the width of the first and so on for each subsequent swath. The effect of this was to have double-sown 45m wide strips alternating with single sown strips. In order to achieve a sowing rate of 8 kg/ha using this method the bucket aperture was set to sow at 4 kg/ha. The final application of bait was around the entire edge of the operational area using a trickle feed aperture. Karori Wildlife Sanctuary staff checked the area outside the fence perimeter for stray pellets but none were found.

The entire Karori Wildlife Sanctuary project has attracted a lot of media attention and the aerial application was no exception. There were several photographers, television camera operators and journalists wanting to film the helicopter landing site and the bait being loaded into the bucket. Although the media coverage was welcomed, trying to accommodate the media while keeping the safety of the ground crew paramount placed extra pressure on the operation at times. There are strict safety guidelines that WRC staff must follow when undertaking aerial operations and as a result only trained staff are permitted beneath a helicopter when the bucket is being loaded. One cameraman became a little annoyed that he could not stand on the truck deck while the bucket was being filled.

#### **9.4 Wildlife Observations**

- While cutting the bait-station access lines, possums were frequently seen and chased up trees by the Biosecurity Officer's dogs. The dogs were able to kill 15 of these possums.
- After the fence was completed, possum droppings were noted on the top of the fence in places. These were likely to have been left by possums leaving the area.
- Four dead possums were found outside the fence. It is possible they were poisoned possums that left the area and could not get back in.
- One possum that was trapped had no ears, but otherwise appeared healthy.
- Four rabbits and three feral cats were captured in the leg-hold traps. One cat was killed and two were collared with a radio transmitter by Craig Gillies from the Department of Conservation (appendix 5).
- One domestic cat was captured in the leg-hold traps and returned to its owner.
- A dead koura (fresh-water crayfish) was found in the main creek 250m above the Upper Dam. This was the first time koura had been recorded in the Sanctuary.
- A New Zealand falcon was often seen near the dam tracks by WRC staff while driving up to the wind turbine. The falcon was seen preying on a bird in flight.
- A morepork was sighted during the day in June 1999.
- Shags were a common occurrence on both dam lakes.
- Tuis, fantails, waxeyes and grey warblers appear to have had a very successful breeding season as a result of the pest eradication operation (appendix 5)

### **10. Acknowledgements**

The Wellington Regional Council would like to thank the Karori Wildlife Sanctuary staff for the opportunity to be involved in a world-first achievement such as this project. In particular, we would like to thank Stephen Fuller, Raewyn Empson, Grant Timlin, Mark Coghlan and Darryl Kee. Thanks also to the numerous volunteers who were involved in collecting the bodies and participated in the aerial application. Many thanks to Charlie Anderson and Dave McGloghlan from Whanganui Aero Works.



Report prepared by:

**RACHEL HELSON**  
**Biosecurity Officer, Animals**

**GLEN FALCONER**  
**Biosecurity Officer, Animals**

Approved by:

**KEN WRIGHT**  
**Senior Biosecurity Officer, Animals**

**RAY CLAREY**  
**Senior Biosecurity Officer, Animals**

## References

Boffa Miskell, 1998. Wellington's Native Vegetation: A Brief Survey of Early Historical Records. *Prepared by Boffa Miskell Limited for Policy Unit-Commissioning, Wellington City Council.*

Bowman, I. 1995. Karori Reservoir Heritage Assessment. *Unpublished Report for Wellington Regional Council, Bulkwater.*

Empson, R.; Fuller, S. 1999. Karori Wildlife Sanctuary: Resource Consent Application and Assessment of Environmental Effects for a Mammal Pest Eradication Operation in the Karori Wildlife Sanctuary Operational Area. *Karori Wildlife Sanctuary Trust (Inc.), Kelburn, Wellington.*

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## Appendix 1 - Definition of Terms

<b>KNE</b>	Key Native Ecosystem. Areas of prime native habitat which have significant conservation values, and are not administered by Department of Conservation (DoC), including conservation covenants. A Wellington Regional Council initiative.
<b>KNE Survey</b>	A survey undertaken by WRC Biosecurity staff to determine the conservation value and local significance of a <b>KNE</b> . The Primary score is derived from DoC's national priority ranking system, which takes into account native flora and fauna values as well as susceptibility to possum damage. The Local Significance score is ranked according to the value that is placed on the habitat and the level of use by the people of the Wellington Region.
<b>GPS</b>	Geographical Positioning System. Hand-held unit which records grid reference locations taken from satellite readings.
<b>Regional Priority Score</b>	The final score given in a <b>KNE survey</b> . This score is a combination of the Primary score and the Local Significance score. If the <b>Regional Priority Score</b> is sufficiently high, WRC will make arrangements with the land owner/occupier to undertake possum control on a cost share basis.
<b>Trap-Catch Rate</b>	Number of possums captured over several nights in an operational area using Leg-Hold traps. The trap-catch rate is calculated as: $N^{\circ} \text{ caught} / (N^{\circ} \text{ traps set} \times N^{\circ} \text{ nights trapped}) \times 100\%$ The trap-catch rate is an index used to calculate the level of possums occurring in an operational area before and after control.
<b>Trap-Catch Rate, Residual</b>	The <b>trap-catch rate</b> recorded in an operational area following possum control. The <b>residual trap-catch rate</b> is calculated as above and is used to indicate the level of success of a control operation. In most cases an operation is considered successful if the <b>residual trap-catch rate</b> is below 5%.
<b>95% CI</b>	Ninety five percent confidence interval. The lower and upper values within which the <b>trap-catch</b> estimate, if re-evaluated, will lie in 95% of instances.



21 APR 1999

# MEDICAL OFFICER OF HEALTH

WELLINGTON, HUTT & WAIRARAPA HEALTH DISTRICTS

*Medical Officers of Health are designated by the Director-General of Health  
under section 7A of the Health Act 1956*

MEDICAL OFFICER OF HEALTH

Regional Public Health Service

Pilmuir House

Private Bag 31907

Lower Hutt

Phone (04) 570 0044 Fax (04) 570 4405

Email -mary.broughton@hvh.co.nz

Approval For

Hand laid Application of Controlled and Uncontrolled Pesticides

Pursuant to Regulation 12 and 15 of the Pesticides [Vertebrate Pest Control] Regulations 1983, approval is given, to

## KARORI WILDLIFE SANCTUARY TRUST

for the hand application of controlled and uncontrolled pesticides subject to the following minimum requirements and conditions:

### 1. REGULATORY REQUIREMENTS

The hand application of controlled and uncontrolled pesticides will be in compliance with the following legislation:

- Pesticides [Vertebrate Pest Control] Regulations 1983
- Health Act 1956 (including):
  - Noxious Substances Regulations 1954
  - Water Supplies Protection Regulations 1961
- Toxic Substances Act 1979 (including):
  - The Toxic Substances Regulations 1983

## 5. Health Protection Officer's Report

### KARORI WILDLIFE SANCTUARY TRUST HANDLAID APPLICATION OF CONTROLLED AND NON-CONTROLLED PESTICIDES 1999

Location: Karori Wildlife Sanctuary, Wellington.

The application describes the projected hand-laying of controlled and non-controlled pesticides in the lower reaches of the Sanctuary. Ground baiting techniques will also be extended throughout the Sanctuary to support the main aerial operation. There are residential dwellings within 150 metres of the lower operational (hand-laid) area but these are protected by the predator-proof fence which surrounds the Sanctuary. When the gateway in this fence is secured, the Sanctuary becomes, in effect, an urban island. The Sanctuary is to remain closed to the public from the beginning of the Operation until the ground baits are consumed or detoxified and/or have been cleared from public tracks. The anticipated date for re-opening is December 1999.

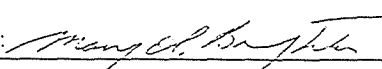
After the re-opening of the Sanctuary the ongoing use of bait stations will become an essential part of the Sanctuary management. Permission for their use in combination with toxins will be sought annually.

The principal bait to be used is the non-controlled toxin brodifacoum but cyanide (controlled pesticide) is to be used before the brodifacoum operation to reduce possum numbers and therefore competition with rats for brodifacoum baits. Several other toxins including sodium monofluoroacetate may be hand-laid after the brodifacoum operation in the event that some animal pests survive the main control phase.

**Recommendation:** The public will be effectively excluded from the Sanctuary for the duration of the pest eradication operation. As comprehensive Risk Management and Risk Communication policies have been designed it is recommended that Medical Officer of Health Approval be given for this operation.

**Condition:** Animal carcasses and any other waste material contaminated with toxins are to be disposed of safely.

Name: Mary Broughton

Signature: 

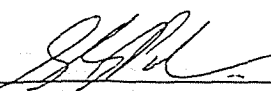
Date: 30/04/99

## 6. Medical Officer of Health Approval

Approved

~~Not Approved~~

Dr Stephen G. Palmer  
Medical Officer of Health

Signature: 

Date: 3/5/99

# P ESTICIDES BOARD

## EXPERIMENTAL USE PERMIT (NOT FOR SALE)

No: 5508/1

Issued to Messrs:

Animal Control Products Ltd  
408 Heads Road  
Wanganui

To allow trials to be carried out with:


### PESTOFF RODENT AND POSSUM BAIT 20R

In accordance with the details below, or as per the attached label.

- 1 This product is not for sale.
- 2 This permit expires three years from the date of issue.
- 3 This product can only be supplied to the Karori Wildlife Sanctuary Trust.
- 4 This product is restricted to use by employees or contracted employees of the Karori Wildlife Sanctuary Trust within the fenced area known as the Karori Wildlife Sanctuary.

DATED AT WELLINGTON

on this Tenth day of May 1988

  
John Reeve  
Registrar  
Pesticides Board

[official seal of  
The Pesticides Board]



*caring about you & your environment*

File: WGN990188

NDC:mm Fuller

23 June 1999

Stephen Fuller  
Karori Wildlife Sanctuary Trust  
P O Box 28107  
WELLINGTON

Dear Stephen

### Notified Resource Consent Application: Application Granted

---

<i>Applicant:</i>	<i>Karori Wildlife Sanctuary Trust</i>
<i>Proposal(s):</i>	<i>To undertake the aerial application of cereal baits containing 20ppm of Brodifacoum in the Karori Wildlife Sanctuary</i>
<i>Location:</i>	<i>Karori Wildlife Sanctuary, Waiapu Road, Karori</i>
<i>Resource consent(s) required:</i>	<i>Discharge to Land and Discharge to Water</i>

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I am pleased to inform you that on 17 June 1999 the Wellington Regional Council Environment Committee granted your resource consent application. I have enclosed a copy of the Committee's decision. If you have any questions or concerns about any aspect of your consent, I would be happy to discuss them with you.

#### Appeals

If either you or any of the submitters are dissatisfied with the consent, you are able to lodge an appeal with the Environment Court within 15 working days of receiving this letter

If no appeals are received by the Court, you will be able to commence using your consent immediately.

Your consent expires on 19 July 2001. We will send you a reminder letter before this date so that you may apply for a new consent.



Please note that, under section 125 of the Resource Management Act 1991, your consent will lapse two years after the date of its commencement unless it has been fully given effect to.

**Charges to Expect and Consent Certificates**

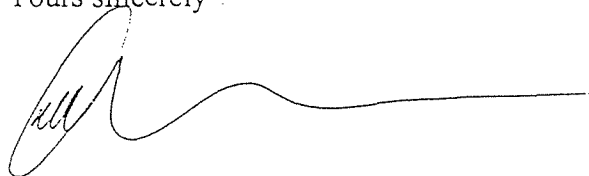
I will send another letter at the end of the appeal period which will outline the charges associated with the processing and granting of your resource consents, and will also include copies of your resource consents.

**Consent Transfers**

If you sell the property to which this consent relates, it is important that you complete a Transfer of Permit form if it is intended that future owners of the property will use the consent. If you do not complete a transfer, you will continue to be liable for any annual charges associated with the consent.

Please feel free to contact either me or your account manager, Paula Bullock, if you have any questions or concerns.

Yours sincerely



NIGEL CORRY  
for Manager, Consents Management

Encl.

30<sup>th</sup> June, 1999

Mr Ken Wright  
Biosecurity Officer  
Wellington Regional Council  
Upper Hutt Division  
PO Box 40847  
Upper Hutt

Property Link : 730123  
Service Request: 54880

Dear Mr. Wright

**RE: Application for Permit to use leg hold Traps under section 3.13 Animal Traps, Wellington City Consolidated Bylaw.**

With regards to your application for the use of Leg hold Traps pursuant to section 3.13 Animal Traps of the Wellington City Consolidated Bylaw, I can inform you that your application has been **approved** subject to the following conditions:

- a) Written permission is obtained to trap on any land from the landowner or occupier (this must be obtained and copies submitted to the Wellington City Council prior to work commencing on the land in question);
- b) Notify all landowners or occupiers of adjoining land when a trap is set within 200 meter's of their property boundary (all distances as measured over the ground);
- c) Not set traps within 20 meter's of a walking track, road, or the property boundary of an occupied residential property;
- d) Set traps a minimum of 70 centimeter's above ground level when working in areas with flightless birds, or where domestic pets may be at risk of injury;
- e) Use temporary, removable or biodegradable markers to mark trap lines and locations. All non-biodegradable markers must be removed when the work is completed;
- f) Place signage on access points to the land on which the trapping area is located, e.g. at entrances to land and on adjacent walking tracks clearly stating that "*Pest control operations are in progress, please keep to tracks*". The signage is to be placed, and remain in place for the duration of the permit period;
- g) Take care of any native animal injured as a result of trapping and deliver it to Department of Conservation staff as soon as possible and in any case within 24 hours;
- h) Check all traps at least once every 24 hours and remove any living creature found trapped inside any trap;
- i) Ensure that trap sites are cleared (on a regular basis) of vines and saplings which may cause limb damage due to entanglement of the trap chain;
- i) Retrieve all hin chain cotton to prevent entanglement of native birds;

- k) Release all caught domestic pets when unharmed. Where injuries are involved, undertake veterinary treatment, with every effort to made to locate the owner.
- l) Submit to the Wellington City Council at the end of every month a report outlining a record of trap catches (including non-target catches)
- m) Submit to the Wellington City Council a final report at the end of the permit period, detailing the results of the monitoring or control program, a record of trap catches (including non-target catches) and what further action was taken.

This letter can be considered to be the written permission of the Council pursuant to section 3.13.3 of the Wellington City Consolidated Bylaw.

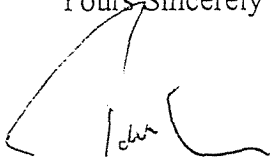
**The permit shall be valid for three months, starting from the 1<sup>st</sup> July 1999.**

**The permit shall have effect only within the fenced off area known as Karori Sanctuary.**

The conditions of this permit may be monitored, for which your assistance would be appreciated, an officer of the Council will be in contact on this matter.

If you have any questions or queries please feel free to give me a call.

Yours Sincerely



**Tim Faulkner**  
**Environmental Control Business Unit**  
**Wellington City Council**  
**Phone : 801 3523**  
**Email : [tim.faulkner@wcc.govt.nz](mailto:tim.faulkner@wcc.govt.nz)**

7<sup>th</sup> July 1999

Mr Ken Wright  
Biosecurity Officer  
Wellington Regional Council  
Upper Hutt Division  
PO Box 40847  
Upper Hutt

Property Link : 730123  
Service Request: 54880

Dear Mr. Wright

**RE: Application for Permit to use leg hold Traps under section 3.13 Animal Traps, Wellington City Consolidated Bylaw.**

Following our phone discussion of today I confirm that your animal trap permit (ref. SR : 54880) is amended as follows:

**Condition (b)**

**Old Condition:** Notify all landowners or occupiers of adjoining land when a trap is set within 200 meter's of their property boundary (all distances as measured over the ground);

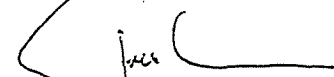
**New Condition:** Trapping up to the edge of the predator proof fence may be undertaken without notification of adjoining landowners provided that the fence is fully meshed in those areas.

**Condition (c)**

**Old Condition:** Not set traps within 20 meter's of a walking track, road, or the property boundary of an occupied residential property;

**New Condition:** Trapping may be undertaken closer than 20 metres to an internal track or road only following full closure of the fence entrances on the 1<sup>st</sup> August 1999

Yours faithfully



**Tim Faulkner**  
**Environmental Control Business Unit**  
**Wellington City Council**  
**Phone : 801 3523**  
**Email : tim.faulkner@wcc.govt.nz**

# Wildlife Sanctuary, 210 Possum Bait Stations

as at 31/8/99 ( Ken WRC )

25	A1p	150	A2p	100	A3p	10 fence																												
12	B1p	147	B2p	154	B3p	146	5mS	B4p	10 fence																									
23	C1p	145	C2p	155	C3p	150	5mN	C4p	150	C5p	20 fence																							
13	D1p	150	5mSW	D2p	150	10mNW	D3p	156	D4p	144	D5p	50	track 16	D6p	3 fence																			
13	E1p	155	E2p	135	E3p	150	E4p	150	track 8	E5p	43	E6p	10 fence																					
8	F1p	149	F2p	149	F3p	150	F4p	145	F5p	5	track 141	F6p	6 fence																					
24	G1p	128	G2p	150	G3p	150	G4p	99	track 55	G5p	146	G6p	20	G7p	11 fence																			
20	H1p	141	H2p	150	H3p	152	H4p	115	track 35	H5p	150	H6p	150	H7p	7 fence																			
12	I1p	147	I2p	141	I3p	141	I4p	144	I5p	22	track 128	I6p	139	I7p	12 fence																			
18	J1p	136	5mN	J2p	147	J3p	156	J4p	149	J5p	150	J6p	140	track 5	J7p	153	J8p	154	J9p	18 fence														
16	K1p	135	K2p	150	K3p	145	K4p	165	K5p	135	K6p	150	K7p	45	track 105	K8p	155	K9p	50	K10p	10 fen													
12	L1p	143	L2p	141	L3p	140	L4p	166	L5p	153	L6p	91	track 50	5mE	L7p	156	L8p	94	L9p	20 fence														
11	M1p	150	M2p	158	M3p	150	4mS	M4p	146	M5p	150	M6p	100	track 55	M7p	145	M8p	103	M9p	20 fence														
5	N1p	145	N2p	155	N3p	150	N4p	145	N5p	175	5mS	N6p	84	track 50	N7p	156	N8p	54	N9p	22 fence														
12	O1p	144	O2p	156	O3p	150	O4p	150	O5p	150	O6p	35	track 111	O7p	147	O8p	67	O9p	15 fence															
8	P1p	145	5mS	P2p	150	P3p	150	5mN	P4p	150	5.5mN	P5p	142	P6p	46	track 108	P7p	149	P8p	47	P9p	15 bush line												
18	Q1p	152	Q2p	147	Q3p	154	Q4p	145	Q5p	151	Q6p	102	track 50	Q7p	146	Q8p	91	Q9p	22 fence															
9	R1p	144	R2p	150	R3p	158	R4p	150	5m	R5p	150	R6p	91	track 59	R7p	150	5mE	R8p	145	R9p	46 fence													
23	S1p	144	S2p	150	S3p	153	S4p	150	S5p	76	Lake 1	S6p	159.	S7p	150	S8p	150	S9p	38 bush line															
7	T1p	153	T2p	150	T3p	150	T4p	88	Lake 12	T5p	157	T6p	150	T7p	88	T8p	17 Fence																	
3	U1p	150	U2p	150	U3p	145	U4p	40	Lake 3	U5p	152.5	U6p	142	U7p	8 fence																			
7	V1p	152	V2p	145	V3p	159	V4p	41	G rd 113	V5p	135	V6p	15 fence																					
5	W1p	150	W2p	150	5m	W3p	75	G rd 77	W4p	147	W5p	6 fence																						
17	X1p	154	X2p	113	G rd 20	X3p																												
5	Y1p	152	Y2p	68	G rd 14	Y3p																												
12	Z1p	150	Z2p	92	Z3p	8	Gully rd																											

<b>Date</b>
<b>Name</b>
<b>Weather</b>

**KEY**

Lake	Physical feature
142	142 Metres between bait stations
5mE	Bait station located 5m east of line

## CONTOUR LINES LOWER DAM

<i>South west</i>										<i>North west</i>																					
					fence					kk2p	100	kk1p	fence																		
					fence					jj2p	200					jj1p	fence														
					fence					ii2p	300					ii1p	fence														
W1l	100	hh7p		hh6p	100	hh5p	100	hh4p	100	hh3p	200					hh2p	300					hh1p	fence								
W10	800											gg2p	200					gg1p	fence												
W9	100	ff6p	200					ff5p	100	ff4p	200					ff3p	300					ff2p	100	ff1p	fence						
Gully rd										Z6	200					ee4p	100	ee3p	200					ee2p	200					ee1p	fence
										Z5	100	dd3p	500					dd2p	100	dd1p	fence										
										Z4	400					cc2p	100	cc1p	fence												
										Z3	200					bb2p	100	bb1p	fence												
<i>South east</i>										<i>North east</i>																					
					Denton gate	aa1p	fence					fen					fen														

200gm fill outcomes (Filled 4/11/99 changed 22/2/00)

	1	2	3	4	5	6	7	8	9	10
A	219	219	196							
B	173	212	213	210						
C	190	45	208	211	227					
D	214	192	214	196	209	207				
E	204	206	219	212	194	204				
F	188	216	211	207	212	197				
G	200	219	219	192	209	193	197			
H	197	192	194	197	197	200	204			
I	188	175	192	184	201	203	198			
J	202	180	197	?	188	200	258	213	188	199
K	180	185	192	187	200	227	233	219	202	
L	186	197	207	195	189	203	197	185	189	
M	183	222	203	212	206	218	224	224	221	
N	189	187	192	186	208	202	195	193	191	
O	189	E	198	197	220	209	207	204	193	
P	183	7	206	195	196	218	210	188	202	
Q	193	169	169	196	205	196	197	195	195	
R	189	191	189	192	195	215	188	209	E	
S	185	192	193	181	189	205	189	219	127	
T	199	192	195	225	E	189	200	221		
U	198	191	187	222	215	224	207			
V	210	190	191	194	200	209				
W	201	194	196	189	219					
X	220	210	193							
Y	193	195	213							
Z	189	194	215							
aa	161									
bb	204	204								
cc	201	217								
dd	210	224	201							
ee	205	220	204	216						
ff	216	221	202	196	193	192				
gg	223	197								
hh	193	193	194	198	203	214	205			
ii	208	201								
jj	206	215								
kk	220	225								

Appendix 4 – Bait remaining in Station

# Feral cat tests predator-proof fence

A BIG, wild tomcat was proving the ultimate test of the predator-proof fence at the Karori wildlife sanctuary in Wellington, conservation manager Raewyn Empson said.

The cat is fitted with a radio tag and Ms Empson has been tracking it as it prowls up and down the fence, trying to re-enter its former home.

"This is a very capable feral cat ... for six weeks it has been prowling along three kilometres of the fence, repeatedly attempting to scale [it], but so far it has failed."

This was giving staff great confidence in the 8.6-kilometre, \$2.1 million fence.

Conservation Department predator scientist Craig Gillies radio-tagged two cats and three stoats as part of the programme to eradicate pests from the sanctuary.

The collar tags were fitted to enable staff to find out more about the animals and the success of pest eradication.

Ms Empson said the fence had been designed so animals such as cats and possums could climb out but not back.

One stoat has died of natural causes, one was poisoned and one



Craig Gillies with one of the cats given a radio tag

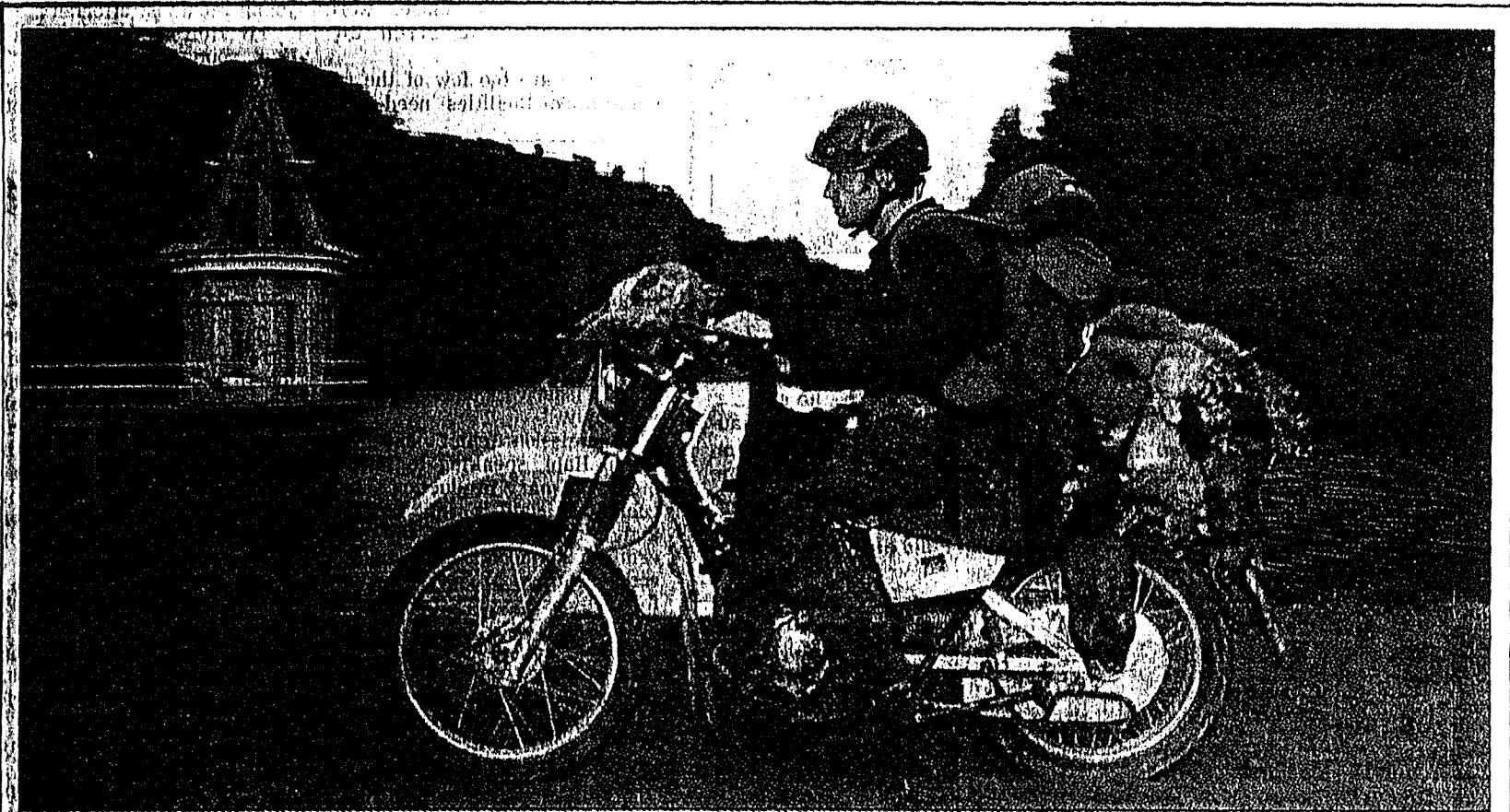
climbed the fence out of the sanctuary, as did the cats.

With the completion of an aerial poison drop in September, she said the focus was on removing any surviving

pests. It was hoped the sanctuary would be pest-free by March and the public would have an opportunity to inspect progress on a series of guided walks, starting on Boxing Day.

## Tuis flock to feast on trees in predator-free sanctuary

FLOCKS OF tuis in unprecedented numbers for Wellington city were the result of the eradication of predators from Karori Wildlife Sanctuary, general manager Stephen Fuller said yesterday. "We have more than 60 tui feeding on the dogwood trees by the upper reservoir dam," Mr Fuller said. "The tui's main predators, rats, stoats and feral cats, were removed from the fenced 252-hectare sanctuary after a nine-month pest eradication programme. Tui breeding pairs now had a safe environment to raise their young and the removal of about 3000 possums had resulted in bumper crops of flowers and fruit," he said. "In unprotected areas, breeding pairs usually successfully raised one or two chicks a season, but some birds in the valley had produced four or more in the past five months and the survival rate had jumped from about 15 per cent to about 90 per cent." Mr Fuller said. "The numbers were unprecedented for Wellington city. Last year, the valley was almost silent but now it was bedlam with fantails, grey warblers and waxeyes joining the chorus," he said. "Tui are loud, boisterous birds and are putting on quite a show for our guided walks. This is a taste of things to come as we introduce more native birds." The sanctuary offers guided walks on the first Sunday of each month and on public holidays. Tours are available next Sunday and Monday.



MARK HOUND

**POSSUMS TO GO:** Wellington Regional Council worker Chris Hoddnott heads for "the pit" to bury another load of possums trapped and killed in Wellington's Karori reservoir wildlife sanctuary, where work has started on an ambitious project to eradicate introduced pests.

Sanctuary conservation mana-

ger Raewyn Empson, who headed the work to remove rats from Kapiti Island, said workers and volunteers had removed more than 600 possums from the fenced reserve and there between 1400 and 1500 left.

Ms Empson, on secondment from the Conservation Department, said all pests would be re-

moved from the 252-hectare valley so rare native species, such as kiwi and tuatara, could be put into the reserve.

It would be a world first in conservation in that pests were being eradicated from a mainland site. It was an urban area and three species not previously the focus of eradication would be re-

moved — hedgehogs, hares and weasels. Possums would be removed first to reduce competition for bait, then other species would be targeted.

The sanctuary, where a native lowland forest is being established, is surrounded by a \$2.1 million, 8.6km fence, and will be closed from August till March.





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## Last Supper for Karori's Possums and Rats

**P**rogress at Karori Sanctuary accelerated dramatically in August and September with two landmark events – completion of the predator-proof fence and the commencement of the major toxin drop to rid the valley of mammal pests.

The 8.6 kilometre, \$2.1 million, world-first predator fence was completed on time and within budget early in September. An impressive feat of design, engineering and construction, the fence appears to be effective already. As part of the monitoring programme, two feral cats and three stoats have been live captured, radio-tagged and released back into the valley. Both feral cats and one stoat have since left the valley (the fence is designed so they can get out) but, so far, they have not been able to return. Monitoring of these animals will continue.

In August the Wellington Regional Council began trapping possums in the valley. By early September over 1500 possums (about 80% of the total estimated population) had been removed. The stage was then set for the real fun – a toxin drop to rid the valley of pests! Raewyn Empson, Conservation Manager at the Sanctuary, has been carefully planning this operation since January. Raewyn has assembled a highly-skilled and motivated team of staff and volunteers and early in the morning of 23 September, with the weather looking just right, the operation went smoothly into motion.

Firstly, Ken Wright and his WRC team moved in with a helicopter and loading crew. Almost 3 tonnes of poison bait was carefully laid across the southern end of the valley by the helicopter using a bucket with calibrated spinners. A global position guidance system

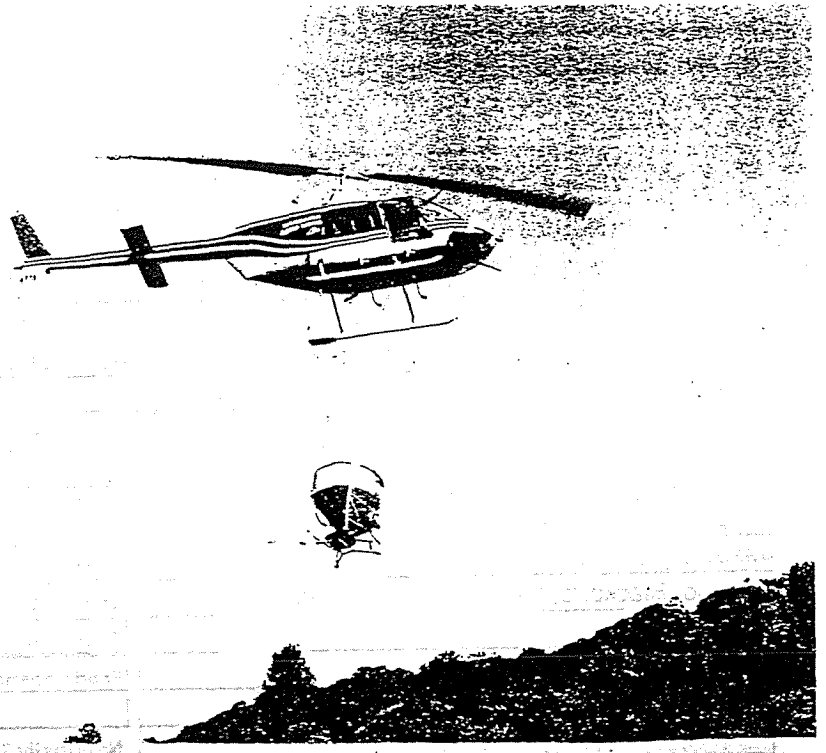
was used to ensure complete accuracy.

Then a team of 50 volunteers moved through the valley in carefully marked lines distributing poison by hand near housing in the lower valley and around the perimeter where the helicopter was restricted from operating. By midday it was all done. That night Karori Sanctuary's possums, rats and mice began what would be their last supper.

A further drop is programmed within 10 days of the first as a back-up to ensure a complete kill. Following this, an intensive programme of monitoring and trapping will remove any predators still surviving in the valley (although it is likely these have already been caught, have died, or have left the valley as their main food supply disappears). A big thanks to Stephen Fuller, Ken

Wright and the Wellington Regional Council team, Raewyn Empson, and the staff and volunteers involved. The programme has been a highly professional operation, well conceived and executed.

With the valley pests dealt to, planning is already under way for the main event, i.e., the restoration of the valley and the return of our native birds to Wellington City. The Sanctuary's whole purpose is to act as a haven for threatened species (such as kiwi) and also as a safe breeding haven and source of dispersal to other protected areas in Wellington (and people's back yards) of species such as tui, bellbird and kereru. Watch this space for the next instalment of the Karori Sanctuary project – the return of our native birds to Wellington.



**Rahui Needs An Editor**

# KEY NATIVE ECOSYSTEMS

## Description and Scoring Form



DoC ID no. (if known)	372
Site name	Karori Wildlife Sanctuary
Ecological region	Wellington
NZMS 260 Map no.	R27
Grid Reference	564 885
Area (ha)	250
Altitude range	80-340
Date	1-Apr 1997
Time (24 hr ) start/stop	0915-1430
Authorised person	Mark & Glen
Protect/ Type (Auth/body)	TLA-WCC
Protection Status	Scenic Reserve

**General Description**  
 A regenerating gully between Wrights Hill and the wind turbine, is an old water catchment site. The top is covered in pines though the gully is native.

**Significant Values (Vegetative association)**  
 Hard Beech hill country.

(1) DoC Plant Score	3.0	(b)
(2) DoC Animal Score	2.0	
(3) DoC Vulnerability Score	1.5	
(4) DoC Primary Score	4.5	(3) X highest of (1) or (2)
(5) Local Significance Score	2.0	
(6) Regional Priority Score	6.5	(4) + (5)

**Other Relevant Factors**  
 Most of the possum damage is on the top ridges. Attached is another species list from Karori Wildlife Sanctuary Trust (Inc), some have been planted.

**Plant Species known to be present**

Emergent Canopy trees	Rewarewa
Canopy trees	Pine, Kahikatea, Hard beech
Middle Storey	Lacebark, Lemonwood, Karaka, Kowhai, Hinau, Wineberry, Tree fuchsia, Helichrysum aggregatum
Lower Storey & shrubs	Hounds tongue fern, Koromiko, Hangehange, Rangiora, Cop robusta, Native Flax, Mahoe, Shinning spleenwort, Cop rotundifolia, Hanging spleenwort, Oler rani, Bracken, Five finger, Lancewood, Tauhinu, Cop grand, Mamaku, Rata vine, Wheki, Manuka, Native orchid, Red matipo, Blueberry, Pate, Toetoe, Silver fern, Ladder fern, Hen & chicken fern, Cabbage tree, Totara, Kawakawa, Bush lawyer, Karo, Tutu, Palm fern, Supplejack, Native broom, Marble leaf, Pigeonwood, Kaikomako, Sickle spleenwort, Hook grass
Other	Barberry, Heather, Toadstool, Blackberry, Sycamore

**Animal Species known to be present**

(include birds, reptiles, mammals, invertebrates, fish, pests)

Magpie, Fantail, Grey warbler, Tui, Shinning
cuckoo, Blackbird, Mallard, Long tail cuckoo

**Threatened Species for Wellington Conservancy**

Category A
Category B
Category C
Priority Species
<b>Nationally Threatened Species</b>