


Effect	Magnitude of effect	Likelihood	Level of benefit
Beneficial effects on human health and safety			
Reduced chance of contracting Tb from close contact with infected animals (herds or feral) resulting in inhalation of contaminated aerosols	Minor	Improbable	B
Reduced chance of contracting Tb from consumption of milk and dairy products from infected herds	Minor	Improbable	B
Reduced chance of contracting Tb through consumption of meat (farmed and feral) from infected animals	Minimal	Highly improbable	A
Reduced exposure to diseases and illness carried by pest species (excluding bovine Tb) including protozoa such as giardia and cryptosporidium	Minor	Improbable	B
Reduced availability of 1080 for pest control is likely to result in increased use of agents associated with higher meat residues, in particular secondary anti-coagulants (brodifacoum/pindone)	Minimal	Very unlikely	B
Beneficial effects on the relationship of Māori to the environment			
Positive impact on tikanga and mātauranga Māori resulting from the use of 1080 in the environment	Major	Very likely	F
Protection of taonga species and resources from browsing by pest species supporting the ongoing roles and responsibilities of iwi/Māori as kaitiaki	Major	Extremely likely	F
Protection of iwi/Māori economic interests	Moderate	Very likely	F
Beneficial effects on society and communities			
Reduced concern about native ecosystem degradation	Moderate to major	Unlikely	E
Enhanced pride and pleasure from the protection of New Zealand's natural heritage	Not assessed	Not assessed	
Reduced concern about bovine Tb risk (stress to farming communities)	Minor	Unlikely	D
Enhanced enjoyment of recreational activities	Minor	Likely	E
Beneficial effects on the market economy			
Reduced likelihood of losing access to/sales in export markets for beef, venison and dairy products	Major	Unlikely	E
Reduced likelihood of restrictions on market access for live animals	Not assessed	Not assessed	
Reduction in loss of livestock to bovine Tb	Minimal	Unlikely	C
Reduced costs to farmers for vector control	Minimal	Likely	D
Removal or relaxation of restrictions on livestock movements	Minor	Unlikely	D
Reduced competition for grazing from pests	Minor to moderate	Very unlikely	C-D
Improved water quality	Not assessed	Not assessed	
Reduced costs of vector control (government and pest control agencies)	Minimal	Unlikely	C
Reduction in crop damage/losses due to possum browsing (for orchards etc)	Minimal	Highly improbable	A
Reduction in damage to exotic forestry plantations, particularly seedlings	Not assessed	Not assessed	
Benefits for tourism as a result of maintenance of healthy forest habitat and native biodiversity	Not assessed	Not assessed	
Benefits to the New Zealand economy from ecosystem services	Not assessed	Not assessed	
Reduced costs from erosion and flood damage	Not assessed	Not assessed	

Table B2: Assessment table for adverse effects (risks and costs)

Effect	Magnitude of effect	Likelihood	Level of adverse effect	Comment Controls/ Recommendations	Adjusted level of risk
Adverse effects on the biological and physical environment					
Manufacture, transport and disposal					
Environmental effects resulting from an accident during road transport of the solid technical grade active from the Port of Auckland to the manufacturing sites.	Minimal – moderate	Improbable	A-B	HSNO identification and emergency management regulations.	
Environmental effects resulting from an accident during road transport of the stock solution from Animal Control Products (ACP), Wanganui, to ACP, Waimate, and to sites for preparation of coated baits.	Minimal – moderate	Improbable	A-B	HSNO identification and emergency management regulations.	
Environmental effects resulting from exposure of the environment during manufacture of pellets, pastes, soluble concentrate and gels; including accidental spillage of formulated products.	Minimal	Highly improbable	A	Discharge consents under the Resource Management Act apply to discharges to land, air and water from manufacturing sites. HSNO identification and emergency management regulations address spills at manufacturing sites.	
Effects on fauna within a landfill resulting from exposure through disposal of solid waste to landfill; disposal of wastewater through local sewerage systems; disposal of the solid technical active ingredient via a waste contractor.	Minimal	Improbable	A	Landfill should be managed under their resource consent conditions to ensure that hazardous waste is buried or otherwise treated to prevent access by fauna. Discharges to sewerage systems require trade waste licences from local authorities.	
Environmental effects resulting from an accident during transportation of packaged goods by from the manufacturing site to the application site.	Minimal-moderate	Improbable	A-C	A large spill to water may have significant localised effects if remote from emergency services. HSNO identification and emergency management provisions intended to manage risks.	Given the existing controls and the Committee's approach to risk, the level of risk has been adjusted to: A where spill is on land. B where spill is into water.
Ground-based application					
Uncontained application methods					
Soil micro-organism	Minimal	Highly improbable	A	Uncontained ground-based methods result in smaller areas being treated compared to aerial application, but	Given the existing and new controls, and recommendations to all users of
Plants					
Native bats	Moderate	Very unlikely	D		

Effect	Magnitude of effect	Likelihood	Level of adverse effect	Comment Controls/ Recommendations	Adjusted level of risk
Native birds	Minimal-moderate	Highly improbable – Very unlikely	A-D	<p>may result in localised areas of higher bait density. Overall exposure of non-target species to substances containing 1080 is reduced at a population level.</p> <p>Compliance with best practice for preparation and distribution of bait minimises risks.</p> <p><i>Changes to controls relevant to risks to the species listed</i></p> <p>Restrictions on use of some substances to contained ground-based methods only:</p> <ul style="list-style-type: none"> • peanut-based paste, fish paste; polymer gel block; cut apple bait. <p>Minimum carrot bait size and content specified. Refer Control Code E4 and requirement to notify formulation changes (Additional Control 10).</p> <p>Recommendation – operational best practice (section 11).</p> <p>Threatened species – loss of a small number of individuals may affect population viability.</p> <p>See controls and recommendations as above.</p> <p>Minimal – highly improbable applies to ‘common’ species with high reproductive and dispersal capacity.</p> <p>Moderate – very unlikely – higher rating for threatened species, reduction in scale of use reduces the magnitude of effect relative to aerial operations.</p>	<p>substances containing to adopt best practice, the level of risk is assessed as C.</p> <p>Given the existing and new controls, and recommendations to all users of substances containing to adopt best practice, the level of risk is assessed as A-C.</p>

Effect	Magnitude of effect	Likelihood	Level of adverse effect	Comment Controls/ Recommendations	Adjusted level of risk
				See controls and recommendations as above.	
Native lizards and frogs	Minimal-moderate	Improbable	A-C	Threatened species – loss of a small number of individuals may affect population viability; frogs and lizards less sensitive to 1080 than birds and mammals. Amended control requires screening of carrot bait to remove small highly toxic pieces (refer Control Code E4). See controls and recommendations as above.	Given the existing and new controls, and recommendations to all users of substances containing to adopt best practice the level of risk is assessed as A-B .
Terrestrial invertebrates	Minimal-minor	Highly Improbable	A	Smaller treatment areas minimise exposure to populations.	
Contained application methods					
Soil micro-organisms Plants	Minimal	Highly improbable	A	Contained methods of application (Control Code E4) minimise exposure of non-target species to all substances containing 1080; some spillage may occur when bait is being accessed by target species. Any effects will be highly localised.	
Native bats	Minimal	Highly Improbable	A		
Native birds	Minimal-minor	Highly improbable – Improbable	A-B		
Native lizards and frogs	Minimal-minor	Highly improbable	A		
Terrestrial invertebrates	Minimal-minor	Highly improbable	A		
Aerial application of pellets and coated baits containing 1080					
Loading of baits into aircraft	Minimal	Highly improbable	A	Additional Control 7 requires decontamination of loading sites.	
Contamination of soil	Minimal	Highly improbable	A	 Low sowing rates and low toxicity to soil micro-organisms Recommendation – operational best practice – see section 11.	
Freshwater vertebrates and invertebrates	Minimal	Highly improbable	A	Best practice – low sowing rates and use of larger baits reduces exposure, use of improved application technology reduce deposition of bait into water.	

Appendix B: Identification and assessment of the risks, costs and benefits of the substance

Effect	Magnitude of effect	Likelihood	Level of adverse effect	Comment Controls/ Recommendations	Adjusted level of risk
				Additional Control 8 reporting requirements for loss/spillage of bait. Recommendation – operational best practice – see section 11.	
Terrestrial plants	Minimal	Highly improbable	A	1.1 Low sowing rates result in exposure levels too low to cause effects. Recommendation – operational best practice – see section 11.	
Native birds	Minimal-major	Improbable-very unlikely	A-E	1.2 Compliance with best practice for preparation and distribution of bait minimises risks. Specified bait colour Control Code E4 reduces visual attractiveness to birds.	Given the existing and new controls, and recommendations to all users of substances containing to adopt best practice, the level of risk is assessed as A-D .
Native bats	Major	Very unlikely	E	1.3 Risk to threatened species is rated higher as loss of a few individuals may affect the viability of a species. Minimal-improbable for 'common' species with high reproductive capacity and dispersal ability. Major-very unlikely for threatened species. <i>Changes to controls relevant to risks to birds and other native fauna</i> Restrictions on use of some substances to contained ground-based methods only: <ul style="list-style-type: none"> cut apple bait treated with soluble concentrate containing 200 g sodium fluoroacetate/litre. 	Given the existing and new controls, and recommendations to all users of substances containing to adopt best practice, the level of risk is assessed as D .
				1.4 Minimum carrot bait size and chaff content. Refer Control Code E4 methods of release and bait size and requirement to notify formulation changes Additional Control 10. Recommendation – operational best practice	

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Effect	Magnitude of effect	Likelihood	Level of adverse effect	Comment Controls/ Recommendations	Adjusted level of risk
				– see section 11.	
Native terrestrial invertebrates	Minimal-moderate	Highly Improbable	A-B	Low sowing rates and use of larger baits reduces exposure. Recommendation – operational best practice – see section 11.	
Native frogs and lizards	Minimal-major	Improbable	A-D	As for birds/bats/ invertebrates but frogs and lizards considered less sensitive to 1080 than birds and mammals therefore lower likelihood of effect occurring. 1 Compliance with best practice for preparation and distribution of bait minimises risks. Risk to threatened species rated higher as loss of a few individuals may affect viability of species. Refer Control Code E4 methods of release and bait size and requirement to notify formulation changes Additional Control 10. Recommendation – operational best practice – see section 11.	Given the existing and new controls, and recommendations to all users of substances containing to adopt best practice, the level of risk is assessed as A-C .
Exposure of soil and plants to the stock solution during the preparation of coated baits at the operation site.	Minimal	Highly improbable	A	Additional Control 7 requires decontamination of loading sites. Recommendation – operational best practice – see section 11.	
Indirect (secondary) exposure – independent of method of application					
Secondary poisoning of native fauna (scavengers, predators and insectivores) feeding on carcasses or live kill of lethally or sub-lethally exposed animals.	Minimal-Minor	Highly improbable – improbable	A	2 Birds most susceptible to secondary poisoning through ingestion of poisoned possums and rodents ie ruru/morepork, weka, kahu/harrier are not threatened species and not affected at a population level. 3 Insectivorous birds such as robins and tomits not affected at a population level. Magnitude of effect greater with aerial	

Effect	Magnitude of effect	Likelihood	Level of adverse effect	Comment Controls/ Recommendations	Adjusted level of risk
				application due to larger scale exposure.	
Disposal post application					
Environmental effects resulting from contamination of soil or groundwater during wash down of equipment and PPE and during disposal of waste to a ground sump and solid waste to landfill.	Minimal	Improbable	A	HSNO disposal regulations.	
Adverse effects on human health and safety					
Adverse human health effects (both short and long term) from exposure of occupationally exposed persons (or bystanders) to 1080 during transportation of technical grade 1080 from Port of Auckland to Animal Control Products (ACP) Wanganui manufacturing plant, and transportation of the Stock Solution and all types of 1080-containing bait from the manufacturing factories (at Wanganui or Waimate) to distribution points or aerial drop areas.	Moderate/ Minor	Highly improbable	A/B		
Adverse human health effects (both short and long term) from exposure of occupationally exposed persons during the handling of:	Moderate	Unlikely	E	The Committee recommends to the companies involved in the manufacture and use of baits in these situations to ensure strict compliance with the controls, particularly personal protective equipment and attention to personal hygiene.	Taking into account the approach to risk and the expectation that compliance with controls will prevent excessive exposure, the level of adverse effect was reduced from E to D.
(a) sodium fluoroacetate (1080) during the manufacture of soluble concentrate at Animal Control Products (ACP) Wanganui manufacturing plant;				1 The Committee also recommends the use of biological monitoring regularly to monitor the adequacy of compliance with the controls.	
(b) soluble concentrate during the manufacture of formulated substances containing 1080 at the factories (Wanganui and Waimate);					
(c) soluble concentrate during the manufacture and handling of treated carrot and apple baits on-site in the field.					
Adverse human health effects (both short and long term) from exposure of occupationally exposed persons to 1080 in both liquid and solid forms during the disposal of small quantities of technical 1080, Stock Solution and manufactured bait from the factories (Wanganui and Waimate) or elsewhere as a result of clean-up of spills, surplus packaging or protective clothing and disposal of this material at	Minor	Improbable	B		

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Effect	Magnitude of effect	Likelihood	Level of adverse effect	Comment Controls/ Recommendations	Adjusted level of risk
controlled waste disposal facilities.					
Adverse human health effects to the general public from acute (short-term) exposure to Pellet bait (0.4–0.8, 1.5–2.0 g/kg) and 1080-coated baits (carrot/apple) from aerial application.	Moderate	Highly Improbable	A		
Adverse human health effects the general public from acute (short-term) exposure to Pellet bait (0.4–0.8, 1.5–2.0 g/kg) and 1080-coated baits (carrot/apple) from contained and uncontained ground application.	Moderate	Highly Improbable	A		*
Adverse human health effects (both short and long term) from exposure of the general public to contaminated drinking water (whether a public water supply, a private supply or from direct surface water collection following aerial application of 1080.	Minimal	Highly Improbable (public) or Improbable (private/other)	A	Recommended further research on degradation of 1080 in water and soil – see section 11.	
Adverse human health effects (both short and long term) from exposure of any person to 1080-contaminated farmed meat resulting from ground or aerial application of 1080.	Minimal	Highly Improbable	A		
Adverse human health effects (both short and long term) from exposure of any person to 1080-contaminated feral meat, resulting from ground or aerial application of 1080.	Minimal	Improbable	A		
Adverse human health effects (both short and long term) from exposure of any person to 1080-contaminated vegetation, resulting from ground or aerial application of 1080, and collection of the vegetation for food or medicinal (roanga) purposes.	Minimal	Highly Improbable	A	Notwithstanding the low level of adverse effect estimated, the Committee concluded that the lack of data relating to residues in watercress if it is grown in contaminated water is a research gap which needs to be remedied.	
Adverse effects on the relationship of Māori to the environment					
Negative impact on tikanga and mātauranga Māori resulting from the use of 1080 in the environment.	Moderate	Likely	E	Recommendation – Research and/or dialogue requirement regarding the non-biophysical effects of the use of toxins like 1080 in the environment.	Given the existing and additional controls and recommendations, any change in the level of adverse effect is dependant on the outcomes of the recommended research therefore no change is assessed – E.
Undermining of the roles and responsibilities of kaitiaki.	Moderate	Likely	E	Permissions Control (Additional Control 4) – Requirement for	Given the existing and additional controls and

Effect	Magnitude of effect	Likelihood	Level of adverse effect	Comment Controls/ Recommendations	Adjusted level of risk
				consultation prior to aerial 1080 operations on DoC land and where public health issues are posed in accordance with Best Practice guidelines. Control – Reporting consultation activity and outcomes on ERMA New Zealand’s 1080 watchlist. Recommendation – DoC review of its implementation of its iwi/Māori consultation requirements to achieve consistency across conservancies.	recommendations, a significant improvement in the involvement of iwi/Māori throughout the processes for the use and management of 1080 would occur. This would change the likelihood of this adverse effect to improbable giving a revised level of adverse effect – C .
Negative impact on the physical and spiritual health and wellbeing of iwi/Māori caused by the compromising or contamination of traditional healing practices and wild foods.	Moderate	Very unlikely	D	Control – Reporting aerial operation details and outcomes on ERMA New Zealand’s 1080 watchlist. Recommendation – Research on the effects of 1080 on plant species of specific importance to the practice of rongoa.	Given the existing and additional controls and recommendations, any change in the level of adverse effect is dependant on the outcomes of the recommended research therefore no change is assessed – D .
Negative impact on the economic development potential of iwi/Māori.	Minimal	Unlikely	C	–	
Adverse effects on society and communities					
Loss of opportunity to hunt due to reduced deer populations (includes loss of amenity and loss of food source).	Minor	Very unlikely	C	Alternative public conservation areas where 1080 is not used are available to hunters. There is major uncertainty around the impact of deer repellent in terms of its effectiveness in reducing by-kill of deer. Recommendation – that users of 1080 consult with the Deerstalkers’ Association at a national and local level prior to major operations in areas where hunting may be affected.	
Anxiety resulting from disagreement between hunting community and government/pest control agencies.	Minor	Unlikely	D	Adverse effect can be reduced (though not removed) by appropriate comprehensive and meaningful consultation and dialogue with communities including listening to community concerns and taking	The Committee considers that the adverse effect can be ameliorated by improved consultation and communication and has reassessed the

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Effect	Magnitude of effect	Likelihood	Level of adverse effect	Comment Controls/ Recommendations	Adjusted level of risk
				account of community perspectives. Recommendation – best practice communication and consultation.	effect as Minor Improbable B.
Anxiety resulting from perceived loss of control over own environment.	Not assessed	Not assessed			
Negative experience in recreational and rural areas due to pest control.	Not assessed	Not assessed			
Grief caused by pet suffering or mortality resulting from pest control operations.	Minor	Improbable	B	1 Controls in place to ensure that dogs are not exposed are adequate. Recommendation – best practice communication and consultation.	
Concern for animal welfare.	Minor	Very Unlikely	C	2 Target animals deserve to be treated humanely and suffering should be minimised. While effects on non – target animals pertain to both ground and aerial application of 1080, the public appears to be more anxious about aerial use.	
Concern about incidents around 1080 operations.	Not assessed	Not assessed		Recommendation – best practice communication and consultation.	
Concern resulting from perceptions of ecosystem degradation.	Moderate	Unlikely	E	This effect is countered by the equivalent beneficial effect. Recommendation – best practice communication and consultation.	
Concern that the use of 1080 is adversely impacting on New Zealand's clean green image.	Not assessed	Not assessed		Unsupported. Perception countered by reduced concern about New Zealand's clean green image from reduction in possum numbers.	
Concerns about sabotage.				Any such concerns would be similar to concerns about all vertebrate toxins.	
Adverse effects on the market economy					
Loss of livestock from poisoning.	Minimal	Very unlikely – improbable	B	Small numbers affected – localised and short term effect.	
Loss of working dogs from poisoning.	Not assessed	Not assessed		Small numbers reported – deaths can be minimised by careful management including use of muzzles.	

Effect	Magnitude of effect	Likelihood	Level of adverse effect	Comment Controls/ Recommendations	Adjusted level of risk
Costs associated with the removal of stock during pest control operations.	Not assessed	Not assessed		Greater accuracy of aerial dropping minimises any impact.	
Negative impact on market values and access for agricultural and horticultural products.	Not assessed	Not assessed		Farmed animals are excluded from treated areas and strict protocols are applied to feral meat to ensure that they are not sourced from 1080 treated areas.	
Negative perceptions of large scale aerial application of pesticide and impact on tourist spending.	Not assessed	Not assessed		Market impact small – more appropriately considered as a social effect.	
Negative financial and commercial impacts from restrictions on hunting.	Not assessed	Not assessed		Any effect would be localised and short term – taking a national perspective the impact on the market economy would be very small. While deer by-kill has adverse social effects as discussed in section 10.6, adverse effects on the (national) market economy due to loss in trade have not been shown since in most cases hunters are able to move to alternative areas.	
1 Negative impact on possum fur industry.	Not assessed	Not assessed		No need for conflict between industry and use of 1080 since most major 1080 aerial operations are on land areas that it is either impossible or very uneconomic to cover using ground control methods. Recommendation – that DoC and AHB work with the fur industry to ensure that where possible fur hunters are able to access the resource.	
Reduced opportunities for employment from trapping and hunting for control of possums and other pests.	Minimal	Improbable	A	Net effect, since it is a “reduced opportunity”.	
2 Negative impact on trade in feral venison and other game animal-based industries.	Not assessed	Not assessed		Collapse of feral venison industry in 1990s due to a range of factors. Current industry small, and unlikely to be affected by use of 1080.	