

Operational Plan for the eradication of brown rats from Farnuff and Dull Islands, Outer Hebrides, UK

[N.B. This is a fictitious example intended for training purposes, based on real islands and some real places and references, but with some details altered to present an illustrative scenario. The project story, all names, organisations and incidents portrayed in this document are fictitious. No identification with actual persons (living or deceased), organisations or buildings is intended or should be inferred].

Acknowledgements:

This document draws on both the worked examples devised by the Pacific Invasives Initiative as part of their Resource Kit for Rodent and Cat Eradication (<http://pacificinvasivesinitiative.org/rce/>) and on the project documents produced by Wildlife Management International Ltd during their extensive work on UK islands. We are very grateful to both organisations.

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Executive Summary

1. This document contains the detailed plans needed to eradicate introduced brown rats from Farnuff and Dull Islands, part of the Stewart Islands in the Outer Hebrides, UK.
2. The project is funded by the Seabird Conservation Foundation with support from the Stewart Islands Restoration Partnership, comprising UK Seabird Conservation Trust (UKSCT), Scottish Wildlife and Conservation Agency (SWCA) and the Clipper family (the landowners). The UKSCT are the implementing agency and will also lead on biosecurity prevention activities in partnership with SWCA.
3. The project will use anti-coagulant rodenticide bait presented inside bait stations. A wax-block rodenticide containing either of the second generation compounds bromadiolone or difenacoum will be used. Plastic pipe stations set out in a 50m grid pattern (denser in areas of likely high rat activity) will be used for the majority of the outdoor areas while commercially available lockable stations will be used inside houses and other buildings as required.
4. Considerable preparatory work will be needed before the start of the poisoning phase: removing harbourage and food sources for rats (e.g. food waste on Farnuff), liaising with the local community, marking out the baiting grid and setting out bait stations.
5. A captive breeding programme for Stewart Island vole is currently being developed, and will run concurrently with the preparatory work.
6. The project will require a core team of around 12 workers for the main six-month body work (Sept-March) who will likely be housed in out-of-season holiday accommodation.
7. The intensive poisoning phase of the project will last approximately three months and be carried out between November and February, leading in to an intensive monitoring phase lasting a similar length of time.
8. A list of all the equipment needed for the project is given in section 8. A task schedule for all the phases of the project is given in section 10.
9. Biosecurity measures will be needed in perpetuity to protect the islands from the risk of rats reinvading, most likely from Lewis. A full Biosecurity Plan will be produced by the Operations Manager before the end of the eradication work, detailing the pathways by which rats could reach the outer islands, a programme for monitoring for rat sign, and an incursion response plan, describing exactly what to do in the event of known or suspected rat sign being found on any of the islands.

Contents

Executive Summary	2
1 INTRODUCTION	5
1.1 The Site	5
1.2 Target Species: brown rat <i>Rattus norvegicus</i>	6
2 GOAL, OBJECTIVES and OUTCOMES.....	7
2.1 Goal.....	7
2.2 Objectives & outcomes	7
3 OPERATION DETAILS.....	8
3.1 Implementation Stage 1: Pre-eradication phase.....	8
3.2 Implementation Stage 2: Establishment of rodenticide grid.....	10
3.3 Implementation Stage 3: Rodenticide baiting phase	10
3.4 Implementation Stage 4: Intensive monitoring of rodents.....	11
3.5 Implementation Stage 5: Install long-term biosecurity equipment	12
4 NON-TARGET SPECIES.....	13
4.1 Stewart Island voles	13
4.2 Other wild mammals	14
4.3 Livestock	14
4.4 Pets	14
4.5 Raptors.....	15
5 ENVIRONMENTAL EFFECTS	16
5.1 Rodenticide risks to humans	16
5.2 Ecological effects	16
5.3 Disposal of rubbish.....	16
5.4 Leftover bait.....	16
5.5 Consents	17
6 HEALTH AND SAFETY	18
6.1 The operational team	18
6.2 Island residents	18
6.3 Island visitors.....	18

7	LOGISTICS.....	19
8	EQUIPMENT LIST	20
9	OPERATIONAL TEAM	28
10	TASK SCHEDULE	30
11	REFERENCES.....	35
12	ANNEX 1: BROMADIOLONE (CONTRAC [®]) MATERIAL SAFETY DATA SHEET (MSDS) ...	36
13	APPENDIX II: DIFENACOUM (NEOSOREXA [®]) MATERIAL SAFETY DATA SHEET.....	38

EXAMPLE

1 INTRODUCTION

The purpose of this plan is to detail how to eradicate invasive brown rats (*Rattus norvegicus*) from Farnuff and Dull, part of the Stewart Islands group in the Outer Hebrides, Scotland, using a ground-based bait station operation following best practice guidelines. The project will mainly be funded by the Seabird Conservation Foundation, with additional funding and in-kind support from the UK Seabird Conservation Trust (UKSCT) and the Wildlife and Conservation Agency (SWCA). UKSCT will be the main implementing agency, with technical support and expertise from SWCA, and a team of contracted and volunteer workers for the field operation. This plan will be the main guiding document used by project leaders and staff in executing the eradication project. It draws on previous work contained in the Feasibility Study (Thornhill & Mitchell 2015) and the Project Plan (*would reference here*) and follows best practice guidance as outlined in the UK Rodent Eradication Best Practice Toolkit (Thomas *et al.* 2017).

We would like to thank colleagues at UKSCT and SWCA for help and support during the preparation of this document, as well as Kate Barnett and Simon Jones of the New Zealand government for technical advice. Warm thanks also to the Clipper family and to the community on Farnuff for their enthusiasm and support for the project and help with the practicalities of working on their islands.

1.1 The Site

1.1.1 Farnuff Island

Farnuff Island is an inhabited island (34 permanent inhabitants) of 147ha situated 4km from Lewis (Fig 1). It has a saddle shaped topography, with sheer cliffs along the north and west coast and also on the south east. The rest of the coastline is either rocky with boulders that can be scrambled over, or comprised of grassy slopes that can be traversed, with care. The island's residents live along the central, low lying belt of the island – there are three farms (mainly farming sheep but with a small number of cattle), a shop (groceries/post office/general store), and ten houses. The island is serviced three times a week by a passenger ferry run by Caledonian MacBrayne from Lewis. The main pier is on the north side of the island, with a secondary landing site on the south coast which is mainly used by residents to launch fishing boats.

The island is covered in grassland with wet heath on the more exposed areas. Low-lying scrub covers some of the slopes on the northern coast where it is more sheltered. The main conservation interest on the island is around the north and south cliffs and adjacent grassy slopes which house the main seabird colonies. The Stewart Island vole, common shrews and rabbits are also present.

1.1.2 Dull Island

Dull Island (38ha) lies 300m off the north coast of Farnuff, situated 3.9km from Lewis (Fig. 1). It is not within rodent swimming distance of any other island. It is mostly a low-lying island, although it rises to around 48m to the west. It is predominated by grasses with some scrubby patches in sheltered areas. It is uninhabited, but has two small landing sites and three buildings – a bothy and two smaller buildings used as stores/shelter by fishermen. The cliffs are not sheer here and are largely vegetated. There are no known species of conservation interest on the island, although it is home to a small colony of seabirds predominated by gulls. Common shrews and introduced brown rats are the only mammal species present.

Both Farnuff and Dull islands are privately owned by the Clipper family.

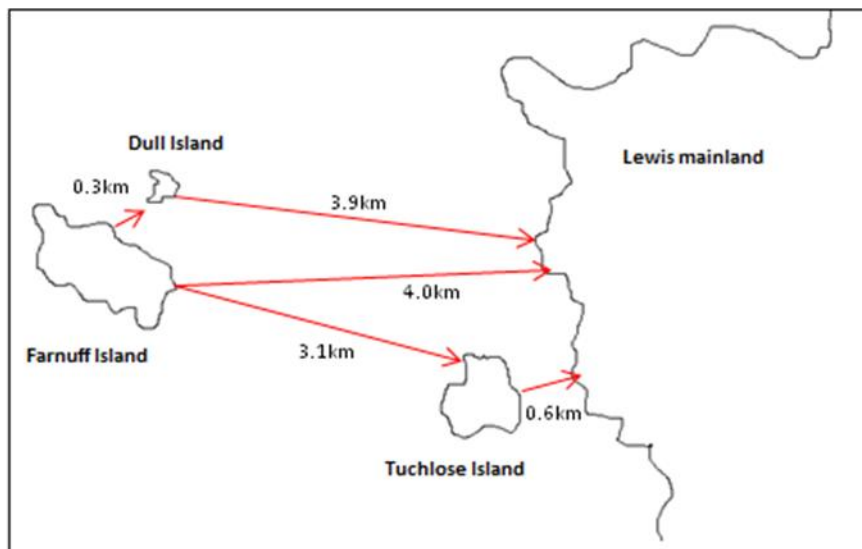


Figure 1: Map showing position of islands within the Stewart Islands group and their distances from each other and the Isle of Lewis, which are beyond the known swimming distances for brown rat.

A detailed description of the site can be found in the accompanying Feasibility Study, (*would reference here*), and Project Plan (*would reference here*).

1.2 Target Species: brown rat *Rattus norvegicus*

The target species is the brown rat, *Rattus norvegicus*, a highly omnivorous species known to impact on a wide range of species including birds, mammals, invertebrates and plants. Native to central Asia it has been expanding rapidly from its native range over the last three hundred years and is now found on all continents except Antarctica. Invasive species in the genus *Rattus* are found on 82% of the world's island groups (Atkinson 1985) and are having a disproportionately severe ecological impact on island species, many of which have evolved in the absence of terrestrial predators (Towns *et al.* 2006).

A detailed description of the target species can be found in the accompanying Feasibility Study, (*would reference here*), and Project Plan (*would reference here*).

2 GOAL, OBJECTIVES and OUTCOMES

2.1 Goal

The goal of the project is to restore functioning ecosystems over Farnuff and Dull Islands, Stewart Islands, Hebrides, through the process of removing the invasive non-native populations of brown rats found on these islands. Removing the highly omnivorous rats, which are known to predate upon many native species in the Isles of Scilly, including birds, invertebrates and plants, is highly likely to lead to outcomes such as enhanced populations of many species, including iconic seabirds such as Manx shearwaters and European storm-petrels.

2.2 Objectives & outcomes

The objectives that this project aims to achieve, and the outcomes that will be seen as a result of achieving these objectives, are described in Table 1. These objectives relate specifically to the operation to remove rats, which will be a subset of any wider project which will aim to undertake wider island restoration work and community engagement and empowerment activities.

Table 1: The objectives that this project will achieve and the outcomes that will be seen as a result of achieving these objectives.

Objectives	Outcomes
1. Eradicate brown rats from Farnuff Island	1.1 No brown rat population on Farnuff
	1.2 Increase in population size of Manx shearwater on Farnuff
	1.3 Recolonisation of Farnuff by European storm-petrel
2. Eradicate brown rats from Dull Island	2.1 No brown rat population on Dull
	2.2 Increase in population size of Manx shearwater on Dull
	2.3 Recolonisation of Dull by European storm-petrel
3. Safeguard native populations of conservation interest/importance	3.1. Stewart Island vole population exceeds pre-eradication level two years after eradication is complete
	3.2 No mortality of White-tailed eagles on either island attributable to rodenticide use
4. Improve the capacity of partner organisations to undertake complex eradication projects	4.1 Partner organisation staff have skills to lead eradication projects of a similar size and complexity to current project
5. Maintain invasive-rodent-free status of islands via appropriate biosecurity measures	5.1 Islands remain free of invasive rodents

3 OPERATION DETAILS

The project will follow the same methods as have been successfully used in other UK rat eradication projects, as outlined in the UK Rodent Eradication Best Practice Toolkit (Thomas *et al.* 2017). A grid of bait stations will be laid across the surface of all the islands included in the project and baited with rodenticide bait for a period of up to six months over the winter. The operational phase will involve five implementation stages, which are outlined in Table 2, along with the timings for delivery.

Table 2: Time line of the implementation stages of the eradication operation

Activity	2018					2019		
	Prior to Sept	Sept	Oct	Nov	Dec	Jan	Feb	Mar
Implementation stage 1: Pre-eradication phase								
Implementation stage 2: Establishment of rodenticide grid								
Implementation stage 3: Rodenticide baiting phase								
Implementation stage 4: Intensive monitoring phase								
Implementation stage 5: Install long-term biosecurity equipment								

3.1 Implementation Stage 1: Pre-eradication phase

3.1.1 Team recruitment

As outlined in the Project Plan (*would reference here*), the Project Manager will be recruited by the UK Seabird Conservation Trust (UKSCT) by the end of 2017, and in position early 2018. The Operational Manager will be recruited by UKSCT for in early 2018, so they are able to be in the position by July 2018. The operational team will be fully recruited by September 2018. The operation team will comprise of:

- The Project Manager, based on Lewis with regular visits to Farnuff;
- The Operational Manager, based on Farnuff, Dull and Lewis;
- Two Team Leaders, rotated between Farnuff and Dull;
- Eight volunteers, rotated with six based on Farnuff and two based on Dull;
- Short-term staff from UKSCT and SWCA to learn about the project; and
- The Farnuff community.

The operation team will be assembled in Lewis in September 2018, and the volunteers will complete an appropriate course to ensure the safe use of rodenticides and to comply with guidance under the stewardship scheme (a list of suitable courses can be found here: <http://www.thinkwildlife.org/list-of-training-and-certification/> or an online course is available from <http://rodentcontrolonfarms.co.uk/login/index.php>). Those members of the team who will undertake the rope access will also undergo rope-access training so that they are fully qualified to undertake the work.

A volunteer agreement form will be provided to all volunteers so that their roles and responsibilities are clear, and to highlight any medical conditions or personal limitations (e.g. fear of heights; ability to swim etc) that the Operational Manager and team leaders should be aware of.

3.1.2 Transport and purchasing / constructing equipment

Where possible, the Project Manager and Operational Manager should support the local businesses in Farnuff Island, which will not only benefit the local economy over the off-season but will further engage the community with the project.

A contract with a local commercial boat operator (with the correct MCA licence for insurance purposes) will be in place by September 2018. A suitable boat operator has been identified (Farnuff Boating Company, which has a vessel deemed appropriate for the transport of all the equipment and personnel. The boat operator will be responsible for the transport of staff and equipment between Lewis and Farnuff and Dull.

The Project Manager and Operational Manager will ensure all required permits will be in place by the end of September 2018.

The Project Manager, Operational Manager and team leaders will purchase all the necessary equipment in August/September 2018 (see Section 8) which will be stored at the UKSCT office on Lewis. The equipment will be stored in rat-proof containers where possible, and biosecurity measures will be put in place at the office on Lewis and checks will be completed prior to transport.

The operation will primarily use 75cm long, 10cm diameter bait stations constructed from corrugated drainage pipe in outdoor areas of the islands, the same design as has been used in previous UK rat eradication projects (Thomas *et al.* 2017). The bait stations will be produced in the work centre at the UKSCT office by UKSCT staff and volunteers in August, and transported to Farnuff and Dull in September 2018. The equipment and rodenticide will be stored in a secure, lockable metal shed on one of the farmers' land on Farnuff and in one of the storage sheds on Dull (following refurbishment in 2017).

3.1.3 Accommodation and subsistence

The team will be housed in a holiday cottage on Farnuff, which will be rented throughout the operation. SWCA are funding the repairs required on the bothy and outhouses during August-October 2017, resolving an issue identified in the feasibility study (Thornhill & Mitchell 2013). The Clipper family has agreed that the bothy and outhouses can be used by the eradication team during the operation.

On Farnuff, drinking water will be available in the rented property, and non-perishable food will be purchased through a bulk order through the local shop. Perishable foods will be purchased in a weekly shop undertaken by the team, using the local businesses (i.e. milk from the local farmer). On Dull, food and water will be transported from Farnuff or Lewis when the team is swapping over. Water will be stored in large containers on island and food will be stored in rat-proof containers.

3.1.4 Community engagement

Once on island, the team will work with the community to minimise harbourage and alternative food sources, such as providing and assembling rat-proof compost bins, clearing fishermen storage sheds etc. so that they can be easily accessed to deploy bait stations and / or rodent monitoring tools. The farming community will be engaged and will be asked to adjust their livestock feeding methods during the baiting phase such that animal feed pellets are not left out in the fields overnight, therefore not providing an alternative food source for the rats.

The Operational Manager and team leader(s) will spend time with the community showing them the bait stations, snap traps and rodenticide, explaining that if there are any concerns regards to pets there will be an antidote available on island which can be administered by certain members of the team, and if anyone notices anything amiss that they should contact the team.

3.1.5 Kill trapping for genetic samples

Once the team is on island, 20 snap traps will be deployed in locked Protecta boxes around the buildings. These will be baited with peanut butter and set at dusk and disarmed at dawn daily to reduce the possibility of non-target mortality, and following Best Practice (Thomas *et al.* 2017). The rats caught will be collected daily, and tail samples will be collected and stored in alcohol to be used for genetic analysis if rats are found on island following the operation. This will enable the team to determine if the operation failed, or if there has been a reincursion. If time, the team will dissect the rats to determine stomach contents and breeding status.

3.1.6 Establishing captive breeding population of Stewart Island vole

The completed trials and methods for establishing a captive population of Stewart Island vole to mitigate for non-target mortality during the baiting phase are detailed in a separate Plan, please refer to Horton *et al.* 2017. Voles will be captured from Farnuff in 2017 to establish breeding in spring 2018.

3.2 Implementation Stage 2: Establishment of rodenticide grid

The grid will be marked out across the island in October 2018 in a 50 x 50m grid across the islands. For the main grid, GIS will be used to generate bait station locations which will then be loaded into handheld GPS units. These units will be used by field staff to pinpoint bait station sites on the ground, which will then be marked with bamboo canes and flagging tape. Grid points around inhabited buildings and in seabird colonies will be set in the best locations using a bait point density of 16/ ha (equating to a 25 x 25m grid). The locations of these points will be mapped using GIS to ensure the stations are at the correct density.

Once the entire grid is in place the team will start to set out bait stations. These will be carried in dumpy bags across the islands (the low, grassy terrain is ideal for this), and one station left at each marker cane. Another team will follow behind, wiring stations into place. Once the entire network of stations is in place individual uniquely numbered tags will be attached to each station. These numbers will also be uploaded into a geo-referenced GIS database, allowing all data relating to each station to be mapped.

One of the team leaders will be responsible for visiting each of the houses of Farnuff to assist with the installation of a Protecta box within each household.

Some monitoring tools (chocolate wax, soap, chocolate, candles and apple etc.) will be deployed around the buildings on Farnuff to obtain samples showing rat sign for training purposes for the team and community.

3.3 Implementation Stage 3: Rodenticide baiting phase

The project will need to use a wax block grain based anticoagulant rodenticide bait, the formulation which has been successfully used in the majority of ground-based bait station operations in the UK and worldwide. Bromadiolone, a second generation anti-coagulant bait, will be used for the main part of the poisoning phase, with difenacoum (also a second generation anti-coagulant rodenticide) being used as the second bait type.

Prior to baiting, all project staff will be trained in the deployment of bait, health and safety precautions, data recording, and roles and responsibilities will be made clear. The team will hold daily briefings to ensure clear communications between volunteers, team leaders and Operational Manager. It is also important that the project provides radios for each person or ensures that all team members have cell phones. Communication between groups in different areas of the islands is vital. Not only for safety, but it will give also the opportunity for one team to assist another if they have finished the work in their assigned area early. It is particularly important for the boat team to have a VHF radio for

communication with the eradication team and Coastguard. The team will be rotated between Farnuff and Dull to reduce the possibility of fatigue.

On the first day of baiting, eight blocks will be placed loosely into each station. This is to allow the rats to remove the bait and cache within their burrows, making bait accessible to nursing mothers, and young which have not yet left the nest. Once rat take has dropped off significantly, the number of blocks will be reduced to four, and wired in to reduce the amount entering the environment.

Bait stations should be checked every 1-2 days for the first two weeks and every 2-3 days thereafter, except for the rope access sites on the cliffs which will be checked 2-3 times per week, on days when it is safe to do so. Bait blocks should be replaced as they are taken by rats and partially eaten bait will be replaced with a new block. Old or partially eaten bait blocks will be disposed off at a registered landfill as recommended by the bait manufacturers (Annex 1). The amount of bait consumed by rats (or non-target species) will be recorded on every visit, along with the number of new blocks added.

Regular checking of bait stations enables constant monitoring of bait take and the resulting die-off of rats. It also reduces the risks of bait stations running out of bait (this is particularly critical in this project where any product requiring multiple feeds, such as bromadiolone is used as the primary bait) and keeps the project team informed about bait take by non-target species. Closely monitoring bait take by non-target species means any problems can be picked up early and risks to non-targets minimised. Bait take (and consumption) will be accurately recorded into notebooks in the field for immediate inputting into the GIS-linked database back at base for ongoing analysis. Refinements to the poisoning programme can be made from this real time data. Hot spots of rat activity can be identified quickly and targeted throughout the programme.

The poisoning should start at the beginning of November and continue through to March 2019, overlapping with the early intensive monitoring phase of the programme. Any surviving rats or problem areas should be obvious by the end of December and could be treated with an alternative poison (e.g. Neosorex blocks, containing difenacoum) or techniques such as targeted trapping. Although most of the rats will die underground, if carcasses are found exposed they will be removed and disposed of appropriately according to the material safety data sheets (Annex 1) and local authorities.

3.4 Implementation Stage 4: Intensive monitoring of rodents

After about six weeks, bait take should be reduced to nil, with all the rats on Farnuff and Dull having been poisoned. During the following three months it is vital to establish an intensive monitoring programme to detect any rats which may have avoided poisoning. A grid of rat-attractive food and monitoring items (chocolate wax, soap, chocolate, candles and apple etc.) as well as chew sticks (small wooden sticks soaked in vegetable oil) or chew cards are pegged out as monitoring tools. Tracking tunnels will also be used to detect the footprints of any surviving rats.

Rats in low numbers (i.e. towards the end of an eradication operation or during an invasion phase) can be difficult to detect and fussy over food types. In a number of recent eradications, non-toxic chocolate wax blocks have been used to detect the last rat. The teeth marks left in these blocks by rodents and other animals are easy to interpret and identify to species and last well in a range of climates.

Monitoring points will be set at each bait station and also in between the stations on each line (resulting in a 25 x 50m grid of monitoring points). All intensive monitoring points would be recorded on GPS, entered into the GIS-linked database and mapped to ensure coverage of the island. Each monitoring site will be checked every 2-3 days to detect rat sign (usually teeth marks or foot prints). If any rat sign is detected, an intensive targeting programme (e.g. alternative bait, reduced spacing in the bait station grid, trapping etc.) will be set in place until rat sign in the area ceases. This would

involve setting a 20x20 grid around the target area with daily checks, plus additional monitoring. If the rat is still avoiding the bait, kill traps baited with peanut butter will be set around the areas of rodent sign, follow best practice protocols (Thomas *et al.* 2017).

It is expected that the monitoring phase of the programme would begin from mid-December. The bait station grid can be removed once the intensive monitoring phase has been completed and rat sign is absent. If rats are detected at the end of winter (i.e. February and/or March) a second baiting (i.e. during the following winter) and continued monitoring operation would have to be completed to finish the eradication, using the same methods described here.

3.5 Implementation Stage 5: Install long-term biosecurity equipment

Long-term monitoring for surviving (or reinvading) rats generally continues for two years after the end of the eradication phase. If no rat sign is detected during this period the island can then be declared rat-free. This is based on the average life expectancy of a wild adult rat (c. 18 months) and their reproductive biology – a single pregnant female rat can give rise to a colony of around 300 rats in approximately 8 months (Russell, Towns & Clout 2008). A surviving rat population should therefore be easily detected after a period of two years using the long term monitoring methods detailed here.

The two-year long-term monitoring checks should be carried out at least every four weeks year-round in order to confirm the success of the eradication project. Permanent bait and monitoring stations will be placed at suitable locations around the island, such as within known seabird areas, optimum rat habitat and in sites of likely rat incursion. This monitoring will be undertaken by UKSCT staff or volunteers. All long-term monitoring points should be recorded on GPS, entered into the GIS-linked database and mapped to ensure coverage of the islands. Any sign or indication of rodents should be photographed and if possible collected or sampled for expert opinions on identification.

This long-term monitoring for the presence of rodents after an eradication operation is done as part of the biosecurity programme. It is important to monitor using a range of detection devices (such as wax (chocolate and plain), chew cards, traps, rodent motels and trail cameras) and have a regular search effort. Low numbers of rats may take a long time to detect. It may also be possible to use the recovery of vulnerable species (such as puffin) or establishment of prospecting species (such as Manx shearwater and storm petrel) to indicate that rats have been successfully eradicated.

It is very important that the Biosecurity Plan is effective and fully implemented, with a clear incursion response in place. The Farnuff community will be integral to the long-term biosecurity of the islands, therefore appropriate training should be provided to them to allow them to effectively carry out necessary biosecurity checks and to recognise rat sign. It is important to be able to distinguish between the failure of the eradication and a biosecurity failure should rodents be detected during the long-term monitoring. DNA samples of rats from Farnuff and Dull, as well as rats from Tuchlose and the Lewis mainland, should be collected and stored to enable comparison with any rats subsequently found on Farnuff and Dull.

4 NON-TARGET SPECIES

The non-target species potentially at risk during the operation, and the mitigation methods to reduce this risk, are outlined in Table 3 below.

Table 3: Risk assessment for non-target species during the eradication of brown rat on Farnuff and Dull Islands.

Species	Potential impact	Preventative action	Risk
Stewart Island vole	Direct or secondary poisoning, potential to impact at a population level	<ul style="list-style-type: none"> Captive breeding programme at the Scottish Animal Park 	High
Common shrew	Direct or secondary poisoning, unlikely to impact at a population level	<ul style="list-style-type: none"> Grid size 	Low
Domestic pets (cats, dogs)	Direct poisoning Secondary poisoning	<ul style="list-style-type: none"> Use of bait stations Community to keep cats in at night Community to only walk dogs on leads during baiting phase Antidote for rodenticide available Search for, collect and safely dispose of rodent carcasses 	Low
Livestock	Direct poisoning	<ul style="list-style-type: none"> Use of bait stations Movement of livestock may be required if interfering with stations Antidote for rodenticide available 	Low
Rabbits	Direct poisoning, unlikely to impact at a population level	<ul style="list-style-type: none"> Use of bait stations with a reduced aperture 	Low
White-tailed eagle	Secondary poisoning, potential to impact at a population level	<ul style="list-style-type: none"> Rodenticide choice Complete baiting phase outside of breeding season Supplementary feeding to provide alternative food source Search for, collect and safely dispose of rodent carcasses 	Low

4.1 Stewart Island voles

The potential impacts of primary poisoning (i.e. direct bait consumption) on the endemic Stewart Island vole will be mitigated by the fact that the grid spacing exceeds the home range size, thus many animals will not encounter any bait stations. However, given the species' endemic status, plans have been made for a temporary captive population to be established at the Scottish Animal Park for the duration of the poisoning phase, which is detailed in a separate Plan (Horton *et al.* 2017; Hodges 2013). Although a second population on Tichlose island will be unaffected by the eradication project,

studies show that the two populations are genetically distinct (Henderson 2013), thus maintaining a captive population of Farnuff voles will ensure their genetic heritage is preserved.

A licence from Scottish Natural Heritage to capture the voles to hold in captivity will be in place by September 2018.

4.2 Other wild mammals

Of the remaining mammal species on the island, only common shrews are small enough to enter the bait stations and consume the bait directly. Shrews are unlikely to take bait in large quantities since they are insectivorous, though they may be more likely to eat the bait in winter time when their natural prey may be scarcer. However, while some shrews may be killed by anticoagulant poisoning it is extremely unlikely to have an effect on the population as a whole. The small home range size of common shrews means that many individuals will not encounter a bait station and thus any poison bait, within their home range.

As herbivores, rabbits are unlikely to take the bait directly in dangerous quantities. However, the potential impacts will be further decreased through the use of wires to reduce the aperture size on bait stations. This method has proved effective at excluding all but the smallest rabbits from the stations in similar projects elsewhere.

If any carcasses of wild animals are found during the operation they will be collected by the team and will be dissected by the Operational Manager or team leader(s) to determine if the cause of death was from rodenticide poisoning (i.e. blue stomach contents; obvious signs of internal bleeding).

4.3 Livestock

The livestock on Farnuff (approximately 800 sheep and 30 cows) are unlikely to be able to reach the bait inside stations. The only way larger animals can access the bait is by crushing the stations or by kicking them until the bait comes out. Sheep have never been observed to interfere with bait stations on UK islands though a small number of cows have occasionally done so on other UK islands. Although it would be virtually impossible for a sheep or cow to consume enough bait to cause it any harm, as animals due to enter the food chain it is important to reduce bait take by livestock to an absolute minimum. Accordingly, bait stations in paddocks will be monitored very closely for signs of damage or interference by livestock. If any signs are found (e.g. bait stations kicked out of position) then the bait in those paddocks will be wired into stations for the remainder of the project. If any persistent signs of interference are found then arrangements will be made with the farmers to move any animals known to be causing problems. In the case of repeated damage by a number of animals the project will arrange with farmers to remove the stations from fields with animals in for a few days, then move the animals to another field while the first is baited again. The animals would need to be moved ideally twice a week. The farmers on Farnuff have agreed in principle to these measures but a formal note of agreement still needs to be drawn up.

In case of possible poisoning, the team will have a supply of antidote, Vitamin K¹, plus a trained member of staff to administer through injection. Who to contact in case of livestock consuming rodenticide will be clearly communicated to the community.

4.4 Pets

On Farnuff there are two pet cats, three farm cats and four pet dogs owned by the community. The owners will be advised to keep cats and dogs in at night, to only walk dogs on leads during the baiting phase and to be caution with letting cats outside at the start of the baiting phase (the risk will decrease once rat take has dropped off significantly). In case of possible poisoning, the team will

have a supply of antidote, Vitamin K¹, plus a trained member of staff to administer through injection. Who to contact in case of pets consuming rodenticide will be clearly communicated to the community.

4.5 Raptors

White-tailed eagles are known to breed on Farnuff and Dull islands. White-tailed eagle is a protected species under Schedule 1 of the Wildlife and Countryside Act (1981). Additional raptors, kestrel and buzzards, are also present on Farnuff and Dull islands. All of these are resident species, and are therefore likely to be present during the baiting phase. There is the possibility that these species may be at risk from secondary poisoning from consuming poisoned rat carcasses.

Impacts on raptor populations will be mitigated in three ways, Firstly, by diligently searching for, collecting and safely disposing of any rat carcasses found on the surface of the island, thus reducing the possibility of secondary poisoning. Secondly, by reducing direct bait consumption by non-target mammal species likely to be preyed upon by raptors, including rabbits (through use of wires to reduce entrance size) and voles and shrews (by having a baiting grid smaller than their home range sizes. Thirdly, we will also provide an alternative food source for eagles and other raptors, by placing dead rabbits (these will be shot for the project by local residents) on feeding tables, set at a height of approx. 1.5m and protected from rats by the presence of a 40cm high smooth aluminium sleeve around the tables' support poles.

A disturbance licence from Scottish Natural Heritage is required for this work and will be in place by September 2018.

If any carcasses of raptors are found during the operation they will be collected by the team and will be sent off for detailed analysis to determine cause of death.

5 ENVIRONMENTAL EFFECTS

5.1 Rodenticide risks to humans

If used appropriately, this risk of rodenticides to human health is very low. All staff members handling rodenticide bait will have undergone an approved training course in safe rodenticide use and will be fully informed of the potential risks it poses to human and animal health. In case of accident, any impacts of rodenticides are readily reversed by the timely application of Vitamin K¹.

Protective equipment will be required, such as latex gloves for handling and touch bait and breathing masks if the bait is stored in an enclosed environment, will be provided to the team prior to the baiting phase.

The local community will be informed of the risks of rodenticides, what they look like, what the bait stations look like, and how to report any concerns.

Signs will be placed on the ferry and at the landing sites on Farnuff, informing visitors to the islands of the potential risks of rodenticides and warning them not to touch bait or bait stations.

5.2 Ecological effects

The environmental impacts of the rat eradication project are considered likely to be strongly positive, benefitting all species preyed upon by rats including seabirds, plants and invertebrates. We recognise that unexpected ecological consequences of rat eradications are possible (e.g. mesopredator release, prey release) and thus have measures in place to manage the most likely effect (of overgrazing caused by an increased rabbit population). Rabbits will be controlled if the population exceeds a threshold of 30 animals per hectare, a figure agreed with UKSCT, SWCA and the landowner. This control will be carried out by local farmers in line with an agreed protocol. The ongoing ecological monitoring activities outlined in the **Monitoring and Evaluation Plan** will hopefully detect any impacts on other taxa, both positive and negative, adding to our body of knowledge about the likely ecological consequences of rat eradication.

5.3 Disposal of rubbish

Any general waste produced by the project will be removed from Farnuff on the regular weekly scheduled rubbish collection services. Waste on Dull will be brought across to Farnuff on the boat used to transport project staff, supplies and equipment.

5.4 Leftover bait

Leftover bait falls into two categories – used and unused.

5.4.1 Used bait

Used bait (i.e. that which has been set out in bait stations during the eradication and removed at the end of the poisoning phase or due to weathering, being partially eaten or as part of routine bait refreshing activities) will be collected and kept in sealed buckets in the bait store (separately from the main bait). At the end of the project it will be removed from the island and disposed of in accordance with the requirements listed on the product label and relevant legislation. It is likely to be disposed of by incineration at an appropriately registered waste disposal site.

5.4.2 Unused bait

100kg of bait will be kept on Farnuff for six months after the end of the project to respond to any subsequent rat sign while the remainder will, where possible, be made available to other island restoration projects in the region.

5.5 Consents

A number of regulatory requirements may need to be fulfilled for the proposed eradication programme, including:

- Animal Ethics approval to undertake many of the research and monitoring components of the plan;
- Review of the Feasibility Study and Operational Plan by either the Island Eradication Advisory Group (IEAG) or independent experts to ensure the proposed techniques comply with best operating practises for island eradications.
- Review of the Feasibility Study and Operational Plan by the Health and Safety Executive (HSE) to ensure the safety of operational staff, volunteers and visitors.
- Ensure operation is valid under the Control of Pesticides Regulations 1986 and the EU **Biocidal Product Regulations 2015**
- Permission from local authority for working in **SPA/ SSSI**

6 HEALTH AND SAFETY

See the Health and Safety Plan (Smith *et al. In prep.*) for full details.

6.1 The operational team

All members of the team will undergo an accredited training course on the safe use of rodenticides, focussing on the safety of island residents, visitors, livestock and wildlife as well as the team members themselves.

The staff members who will be doing rope-access work are highly experienced and have had all the appropriate training. The whole operational team will receive regular briefings on safety issues at their daily meetings. Face masks will be available for use when moving bait between containers (although the bait is in wax block form and produces little dust).

Life jackets will be worn by all team members on all boats other than scheduled ferry services. These will be bought by the project and used exclusively by them. At least four project staff will hold a relevant first aid qualification and the island also has a registered nurse who is prepared to administer vitamin K1 injections in cases of accidental poisoning.

6.2 Island residents

A detailed presentation on the methods to be used by the project and the potential risks of touching or consuming bait will be given to all island residents, all of whom have already been consulted about the project and are supportive of it. Project staff will discuss with parents how best to get the message across to the island's children, through activities and explanations tailored to them.

6.3 Island visitors

Visitors to the island will be notified by signs at Southport, the main harbour on Farnuff, as well as at other potential anchoring spots on both Farnuff and Dull. Visitors arriving via the scheduled CalMac ferry service from Lewis will also receive information via a short onboard announcement and directed to further sources of written information (leaflets and signs) on the ferry as well as the Southport Harbour Office. The signs and leaflets will explain the background to the project and the nature of the poison being used, as well as photographs of both bait blocks and bait stations and warnings of the potential dangers, especially to children and pets. All bait stations will carry a sign warning that they contain rodenticide bait and should not be touched.

7 LOGISTICS

The bulky project equipment (bait, bait stations, wires, bamboo canes for marking grid points etc, monitoring equipment) will travel to Farnuff via a chartered boat from the Lewis mainland. The bait will be transported by road from the factory to Uig, then across to Tarbert on a chartered boat and then transported by road to the ferry terminal on Lewis that deals with transport to the Stewart Islands. The bait will be carefully packed onto pallets at the factory and transported via experienced haulage companies to ensure it arrives safely and in good condition. The journey is estimated to take no longer than 18 hours and the bait will not be subject to any extremes of temperature. Bait and other equipment will be unloaded on Farnuff and transported by tractor and trailer to a large shed/workshop near the harbour that has been rented for the duration of the project.

The operational team will get to Farnuff via the scheduled CalMac ferry service, which runs three times a week year round. From Farnuff they will travel to Dull via boat. Several Farnuff residents have expressed an interest in transferring personnel between the two islands. It is envisaged that staff will stay on Dull for a week at a time (depending on the weather) before being replaced by other staff from the larger part of the project team on Farnuff. Extensive food and water supplies will be stored on Dull in the case of bad weather affecting boat transport. Three sound but currently unused farm buildings are available for storage of equipment, fuel, food and water supplies and the project team will stay in the island's bothy, a solid stone built structure capable of comfortably housing a team of four staff (though in need of some renovation work – see task schedule). The bothy has an outbuilding suitable for housing a diesel powered generator for electricity and heating, and also has space for propane-fuelled cooking facilities in the kitchen area. The team on Farnuff will stay in one or more houses/holiday let properties on the island, which are under-occupied in the winter season. Several island residents have indicated a willingness to rent accommodation to the project team.

Due to the small size of the islands the team will mainly move around on foot. On Farnuff the team will also have access to a quad bike and trailer, which will be useful for transporting bait and bait stations around the island. On Dull everything will have to be transported on foot, with depots of bait stations and bait being stored in several locations across the island. Operational staff will all have walkie-talkie radios to keep in touch with each other as well as laminated maps showing the locations of all bait stations. They will also all have compasses, for both marking out grid lines and general orientation. Mobile phone reception is moderately good on both islands and the team on Dull will make nightly contact at a pre-arranged time with the main team on Farnuff to check on team safety and also the progress of the work.

8 EQUIPMENT LIST

The following equipment detailed in Table 4 is required to undertake the preparation, implementation of the eradication operation, intensive monitoring and long-term monitoring on Farnuff and Dull islands. This is not a complete list; other equipment may be needed throughout the project or recommended by the researcher(s) who undertake the pre- and post-eradication monitoring aspect. As such, a 20% contingency amount has been added to the budget.

There are a number of items that can be used throughout the operation (such as project laptop, radios, first aid kits, notebooks, marking canes, flagging tape etc.). Although the list is detailed, it is likely that a number of other items will be needed; as such a 20% contingency cost has been added to the budget. It is possible that many of these items will be able to be provided in-kind by partner organisations or other agencies. All products listed are required for the success of the project. It is possible that sponsorship and donations may also reduce costs further.

It is important that a 20% contingency amount is built into the budget to allow for the possibility of rats being detected at the end of poisoning phase or aspects of the project go over the allocated time. This additional funding should allow for a second baiting operation (i.e. during the following winter as it is more difficult to target rats successfully during spring and summer when natural food is widely available) to complete the eradication programme. Although, based on similar eradication projects in the UK this should not be necessary, it is important to plan for every outcome.

Table 4: The essential equipment list for the eradication of brown rats from Farnuff & Dull islands

PROJECT STAGE	Item	unit size	number	unit cost (£)	total cost (£)
Implementation stage 1. Pre-eradication phase					
Notebooks	Waterproof notebooks		210	8.99	1887.90
Pencils	Pencils, HB, 4 per person	12 pack	18	2.86	51.48
Pens	Pens , biros, blue, black and red, 1 per person	12 pack	18	2.86	51.48
Laminator	To produce field maps for team		4	34.99	139.96
Laminator pouches	To produce field maps for team	100 pack	8	35.00	280.00
Cell phone and credit	For maintaining contact between Team Leaders		4	150.00	600.00
Radio	Hand held (line of site) radios (such as Motorola XTR446)	2 pack	40	74.75	2990.00
Headlamps	1 for each team member		80	39.95	3196.00
Wet weather gear	Jackets, over-trousers and gaiters		80	500.00	40000.00
Batteries	Rechargeable AA and/or AAA batteries for headlamps etc., including recharge unit	4 batteries plus charger	80	12.49	999.20
First aid kits	First aid kits, field type for team members		80	12.30	984.00
Safety blankets	Emergency or safety blankets		80	3.95	316.00
A4 paper	A4 paper, for reports, info, letters or maps	ream (500 pages)	12	2.29	27.48
Map	Enlarged maps of Scillies	OS Map	20	6.99	139.80
Notice board	Notice board, for team notices, etc.		4	21.99	87.96
Whiteboard	Whiteboard for team notices and field locations		4	29.00	116.00

Whiteboard pens	Whiteboard pens for team notices and field locations	4 pack	6	10.00	60.00
Whiteboard eraser	Whiteboard eraser		4	5.00	20.00
Stuff sacks	1 per team member, for carrying all emergency equipment	Outdoor designs (large)	100	3.49	349.00
Tools	For construction of wooden bait stations; handsaw (£16), hammer (£16), nails (£2.86 for 100), hinges (£10.75 for 12)		10	29.61	296.10
Whistles	1 per team member, 'referee' type, for safety		100	3.35	335.00
Hi-visibility vests	1 per team member, for safety		100	1.65	165.00
Pocket knives	1 per team member, for scraping wax blocks clear	Spartan	80	19.95	1596.00
Thermos flasks	1 per team member	500 ml	80	14.95	1196.00
Lunch box	1 per team member		80	11.95	956.00
Waterproof bags (small)	1 per Uninhabited Islands Team Member, for transporting personal equipment to islands	e.g. Lomo Dry Bag Walking Rucksack 40L	12	40.00	480.00
Waterproof bags (large)	For transporting Uninhabited Island Team equipment to islands	e.g. North Face Base Camp Duffel bags, XL	6	100.00	600.00
Lifejackets	For Uninhabited Islands Team. Seek advice from locals on best models to use		12	150.00	1800.00
Wetsuits, gloves and boots	For Uninhabited Islands Team. Seek advice from locals on best models to use		12	280.00	3360.00
VHF radios	For Uninhabited Islands Team. Seek advice from locals on best models to use		12	200.00	2400.00
Vegetation management tools & PPE	For vegetation control, in order to reduce rat harbourage and natural food supply	Brush cutters etc.	6	400.00	2400.00
Storage shed	For vegetation management tools and PPE		1	500.00	500.00

Wheely bins for all households	To reduce food supply available to rats	240l	300	70.00	21000.00
Wheely bins for businesses producing food waste (e.g. Restaurants, campsites)	To reduce food supply available to rats	500l - 770l	50	230.00	11500.00
Compost bins for all households	To reduce food supply available to rats e.g. Green Johanna bins	e.g. Green Johanna bins (with winter jackets)	300	170.00	51000.00
Trail cameras	To detect rats and identify non-target interference with bait stations		50	200.00	10000.00
Laptop	For data entry and GIS work		4	700.00	2800.00
Hats	Coloured hats for use by all project workers		80	10.00	800.00
Camping mats	For use on Dull Island		12	60.00	720.00
Sleeping bags	For use on Dull Island	4 season	12	60.00	720.00
Camping stoves, 2 ring	For use on Dull Island		3	60.00	180.00
Fuel for camping stoves	For use on Dull Island		6	40.00	240.00
Crockery	For use on Dull Island		12	8.00	96.00
Cutlery	For use on Dull Island		12	4.00	48.00
Saucepans	For use on Dull Island		6	8.00	48.00
					167,532.40
Implementation stage 2: Establishing rodenticide grid					
Marking poles	8 ft bamboo poles (these will be cut in half)	3 m x 100 mm diameter (100 pack)	28	77.98	2183.44
Flagging tape	Hazard tape, red and white striped	75 mm (500 m)	50	9.49	474.50
Plastic tags	2 inch square, holed, for numbering bait stations	250 tags (75 x 50 mm)	22	77.00	1694.00
Marker pens	Permanent marker pens, good quality, to	12 pack	24	8.99	215.76

	number tags				
Poison labels	Poison labels (poison, do not touch)		5500	0.86	4730.00
Bait stations (plastic tubes) plus wires	For setting up the outdoor baiting grid		5000	4.81	24050.00
Protecta boxes	For use in and around buildings		300	10.00	3000.00
Metal bait boxes	For use in houses with domestic animals, if preferred by homeowners		100	20.00	2000.00
Spray paint	Orange, red and blue, to mark end of bait station lines	(6 of each)	18	5.00	90.00
GPS	For recording locations of grid points		8	150.00	1200.00
Snap traps	Collecting rats for DNA sampling and for poison-free rat control ahead of poisoning phase	Trapper T-rex traps	300	5.00	1500.00
A24 rat traps	Collecting rats for DNA sampling and for poison-free rat control ahead of poisoning phase	Goodnature A24 self-resetting traps	100	90.00	9000.00
					50,137.70
Implementation stage 3: Rodenticide baiting phase					
Primary bait	Bromadiolone (Contrac®)	Per kg (25kg/ha)	20450	8.00	163600.00
Secondary (back up) bait	Difenacoum (Neosorexa®)	Per kg (0.5kg/ha)	410	8.00	3280.00
Vitamin K1	Vitamin K1, both injections and tablets	10 doses	6	22.00	132.00
Nitrile gloves	Nitrile gloves, thick surgical gloves, 100 per box, for handling bait and rats	1 box (100 gloves) of each (S, M and L)	12	5.52	66.24
Deb Skin Safety station	Deb Skin Safety station, for cleaning hands after using bait and handling carcasses		4	89.32	357.28
Deb Skin Safety station refills	Deb Skin Safety station refills, for cleaning hands after using bait and handling carcasses	3 of each	12	51.27	615.24

					168,050.80
Implementation stage 4: Intensive monitoring of rodents					
Marking poles	8 ft bamboo poles (these will be cut in half)	3 m x 100 mm diameter (100 pack)	30	77.98	2339.40
Flagging tape	Hazard tape, red and white striped	75 mm (500 m)	20	9.49	189.80
Plastic tags	2 inch square, holed, for numbering monitoring stations	250 tags (75 x 50 mm)	10	77.00	770.00
Plastic bags	Self sealing, 25 ml, to collect samples and unclear monitoring items	3.5" x 4.5" (1000 pack)	10	22.98	229.80
Materials for making flavoured non-toxic wax monitoring blocks	Wax beads (e.g. Chandler 280P, 4candles.com)	20kg	40	63.80	2552.00
	Cocoa powder	250 g	30	2.18	65.40
	Creamed coconut	200g	30	1.00	30.00
	Peanut butter	340g	30	1.50	45.00
	Saucepan	12 cm, 0.7 L	3	25.00	75.00
	Muffin trays	24, mini	16	8.00	128.00
	Gas cooking Ring	single	3	21.60	64.80
	Gas bottles	9 kg	3	17.85	53.55
Candles	Candles, 50 mm lengths or tea lights	50 pack (tea lights)	250	8.50	2125.00
Soap	Soap, small hotel type	144 bars per box	200	15.36	3072.00
Chew cards	Commercially available	20 pack	200	3.20	640.00
Tracking tunnels		Trakka (with wires)	400	10.00	4000.00
Tracking cards		Trakka (50 pack)	100	31.00	3100.00
Tracking ink		Black track (100 ml)	15	9.00	135.00

Waxtags	Commercially available	peanut flavoured	2000	0.50	1000.00
Cordless drill	For making holes in monitoring items (e.g. chew cards, chocolate wax, soap etc.)	18 V	4	52.99	211.96
Drill bits	6 mm	6 pack	4	19.99	79.96
					20,906.67
Implementation stage 5: Install long-term biosecurity equipment					
Bait	Bromadiolone (Contrac ^(C)), wax blocks, 10 kg buckets	10 kg	5	68.00	340.00
Protecta boxes	For use as permanent bait stations as part of long-term biosecurity		100	10.00	1000.00
Wooden rat motels	Stained, hinged and lockable, individually numbered with warning labels, etc. To be made by project staff		200	30.00	6000.00
Tracking tunnels		Trakka (with wires)	400	10.00	4000.00
Tracking cards		Trakka (50 pack)	100	31.00	3100.00
Tracking ink		Black track (100 ml)	10	9.00	90.00
Candles	Candles, 50 mm lengths or tea lights	50 pack (tea lights)	200	8.50	1700.00
Soap	Soap, small hotel type	144 bars per box	100	15.36	1536.00
Chew cards	Commercially available (connovation.co.nz)	20 pack	100	3.20	320.00
Flavoured wax	Wax beads, 360kg	20kg	18	63.80	1148.40
	Cocoa powder	250 g	15	2.18	32.70
	Creamed coconut	200g	15	1.00	15.00
	Peanut butter	340g	15	1.50	22.50
	Gas bottles	9 kg	5	17.85	89.25

Notebooks	Waterproof notebooks		20	8.99	179.80
Pencils	Pencils, HB	12 pack	2	2.86	5.72
Pens	Pens , biros, black	12 pack	2	2.86	5.72
Notebooks	Waterproof notebooks		6	8.99	53.94
Pencils	Pencils, HB	12 pack	2	2.86	5.72
					19,644.75
TOTAL					426,272.20

9 OPERATIONAL TEAM

The operational team, the organisations, roles and responsibilities are provided in Table 5.

The Terms of Reference for Project Manager and Operations Manager can be found in Annex 2.

Table 5: The Operational Team, the organisations involved, and their roles and responsibilities for the delivery of the eradication of brown rats from Farnuff and Dull islands.

Name	Organisation	Role	Responsibilities
Louise Small	UK Seabird Conservation Trust	Project Executive	<ul style="list-style-type: none"> The accountable person on the project – overall (ultimate) accountability for the project. Leadership role – setting and guiding the overall direction and management of the project Involved from the start of the project and is ultimately accountable for the project. This includes defining the project in conjunction with the Project Manager
Kate Vickerman	UK Seabird Conservation Trust	Project Manager	<ul style="list-style-type: none"> The responsible person on the project – overall responsibility for the project. Leading the project effectively to deliver the agreed outputs and meet the agreed objectives (in order to achieve the agreed outcomes) Leading on planning, relationship building, listening and communicating (including defining the project, setting objectives, planning the work etc.) Creating and maintaining project documentation.
Philippa Connolly	UK Seabird Conservation Trust	Operations Manager	<ul style="list-style-type: none"> Day to day project management of poisoning, intensive monitoring and final check phases. Co-ordination of Operational Team leaders and staff Producing technical reports
Sam Peason	Wildlife and Conservation Agency	Deputy operations manager/ team leader	<ul style="list-style-type: none"> Assisting operations manager and leading a team of field staff and volunteers
Sarah Trellis	Wildlife and Conservation Agency	GIS technician	<ul style="list-style-type: none"> All GIS and mapping work
Richard Narracott	UK Seabird Conservation Trust	Team Leader	<ul style="list-style-type: none"> Leading team of field staff and volunteers
John Macsween	UK Seabird Conservation Trust	Team Leader / Lead rope access worker	<ul style="list-style-type: none"> Setting up and using system of rope access points for baiting cliffs

Lydia Steeple	UK Seabird Conservation Trust	Rope access worker	<ul style="list-style-type: none"> As above
Elliot Graves	UK Seabird Conservation Trust	Rope access worker	<ul style="list-style-type: none"> As above
Emily Adamson	UK Seabird Conservation Trust	Rope access worker	<ul style="list-style-type: none"> As above
Volunteers (8 needed at any one time)	UK Seabird Conservation Trust	Field workers	<ul style="list-style-type: none"> General field work duties – mainly checking bait stations and monitoring equipment

10 TASK SCHEDULE

The task schedule for eradicating brown rats from Farnuff and Dull islands is presented in Table 6 below.

EXAMPLE

Table 6: A checklist of key tasks for the delivery of the eradication of brown rats from Farnuff and Dull islands. Month 0 = start of project (assumed to be 1st January) and that the intensive six-month poisoning and monitoring part of the eradication will start around month 9 (September) with the poisoning phase starting around month 11 (November) and running for around 3 months, before moving into the intensive monitoring phase.

Actions for each project stage	Responsible party	Timeframe
Operational Planning Stage		
Funding secured.	Project Executive	
Stewart Island vole plan in place	Project Executive; Project Manager	
Implementation stage 1: Pre-eradication phase		
Recruit Project Manager	Project Executive	Month 0
Liaise with and inform island communities about the project, encouraging community involvement and ownership	Project Executive; Project Manager	Month 0-ongoing
Put operational side of the eradication project out to tender and appoint appropriate Operations Manager	Project Executive; Project Manager	Months 0-3
Recruit Admin Manager to deal with finding and recruiting volunteers, and travel and accommodation for all staff and volunteers	Project Executive; Project Manager	Months 0-3
Recruit lead boat operator(s) for transporting field workers on the uninhabited islands part of the project. Sign contract.	Project Manager; Operations Manager	Months 0-3
Establish captive population of Stewart Island vole at the Scottish Animal Park	Project Manager; vole specialist group	Months 0-6
Ensure suitable accommodation and workspace is available on Farnuff and Dull and repairs are completed on the bothy and outhouses	Project Manager; Operations Manager; Admin Manager	Months 0-6
Ensure all rodenticide use stops on the islands at least 6 months before the start of the poisoning phase	Project Manager	Months 0-6
Ensure farmers are fully aware and compliant to change livestock feeding methods during the baiting phase to prevent an alternative food source for the rats	Project Manager	Months 0-6
Find source for the rodenticide bait that will be required and order well in advance (this can take months to make and further time to be delivered)	Project Manager; Operations Manager; Admin Manager	Months 0-6

Ensure all necessary permits are in place to carry out the work - agreements from landowners, statutory bodies	Project Executive; Project Manager	Months 0-9
Review food waste collection on Farnuff, ensuring no accessible food is left for rats	Project Manager; Operations Manager	Months 0-9
Review procedures on Farnuff Quay to minimise chances of rodents being inadvertently transported to any of the outer islands	Project Manager; Operations Manager	Months 0-9
Source all necessary equipment (see list in section 10): bait stations, monitoring equipment, snap traps, flagging tape, PPE for staff and volunteers	Project Manager; Operations Manager; Admin Manager	Months 0-9
Get Farnuff 'rat-removal ready' - encourage homeowners and businesses to clear out sheds and outbuildings etc.	Project Manager; Operations Manager	Months 0-11
Recruit other operational staff as necessary - team leaders and deputy leaders	Project Manager; Operations Manager	Months 3-6
Ensure all staff and as many volunteers as is practicable are trained in safe and responsible rodenticide use (1-day course)	Project Manager; Operations Manager; Admin Manager	Month 6-ongoing
Source, buy and distribute rat-proof bins to all households and businesses on the inhabited islands	Project Manager	Months 6-9
Implementation stage 2: Establishment of rodenticide grid		
Establish network of bait stations across all islands included in the eradication project, including inside all buildings	Project Manager; Operations Manager	Months 9-11
Record position of all stations on GIS database	Operations Manager	Months 9-11
Produce maps of bait station locations for staff and volunteers to use in the field	Operations Manager	Months 9-11
Buy Vitamin K1 (anticoagulant rodenticide antidote) for emergency use on all three inhabited islands	Project Manager and Admin Manager	Months 9-11
Ensure sufficient numbers of trained people are available to administer Vitamin K (at least one person available on each of the inhabited islands at all times)	Project Manager	Months 9-11
Implementation stage 3: Rodenticide baiting phase		
Train staff and volunteers in recognising field and feeding sign left by rats and key non-target species	Operations Manager	Month 10-ongoing
Thoroughly brief staff and volunteers on how to check bait stations safely and effectively	Operations Manager	Month 10-ongoing

Carry out daily briefing and feedback sessions for field staff and volunteers	Operations Manager; team leaders	Month 10-ongoing
Carry out briefing and feedback sessions for local residents around rodenticide use, prior to and throughout the poisoning phase. Ensure clear lines of communication should anyone need to report suspected accidental poisoning or other issues	Operations Manager; team leaders	Months 10-15
Place agreed number of blocks in every bait station	Operations Manager; team leaders, volunteers	Months 10-15
Ensure all livestock and other domestic animals are protected from accidental poisoning – cows, sheep, horses etc may need to be kept in areas away from bait stations if they show signs of interfering with them. If so, alternative plans will need to be made to ensure all areas are baited (e.g. moving stock between fields)	Operations Manager	Months 10-15
Check bait stations as frequently as possible, ideally every 1-3 days	Operations Manager, team leaders, volunteers	Months 10-15
Store used bait safely and dispose of in accordance with manufacturer's instructions	Operations Manager	Months 10-15
Search for, collect and dispose of any dead rodents in accordance with bait manufacturer's instructions and local guidelines	Operations Manager; team leaders, volunteers	Months 10-15
Implementation stage 4: Intensive monitoring of rodents		
Thoroughly brief staff and volunteers on how to set and check monitoring tools effectively	Operations Manager	Month 12-ongoing
Carry out daily briefing and feedback sessions for field staff and volunteers	Operations Manager, team leaders	Month 12-ongoing
Check monitoring stations as frequently as possible, ideally every 1-3 days	Operations Manager; team leaders, volunteers	Month 12-15
At the end of the baiting and monitoring phases: remove all remaining bait, bait stations and the majority of monitoring tools	Operations Manager	Month 15
Clean and safely store equipment which could be used in ongoing biosecurity and incursion response work	Project Manager; Operations Manager	Month 15
Make and safely store flavoured wax blocks for use in ongoing biosecurity and incursion response work	Project Manager; Operations Manager	Month 15
Implementation stage 5: Install long-term biosecurity equipment		
Produce a full biosecurity plan for the islands	Operations Manager; Project Manager	Month 12-15
Establish network of permanent monitoring stations on the three inhabited as well as key uninhabited islands	Operations Manager; Project Manager	Month 15-ongoing

Establish and maintain long term rat control actions on the Quay on Lewis	Project Manager	Month 15-ongoing
Identify and train people (ideally volunteers) able to check the monitoring stations on a regular (ideally monthly) basis	Project Manager	Month 15-ongoing
Carry out 2 year check after last sign of rats to determine rat-free status	Project Manager; Operations Manager	Month 36-39

EXAMPLE

11 REFERENCES

Genuine references are listed here. Others included in the text are fictional.

Would also include reference to Feasibility Study, Project Plan and Health and Safety Plan

Atkinson, I.A.E. (1985). *The spread of commensal species of Rattus to oceanic islands and their effects on island avifaunas*. Pages 35-81 in Moors, P.J. (ed.). *Conservation of Island Birds*. ICBP Technical Publication No. 3, Cambridge, UK.

Bell, E. (2013) Feasibility study and Operational Plan for the eradication of black rats (*Rattus rattus*) from the Shiant Isles, Hebrides, Scotland. Unpublished report for the Royal Society for the Protection of Birds.

Eason, C. & Wickstrom, M (2001) Vertebrate Pesticide Toxicology Manual (poisons) *Department of Conservation Technical Series 23* Wellington, New Zealand

Russell, J.C., Towns, D.R. & Clout, M.N. (2008) Review of rat invasion biology: implications for island biosecurity. *Science for Conservation 286*. Department of Conservation, Wellington, New Zealand.

Thomas, S., Varnham, K. & Havery, S. 2017: *UK Rodent Eradication Best Practice Toolkit* (Version 4.0). <http://www.nonnativespecies.org/index.cfm?pageid=613> Royal Society for the Protection of Birds, Sandy, Bedfordshire.

Towns, D.R., Atkinson, I.A.E. and Daugherty, C.H. (2006). Have the harmful effects of introduced rats on islands been exaggerated? *Biological Invasions* 8(4): 863-891

12 ANNEX 1: BROMADIOLONE (CONTRAC®) MATERIAL SAFETY DATA SHEET (MSDS)

[Example obtained from: (Bell, 2013)]

PRODUCT NAME: CONTRAC® All-Weather Blox	
MANUFACTURER'S ADDRESS: BELL LABORATORIES, INC. 3699 KINSMAN BLVD. MADISON, WI 53704, TELEPHONE NO: (608) 241-0202	
USE: Anticoagulant Rodenticide	
BAIT FORM: Formulated Dry Bait	
EPA REGISTRATION NO: 12455-79	
SECTION I. HAZARDOUS INGREDIENTS	
INGREDIENT NAME % BY WEIGHT CURRENT TLV: Bromadiolone [3-[3-(4'-Bromo-[1,1'-biphenyl]-4-yl)-3-hydroxy-1-phenylpropyl]-4-hydroxy-2H-1-benzopyran-2-one] CAS No. 28772-56-7 0.005 % N/A	
This product contains no components subject to the reporting requirements of Section 313 of the Superfund. Amendment and Reauthorization Act (SARA) of 1986	
SECTION II. PHYSICAL DATA	
APPEARANCE: Polygonal Block	WATER REACTIVITY: N/A
COLOUR: Blue	EVAPORATION RATE: N/A
ODOUR: Sweet, grain-like	VAPOR PRESSURE: N/A
SPECIFIC GRAVITY: 0.629 gm/cc	BOILING POINT: N/A
VAPOR DENSITY: N/A	SOLUBILITY: Not soluble in water
MELTING POINT: N/A	BULK DENSITY: N/A
SECTION III. FIRE AND EXPLOSION DATA	
FLASH POINT (Method Used): N/A	
FLAMMABLE LIMIT: Upper Limit: N/A Lower Limit: N/A	
AUTO-IGNITION TEMP: N/A	
EXTINGUISHING MEDIA: Extinguish with water, foam or inert gas	
SPECIAL FIRE FIGHTING PROCEDURES: Fire fighters should be equipped with protective clothing and self-contained breathing apparatus.	
UNUSUAL FIRE OR EXPLOSION HAZARDS: None	
SECTION IV. REACTIVITY HAZARD DATA	
STABILITY: Stable	
CONDITIONS TO AVOID: None	
POLYMERIZATION: Will not occur	
CONDITIONS TO AVOID: None	
INCOMPATIBILITY (MATERIALS TO AVOID): Strongly alkaline materials	
HAZARDOUS DECOMPOSITION PRODUCTS: Oxides of carbon	
SECTION V. TOXICITY DATA	
LD50, ORAL (INGESTION): >5000 mg/kg (rats)	
LD50, DERMAL (SKIN CONTACT): > 2000 mg/kg (rats)	
LC50, INHALATION: N/A	
EYE IRRITATION: None (rabbits)	
SKIN IRRITATION: None (rabbits)	
DERMAL SENSITIZATION: Not Considered a Sensitizer	
SECTION VI. HEALTH HAZARDS	
PRIMARY ROUTE OF ENTRY: Ingestion	
SIGNS & SYMPTOMS OF EXPOSURE: Nausea, vomiting, loss of appetite, extreme thirst, lethargy, diarrhea, bleeding	

EMERGENCY FIRST AID PROCEDURES:
Eyes: Flush with cool water for at least 15 minutes. If irritation develops, obtain medical assistance.
Skin: Wash with soap and water.
Ingestion: Call physician or emergency phone number immediately. Do not give anything by mouth or induce vomiting unless instructed by physician.
Inhalation: None.
NOTE TO PHYSICIAN: If ingested, administer Vitamin K1 intramuscularly or orally as indicated by bihydroxycoumarin overdoses. Repeat as necessary as based upon monitoring of prothrombin times.
SECTION VII. CONTROL AND PROTECTIVE MEASURES
RESPIRATOR TYPE: Not required
EYE PROTECTION: Not required
GLOVES (Recommended): Rubber Gloves
VENTILATION: Not required
OTHER PROTECTIVE MEASURES: Not required
NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) RATINGS: HEALTH: 1 (Caution) FIRE: 0 (Will not burn) REACTIVITY: 0 (Stable) SPECIFIC HAZARD: None
HAZARDOUS MATERIAL INFORMATION (HMIS) RATINGS: HEALTH: 2 (Moderate)
FLAMMABILITY: 0 (Minimal) REACTIVITY: 0 (Minimal) PROTECTIVE EQUIPMENT: B
SECTION VIII. SPILL OR LEAK PROCEDURES
STEPS TO BE TAKEN IN THE EVENT MATERIAL IS RELEASED OR SPILLED: Sweep up spilled material, place in properly labelled container for disposal or re-use.
WASTE DISPOSAL METHOD: Wastes resulting from use may be disposed of on-site or at an approved waste disposal facility. Dispose of all wastes in accordance with all Federal, state and local regulations.
SECTION IX. SPECIAL PRECAUTIONS AND STORAGE DATA
STORAGE TEMPERATURE: Room temperature
AVERAGE SHELF LIFE: Bait is stable for a minimum of 1 year when stored at room temperature
SPECIAL SENSITIVITY (HEAT, LIGHT, MOISTURE): Avoid exposure to light and extreme humidity
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: Store in a cool, dry place inaccessible to children, pets and wildlife. Keep container tightly closed when not in use. Avoid contamination of lakes, streams and ponds by use, storage or disposal. Wash thoroughly with soap and water after handling.
SECTION X. SHIPPING DATA
DOT SHIPPING NAME: None required
DOT HAZARD CLASSIFICATION: Non-hazardous
DOT LABELS REQUIRED: None required
FREIGHT CLASSIFICATION: LTL Class 60
WARRANTY: The information provided in this Material Safety Data Sheet has been obtained from sources believed to be reliable. Bell Laboratories, Inc. provides no warranties; either expressed or implied, and assumes no responsibility for the accuracy or completeness of the data contained herein. This information is offered for your consideration and investigation. The user is responsible to ensure that they have all current data relevant to their particular use.

13 APPENDIX II: DIFENACOU (NEOSOREXA[®]) MATERIAL SAFETY DATA SHEET

[Example obtained from: (Bell, 2013)]

1	Identification of the preparation and the supplying Company	Neosorexa[®] Blocks BASF (The Chemical Company), BASF PLC, PO Box 4, Earl Road, Cheadle Hulme, Cheshire, SK8 6QG, UK, Tel: +44-161-4856222, Fax: +44-161-4274, Email: product-safety-north@basf.com	
2	Composition and information on ingredients	Difenacoum	0.005%w/w
3	Hazards identification	Rodenticide, biocide, bait	
4	First Aid measures	No specific dangers known, if the regulations/notes for storage and handling are considered.	
	General:	Avoid contact with skin, eyes and clothing. Take off immediately all contaminated clothing. First Aid personnel should pay attention to their own safety. If the patient is likely to become unconscious, place and transport in stable sideways position (recovery position). If difficulties occur obtain medical attention. Show container, label and/or safety data sheet to doctor.	
	Ingestion:	DO NOT INDUCE VOMITING. Rinse mouth immediately with water. Seek medical attention if necessary.	
	Skin contact:	After contact with skin, wash immediately with plenty of water and soap. If irritation develops, seek medical attention.	
	If inhaled:	Remove the affected individual into fresh air and keep the person calm. Seek medical attention if necessary.	
	Eye contact:	Immediately wash affected eyes for at least 15 minutes under running water with eyelids held open. Consult an eye specialist.	
		Advice to doctor: Difenacoum is an indirect anticoagulant. Vitamin K1 (phytomenadione) is antidotal. Poisoning is unlikely unless large quantities have been ingested. In case of suspected poisoning, determine prothrombin times not less than eighteen hours after consumption. If elevated, administer vitamin K1 and continue until prothrombin times normalise. Continue determination of prothrombin times for three days after withdrawal of antidote and resume treatment if elevation occurs in that time. For comprehensive medical advice on the treatment of poisoning contact the nearest Poisons Information Centre. Symptoms include coagulation disorders, blood in urine, internal bleeding, shock, weakness and loss of appetite.	
5	Fire-fighting measures	Use water spray; dry chemical, carbon dioxide or foam fire extinguishers. Toxic fumes (including carbon monoxide, carbon dioxide and nitrogen oxides) can be released in a fire. Self-contained breathing apparatus and chemical-protective clothing should be worn by fire-fighters. Keep containers cool by spraying with water if exposed to fire. In case of fire and/or explosion do not breathe fumes. Collect contaminated extinguishing water separately, do not allow to reach sewage or effluent systems. Dispose of fire debris and contaminated extinguishing water in accordance with official regulations.	
6	Accidental release measures	Personal precautions:	Use personal protective clothing. Avoid contact with skin, eyes and clothing.
		Environmental precautions	Do not discharge into the subsoil or soil. Do not discharge into drains, surface water or groundwater.
		Spillage (containment and disposal):	Collect waste in suitable containers, which can be labelled and sealed. Clean contaminated floors and objects thoroughly with water and detergents, observing environmental regulations. Incinerate or take to a special

			waste disposal site in accordance with local authority regulations.
7	Handling and storage	<div>Handling:</div> <div>Protection against fire and explosion</div> <div>Storage and transport precautions:</div>	<p>No special measures necessary if stored and handled correctly. Keep in original container, tightly closed, in a safe place. If dead or dying rats or mice are found during and after the control programme, these must be cleared away immediately in order to avoid secondary poisoning. Do not apply in the open (use bait stations, bait cartons or foil bags). Avoid all contact by mouth.</p> <p>Avoid all contact by mouth, wash hands and exposed skin before meals and after work.</p> <p>Prevent access to the bait by children, birds and domesticated animals, particularly dogs, pigs and poultry. Do not use baits where food, feed or water could become contaminated.</p> <p>Remove all remains of bait, bait containers and carcasses after treatment and incinerate or take to a special waste disposal site in accordance with local authority regulations.</p> <p>The product is combustible, but not self-combustible or explosive and does not add to the spreading of fire. Dust can form an explosive mixture with air. Avoid dust formation. Avoid deposition of dust. Prevent electrostatic charge; keep sources of ignition well clear. Fire extinguishers should be kept handy.</p> <p>Store in original container, tightly closed under cool and dry conditions in a safe place.</p> <p>Protect from moisture, keep away from heat, protect from direct sunlight.</p> <p>Segregate from food and animal feed.</p> <p>Store and transport away from products which have an odour.</p> <p>Store for 24 months.</p>
8	Exposure controls and personal protection	<div>Breathing:</div> <div>Hands:</div> <div>Body:</div> <div>Eyes:</div>	<p>Dust mask if sweeping up or aerosols or dust is formed [Particle filter with medium efficiency for solid and liquid particles such as EN 143 or 149 with Type P2 or FFP2 filter]</p> <p>Although gloves are not necessary for the safe use of this product, they are recommended for protection against rodent-borne diseases. Unlined synthetic rubber, 300 mm in length, e.g. Solvex nitrile.</p> <p>Protection depends on activity and possible exposure likelihood. Basic heavy duty polycotton or disposable, dust resistant overalls are recommended. In spills chemical protection suits (such as EN 14605 or EN ISO 13982) should be available.</p> <p>Safety glasses with side shield (frame goggles) such as EN 166 should be worn.</p>
9	Physical and chemical properties	<div>Appearance:</div> <div>pH:</div> <div>Flash point:</div> <div>Flammability:</div> <div>Solubility:</div> <div>Odour:</div>	<p>Green, wax blocks</p> <p>Not tested</p> <p>Non-volatile solid</p> <p>Does not ignite. Not considered a fire hazard but it will burn. Not explosive. Not fire-propagating.</p> <p>Not soluble in water.</p> <p>No significant odour.</p>
10	Stability and reactivity		Chemically stable. Not a reactive preparation. No decomposition if stored and handled as indicated.

11	Toxicological information	LD50:	1.8 mg/kg (rats - oral) 0.00346- 0.005848 mg/l/h (rat – inhalation) 63 mg/kg (rat – dermal)
		Irritants:	Non-irritant in rabbits, skin-sensitising effects were not observed in animal studies.
12	Ecological information	Hazardous to mammals (including domestic animals) and birds if ingested. Access to bait by non-target animals must be prevented.	
13	Disposal considerations	Unused, old or contaminated packaging must be dumped or incinerated in accordance with local regulations. The UK Environmental Protection (Duty of Care) Regulations and amendments should be noted. This product and any unclean containers must be disposed of as hazardous waste in accordance with the 2005 Hazardous Waste Regulations and amendments.	
14	Transport information	Not classified as hazardous or dangerous goods for transport under transport regulations for land, inland waterway, sea or air transport.	
15	Regulatory information (EU)	This product does not require a hazard warning label in accordance with EC Directives. The data should be considered when making any assessment under the Control of Substances Hazardous to Health Regulations (COSHH), Health & Safety at Work Act and related guidelines. The information contained in this data sheet does not constitute the user's own assessment of workplace risks as required by legislation	
16	Other information	Use only in accordance with label instructions. Observe statutory conditions of use on label. Read the label before use. Use pesticides safely.	