ENVIRONMENTAL GOOD PRACTICE IN AGRICULTURAL AND RURAL AVIATION IN NEW ZEALAND

Abstract

The agricultural aviation industry provides services to primary production activities and associated rural activities through applying agrichemicals, fertilisers and baits from the air, from both fixed wing aircraft and helicopters. These activities have the potential to have adverse environmental effects if not adequately managed, including the generation of noise.

Regional plans address discharges to air, land and water and district plans address amenity issues such as noise.

This guidance note provides a background to the agricultural aviation industry and guidance as to how the use of aircraft for these activities can be managed through regional or district plans.

ENVIRONMENTALGOOD PRACTICE IN AGRICULTURAL AND RURAL AVIATION IN NEW ZEALAND

Contents

1. Introduction

The agricultural aviation industry provides services to primary production activities and associated rural activities through applying agrichemicals, fertilisers and baits from the air, from both fixed wing aircraft and helicopters. Agricultural aviation also extends to activities such as pest eradication operations carried out in native forests. Typically aircraft used in agricultural activities are also used in fire fighting operations and have also been used in urban biosecurity operations such as the Painted Apple Moth eradication programme.

Application of agrichemicals, fertilisers and baits is essential for the production of crops and protection from unwanted pests. Such applications contribute to economic wellbeing and the GDP of the country. Without the ability to apply such substances from the air production from agriculture and forestry would be significantly reduced and indigenous biodiversity would face greater pest incursions and threats.

These activities have the potential to have adverse environmental effects if not adequately managed, including the generation of noise, so agricultural aerial operators face a number of environmental issues on a daily basis. Most operators work in a number of different regions so have to ensure that the appropriate plan requirements are met in the respective areas, increasing the complexity of the operations. Because aircraft, particularly when discharging substances, are very visible there is often a perception that the adverse effects are significant.

Regional and District Councils have responsibilities under the RMA to managed these activities. This guidance note focuses on providing an overview of the operating environment of the industry and approaches that can be applied in regional and district plans to address the potential environmental effects of agricultural aerial operations.

1.1 Purpose of the Guidance Note

This guidance note sets out how operators use best practice to ensure that adverse environmental effects are avoided and how the use of this best practice can be the basis for provisions in plans.

The guidance note seeks to:

a) raise the knowledge and understanding of policy makers and planners in relation to agricultural aviation practice;
b) outline industry best practice and Codes of Practice, including the AIRCARE™ Programme;
c) assist in achieving plan regimes that are consistent and achievable, which will enable the industry to operate in a sustainable manner, using best practice, while delivering good environmental outcomes.

The guidance note provides information to guide regulators and enforcement agencies in constructing plan policy and rules and resource consent conditions that will deliver the outcomes to manage effects on the environment from both the councils and the aviation industry's perspective. The emphasis is on risk assessment of the task at hand, coupled with the ability to show (verify), if required, how any environmental risks will be or were managed. Technical information is provided to support this risk management approach.

1.2 Scope and structure of the Guidance Note

The Guidance Note is focussed on agricultural aviation activities such as applications of fertiliser, agrichemicals and baits. These products may also be applied by ground based methods. However the potential effects of aerial applications and management tools are different to ground based methods. The potential effects of and management tools for ground based methods are not addressed in this guidance note.

The Guidance Note provides background information on the specific products which are discharged – fertilisers, agrichemicals and baits - and then sets out management options when applying these products from air. Related land use matters, including storage, and amenity issues relating to aircraft use, such as noise and reverse sensitivity, which are generic to applications of all three groups of substances and aircraft, are also addressed in the rural context.

The guidance note is structured into the following sections:

- The agricultural aviation industry – An overview of the industry and its contribution to NZ, including its capabilities and operations,(www.nzaaa.co.nz)

- The environmental legislative context for agricultural aviation – the interface between the RMA, HSNO, ACVM and HSE Acts and agricultural aviation.

- Resource Management and agricultural aviation - including the outcomes sought, and methods to address issues.

- A risk management approach to addressing resource management issues and agricultural aviation – a description of a risk management approach and how it could be applied in plans to address resource management issues.

- SUBSTANCE SPECIFIC SECTIONS
    - Fertilisers
    - Agrichemicals
    - Vertebrate Toxic Agents (VTA's

  These sections provide background information on aerial application of the specific substances so that a risk management approach can be applied to manage the effects through plan provisions.

- Managing Land use and Amenity issues
    - Noise
    - Loading areas and mixing sites
    - Reverse sensitivity
- Glossary

Technical information to support the Guidance Note is on the New Zealand Agricultural Aviation Association (NZAAA) website www.nzaaa.co.nz.

NOTE:
There is potential for confusion with the terminology used in the various acts and regulations.
For instance:

- Agricultural compounds
- Agricultural chemicals
- Pesticides
- Agrichemicals
- Fertilisers
- VTA's

Agrichemicals, veterinary medicines and animal health products are commonly known as agrichemicals.

A diagram setting out the relationship between the various terms is included in the Technical Information.

1.3 Development of the Guidance Note

This guidance note was initiated in 2011 by the NZAAA, which is the industry body representing pilots, operators and aerial organisations. NZAAA is a division within Aviation Industry Association of NZ (AIA). Funding was obtained from the Sustainable Farming Fund and stakeholder organisations to develop the guidance note. The development process has involved regional meetings with councils, operators and stakeholders where key issues were identified and workshops with pilots and operators at NZAAA conferences. Feedback on draft material was sought from the stakeholder group, which included industry, councils and related industries such as horticulture, agriculture and also environmental organisations. The Guidance Note has been considered and feedback provided by planning practitioners and industry and was included on the QP website in 2013.

2. The agricultural aviation industry

2.1 Industry overview

Aerial agricultural operators apply agrichemicals, fertilisers and Vertebrate Toxic Agents (VTA's) in situations where ground based application is not possible or not the most efficient or effective means of application. Aerial application has also been used to apply substances for bio-security purposes – such as the painted apple moth in Auckland.

Aerial operations can be from either fixed wing (FW) aircraft or helicopters. The aircraft used will depend on the nature of the task to be undertaken. For instance, helicopters are better suited to follow complex boundaries such as setbacks from streams or watercourses whereas fixed wing aircraft are the logical choice for larger areas and higher payloads.

Currently there are approximately 116 fixed wing aircraft and 190 helicopters that undertake some agricultural aviation work.

Agricultural aviation operators vary in size from some operating one aircraft to others operating over 10, with a mixture of fixed wing and helicopters. Some operators elect to provide only one service, e.g. fertiliser application, whereas others will carry out agrichemical and VTA applications as well. There are no restrictions on what part of the country an operator can work with many operators working in a number of regions throughout NZ. Typically, especially with fixed wing aircraft, an operator will work from a base with an established client list.

Each year about 60,000 hours of flying time (helicopters and fixed wing) can be attributed to agricultural work, with a trend towards more helicopter hours and less fixed wing. Actual figures for the various types of application vary according to the season but agricultural work in NZ in 2005 – 2010 is summarised in Table 2.1.

Table 2.1 Agricultural aviation work in New Zealand (all figures rounded)

Year	A/C	Bait (tonne)	Fertiliser including lime ('000 t)	Spray ('000 litres)
2010	FW Heli	475 1000	439 39	4900 60,300
2009	FW Heli	600 1850	380 26	6700 54,500
2008	FW Heli	1700 1800	482 35	6600 55,500
2007	FW Heli	500 1450	567 27	2000 40 000
2006	FW Heli	70 1250	577 28	2500 41000
2005	FW Heli	300 2300	704 28	5500 51500

Note:

- Total bait application (tonnes) trending down because of lower application rates per ha.
- Helicopters now fly more hours on agricultural work than aeroplanes (FW).

- For helicopter spraying 70 – 80% of the total is agrichemical and about 15% is for fine particle suspension.

2.2 Flight Safety

Agricultural and rural aviation is regulated by The Civil Aviation Authority (CAA) General Aviation Group. CAA operates a rules based system, and all operators and pilots are expected to comply with the standards set by these rules. To work in agricultural aviation, an operator must hold a CAR Part 137 Certificate issued by CAA. The certificate is held by the organisation or operator who may have a number of aircraft operating under that certificate.

In addition to the CAR Part 137 Certificate, other Civil Aviation Rules (CAR) apply, including CAR Part 91 - General Operating and Flight Rules. The AIRCARE™ diagram (Fig 1), shows matters of flight safety (on the left hand side) are managed by CAA under the CAA Act 1990 and health and safety matters under the Health and Safety in Employment Act 1992.

2.3 Environmental management

Environmental management is a key component of an agricultural aerial operation, particularly meeting the requirements of the Resource Management Act 1991, Hazardous Substances and New Organisms Act 1996, the Agricultural Compound and Veterinary Medicines Act 1997. These regulations are described in more detail below (Link in document to Legislative context). Environmental management is addressed by the industry through the AIRCARE™ programme.

2.4 AIRCARE™

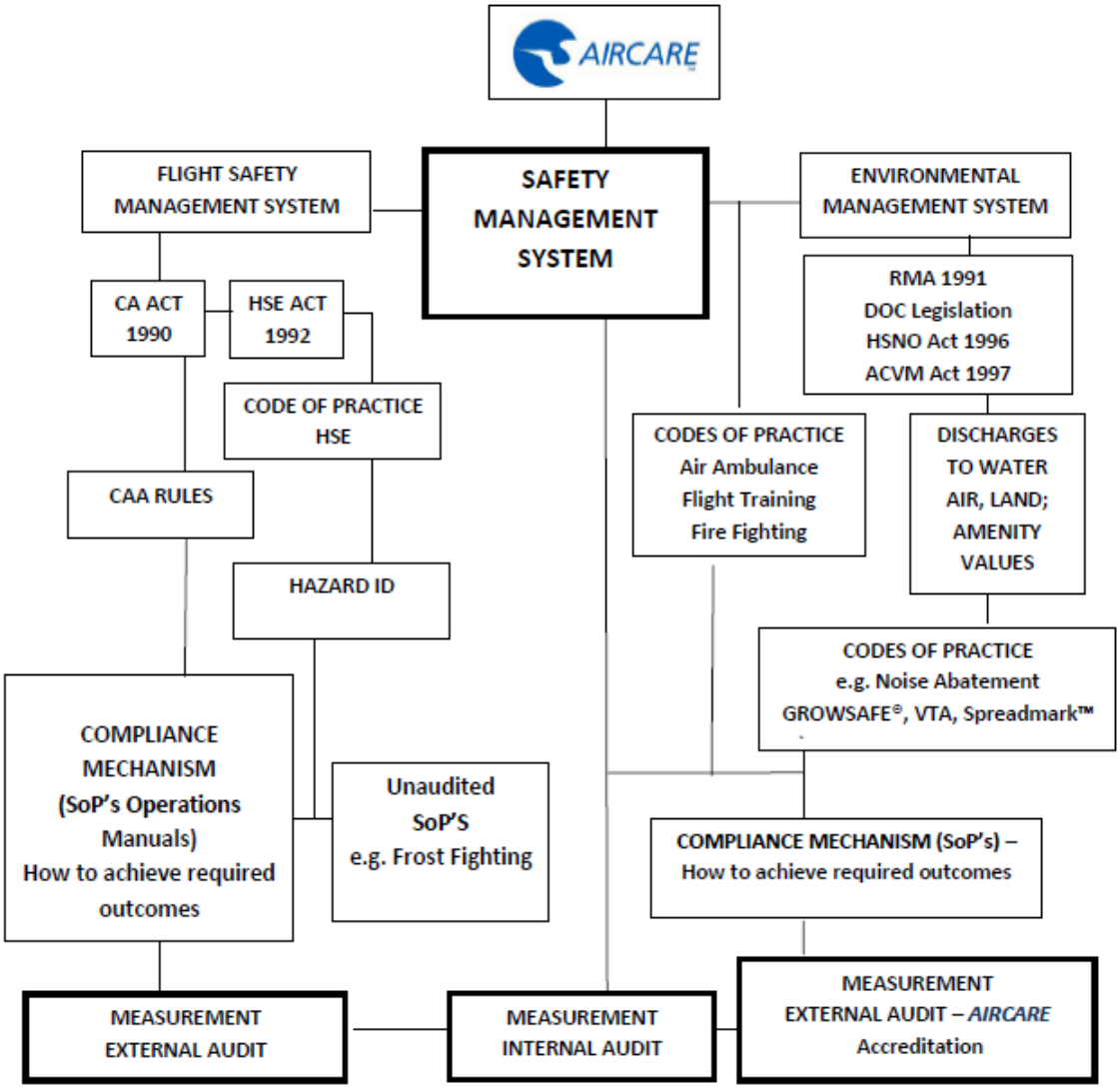
AIRCARE™ is an integrated accreditation programme for all of an aviation business. It brings flight safety and environmental management together in one safety assurance programme.

Figure 1 represents the compliance requirements for aerial operators. The left hand side sets out aviation flight safety and is mandatory under the Civil Aviation Authority (CA) Act 1990 for continued certification and licence to operate. The right hand side sets out the voluntary codes of practice covering environmental management. Figure 1 shows that flight safety and environmental management both have external audit requirements.

The four codes of practice (COP) that currently make up environmental management are:

- NZS8409:2004 Management of Agrichemicals (GROWSAFE®) www.growsafe.co.nz
- SPREADMARK™ (Aerial) COP for the Placement of Fertilisers in NZ www.fqc.org.nz/aerial
- AIRCARE™ COP for the Aerial Application of Vertebrate Toxic Agents www.nzaaa.co.nz
- AIRCARE™ COP for Noise Abatement www.nzaaa.co.nz

Fig 1 AIRCARE™



There are three parts to the AIRCARE™ programme:

- *Pilot competency*: Certification is evidence of competency – in this context pilots must hold a current Agricultural Rating which demonstrates the pilot's competency to manage flight operations associated with applying all agricultural products. A pilot must also have a Pilot Chemical Rating to apply agrichemicals and VTA's.

- *Safety management system (SMS):* The organisation (business) is required to run a safety management system. Accreditation is the reward the organisation gets for being able to demonstrate that the organisation has competent people – pilots and ground crew, operating using a robust and active safety management system. It is the organisation that is accredited – not the pilots.

- *Third Party audit:* An aerial organisation can attain AIRCARE™ Accreditation only by satisfying an independent third party audit of the SMS and compliance with the relevant Codes of Practice for the operation.

SMS is the way in which the entire organisation is run. In this context the focus is on those activities that have a direct bearing on environmental sustainability. The SMS audit has four main requirements:

- A quality assurance process
- A procedure to identify hazards
- A procedure to place controls on the hazards
- A procedure to measure the effectiveness of those controls i.e. Quality assurance and Risk Management.

The Safety Management System (SMS) is the management system operators utilise to manage their compliance with both the CAA Rules and the AIRCARE™ codes of practice.

3. Legislative context for environmental management in rural and agricultural aviation

There are a number of pieces of legislation that interface with agricultural aviation and environmental issues. These include:

- Resource Management Act 1991 (RMA)
- Hazardous Substances and New Organisms Act 1996 (HSNO)
- Agricultural Compounds and Veterinary Medicines Act 1997 (AVCM)
- Health and Safety in Employment Act 1992 (HSE)

While the RMA is the main piece of legislation in respect of environmental matters, particularly discharges, both ACVM and HSNO are important as they have a role in managing the substances that agricultural aviation discharges. Both HSNO and ACVM can apply conditions or controls relating to the use of agrichemicals, fertilisers and VTA's. Therefore pilots and operators have a range of requirements to meet. There is the potential for duplication of requirements, thereby increasing complexity and compliance costs. Alignment of controls and conditions to ensure that matters are managed through one control has advantages to the industry.

The Health and Safety in Employment Act is included in this section as it relates to the safety of people – which is also an RMA matter. In the aviation context the HSE Act is also included as part of the flight safety requirements.

The following sections describe relevant aspects of the legislation to identify the areas of interface and alignment. Sections 6-8 of this Guidance Note on the specific substances address the issues pertaining to those substances.

3.1 Resource Management Act 1991 (RMA)

Purpose: To promote sustainable management of natural and physical resources.

Relevant sections of the RMA are:

- s2 Interpretation
- s15 discharge of contaminants
- s16 duty to avoid unreasonable noise
- s30 Functions of regional councils under this Act
- s31 Functions of territorial authorities under this Act
- s32 Duties to consider alternatives, assess benefits and costs

Both regional councils (s30 of the RMA) and territorial authorities (s31 of the RMA) have responsibilities for managing effects of activities under the RMA.

Section 15 of the RMA sets out requirements for discharges of contaminants to the environment, which include agrichemicals, fertilisers and vertebrate toxic agents (VTA's) discharged to air, onto or into land where it may enter water or direct to water. These substances are classed as contaminants under the RMA. Resource consent is required unless a discharge into water or onto land where it may enter water is provided for in a regional plan. Regional plans often include permitted activity rules to enable such discharges, subject to conditions, for both ground based and aerial application.

Under s30 of the RMA regional council functions include the control of discharge of contaminants into or onto land, air or water and the control of the use of land for the purpose of maintaining and enhancing the quality of water. In the context of agricultural aviation control of the use of land may relate to loading and mixing sites.

Under s31 of the RMA territorial authorities (TA's) are responsible for managing effects of land use activities and amenity values. In this case the amenity value of interest is noise. It is noted that the TA's only control aircraft noise while the aircraft is on the ground so the relevant matters are airstrips, and landing areas. Some TA's seek to include rules to manage effects of the land use associated with rural aviation, as a means to manage the noise associated with the activity.

Regional councils (s30) and territorial authorities (s31) both have responsibilities for preventing or mitigating the adverse effects of the storage, use, disposal or transportation of hazardous substances. The territorial authority has the primary responsibility unless the RPS specifies otherwise (Section 62 (1) i)).

3.2 Hazardous Substances and New Organisms Act 1996 (HSNO)

The Hazardous Substances and New Organisms Act (HSNO) was enacted in 1996 and the hazardous substances related provisions of the Act came into force on 2 July 2001.

Purpose: To protect the environment, health and safety of people and communities by preventing or managing the adverse effects of hazardous substances and new organisms.

The definition of hazardous substance is any substance with one or more of the following intrinsic properties:

- Explosiveness
- Flammability
- Capacity to oxidise
- Corrosiveness
- Toxicity
- Ecotoxicity.

All hazardous substances are assessed to determine hazard classifications and controls.

A HSNO assessment has two key steps:

- Hazard classifications are given to a hazardous substance. The hazard classification is based on Hazardous Substances Minimum Degrees of Hazard Regulations 2001 and (Classification) Regulations 2001.
- Controls are then placed on the substance depending on the hazard classification. Such controls may include requirements for identification, emergency management, disposal, tracking and the competency of users (approved handler).

The hazard classifications are divided into physical and biological classes. (Table F 3.1 and F3.2, Technical Information).

Physical hazard classes are:

- Flammability (Classes 2, 3, 4)
- Capacity to oxidise (Class 5)

For substances with physical hazard classification(s) there are provisions for controls on storage (location test certificates) and competency of persons in possession of the substance (Approved Handler).

Biological hazard classes are:

- Toxicity (Class 6)
- Corrosiveness (Class 8)
- Ecotoxicity (Class 9)

The HSNO legislation includes a number of regulations, which set out the detailed requirements and provide tables showing threshold values for volumes or weights of hazardous substances beyond which the controls apply. HSNO Controls are rules put in place to prevent or manage the adverse effects of hazardous substances. A summary of the controls that may be required for a hazardous substance are listed in Table 3.1 below.

Under the HSNO regulations there is provision for group standards approvals for a group of hazardous substances of a similar nature, type or use. A group standard sets out conditions that enable a group of hazardous substances to be managed safely. Most domestic and workplace chemicals (except for pesticides, veterinary medicines, timber treatment chemicals and vertebrate toxic agents) are approved under group standards. There are specific group standards for fertilisers and for agricultural compounds, which set out nationally consistent conditions under which these hazardous substances can be managed safely.

3.2.1 HSNO interface with RMA

Councils need to consider the role of HSNO when examining how hazards relating to land use and hazardous substances are to be dealt with in their district plans. Sections 30 and 31 of the RMA need to be read together with section 142 of the HSNO Act. Section 142 of HSNO provides that RMA instruments can only include more stringent requirements than HSNO when they are considered 'necessary' for the purposes of the RMA. Where the HSNO requirements are sufficient to meet the purposes of the RMA that test will not be met. Any RMA controls must also be justified in terms of a section 32 evaluation under the Act.

For more information on the interface between the HSNO Act and the RMA see http://www.qualityplanning.org.nz/index.php/planning-tools/10-useful-links/452-managing-hazardard-substances

Table 3.1 HSNO Controls

HSNO Control	Explanation
Approved handler (AH)	Depending on the degree of hazard users may need to show that they are competent to handle and use the substance, by being an approved handler as described by the HSNO Personnel Qualifications Regulations.
Disposal	Disposing of unwanted substances poses a risk to the environment. The HSNO Disposal Regulations require that the substance must either be treated so that it is no longer hazardous or discharged within set environmental concentration limits.
Documentation (information about the substance)	The HSNO Identification Regulations set out the information that must be available for any hazardous substance. The information ranges from a description of the substance and the types of hazard it has, to steps that can be taken to prevent harm.
Emergency Management	HSNO Emergency Management Regulations have three levels of emergency management depending on the amount of substance and the hazard classifications of each substance.
Emergency Response Plans	If the quantity stored triggers Emergency Response Level 3 then an Emergency Response Plan must be developed. This plan sets out what actions need to be taken in an emergency, who is responsible for actions needed, and what information and equipment these people will need.
Equipment to use	The HSNO Personnel Qualification Regulations describe the qualifications relating to being an approved handler. An approved handler must know about the operating equipment used to apply the hazardous substance. This includes personal protective equipment.
Location Test Certificate	If the substance has a hazard classification of 2, 3, 4 or 5 and the amount stored is greater than the quantity given in the HSNO (Controls 1-5) Regulations then the site will need a Location Test Certificate (LTC) which can be obtained through a Test Certifier who is able to issue LTC's. A site visit will be necessary.
Priority identifier	A priority identifier is part of the HSNO Identification Regulations. For any hazardous substance there must be some words or pictures (pictograms) on the label that tells what the main hazard is with that substance. This is a priority identifier and the information must be able to be located within 2 seconds.
Record keeping (Documentation after use)	A record of an application must be kept if specified in the HSNO Classes (6, 8 and 9) Control Regulations. This will depend on the hazard classification of the substance, if it is applied in a place where the public may be present, or if it may move off the application site through the air or water. This is not the same as tracking (see below).
Secondary identifier	The secondary identifier is information that must be available to any person handling the substance within ten seconds, and primarily consists of an indication of the degree of hazard and other risks associated with the substance, together with information on how to prevent and manage those risks. Normally it is in the form of hazard, warning or precautionary statements, and/or risk phrases.
Signage in the workplace	Where the amount of hazardous substance held exceeds set trigger levels then there must be signage that says what the substance is, what the hazard is and what action is needed in an emergency.
Secondary containment	Secondary containment is needed when the amounts stored exceed certain thresholds. A concrete or other impervious bunding around the edge of the storage area a common method used to provide secondary containment.
Tracking	The more highly hazardous substances are required to be tracked. Under the HSNO Tracking Regulations the location and movement of tracked substances must be recorded through every stage of its lifecycle (transport, storage, use, and disposal). Tracked substances require an approved handler.

3.3 The Agricultural Compounds and Veterinary Medicines Act 1997 (ACVM)

Purpose: The ACVM Act requires registration of products to ensure that they meet certain standards and do not pose unacceptable risks to:

- trade in primary produce;
- animal welfare;
- agricultural security; and
- public health.

Registration is also to ensure that the use of products does not breach domestic food residue standards and that sufficient consumer information is provided on the label so the product can be used safely.

Agrichemicals, vertebrate toxic agents and fertilisers are substances that need to registered under the ACVM Act, unless exemptions apply. Section 5 of the ACVM Act species requirements whereby Agricultural compounds are exempt from registration if conditions are met. Most fertiliser products are exempt from registration.

As part of the registration process conditions may be imposed to manage or reduce the risks specified in the ACVM Act with the product label specifying any prohibition, obligation or requirement on users as a condition of the registration. Such information may include such things as withholding periods for a substance.

If the product is used outside of the conditions on the label, the user is liable and responsible for all actions taken, and any consequences, provided certain conditions are met. Following label directions will help ensure safe and responsible use of the product, including not exceeding any Maximum Residue Limit (MRL) set.

NOTE: Under the HSNO Act, there are also labelling requirements include priority and secondary identifiers relating to the hazard of the substance.

The ACVM Act is administered by Ministry for Primary Industries (MPI)
http://www.foodsafety.govt.nz/industry/acvm/

3.3.1 ACVM interface with the RMA and HSNO

The ACVM Act is the means by which the information on a product label is determined. This information establishes the framework within which a substance can be used. The HSNO Act also has labelling requirements, include priority and secondary identifiers, as a result of assessment of the hazards associated with the substance. Therefore the label information provides the necessary information for a substance to be used safely and is required to be adhered to. Providing this information is adhered to, the risks associated with the use of the substance should be adequately managed. Currently many RMA plans require that manufacturer's recommendations are complied with as a means of avoiding, remedying or mitigating adverse effects. The manufacturer's recommendations are based on the regulatory body requirements for the label. As the label requirements are determined by the regulatory body, not the manufacturer, it would be more accurate for plans to require that the label requirements are complied with, rather than the manufacturer's recommendations.

3.4 The Health and Safety in Employment Act 1992 (HSE)

Purpose: To prevent harm to people at work, or in the vicinity of work.

The HSE Act promotes the prevention of *harm* to all people at work and other people in or around a place of work. The starting point for the HSE Act is the identification of hazards. The hazards then need to be assessed so that *significant hazards* can be identified and procedures (controls) developed to manage those hazards.

3.4.1 HSE interface with RMA, HSNO and ACVM

The HSE Act seeks to ensure the safety of people and places and responsibilities of the person in charge, the landowners or manager, employees, contractors and visitors in terms of managing potential hazards. The RMA also seeks to ensure the safety and wellbeing of people. The use of machinery and the products applied in agricultural aviation present potential hazards so an aerial operator has to have adequate safety systems in place. There should be no requirement for safety matters to be duplicated in regional or district plans.

3.5 Summary

While the focus is on the RMA and how agricultural aviation is managed through regional and district plans it is important to understand the interaction between the various pieces of legislation to ensure that unnecessary duplication is avoided.

Essentially the roles can be described as:

- The RMA identifies and manages *risks* to the environment associated with the discharge of the substances (contaminants) through rules and conditions in plans.
- ACVM and HSNO identify the *hazards* (and degree of hazard) associated with a substance and place conditions or controls to reduce *exposure,* and hence to reduce *risk*;
- HSE manages the *exposure* of people to identified *hazards* to reduce *risk*;

The interaction between *risk, exposure* and *hazard* is developed in the risk management section of this Guidance Note.

RMA plans can use conditions and controls from HSNO, ACVM and HSE as tools to assist in managing the risks to the environment. For instance:

- HSNO controls and classifications can inform storage and management of substances, such as group standards for fertiliser;
- Label requirements set by ACVM and HSNO form the basis of how a substance should be used and managed;
- NZS8409:2004 Management of Agrichemicals is an approved Code of Practice under HSNO that is also relevant to management of agrichemicals under the RMA:
- Controls on use of VTA's through HSNO requirements cover the issues that a council would need to address in terms of VTA discharges.

Where an appropriate framework exists under other legislation it is not necessary for RMA policies and plans or conditions of consent to duplicate other regulatory requirements, but rather draw from them to assist in implementation to meet RMA requirements.

4. Resource Management and agricultural aviation

This section will address:

- The interface between agricultural aviation activities and RMA outcomes
- Potential adverse effects arising from agricultural aviation activities
- RMA issues for agricultural aviation
- Methods to address identified issues

4.1 Interface between agricultural aviation activities and RMA outcomes

On face value it could seem that the outcomes sought by agricultural aviation operators and councils implementing the RMA would be very different. But in fact there is considerable similarity in the outcomes sought, though they may be expressed in different ways.

For an aerial agricultural operator the key to a successful application is dependent on accuracy:

- right product
- at the right rate
- in the right place
- at the right time.

Councils seek outcomes that:

- ensure that adverse effects are avoided, remedied or mitigated, and in particular that there are no adverse effects from off target drift
- products are applied in a safe manner

Therefore there is similarity between what both the councils and the operator are seeking to achieve. The challenge is to how to write plan provisions that adequately provide for such outcomes.

It is important to recognise that there are many variables that can affect an agricultural aviation operation. Many of the relevant parameters affecting the potential environmental impact are variable in both:

- over time at any one place; eg weather conditions, and
- at the same time in different places– e.g. wind speed, wind direction, temperature, target plants, surrounding location.

That is: no two situations will be the same. An operator has to assess a range of factors to ensure that the outcomes sought are achieved.

The fact that no two situations are the same presents a challenge for councils in writing plan provisions to fit all situations for an activity which has a range of variables, and yet achieve the outcomes sought.

The visibility of an aircraft and the height and speed at which a discharge is made can lead to the perception that the degree of risk is great and therefore the activity should be highly regulated.

However, to assist in achieving accuracy and to manage risks agricultural aerial operators use a range of tools and methods such as GPS, calibration, nozzle selection, pattern testing to certify equipment swath width and spreading evenness. The assessment of a specific situation will determine which tools an operator uses to address the risks that the situation presents.

A risk assessment/management approach by the party carrying out the operation – in this case the aerial operator - is an effective approach because it deals with specific situations and decisions made to address the risks and potential adverse effects of that situation and to achieve the outcomes sought.

4.2 Potential adverse effects arising from agricultural aviation activities

The focus of the RMA is on managing the effects of the activity, rather than the activity per se. In terms of discharges of agrichemicals, fertilisers or baits the potential adverse effects that need to be managed include:

- Health effects
- Contamination of crops and plants
- Contamination of domestic or commercial water supplies
- Contamination of indigenous flora and fauna, habitat areas and reserves
- Contamination of wetlands, surface water body and coastal and marine environments
- Contamination of groundwater
- Contamination of soils/ land
- Amenity values where it creates an offensive and/or objectionable effect.

The degree of potential effects is an important factor in considering controls in a Regional or District Plan. While agrichemicals, fertilisers and baits can all have adverse effects the nature of the potential effects varies because of the different nature of the substances and the receiving environment. For instance agrichemicals are designed to control pests – such as plant pests, while fertilisers are designed to assist plant growth. Both products have the potential to drift off target but the consequences of such drift are significantly different. For instance agrichemicals are likely to damage a non-target crop but fertilisers are unlikely to cause such damage. Off target drift onto an organic property of substances could affect the organic registration of the property.

The two pathways by which adverse effects may occur as a result of aerial applications are:

- direct application; or
- indirect – that is off-target drift of the substance being used.

An applicator is seeking to place the product at the correct rate on the target crop or site so direct application should not arise. The most likely cause of adverse effects is from off target drift. Therefore there needs to be a focus on ways to minimise the risk of off target drift, and hence the potential for adverse effects from off target drift.

The substance specific sections below address the potential adverse effects in respect of fertilisers, agrichemicals and VTA's

4.3 RMA Issues related to agricultural aviation

There are a number of resource management issues related to agricultural aviation that councils need to consider and provide for in regional and district plans.
Key issues include:

- Potential for adverse effects from off target drift
- Potential for adverse effects from discharges into water bodies
- The need for advice and information about discharges
- Potential for reverse sensitivity effects
- Noise

4.3.1 Potential for adverse effects from off target drift

Off-target drift is where the substance being applied ends up in a place other than the target. It can occur in both fertiliser and agrichemical applications. The potential for off-target drift is less for VTA's because of the physical properties of the substance being applied (large particle size and predictable trajectory from the point of release).

Off-target drift is a direct resource management issue because of the potential adverse effects that may arise as a result of the off-target drift, particularly in sensitive areas where people and non-target property are exposed to the discharge. Sections 6.5 (fertiliser), Table 7.1 (agrichemicals) and Table 8.3 (VTA) provide more details on the potential adverse effects from off-target drift of the specific substances.

Off-target drift is also a major source of complaints that arise from aerial applications. Therefore it is appropriate for councils to identify potential off target drift as an issue and include methods to manage such potential.

Determining how off target drift occurs is not a simple matter as there are a range of variables which all contribute, to a greater or lesser extent, depending on the circumstances.

The five groups of important variables are:

- Material (e.g. formulation or product type)
- Physical Characteristics (e.g. droplet size or particle size)
- Release position (i.e. height above the ground /target)
- Interception (by the target)
- Meteorology (wind speed and direction)

These variables are either:

- pre-determined - factors that do not change once the application has begun e.g. spray nozzle type and hence droplet size; or
- "real time" - factors e.g wind speed.

The distinction between pre-determined and real time factors is important because the most significant factor in an adverse event from spray drift is almost always wind direction – a real time factor. Further information on off-target drift is included in the Technical Information and specific management measures are included in the substance specific sections for agrichemicals, fertilisers and VTA's.

4.3.2 Potential for adverse effects from discharges into water bodies

Discharges in proximity to water bodies are a resource management issue as such discharges have the potential to have adverse effects both on the water body (its ecosystem) and uses of the water, such as drinking water supplies or water for irrigation. Such discharges could be either direct or indirect through off-target drift. Clear identification of the water bodies is a critical part of ensuring that measures are taken to avoid discharges to the water. Some plans include specified setback distances as a means to manage the potential for adverse effects on water bodies. But the setback distance that may need to be applied will vary according to the circumstances of the individual situation. Therefore the issue and methods to manage are key resource management matters. Other activities associated with aerial applications, such as loading and mixing sites need to be located to avoid potential adverse effects on water bodies. There are management measures that can be used that address the potential for such effects.

4.3.3 The need for information and advice about discharges

People who may be adversely affected by an aerial application of a substance often want to have information beforehand that a discharge is to occur and the nature of the discharge. How and when this advice is provided is a resource management issue that should be addressed to ensure that advice is timely and appropriate. Notification, or lack of it, is often raised in complaints relating to discharges. However providing information and advice raises a range of issues relating to methods, obligations and responsibilities, particularly for aerial operators.

For agricultural aviation operators notification is an issue because they fly onto a property to complete a task but do not interface with the neighbours or surrounding land owners. Yet in the event of a complaint it is usually the aviation company that is identified. Therefore obtaining clarity and certainty regarding obligations and responsibilities for notification is an important matter to be resolved. These include who will undertake the notification, what form it should be in and what timeframe is required.

4.3.4 Potential for reverse sensitivity effects

Reverse sensitivity is relevant to a number of resource management activities. In respect of agricultural aviation it is usually where a complaint is made about an application because a discharge is being undertaken, even if there is no adverse effect from the activity. That is: the 'perception' may not be the reality of the situation. Reverse sensitivity is particularly evident in peri-urban locations or where there are 'lifestylers' living who may not appreciate the importance of applying substances by air or the measures that are taken to avoid, remedy or mitigate adverse effects. Reverse sensitivity can also occur between primary production activities, where one activity is sensitive to the substances being applied e.g vineyards amongst pastoral land uses or organic properties. The resource management issue to be addressed is the compatibility of activities and how council seek to reduce the potential for reverse sensitivity complaints.

4.3.5 Noise

The main area of potential adverse effect on amenity is from the aircraft noise, which, in the rural area, is generally a reverse sensitivity issue. That is: there can be objection to the noise of the aircraft operating in the area. The RMA does not control noise of aircraft in the air, nor does CAA.

Noise from the aircraft is included as a resource management issue because of the links to reverse sensitivity and the potential for complaints.

4.4 Methods to address identified issues

Provisions are also needed for the direct application of aquatic herbicides to water as aerial application is a mechanism used to control weed and pests in water bodies. Clearly set criteria can be established to ensure that the application is safe and will not result in adverse effects.

The potential for adverse effects from aerial application of agrichemicals, fertilisers and baits can be managed through permitted activity conditions in rules. The approach that is proposed in this guidance note is to assess the potential risk and adopt actions to minimise such risks.

The methods or management options to address potential adverse effects are outlined in the substance specific sections as they vary according to the nature of the substance and application situations.

4.5 Considerations in writing plan provisions to achieved desired outcomes

Writing plan provisions for agricultural aviation is complex as there are multiple variables that need to be considered for any application of agrichemicals, fertilisers or baits. Yet while there are multiple variables a Plan should be simple. So there is an inherent tension about how to develop simple provisions for a complex matter.

In writing plan provisions to address the identified resource management issues there are a number of factors to consider.

- The provisions should recognise the multiple variables involved in an aerial application.
- Controls should be based on risk assessment and outcomes sought.
- Duplication from other legislation should be avoided such as HSNO, ACVM, and HSE.
- If possible there should be alignment or consistency across regions to assist where pilots operate in a number of regions.
- There should be recognition of the positive effects of agricultural aviation – e.g. pest control, increased or improved production TB control – public health benefit
- Management controls should be achievable and verifiable.
- Use of industry best management practices is an appropriate mechanism to use.
- Provisions should provide the flexibility to adjust and use best practice according to the circumstances of the situation.

5. A risk management approach to writing plan provisions in agricultural aviation

5.1 Rationale for a risk management approach

Agricultural aircraft operate in an environment where many of the relevant parameters are variable over time and from place to place – e.g. wind speed, wind direction, temperature, location of the application target, the coverage required, and surrounding location. Therefore it is a challenge to write plan provisions that will fit all situations.

Traditionally the approach has been to prescribe limits or specifications including state how the task or operation should be carried out. Such an approach assumes that the prescribers know what to prescribe and that compliance will achieve the required outcome often resulting in a complex suite of requirements to catch all possibilities, which may not actually adequately address the actual situation.

The approach provided in this Guidance Note seeks to address all potential circumstances using a risk assessment/management approach which requires performance standards or outcomes to be achieved e.g. ... "no fertiliser directly into water.." or "no significant adverse effects beyond the boundary or target area".

Rules and conditions written using a risk management approach require the person responsible for the discharge to assess the situation and circumstances and adopt appropriate procedures to ensure that the plan objectives are met.

A risk management approach requires a pilot to:

- Undertake a risk assessment which takes into account the actual (real time) situation
- Choose actions to address the identified risks
- Follow best practice AND be able to verify that.

A pilot must also:

- Accept the responsibility for the outcome
- Take all practicable steps to minimise the risk
- Show how it was achieved (if called upon to do so):
    - What discharges occurred?
    - Where did the discharge go? (a/c or ground-spray tracks)
    - What were the (weather) conditions at the place and time of application?

The methods adopted and the verification evidence must "reflect the risk". In a high risk situation the level of care and due diligence demands greater rigour. A risk management approach is the most effective way to deliver on the objective.

A supplement to this Guidance Note: Technical information to support the guidance note contains the relevant technical information needed so that the pilot can manage any risk as well as satisfying the task verification requirements by any authorised third party to show that the aerial application task was carried out according to best practice.

The risk management approach is used in the three substance specific sections (6, 7 and 8) which address fertiliser, agrichemical and VTA applications, and sets out risk assessment and management options for each substance. Section 9 deals with amenity values (noise abatement) an issue which includes but is not confined to discharge of specific substances or agricultural aviation.

5.2 Risk management described

The risk assessment/risk management approach is based on the relationship between hazard and exposure.

Hazard x Exposure = Risk (level)

Hazard	=	Something that could present a risk – a potential adverse effect
Exposure	=	The extent to which you are exposed to the hazard
Risk	=	The combination of the nature of the hazard and level of exposure leads to the degree of risk.

Reducing the risk results from:

- identifying the hazard
- then eliminating it; or
- isolating it; or
- reducing any exposure to it.

Table 5.1 A risk-management approach in action

Question	How these can be described
What could be the adverse effect?	Potential adverse effects
What are the possible reasons for the adverse effect?	Risk factor
How could it occur?	Exposure pathway
How can the potential effect be managed?	Management options

5.2.1 Potential adverse effects

Potential adverse effects arising from agricultural aviation activities are identified in 4.2 above. Differing application practices can lead to various adverse effects occurring.

An analysis of the potential adverse effects shows that the greatest potential exists where the area likely to be contaminated is close or adjacent to the application site, regardless of the method of application or who is doing the application.

5.2.2 Possible reasons for the adverse effect - risk factors

The reason for the potential adverse effect, i.e. why did the problem occur is called the risk factor. In seeking to avoid or minimise adverse effects the risk factors need to be addressed. The extent to which a risk factor applies varies according to the nature of the receiving environment and the potential adverse effect. For instance:

- The chemical being used, and exposure pathway
- The concentration and rate of application of the substance
- The timing of the application

- The proximity of people – timing and location
- The location of the application and use, including mixing sites
- On site weather conditions unsuitable for the task
- Substance characteristics e.g. particle size or ballistic properties
- Inadequate target identification
- The permeability of the soil

5.2.3 How can it occur? – Exposure pathways

The exposure pathways can be either direct or indirect:

- Indirect – off target drift, leaching, overland flow
- Direct – application on subject areas, point source discharges (e.g. spillages).

5.2.4 How can the potential effect be managed? – Management Options

Section 6, 7 and 8 of this Guidance Note are substance specific sections on aerial application of fertilisers, agrichemicals and VTA's and set out a risk management approach. The management options are included in the table in each section and summarises the various methods available to the operator to deal with the risks associated with the specific potential adverse effects identified.

A risk based approach would ensure that the management controls be clearly linked to addressing these risk factors. The discussion on off target drift hazard expands on this.

5.3 Simple risk matrix

A simple risk matrix such as set out below brings together the likelihood of an adverse effect with the potential impact of that adverse effect. A more detailed matrix has been developed, the AIRCARE™ Risk Matrix, which pilots can use to assess the situation, which is the first stage of a risk assessment of the specific situation.

Table 5.2

Potential impact (of an adverse effect)	Likelihood (of an adverse effect occurring)		
	High	Medium	Low
High			
Medium			
Low			

The colours indicate the degree of risk. An assessment would then indicate the level of potential adverse effects and the likelihood of that occurring. Management options would be selected to reflect the degree of risk, which may include not proceeding at that point in time.

6. Aerial application of fertilisers

This section includes:

- A description of fertilisers including definition
- Relevant legislation - RMA HSNO and ACVM
- Aerial application of fertilisers including best practice
- Risk factors of aerial application of fertilisers
- Exposure pathways and management options
- Possible plan provisions for aerial discharges of fertiliser

6.1 Fertilisers

Fertilisers are substances that are applied to land to improve the productivity of plants for primary production, which includes pastoral farming (sheep, beef, deer, dairy) horticulture, viticulture, and forestry. They are critical to the success of primary production and so contribute to GDP and the economic wellbeing of the community. Fertilisers are also used on sports fields and golf courses. About 600,000 tonnes fertiliser is applied by air annually in New Zealand, both by fixed wing aircraft and helicopters. When applied these substances are classed under the RMA as a discharge of contaminants to air, land or water.

There are a wide range of fertilisers used for different purposes, in both solid and liquid forms. However the most common are superphosphate – (P) and nitrogen based fertilisers (N). Essential nutrients to retain soil balance, such as potassium and sulphur, magnesium and cobalt, are also applied as fertilisers or added to fertiliser mixes.

Agricultural lime is applied particularly to condition soil to change the pH of the soil. It is made from digging out limestone rock and grinding it to small particles to make it more suitable for application, and also to increase the response through the greater surface area to volume ratio achieved with smaller particles.

6.1.1 Definition of fertiliser

The ACVM Regulations define fertiliser as:

(a) means a substance or biological compound or mix of substances or biological compounds that is described as, or held out to be for, or suitable for, sustaining or increasing the growth, productivity, or quality of plants or, indirectly, animals through the application to plants or soil of—

(i) nitrogen, phosphorus, potassium, sulphur, magnesium, calcium, chlorine, and sodium as major nutrients; or

(ii) manganese, iron, zinc, copper, boron, cobalt, molybdenum, iodine, and selenium as minor nutrients; or

(iii) fertiliser additives; and

(b) includes non-nutrient attributes of the materials used in fertiliser; but

(c) does not include substances that are plant growth regulators that modify the physiological functions of plants.

The HSNO Group Standards define fertiliser as:

a) means any material (whether in solid or liquid form) which is described as, or held out to be for, or suitable for, sustaining or increasing the growth, productivity, or quality of plants or, animals through the application of the following essential nutrients to plants or soil:—

(i) nitrogen, phosphorus, potassium, sulphur, magnesium, calcium, chlorine, and sodium as major nutrients; or

(ii) manganese, iron, zinc, copper, boron, cobalt, molybdenum, iodine, and selenium as minor nutrients; or
(iii) additives; and

(b) any other product which is considered to meet identified soil or plant nutrient deficiencies and is applied with this as the principal objective and
(c) the material shall be free from pathogens or any other agents which could affect disease and pest transmission.

Other definitions

The Fertiliser Association has a slightly wider definition of fertiliser in the Code of Practice for Nutrient Management: http://www.fertiliser.org.nz/Site/code_of_practice/default.aspx

.."any substance (whether solid or fluid in form) which is described as or held out to be for, or suitable for, sustaining or increasing the growth, productivity, or quality of plants or animals through the application of essential nutrients to plants or soils".

A number of regional plans have a definition for fertiliser based on this definition, but they may exclude certain substances, such as soil conditioners (e.g. agricultural lime).

6.2 Legislation

There are three main pieces of legislation relating to the application of fertiliser:

- Agricultural and Veterinary Medicines Act 1997 (ACVM).
- Hazardous Substances and New Organisms 1996 (HSNO)
- Resource Management Act 1991 (RMA)

The various Acts are described in Section 3 of this Guidance Note. For planners the main legislation is RMA in terms of land use and discharges but consideration needs to be given to HSNO particularly in terms of storage of fertilisers and the Group Standards for fertilisers. ACVM is relevant for defining fertiliser.

6.2.1 RMA

While not specifically mentioned or provided for in the RMA, fertilisers are also managed under the RMA as they are classed as contaminants which are discharged to air, onto or into land and/or water. The requirements of the Act are that discharge of contaminants must be provided for in a regional plan or resource consent is required. Therefore regional plans need to provide for such discharges. The application of fertiliser, including aerial applications, is generally provided for in Regional Plans as a permitted activity, subject to conditions.

District Plans have responsibility for land use including controls for hazardous substances. As some fertilisers are hazardous substances the district plan should address how such matters as storage are to be managed. The HSNO regulations are relevant in this regard.

6.2.2 HSNO

Most (but not all) fertilisers are classed as hazardous substances so HSNO controls will apply, mainly through the subsidiary hazard group standard, in which case any controls applied under the HSNO regulations must be complied with. The controls may relate to any stage of the life cycle of the substance including manufacturing, transport, storage, use or disposal.

Fertiliser group standards apply under the HSNO regulations and sets out conditions that enable a group of hazardous substances to be managed safely.

There are four fertiliser group standards:

- Corrosive
- Oxidising
- Subsidiary hazard
- Toxic

6.3 Aerial Application

Superphosphate (P) is typically applied by air at rates of between 100 and 300kg/ha over complex topography where no other application methods are viable. P fertilisers tend to be of variable quality in terms of particle size and size range. Nitrogen based fertilisers (and other high analysis fertilisers) tend to be applied over more productive, and hence more uniform, land, both pasture and cropping, and usually are more uniform and consistent in terms of particle size.

Maximising the productivity gains from fertiliser application requires evenness of application across the target area. With aerial application of fertiliser the achievement of even application within the target area has an impact on the precision of application, i.e. the requirement to confine the fertiliser to the target area. The systems, equipment and techniques required to consistently and reliably achieve even application also enable requirements to confine fertiliser to the target to be met.

6.3.1 Best practice for fertiliser application

There are a number of publications setting out best practice for fertiliser application including:

- Safety Guideline: Farm Airstrips and associated fertiliser cartage, storage and application
  http://www.caa.govt.nz/HSE-CAA/HSE_Info.htm#Ag

- Code of Practice for Nutrient Management (COPNM)
  http://www.fertiliser.org.nz/Site/code_of_practice/default.aspx

- Fertmark Code of Practice
  http://www.fertqual.co.nz/files/downloads/fertmarkcodeofpractice.pdf

- The Aerial Spreadmark Code of Practice
  Aerial Spreadmark Code Part A http://www.fertqual.co.nz/download.php?view.5
  Aerial Spreadmark Part B http://www.fertqual.co.nz/download.php?view.6

Part A deals with Spreadmark protocols and procedures.
Part B is the Aerial Spreadmark Code of Practice which includes risk management.

Spreadmark is the performance standard for placement of fertiliser that applies to any aerial application of fertiliser and sets out the requirements for aerial operators. This is one of the Codes of Practice that forms part of the AIRCARE™ Accreditation programme and which operators are audited against.

Fertmark is a fertiliser quality assurance scheme managed by the Fertiliser Quality Council and was originally formed to ensure farmers could be confident in purchasing quality fertiliser and having it accurately spread.

The Fertmark brand means that fertiliser has been independently audited to ensure that the declared chemical composition for major nutrient elements (N, P, K, S, Mg, Ca, Na, Cl) and micronutrient elements (B, Co, Cu, Fe, Mn, Mo, Zn and Se) are according to claims on the label.

The Fertmark auditing only addresses chemical properties of the product. Currently it does not extend to physical properties such as particle size or size range for fertilisers.

6.4 Risk factors of aerial application of fertilisers

Key risk factors for aerial application of fertiliser are:

- Particle size – fertiliser physical properties
- Wind speed
- Verification of application

6.4.1 Particle size – fertiliser quality (Physical properties)

Not all fertiliser has the same physical characteristics. The particle size of fertilisers varies, which directly affects the ballistic property of the substance and how it falls when discharged. The coarser the particle size means that the product trajectory will be more predictable than products with a smaller particle size which present a greater likelihood of drift and dust.

6.4.2 Wind speed and wind direction

Wind speed at the time of application influences how far the fertiliser will travel from the point of release. At a given wind speed small particles will move downwind more than large particles. Wind direction determines the direction in which the fertiliser particles will travel. This needs to be factored in by the pilot, along with the product quality, to determine flight paths, and avoidance of sensitive areas ensuring that the product is applied to the target area.

6.4.3 Verification of application

An operator can verify the track flown and where they have discharged fertiliser but to accurately verify where the product has landed requires information on wind speed (which influences how far the product will go from the track flown) and wind direction which determines the direction the fertiliser particles will travel from the point of release.

6.5 Potential adverse effects from aerial discharge of fertiliser

There are a number of potential adverse effects that could arise from the aerial application of fertiliser, which are set out in the following table. The nature of potential adverse effects is largely influenced by differing application practices and potential for off target drift. Aspects of application that could lead to the various adverse effects occurring include:

- The fertiliser being used (physical properties)
- The timing of the application
- Weather conditions
- Target identification
- The permeability of the soil

The following table sets out a risk management approach for use of fertiliser including:

- The potential adverse effects

- The risk factors – that is the reason for the potential adverse effect, i.e. why did the problem occur
- Exposure pathways
- Pilot Management options
- Options for plan provisions.

The extent to which a risk factor applies and management options need to be considered varies according to the nature of the receiving environment and the potential adverse effect.

Table 6.1 Risk management approach for fertiliser use

Potential adverse effects	Risk factor	Exposure pathway	Pilot Management options	Options for plan provisions *Refer to draft rule at end of section*
Health effects – caused or possible - Allergic reactions - Irritations - Toxic poisoning	Hazard class of chemical (substance) being used and exposure to it (Class 6 and 9)	Indirect – off target drift or dust Direct – applications to non-target area Through handling and loading	Indirect: - Minimising potential for drift – technical options (Refer Technical Information*) Direct - PPE Management of loading and handling operations	Require operator risk assessment to ensure use of appropriate technical options Classify dwellings, educational facilities and public places as public places as *sensitive areas* (drift hazard of fines)
Contamination of crops and plants including sensitive crops and organically farmed properties. Effects include: - Growth and quality of the crop; or - Threatens organic registration	Fertiliser type Excessive residue levels Timing of application Crop stage Application rate – calibration Drift	Indirect Off target drift	Indirect: - Minimising potential for drift – technical options (Refer Technical Information*)	Require operator risk assessment to ensure use of appropriate technical options Classify crops and non-target plants as *sensitive areas*
Contamination of domestic or commercial water supplies where it renders the drinking water non-potable.	Fertiliser hazard and type Hazard classes	Indirect: Off target drift Direct: applications to non-target area	Indirect: - Minimising potential for drift – technical options (Refer Technical Information*)	Require operator risk assessment to ensure use of appropriate technical options Classify water bodies/ drinking water supplies as *sensitive areas* It may be appropriate to include conditions for some applications over or near such areas
Contamination of indigenous flora, fauna, habitat areas and reserves	Ecotoxicity of fertiliser 9.3A and 9.4A	Indirect: Off target drift	Indirect: - Minimising potential for	- Require site identification as part of risk assessment

Potential adverse effects	Risk factor	Exposure pathway	Pilot Management options	Options for plan provisions *Refer to draft rule at end of section*
where the inherent values of these areas are damaged or lost.	Poor/no target identification Fertiliser quality (particle size and stability)	Direct: applications to non-target area	drift – technical options (Refer Technical Information)* - Target site ID (GPS) - Ensure that fertiliser quality is appropriate to minimise potential for drift	- Classify as *sensitive areas* - Controls by hazard classification (eg 9.3 and 9.4)
Contamination of wetlands, surface water bodies, and coastal and marine environments where it causes: - Death of fish or flora and fauna - Water takes affected leading to un-potable water or damage to crops and animals	Fertiliser type and hazard class 9.1A, 9.3A or 9.4A 6.1A, 6.1B, and 6.1C Application rates Location of application and proximity to water take points Inappropriate disposal Poor/no target identification No ID of at-risk water bodies Non-point fertiliser - dust	Indirect: - Applications adjacent to water bodies – off target drift or overland flow - Disposal adjacent to water Direct: - Applications into water - Spillages/ overflows at mixing sites - Disposal to water	Management measures for loading sites Follow label requirements All *reasonable measures* must be taken to avoid discharges to surface water bodies – risk assessment to establish appropriate measures Use of fertiliser with good ballistic properties (particle size).	Require that loading sites in proximity to waterbodies be managed to contain spillages Require operator risk assessment to ensure use of appropriate technical options, including identification of sensitive areas Require that all reasonable measures are taken to avoid discharges to surface water bodies Classify water bodies as *sensitive areas* Require that label requirements are followed
Contamination of groundwater	Concentration of fertiliser and application rates Soil type – highly permeable and fertilisers	Indirect: - Leaching through soil Direct: - Spillages/ overflows at loading sites	Management of loading sites Ensure that client has established appropriate rate, concentration gradient for the soil profile	- Require that loading sites in proximity to wellheads be managed to ensure that spillages are contained

Potential adverse effects	Risk factor	Exposure pathway	Pilot Management options	Options for plan provisions *Refer to draft rule at end of section*
	that are mobile	- Inappropriate disposal Direct and indirect: - Inappropriate disposal of wastes	Methods of disposal	
Contamination of soils/ land	Fertilisers that are or contain substances not mobile in soil Inappropriate application rates Inadequate containment at loading sites	Indirect: - Permeability – water moves nutrients through soil profile but contaminants eg Cd and F remain bound to soil particles Direct: - Frequency and rate of application of fertiliser	Follow use requirements Ensure that client has established appropriate rate, for the soil profile Loading sites, and storage	- Require that use requirements are followed - Ensure management of loading sites to contain spillages.
Amenity values	Proximity of people – timing and location Fertiliser volatility and toxicity class Aircraft operating	Indirect: - Off target drift Direct: - Exposure if public in public areas at time of application Noise: - aircraft and machinery	Minimising potential for drift – technical options*	Classify amenity areas as *sensitive areas* Plan provisions relating to reverse sensitivity in rural areas – including noise and drift to benchmark what is to be reasonably expected in the rural area
All potential adverse effects			Competent to carry out risk assessment for operation.	Require pilot competency through Pilots Agrichemical Rating issued by CAA and the operator to be AIRCARE™ accredited for fertilisers.

* Section 4 pg 87 http://www.fertqual.co.nz/files/downloads/aerialapp02.pdf

6.6 Exposure pathways and management options

The *indirect* exposure pathways for adverse effects from fertiliser use are:
- Off target drift or dust
- Overland flow
- Leaching through soil

The *direct* exposure pathways for adverse effects from fertiliser use are:
- Applications direct to non-target area
- Applications into water
- Frequency and rate of application of fertiliser
- Exposure if public in public areas at time of application

Indirect and direct exposure pathways:
- Disposal adjacent to water
- Inappropriate disposal of wastes
- Spillages/ overflows at loading sites

Noise: - aircraft and machinery

6.6.1 Indirect pathways

Off target drift

Off target drift is where the fertiliser drifts beyond the target area. Such drift may, or may not, lead to adverse effects, depending on the nature of the non-target area. Lime dust on a neighbouring farming property may not be regarded as an adverse effect by the owner, but lime dust on a roof where water is being collected may be regarded as an adverse effect. There are management options that an operator can take to minimise the risk of adverse effects from off-target drift.

Overland flow

Run off water from land on which fertiliser has been applied can flow overland to water bodies in a rainfall event. There is the potential for fertiliser to be moved in the overland flow, ending up in a waterbody. Care should be taken to ensure that fertiliser has time to be absorbed into the soil before heavy rainfall events.

Leaching

Leaching is the movement of a substance through the soil into groundwater. Leaching may only remove mobile components of the fertiliser while some immobile components remain bound to soil particles and accumulate to unacceptable levels. The potential for leaching depends in part on the chemical and physical properties of a product and the permeability of the soil to aid the movement through the soil profile. To reduce the potential for leaching regional plans may have controls on the amount of fertiliser that can be applied (input control) or have limits on the amount of leaching that can occur (output control). The rate of fertiliser being applied needs to take into account any such requirements. While the responsibility for meeting such plan requirements lies with the land owner or manager, a pilot applying product should confirm that the client is aware of any plan requirements in this regard.

6.6.2 Direct pathways

Applications to non-target area including direct applications into water

This is where there is a direct application of fertiliser on a non-target area, such as a non-target crop, water or sensitive area which may result in adverse effects. Such a situation should only arise because due care has not been taken to ensure that the application is only directed at the target area.

A management control is to have a requirement to avoid applications to non-target areas, water bodies or sensitive areas.

Exposure if public in public areas at time of application

Fertiliser applications can occur in public areas – such as farm parks and reserves. There is the risk of direct exposure to the fertiliser being applied and also to the noise of the aircraft and so affecting the amenity value of the area. Care needs to be taken to ensure that public areas are free of people at the time of application.

6.6.3 Indirect and direct exposure pathways

Spillages/ overflows at loading sites

For aerial applications the loading site is the area between the storage area and where the aircraft stops for loading. The Safety Guidelines and the COPNM provide details on the loading http://www.caa.govt.nz/HSE-CAA/HSE_Info.htm#Ag. Care should be taken to ensure that all product is loaded into the aircraft to avoid excess fertiliser in one area. It could lead to contamination of the specific area or lead to leaching into water. If the loading area is near a water body or bore head then extra care is required to ensure that no fertiliser ends up in the water body or bore.

Disposal to water or inappropriate disposal

Inappropriate disposal of surplus fertiliser or waste could lead to product ending up in water bodies or sensitive areas. Care should be taken to ensure that disposal does not lead to such effects. Refer COPNM.

Frequency and rate of application of fertiliser

The frequency and rate of application of fertiliser can affect the potential for adverse effects, particularly soil contamination or leaching to water. The task of the aerial applicator is to apply the required amount of product to the target area as instructed by the land manager. It is the role of the land manager (client) to ensure that Council plan requirements are met. All farmers or growers applying fertiliser should do a nutrient management plan to ensure that the amount of fertiliser being applied is appropriate. Refer COPNM.

6.7 Management options

There are a range of technical management options that pilots can use and also options that can be included in plan provisions to address the potential adverse effects. The options are listed here and details are included in the Technical Information (www.nzaaa.co.nz).

Indirect:

Pilot options

- Minimising potential for drift – technical options pg A 85 http://www.fertqual.co.nz/files/downloads/aerialapp02.pdf
- Target site ID (GPS)
- Use of fertiliser with good ballistic properties (particle size)

Planning options

- Classify as *sensitive areas:*
  - Residential buildings
  - Educational facilities
  - Public places and amenity areas where people congregate
  - Domestic and community water supplies
  - Water bodies and associated riparian vegetation
  - Crops which are sensitive to agrichemicals or faming systems (eg organic farms, greenhouses)
  - Wetlands, indigenous vegetation habitat areas and reserves
  - Public roads

Possible conditions re application over or near sensitive areas.

- All reasonable measures must be taken to avoid discharges to surface water bodies – risk assessment to establish reasonable measures
- Controls by hazard classification (eg 9.3 and 9.4)

Direct

Pilot options

- Appropriate rate, concentration gradient, soil profile
- Management measures for loading sites, mixing sites and storage

Plan options

- Management measures for loading sites, mixing sites and storage
- Requirement to meet label recommendations
- Methods of disposal
- Fate processes

6.8 Possible plan provisions for aerial discharges of fertiliser

Given that no two applications of fertiliser are the same it is difficult to write prescriptive rules that would apply in every situation. For instance the application equipment, location, wind conditions, and product being applied will all vary. Therefore the approach that is recommended for a rule framework is to require best management practices and that a risk assessment is undertaken to establish the potential for adverse effects and measures used to reduce that potential.

The Fertiliser Group Standards provide for the safe use of fertiliser products to protect human health and environment so a permitted activity condition recognising approvals under the group standards provides an appropriate level of control over the potential adverse effects of fertiliser storage and use, when applied in combination with industry best practice.

A requirement for an organisation to be AIRCARE™ accredited provides assurance that the industry best management practices are being used by the pilot. The pilot will have the necessary qualifications so it is not necessary for the plan to specify qualifications.

Records should be required to be kept so in the event of an incident or complaint the council is able to access information to be able to investigate such complaints.

If the permitted activity conditions cannot be met and resource consent is required the

activity could be controlled to restricted discretionary and the matters of control or discretion specified and linked to the permitted activity conditions where there is non-compliance.

Example of Permitted Activity conditions for Aerial Application of fertiliser
The application of fertiliser by air is permitted subject to meeting these conditions:

- *The application is undertaken by an AIRCARE™ accredited operator*
- *The pilot undertakes a risk assessment *of the area and weather at the time of application to ensure that sensitive areas are avoided and all reasonable measures are used to minimise drift and provide to council if requested (*Refer to the risk assessment contents below)*
- *Product label recommendations are met*
- *Storage, mixing and loading sites meet the requirements of the HSNO Group Standards for fertilisers and are managed to contain spillages.*
- *The pilot must record details of the application including:*
    - *Location of the application site*
    - *Date of application*
    - *Fertiliser applied, including trace elements and other additives*
    - *Application rate (kg/ha)*
    - *Written daily flight logs*
    - *Verification of tracks flown*
    - *Weather conditions at time of application including wind speed and direction*

Such records to be made available on request.

In addition, to support this rule, definitions should be included for sensitive areas and fertiliser.

Sensitive areas include:
- Residential buildings
- Educational facilities
- Public places and amenity areas where people congregate
- Domestic and community water supplies
- Water bodies and associated riparian vegetation
- Crops which are sensitive to agrichemicals or faming systems (eg organic farms, greenhouses)
- Wetlands, indigenous vegetation habitat areas and reserves
- Public roads

Include a definition for fertiliser:

Fertiliser means:

a) any material (whether in solid or liquid form) which is described as, or held out to be for, or suitable for, sustaining or increasing the growth, productivity, or quality of plants or, animals through the application of the following essential nutrients to plants or soil:—

(b) nitrogen, phosphorus, potassium, sulphur, magnesium, calcium, chlorine, and sodium as major nutrients; or

(ii) manganese, iron, zinc, copper, boron, cobalt, molybdenum, iodine, and selenium as minor nutrients; or
(iii) additives; and

b) any other product which is considered to meet identified soil or plant nutrient deficiencies and is applied with this as the principal objective and

© the material shall be free from pathogens or any other agents which could affect disease and pest transmission.

Assessment matters if resource consent required:

- *A risk assessment of the activity, including the matters in A below, shall be provided that demonstrates how adverse effects on sensitive areas will be avoided*
- *Location of the loading and mixing sites, in particular proximity to water bodies*
- *Evidence of competency of the applicators/ pilot*

Operational risk assessment

The permitted activity condition requires a risk assessment to be undertaken for the activity to be undertaken. It is recommended that this be included in the rule or as a schedule or appendix in a Plan.

A risk assessment should address the following matters:

1. Target identification- where application is to occur- detailing location and boundaries
2. Identification of *sensitive areas* in relation to target area including nature of sensitivity in relation to the operation being undertaken eg fertiliser dust near residential areas.
3. Product to be applied – rate/ product physical properties or quality and hazards associated with the product eg propensity for drift, ballistic qualities, HSNO classification
4. On-site real time weather conditions – wind speed, wind direction,
5. Optimum operational practice – release height, speed, equipment to be used
6. Operational constraints – e.g physical hazards – such as poles, buildings, wires, shelter belts
7. Taking all these factors into account determine:
    a. Quantify where the product will go given all parameters - model if required
    b. Risk of drift and consequences – risk profile
    c. Select appropriate measures to reduce potential, such as: (not in order of importance)
        i. Ensure appropriate application equipment – eg spreaders to ensure no significant departure above or below required mean application rate
        ii. For fertilisers ensure fertiliser physical properties compatible with application systems used
        iii. Setback distances from sensitive areas
        iv. Only apply when wind direction is away from sensitive areas
        v. Amend operational practice - eg. reduce fertiliser release height especially near downwind edge of the application site
8. How reassessment throughout the operation will be undertaken – to assess change in circumstances and adjustment to operation.
9. How actions will be document to verify what has been done

7. Aerial application of agrichemicals

This section includes:

- A description of agrichemicals, including definition
- Relevant legislation – RMA, HSNO
- Aerial application of agrichemicals including best practice
- Risk factors of aerial application of agrichemicals
- Exposure pathways and management options
- Possible plan provisions for aerial discharges of agrichemicals

7.1 Agrichemicals

Agrichemicals are substances applied to land, water or crops to control pests in primary production activities of pastoral farming, (sheep, beef, dairy and deer) horticulture, viticulture and forestry. Some agrichemicals are specifically designed to be applied to water to control aquatic weed pests. Agrichemicals are usually discharged into air rather than applied directly onto the target species so under the RMA such applications are classed as a discharge to air, land or water.

Agrichemical applications vary due to a range of factors and considerations so planning provisions need to be appropriate and applicable across the range of situations. Aerial application of agrichemicals can be by both fixed wing and helicopters, and range from total vegetation control e.g. pre-plant herbicide application in cropping and forestry, where confining the spray to the target area is the first priority, through to application of a biological insecticide as a biosecurity requirement e.g. Painted Apple Moth eradication Auckland City. In that case, large urban areas were sprayed with the objective of using small spray droplets and selected local wind conditions to get the required target penetration and coverage.

7.1.1 Definition of agrichemical

The term 'agrichemical' is the common term used to describe a range of substances that are used to control pests.

Examples of agrichemicals include:

- herbicides to control unwanted plants, including some that are specific for aquatic use in water
- insecticides to control insects such as clover flea or potato psyllid
- fungicides to control fungus eg rust, mildew, moulds

The terms agricultural chemicals, agricultural compounds and pesticides are also used to describe the same or similar groups of products. The terminology and definition used in a plan is important so it is clear exactly what substances fall within the parameters of any regulation.

The most commonly used definition in RMA plans is the definition from NZS 8409 2004 Management of Agrichemicals which defines agrichemicals as:
"Any substance, whether inorganic or organic, man-made or naturally occurring, modified or in its original state, that is used in any agriculture, horticulture or related

activity, to eradicate, modify or control flora and fauna. For the purposes of this Standard, it includes agricultural compounds but excludes fertilisers, vertebrate pest control products and oral nutrition compounds."

The ACVM Act 1997 refers to agricultural chemicals:
An agricultural chemical is an agricultural compound that is applied directly to or on plants for one or more of the purposes listed in the Agricultural Compounds and Veterinary Medicines (ACVM) Act 1997.

The HSNO Act refers to pesticides rather than agrichemicals. Pesticides are defined under the HSNO regulations and include any chemical mixture of substances intended for preventing, destroying or controlling any pest. Pesticides include a wider range of substances than the definition of agrichemical in NZS8409. For instance vertebrate toxic agents (VTA's) or timber treatment chemicals would be classed as a pesticide, but not an agrichemical as defined in NZS8409. Not all products included in the NZS8409 definition of agrichemical, for example fumigants and veterinary medicines are applied by air.

Adjuvants are sometimes added to the mixture just before the product is applied although most agrichemicals already have one or more adjuvants in the formulated product. Adjuvants are substances which enhance the effectiveness, reduce drift or act as 'stickers', so are designed to retain the product on the target. Adjuvants themselves are not agrichemicals.

7.2 Legislation

The three main pieces of legislation relating to the application of agrichemicals:

- Resource Management Act 1991 (RMA)
- Hazardous Substances and New Organisms 1996 (HSNO)
- Agricultural and Veterinary Medicines Act 1997 (ACVM).

7.2.1 RMA

While not specifically mentioned or provided for in the RMA, agrichemicals are managed under the RMA as they are classed as contaminants which are discharged to air, onto or into land and/or water. The requirements of the Act are that discharge of contaminants must be provided for in a regional plan or resource consent is required. Therefore regional plans need to provide for such discharges. The application of agrichemicals, including aerial applications, is generally provided for in Regional Plans as a permitted activity, subject to conditions.

District Plans have responsibility for land use including controls for hazardous substances. As most agrichemicals are hazardous substances the district plan should address how storage is managed. The HSNO regulations and NZS8409:2004 Management of Agrichemicals are relevant in this regard.

7.2.2 HSNO

Most agrichemicals are classed as hazardous substances so HSNO controls must be complied with. Such controls may include requirements for identification, emergency management, disposal, tracking and the competency of users (approved handler).

NZS8409:2004 Management of Agrichemicals is recognised under HSNO as an approved Code of Practice and a means of compliance in respect of hazardous substance regulations for controls, disposal and emergency management.

The related GROWSAFE® training courses (which are based on NZS8409) are also a pathway for achieving approved handler requirements under HSNO.

7.2.3 ACVM

ACVM specifies the label requirements for use of a product (conditions of use) and these must be complied with. RMA plans sometimes have a permitted activity condition requiring compliance with manufacturer's recommendation. It is more appropriate to require compliance with the label requirements as they have been set through a regulatory assessment for the specific product.

7.3 Aerial Application

The active substance is mixed with water in a spray tank according to the rate and concentration specified on the product label and applied using a boom fitted to the aircraft that has the appropriate number and type of nozzles fitted. The nozzles regulate the flow rate and determine the droplet size produced. Getting an even spray pattern from an aircraft, whether fixed wing or helicopter also depends on the way in which the spray boom and nozzles are mounted on the aircraft.

Most aerial spraying in NZ involves herbicide application where it is important to ensure maximum deposition onto the target, while minimising off target loss. Application equipment used, the way in which the equipment is fitted and the aircraft is operated can significantly affect the extent to which off target drift is minimised.

Sometimes a different technique is needed, where lateral movement of small droplets in the spray is used to obtain large swath widths and horizontal droplet deposition. Examples of this technique in NZ include fungicide application to broad-acre crops and control of incursions such as the Tussock Moth and Painted Apple Moth. While this technique can produce very good target coverage containing such spray in the target area is more difficult.

7.3.1 Best practice

NZS 8409 2004 Management of Agrichemicals (NZS8409) is the performance standard that applies to any agrichemical application, including by aerial methods. NZS8409 was developed by Standards New Zealand and sets out the requirements for the safe, responsible and effective management of agrichemicals.

NZS8409 is one of the Codes of Practice that form part of the AIRCARE™ Accreditation programme.

7.4 Agrichemicals, potential adverse effects and risk factors

Section 5 of this Guidance Note sets out the general framework for a risk management approach to aerial applications. This section addresses the approach specific to agrichemicals.

There are a number of potential adverse effects that can arise from agrichemical applications which are set out in Table 7.1. The nature of the potential adverse effects will vary depending on the combination and nature and combination of risk factors for the operation.

Such risk factors include:

- The chemical being used, hazard class and type, and exposure to it
- The concentration and rate of application of the chemical
- The timing of the application
- Location of sensitive activities
- The proximity of people – timing and location
- The location of the application and use, including mixing sites
- Weather conditions
- Spray quality
- Target identification
- The permeability of the soil

The exposure pathways can be either direct or indirect:

- Indirect – off target drift, leaching, overland flow
- Direct – application on subject areas, point source discharges (e.g. spillages).

In seeking to avoid or minimise adverse effects the risk factors need to be addressed.

7.4.1 Regional plan mechanisms

Current RMA plans have used a range of mechanisms as the basis for regulating agrichemical applications. For instance:

- The nature of the user or applicator – Northland
- The purpose of the application – BOP and West Coast
- The location, land use or zone – Taranaki, Marlborough, Tasman, West Coast, Otago
- The quantity applied – Nelson
- The method of application such as 'small scale', hand-held' and 'widespread' applications - 'Auckland, Waikato, BOP, Gisborne, Hawkes Bay, Horizons, Wellington, Canterbury and Southland.

In essence these approaches are used as a means to manage the risks associated with the application. However they do not equate to a risk assessment for an activity as there will be risks associated with the activity that are not addressed. For instance the plan requirements for 'small scale' applications may be less than 'widespread' on the presumption that the risk associated with 'small scale' will be less than for 'widespread'. In many instances that may be correct, but there are still risks associated with 'small scale' or handheld that may not be appropriately addressed, such as being located next to a sensitive crop or a school.

7.4.2 Sensitive areas

An analysis of the potential adverse effects shows that the greatest potential risk exists where the application site is adjacent to sensitive areas, regardless of the method of application or who is doing the application.

Sensitive areas include:

- Residential buildings
- Educational facilities
- Public places and amenity areas where people congregate
- Domestic and community water supplies
- Water bodies and associated riparian vegetation
- Crops which are sensitive to agrichemicals or faming systems (eg organic farms, greenhouses)
- Wetlands, indigenous vegetation habitat areas and reserves
- Public roads

These areas are where potential adverse effects from agrichemical off target drift is likely to be greatest because they are where people are located, or are areas in the environment more likely to be affected by agrichemical applications.

A risk based approach takes into account the proximity of sensitive areas and methods to manage the risk factors and hence potential adverse effects.

In addition to proximity to sensitive areas, the other key risk factor is the chemicals being used and hence the degree of potential for adverse effects. In the case of Class 6 toxicity classifications the effects on people is the primary risk and for Class 9 toxicity classifications then the effects on the environment is the primary risk. Therefore the potential risk increases when these substances are used in proximity to sensitive areas where there are either people or the environment that could be affected.

7.4.3 The following table sets out a risk management approach for use of agrichemicals including:

- The potential adverse effects
- The risk factors – that is the reason for the potential adverse effect, i.e. why did the problem occur
- Exposure pathways
- Pilot Management options
- Options for plan provisions.

The extent to which a risk factor applies and management options need to be considered varies according to the nature of the receiving environment and the potential adverse effect.

Table 7.1 Risk management approach for rules and conditions for agrichemical use

Potential adverse effects	Risk factors	Exposure pathway	Pilot Management options	Options for plan provisions *Refer to draft rule at end of section*
Health effects caused or possible: - Allergic reactions - Irritations - Toxic poisoning - Exposure to carcinogens and teratogens	Hazard class of chemical being used and exposure (Class 6 and 9)	Indirect – off target drift Direct - applicator	Indirect: - Minimising potential for drift – technical options - Notification (drift hazard) Direct: - PPE	Require operator risk assessment to ensure use of appropriate technical options Classify dwellings, educational facilities and public places as *sensitive areas* Require notification where application adjacent to sensitive areas
Contamination of crops and plants including sensitive crops and organically farmed properties. Effects include: - Growth and quality of the crop - Contamination to levels in excess of residue levels - Threatens organic registration	Chemical type (herbicide, insecticide, fungicide etc) Excessive residue levels Timing of application – crop stage Application rate (calibration)	Indirect – off target drift	Minimising potential for drift – technical options	Require operator risk assessment to ensure use of appropriate technical options including identification of sensitive crops and methods to avoid drift onto those areas. Classify crops and non-target plants as sensitive areas Require notification to greenhouse operations in the area
Contamination of domestic or commercial water supplies where it renders the drinking water non-potable	Chemical type and hazard class	Indirect – off target Direct discharges	Minimising potential for drift – technical options	Require operator risk assessment to ensure use of appropriate technical options Classify water supplies as sensitive areas.

Potential adverse effects	Risk factors	Exposure pathway	Pilot Management options	Options for plan provisions *Refer to draft rule at end of section*
				It may be appropriate to include conditions to avoid direct applications over such areas
Contamination of indigenous flora and fauna, habitat areas and reserves where the inherent values of the areas are damaged or lost	Ecotoxicity of substance 9.3A and 9.4A Poor or no target identification Spray quality	Indirect - Off target drift Direct applications	Minimising potential for drift – technical options Target site ID (GPS) Controls by hazard classification eg 9.3 and 9.4.	Require site identification as part of risk assessment Require operator risk assessment to ensure use of appropriate technical options Classify as *sensitive areas* Controls by hazard classification (eg 9.3 and 9.4)
Contamination of wetlands, surface water body and coastal and marine environments where it causes: - Death of fish or flora and fauna - Water takes affected leading to un-potable water or damage to crops and animals	Chemical type and hazard class 9.1A, 9.3A or 9.4A 6.1A, 6.1B or 6.1C Concentration of chemical and application rates Location of application in proximity to water take points Inappropriate disposal Poor or no target identification No ID of at- risk water bodies Non- point spray quality	Indirect: - applications adjacent to water bodies – off target drift or overland flow - Disposal adjacent to water Direct: - Applications into water - Spillages/ overflows at mixing sites - Disposal to	Minimising potential for drift – technical options Target site ID (GPS) Controls by hazard classification eg 9.3 and 9.4. Management measures of mixing sites – NZS8409 Sec 5.3.2 and App R Management of disposal – NZS8409 Sec 6 and App 6	Requires that reasonable measures be taken to avoid discharges to surface water bodies unless for intended aquatic use and operator risk assessment undertaken to establish reasonable measures and ensure use of appropriate technical options Classify water bodies as *sensitive areas* Ensure that label requirements are followed. It may be appropriate to include conditions to avoid direct applications over such areas

Potential adverse effects	Risk factors	Exposure pathway	Pilot Management options	Options for plan provisions *Refer to draft rule at end of section*
		water		Use of substances approved for aquatic use and HSNO controls.
Contamination of groundwater	Concentration of chemicals and application rates Soil type – highly permeable and chemicals that are mobile	Direct: - Spillages/ overflows at mixing sites Indirect: - Leaching through soil Direct and indirect: - Inappropriate disposal of unwanted agrichemicals and surplus spray mix	Management measures of mixing sites – bunded etc NZS8409 Sec 5.3.2 App R Appropriate rate, concentration, gradient, soil profile (GROWSAFE calculator) Methods of disposal NZS8409 Sec 6 and App S	Require compliance with NZS8409 Sec 6 and App S and Sec 5.3.2 and App R
Contamination of soils/ land	Use of substances that persist and accumulate in the soil – e.g copper 9.2A Inappropriate application rates Inadequate containment at storage and mixing sites	Direct: - Frequency and rate of application of persistent chemicals 9.2A Indirect: - Permeability – includes water source to mover	GROWSAFE calculator NZS8409 App F Fate processes Mixing sites and storage NZS8409 Sec 4 App L	Meet label requirements Require that NZS8409 Sec 4 and App L are met.

Potential adverse effects	Risk factors	Exposure pathway	Pilot Management options	Options for plan provisions *Refer to draft rule at end of section*
		through the soil profile		
Amenity values Offensive and/or objectionable effects such as: - Limiting access to public areas - Off target drift other than health and vegetation damage - Excessive noise	Proximity of people – timing and location Chemical – volatility and toxicity class Air craft and machinery operating	Direct exposure if public in public areas at time of application Off target drift Noise – aircraft and machinery	Minimising potential for drift – technical options Notification (drift hazard)	Classify amenity areas as *sensitive areas* Plan provisions relating to reverse sensitivity in rural areas – including noise, odour, spray drift to benchmark what is to be reasonably expected in the rural area
All potential adverse effects			Competent to carry out risk assessment for operation.	Require pilot competency through Pilots Agrichemical Rating issued by CAA and the operator to be AIRCARE™ accredited for agrichemicals.

7.5 Exposure pathways and management options

Indirect – off target drift, leaching, overland flow
Direct – application on subject areas, point source discharges (e.g. spillages).

7.5.1 Indirect exposure pathways

7.5.1.1 Off target drift - Spray drift and drift hazard

Drift hazard is defined in NZS 8409:2004 as the hazard associated with drift and consequent trespass which may result in an adverse effect to human health animal health or the environment. In relation to AS/NZS 31000:2009 Risk Management – Principles and Guidelines, drift hazard can be regarded as risk level.

Every spray application of agrichemicals will result in spray drift. In a biological system it is not possible to have zero drift. From a risk management viewpoint however, the question is what risk does the spray drift pose and how can the risks be avoided or minimised.

The level of risk can be expressed this way:

- Risk (level) = drift hazard (dh) x exposure (Ex)
- Drift hazard (dh) = environment (i.e. HSNO Class 9) and/or human (i.e. Class 6 – 8)
- Exposure (Ex) = environment or human
  - Ex (env) ≡ air, water, soil
  - Ex (human) ≡ Personal Protective Equipment (PPE), presence or absence of people

Below as Table 7.2 is table from NZS8409:2004 Appendix G that sets out factors contributing to off target drift and the extent to which the factors may be high or low hazard.

- Column A lists the factors which separately or collectively affect drift hazard.
- Column B identifies the situations where the drift hazard would be high.
- Column C identifies when the drift hazard would be low.
- Column D shows that some factors require further qualification, e.g. buffer zones only apply downwind of an application.

Table 7.2: Potential drift hazard scale

A		B	C	D
	Factor	High hazard	Low hazard	Comment
1	Wind speed	Zero/very low (less than 1 m/s) or greater than 6 m/s	Steady (1 – 3 m/s)	Measure or estimate using smoke
2	Wind direction	Unpredictable	Predictable, and away from sensitive areas	Use smoke to indicate
3	Humidity	Low (delta T > 8 ^{o}C)	High (delta < 4 ^{o}C)	Measure, using whirling psychrometer
4	Atmospheric stability	Inversion layer present	No inversion layer	Use cold smoke to indicate
5	Maximum height of	> 1.5 m above the	< 0.5 m above the	Application

	release of agrichemical	target	target	technique
6	Particle (droplet) size	< 50 microns diameter	> 250 microns diameter	Spray quality
7	Volatility of agrichemical	High (vapour pressure > 10 mPa)	Low (vapour pressure < 0.1 mPa)	Check product label, SDS, or PSC
8	Sensitive area	Close (< 100 m) away	None, or more than 1 km distant	Identify on property spray plan
9	Buffer zone	None	Yes (> 100 m)	Guideline only
10	Shelter belts	No shelter	Live shelter, > 3 m high and 1 m thick	Not for herbicides
11	Toxicity	Class 6.1A, B, C,	Class 6.1D, E	Check label

Table 7.2 highlights the range of variables that need to be considered and ways to address these Addressing these variables requires knowledge of all the variables (listed in Column A) that are relevant to the agrichemical application at the time so conditions in a rule in a plan need to ensure that they recognise that the methods in Columns B and C are options that an operator would assess at the time of application. what indicate, because to do so

Some factors, for example wind direction, have no effect on the amount of drift produced but do have a direct effect on who or what may be at risk. Because spray drift does not move against the wind, buffer zones are only relevant for sensitive areas downwind of a spray application.

The distinction between pre-determined (PD) and real time (RT) factors is important because the most significant factor in an adverse event from off target spray drift is almost always wind direction – a real time factor. A pre-determined factor is one that is evident and on which decisions are made before the application commences. The real time factors are those which can vary over the time of the operation, such as the weather conditions. These are identified in Table 7.3 below.

Table 7.3 is developed from Table 7.2 using a risk management approach with the order of the risk in order of significance.

There is a large amount of information, published papers, documents and other reports on spray drift. It is a complex issue and generally is technical in terms of what spray drift is, what are the main causes and what can be done to reduce it.

Table 7.3: Risk factors, task verification and management controls

	Risk Factor (order of significance)	Nature Of risk factor	Information needed	Information able to be used for task verification	Pilot Management
1	Application site (spray target)	PD	Location and boundaries	GIS co-ordinates, dated photograph Hand-written diagram or map verbal	Spray plan with map detailing location and boundaries
2	Sensitive area	PD	Nature of and location with respect to application area	GIS co-ordinates, dated photograph Hand-written diagram or map verbal	Sensitive areas identified and actions taken to avoid adverse effects
3	Wind direction	RT	Direction (bearing) at the application site at the time	Digital recording wind vane/sensor with time base Hand held vane or equivalent Smoke or other visual indicators	Adjacent to sensitive areas only spray when wind is away from sensitive areas and wind speed is steady
4	Wind speed	RT	Speed at the application site at the time	Digital recording wind vane/sensor with time base Hand held anemometer or equivalent Smoke or other visual indicators	Adjacent to sensitive areas do not spray when wind speed is less than 1 m/s and greater than 6 m/s.
5	Particle (droplet) size	PD	Spray quality	Spray nozzle selected for correct spray quality wrt risk of off target drift as priority, with documented record Nozzle selected for reasons other than drift mitigation, with documented record No formal nozzle selection criteria used	Adjacent to sensitive areas spray quality must be coarse
6	Agrichemical Hazard	PD	HSNO Hazard class(es)	Agrichemical selected taking account of HSNO class and the at-risk sensitive locations, all documented Agrichemical selected according to efficacy and other attributes including HSNO Class Agrichemical selected on price and other attributes not relevant to potential adverse effects	Extra care taken if using Class 6.1 A, 6.1B, 6.1C, 9.1A, 9.2A, 9.3A , 9.4A adjacent to sensitive areas.
7	Effective height	PD	Application method	Application equipment selected and to minimise	Spray directed to the target at all

	Risk Factor (order of significance)	Nature Of risk factor	Information needed	Information able to be used for task verification	Pilot Management
	of release of agrichemical		Ground – Knapsack, Gun and Hose, Mist Blower, tree/vine crop Aerial – Boom, ½ Boom	spray losses between the nozzle and the spray target, all documented fully, including spray quality data Equipment selected and operated mainly for efficacy/price, with little regard for potential drift loss Equipment and nozzles used are the same for all applications with no attempt to minimise drift hazard	times
8	Type of agrichemical	PD	Herbicide, insecticide, fungicide etc (Trade name)	Agrichemical selected according to application task, taking account of HSNO class and the at-risk sensitive locations, all according to written prescriptions documented Agrichemical selected according to efficacy and other attributes including HSNO Class Agrichemical selected on price and other attributes not relevant to potential adverse effects	Choose least hazardous chemical suitable for the task e.g 2,4D formulations that are least volatile
9	Buffer zone	PD/RT	Downwind application free zone	Location of spray target and sensitive area known and logged, communication/notification confirmed, spray quality, and wind direction known and drift modelling done As above but spray quality not optimal for drift minimisation and no modelling (written guidelines for buffers used) No buffer used, poor/no information on other factors	Adjacent to sensitive areas only spray when wind is away from sensitive areas and is a steady wind speed
10	Shelter belts	PD	Nature of and location with respect to application area	Location of spray target and sensitive area known and logged, communication/notification confirmed, spray quality, and wind direction known and drift	Useful but not significant.

	Risk Factor (order of significance)	Nature Of risk factor	Information needed	Information able to be used for task verification	Pilot Management
				modelling done As above but spray quality not optimal for drift minimisation and no modelling (written guidelines for buffers used) No buffer used, poor/no information on other factors	
11	Humidity	RT	Air temperature	Humidity measured and recorded on site at the time Humidity measured with hand held instrument but not at the site at the time Humidity estimated	No specific controls
12	Atmospheric stability	RT	Inversion layer	Wind and temperature data recorded on site such that no inversion layer present Visual clues e.g. smoke to test for inversion Visual evidence	If label information indicates volatility an on-site test for inversion layer should be made.

7.5.1.2 Leaching

Leaching is the movement of a substance through the soil into groundwater. Leaching may only remove mobile components of the substance while some immobile components remain bound to soil particles and accumulate to un acceptable levels. The potential for leaching depends in part on the chemical and physical properties of a product and the permeability of the soil to aid the movement through the soil profile. To reduce the potential for leaching regional plans may have controls on the application rate that can be applied (input control) or have limits on the amount of leaching that can occur (output control). The application rate of agrichemical used needs to take into account any such requirements. While the responsibility for meeting such plan requirements lies with the land owner or manager, a pilot applying product should confirm that the client is aware of any plan requirements in this regard.

7.5.1.3 Overland flow

Run off water contaminated by agrichemicals can flow overland to waterbodies, indirect flow as sediment with absorbed chemical or wash off from the target crop by unexpected rainfall

Such runoff can pose risks to health, water supplies, aquatic environments, and irrigated crops. The objective is to avoid such effects through a range of mechanisms including:

- Use of riparian vegetation alongside waterbodies
- Use of buffer zones between spray application and sensitive areas
- Ensure application rates are appropriate
- Calibrate equipment to ensure correct amount of chemical applied
- Only apply in suitable weather
- Select products carefully to avoid products that are easily absorbed by soil particles

7.5.2 Direct exposure pathways

7.5.2.1 Application on subject areas

A direct application of agrichemical to a non-target area, such as water or non-target crop, can lead to adverse effects. Such a situation would only arise because due care has not been taken to ensure that the application is only directed at the target area.

A management control that there should be no direct discharges to sensitive areas or water, except when provided for as aquatic discharges, could be applied.

7.5.2.2 Point source discharges (e.g. spillages).

NZS8409: 2004 Management of Agrichemicals Appendix F describes the various fate processes for agrichemicals. Point source discharges, other than unintentional direct applications, could arise because of spillages at storage or mixing sties. Groundwater is particularly vulnerable is where a mixing site is located adjacent to a bore head

Management options to avoid groundwater contamination include:

- Bores should be properly capped and sealed to prevent contamination
- Keep surface run off away from the bore
- Prevent spills
- Mix chemicals away from the bore head
- Dispose of chemicals as in NZS8409.

7.6 Management controls

The question of how to regulate agrichemical use is complex. Options include:

- State exactly how the agrichemical applicator should behave (prescriptive standards)
- Define a level of performance and enable the operator to determine how to meet the standard (performance standards).

Recommended plan provisions for application of agrichemicals

The recommended rule implements a risk management approach to agrichemical applications. Such an approach is not dependent on the method of application but rather the assessment of the risks associated with the operation so the rule covers all forms of application, including aerial.

The recommended rule for agrichemical use therefore applies to all users, who must complete a spray plan to determine sensitive areas. If there are sensitive areas adjacent to where spraying is to occur then there are additional requirements in the rule for those spraying activities.

A separate rule for applications of agrichemicals direct to water is included. There are a limited number of substances that can be used for such purposes and it is suggested that those undertaking such activities should be specifically trained for that use.

The following diagram sets out visually how the recommended Permitted Activity rule for agrichemical use would work. There are effectively two categories:

- All applications
- Applications adjacent to sensitive areas

The required conditions cascade depending on the nature of the use. The diagram could be useful in material about the rules to show how the requirements apply.

The rule is dependent on a definition of sensitive area as this is critical to determining whether conditions 10-14 will need to be undertaken. The following definition is based on NZS8409:2004 Management of Agrichemicals. It includes areas where there is potential for significant adverse effects from off-target agrichemical spray drift based on the proximity of places where people are located or the environment is sensitive such as water bodies or other crops. These are the areas where additional measures need to be undertaken to ensure that the risk of off-target drift is assessed and appropriate steps taken to avoid such risks.

Definition of sensitive areas

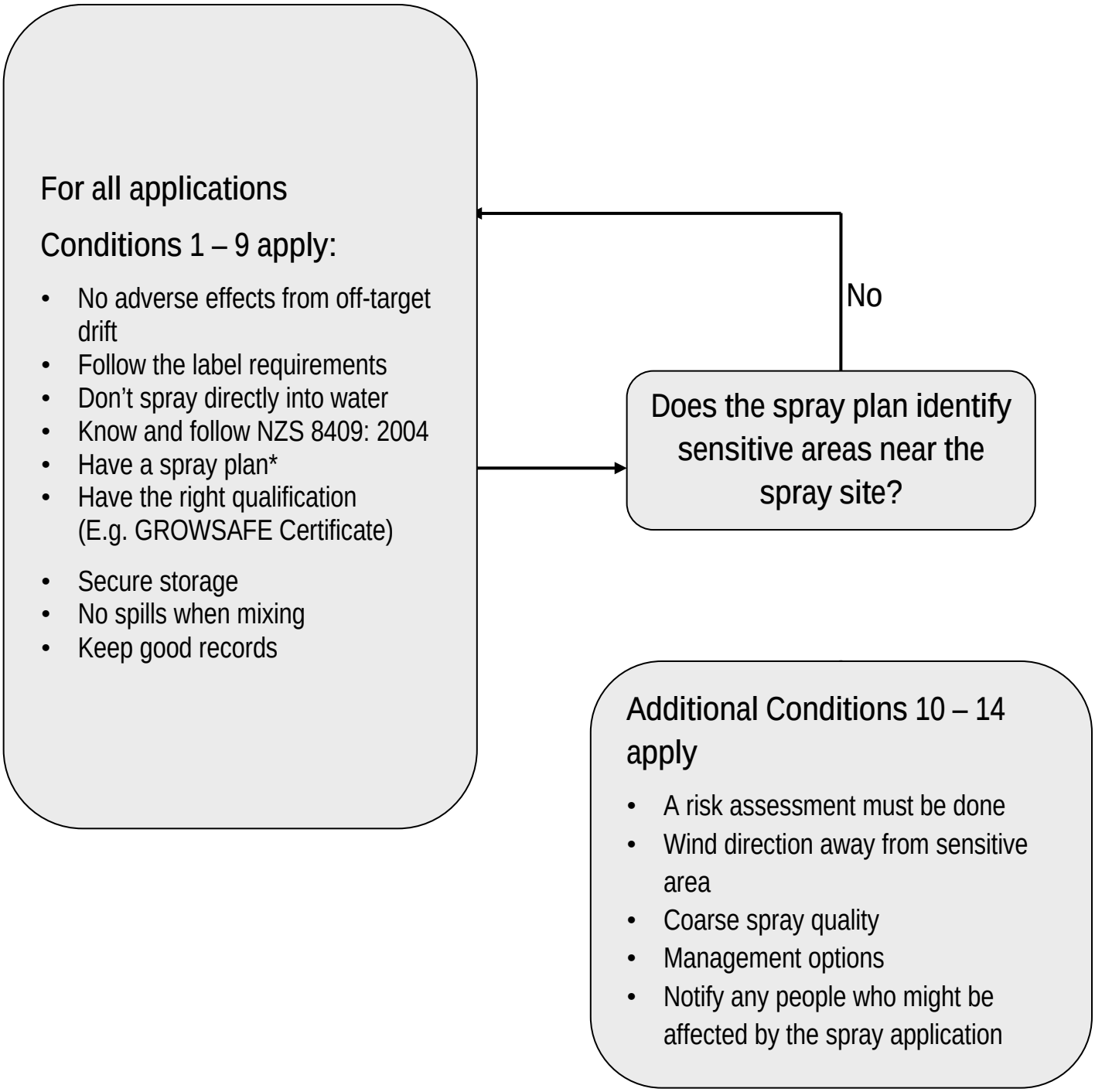
Sensitive areas include:

- Residential buildings
- Educational facilities
- Public places and amenity areas where people congergate
- Domestic and community water supplies
- Water bodies and associated riparian vegetation
- Crops which are sensitive to agrichemicals or faming systems (eg organic farms, greenhouses)
- Wetlands, indigenous vegetation habitat areas and reserves
- Public roads

Applications of Agrichemicals- Permitted Activity Rule

Are you applying agrichemicals? If so, follow the chart to determine what requirements you need to meet.

Note: If you are applying direct to water refer to specific rule for Aquatic Use



Permitted activity rule for agrichemical use

The discharge of agrichemicals into air or onto land where it may enter water is a Permitted Activity subject to the following conditions:

All applications:

1. There must be no significant adverse effects from off target spray drift beyond the boundary property.
2. The rate of application should not exceed rates of application specified on the agrichemical label or contravene any label requirements
3. There must be no direct discharges to waterbodies or human drinking water sources.
4. The discharge shall be undertaken in a manner consistent with NZS8409:2004 Management of Agrichemicals and for specific activities compliance with the following sections of NZS8409: 2004 Management of Agrichemicals:
    - Storage – Appendix L4
    - Use – Part 5.3
    - Disposal – Appendix S
    - Records – Appendix C9
5. Spray plan

    The owner/ occupier or manager shall:

    i. Prepare a spray plan in accordance with NZS8409:2004 5.3 and Appendix M4 at least once a year including identifying sensitive areas adjacent to where discharges will occur

    ii. Notify adjoining neighbours that a spray plan is available on request at least 7 days before first application; and

    iii. Supply a copy of spray plan to any person or property identified as a sensitive area and likely to be directly affected by the applications and who requests a copy of the spray plan.

    iv. Supply a copy of the spray plan to the applicator to enable risk assessment to be undertaken.

6. Training

    All users of agrichemicals must know what to do, and shall hold qualifications according to the task:

    a) Where the application is undertaken by a contractor for hire and reward the following qualifications must be held:

        i. Ground based application:

            Either

            GROWSAFE® Registered Chemical Applicators Certificate

            Or:

            GROWSAFE® Introductory Certificate and under direct supervision of GROWSAFE® Registered Chemical Applicator

        ii. Aerial application –the pilot must hold a GROWSAFE® Pilots Agrichemical Rating Certificate issued by CAA and the application company or operator must hold a current AIRCARE™ Accreditation.

    b) All other users (other than domestic) must hold a GROWSAFE® Introductory Certificate or be under direct supervision of a person holding a GROWSAFE® Applied Certificate or Registered Chemical Applicators Certificate.

7. Storage
Storage must meet the requirements in NZS8409:2004 Management of Agrichemicals Appendix L4 to ensure that agrichemicals are effectively contained to the site and the site is secure.

8. Mixing site
Mixing agrichemicals must meet the requirements in NZS8409:2004 Management of Agrichemicals 5.3.2 to ensure that there is no spillage from the site or contamination of water sources or land.

9. Records
All users must keep records consistent with Appendix C9 of NZS8409:2004 Management of Agrichemicals as evidence and information that provides an authentic record to verify that the storage and use of agrichemical(s) has been carried out in a safe responsible manner, in particular with respect to the means by which risks associated with spray drift have been minimised, and agrichemicals are contained to the storage and mixing site. Such records must be provided to council when requested.

NOTE: The storage and use of agrichemicals is subject to specific requirements under the Hazardous Substances and New Organism Act 1996 and pursuant Regulations which may cover the person in charge, training, signage, storage and emergency management.

Applications adjacent to sensitive areas

In addition to the requirements for all applications, where the discharge will occur adjacent to sensitive areas identified in the spray plan then the following must be undertaken:

10. The applicator shall undertake a risk assessment prior to the application to ensure that adequate measures are in place to avoid adverse effects on the sensitive area(s).

11. Applications shall only occur when the wind direction is away from the sensitive area.

12. The application equipment shall be configured to produce a spray quality no finer than coarse (See note below).

13. If conditions 11 and 12 cannot be met then the applicator must take alternative steps to avoid off target spray drift and document the steps taken. Such steps could include:
    - Spray drift reduction adjuvant added to spray
    - Reduce spray release height
    - Increase droplet size (spray quality)
    - Use spray modelling software to predict the outcome.

    (Refer to the Drift Hazard Chart in NZS8409 for more details.)

14. Notification:

    The owner/ occupier or manager shall ensure that notification has occurred prior to application commencing as follows:

    a) Sensitive areas other than amenity areas and public places:

The owner/ occupier or manager of the property where agrichemicals are to be used is to ensure that any person likely to be directly affected by application and who requests notification, is notified prior to application commencing:
EITHER BY:
Written, telephone or email notification of intent to spray at least 24 hours prior to the proposed application, unless there is an alternative agreed timeframe between the parties.
OR:
If more practicable provide notice publicly, such as local newspaper or letter drop at least 7 days prior but no more than 1 month before proposed application

b) Amenity areas and public places

The owner/ occupier or manager shall provide a public notice in a local newspaper or letter drop in the area to be sprayed at least 7 days before the proposed application and ensure that the signage below is provided:

i) Where spraying is occurring in a public place signs shall be placed within the immediate vicinity of the spraying prior to commencing and maintained until spraying has ceased,
ii) Where the spraying is occurring on or alongside roads vehicles associated with the spraying shall display signs on the front and rear of the vehicles advising that spraying is occurring.

Note - Spray Quality
Spray droplet size from a nozzle is important because it determines spray target coverage and deposition as well as the amount of losses from spray drift. The term 'spray quality' is used to compare different nozzles with respect to spray drift. NZS8409:2004 Appendix Q Application Equipment sets out information about spray quality and nozzles and what equipment will produce a coarse spray quality. Nozzle manufacturers will provide information on spray quality while the technical specifications are set out in Spray Nozzle Classification by Droplet spectra ANSI/ASAE S572.1 March 2009 (Insert web link).

If one or more of these conditions cannot be met agrichemical use becomes a restricted discretionary activity and will require resource consent from Council.

Definitions

In addition to the definition of sensitive areas other definitions that would assist with interpretation of the rule are:

- Agrichemicals
- Spray plan – either a definition or a note to state where the spray plan requirements are set out

Agrichemicals means: any substance, whether inorganic or organic, man-made or naturally occurring, modified or in its original state, that is used in any agriculture, horticulture or related activity to eradicate, modify or control flora and fauna. For the purposes of this Plan it includes animal remedies but excludes fertilisers, vertebrate toxic agents and oral nutrition compounds and chemicals when used in the treatment of potable water and biocides when used in cooling towers.

Spray plan means: a Spray plan prepared consistent with NZS8409: 2004 Management of Agrichemicals Section 5.3 and Appendix M4. A template can be found on the GROWSAFE website www.growsafe.co.nz

Restricted Discretionary Activity

If the conditions of the permitted activity rule cannot be met then consent as a restricted discretionary activity would be required. The following matters provide the basis of an appropriate list of matters of discretion to be considered.

Matters of discretion

When assessing an application for discharge of contaminants into air, or onto or into land or water from the use or application of agrichemicals, the matters to be considered are:

(a) The type of agrichemical to be discharged, including its toxicity and volatility and the carrying agent (formulation);
(b) The proposed method of application, including the type of spray equipment to be used, the spray volume and droplet size, the direction of spraying and the height of release above the ground;
(c) The nature of any training undertaken by the operator;
(d) Measures to avoid agrichemical spray drift*;*
(e) The extent to which the use or application complies with NZS8409:2004 Management of Agrichemicals;
(f) The proximity of the use or application to potable water including roof water;
(g) The proximity of the use or application to waterbodies;
(h) The timing of application in relation to weather conditions; and
(i) Communication requirements.

Aquatic use

It is necessary to provide for applications of agrichemicals direct to water for managing aquatic weeds. As applications direct to water are a specific type of application they have been separated from other applications of agrichemicals. There are a limited number of substances that can be used for such purposes and it is suggested that those undertaking such activities should be specifically trained for that use.

Rule for application of agrichemicals direct to water for aquatic purposes.
The discharge of agrichemicals directly into water is a Permitted Activity subject to the following conditions:

1. The substances, including any adjuvants, are approved by EPA under the HSNO Act for discharge directly into or onto water and must comply with requirements covering the person in charge, training, signage, storage, emergency management and all other requirements under the Hazardous Substances and New Organisms Act 1996 and pursuant Regulations

2. The person authorising the discharge direct to water shall notify:
   i. Every person taking water for potable supply within 1km downstream of proposed discharge at least 12 hours prior to discharge occurring; and
   ii. Every resource consent holder for taking of water for public potable water supply purposes downstream of proposed discharge at least 1 week before commencing discharge.
   iii. Qualifications

   Discharge of agrichemicals directly into or onto water can be carried out only by persons

   Holding either:

   a) a GROWSAFE® Registered Chemical Applicators Certificate (National Certificate in Agrichemical Aquatic strand)

or:

GROWSAFE® Introductory Certificate and under direct supervision of a person holding a GROWSAFE® Registered Chemical Applicator Certificate (National Certificate in Agrichemical Aquatic strand)

b) Aerial application –the pilot must hold a GROWSAFE® Pilots Agrichemical Rating Certificate issued by CAA and the application company must hold AIRCARE™ Accreditation

Where spraying is occurring in a public place signs shall be placed within the immediate vicinity of the spraying prior to commencing and maintained until spraying has ceased.

iv. Records
All users must keep records consistent with Appendix C9 of NZS8409:2004 Management of Agrichemicals as evidence and information that provides an authentic record to verify that the application of agrichemical(s) directly to water has been carried out in a safe responsible manner, in particular with respect to notification of any person who may take water for their own use. Such records must be provided to council when requested.

NOTE: The discharge of agrichemicals directly into water is subject to specific requirements under the Hazardous Substances and New Organism Act 1996 and pursuant Regulations.

If one or more of these conditions cannot be met use of agrichemicals directly to water becomes a restricted discretionary activity and resource consent will be required from Council.

Operational risk assessment

The permitted activity condition requires a risk assessment to be undertaken for the activity to be undertaken. It is recommended that this be included in the rule or as a schedule or appendix in a Plan.

A risk assessment should address the following matters:

1. Target identification- where application is to occur- spray plan detailing location and boundaries
2. Identification of *sensitive areas* in relation to target area including nature of sensitivity in relation to the operation being undertaken eg 2,4D near greenhouse.
3. Product to be applied – rate/ product physical properties or quality and hazards associated with the product eg propensity for drift, volatility, ballistic qualities, HSNO classification
4. On-site real time weather conditions – wind speed, wind direction, temperature, inversion layers (refer to potential drift hazard scale Table 7.2 for assessment methods
5. Optimum operational practice – release height, speed, equipment to be used
6. Operational constraints – e.g physical hazards – such as poles, buildings, wires, shelter belts
7. Taking all these factors into account determine:
    a. Quantify where the product will go given all parameters - model if required
    b. Risk of drift and consequences – risk profile
    c. Select appropriate measures to reduce potential, such as: (not in order of importance)
        i. Ensure appropriate application equipment – eg nozzle sizes
        ii. For agrichemicals increase droplet size so no finer than coarse
        iii. Setback distances from sensitive areas
        iv. Only apply when wind direction is away from sensitive areas

v. Amend operational practice - eg. reduce spray release height
vi. Amend choice of substance to least hazardous eg least volatile 2,4D formulation
vii. Add drift reduction adjuvant to spray
viii. Go away and come back on another day

8. Reassessment needs to be continual throughout the operation – to assess change in circumstances and adjustment to operation.
9. Document actions to verify what has been done

8. Aerial application of VTA's

8.1 Vertebrate Toxic Agents (VTA's)

Vertebrate toxic agents (VTA's) are substances that are used to kill, control or limit vertebrate pest animals, including possums, rat, rabbits and mustelids. These are sometime known as vertebrate pest control products and include products that have a negative effect on reproduction, but do not include attractant or repellent substances that are not toxic.

VTA's include baits containing sodium fluoroacetate (1080), soluble concentrate containing sodium fluoroacetate (when mixed with food bait), and baits containing pindone and brodifacoum. This Guidance Note deals with the most common aerial application system – 1080 applied as cereal bait or carrots, and Pindone – so does not address applications of other VTA's by other methods. The 1080 is contained within the cereal bait whereas it is added as a soluble concentrate on site with carrot bait. 1080 is principally used to manage possums in the DOC estate to protect indigenous flora and fauna and also on primary production land to control possums as vector carriers of TB to cattle. 1080 and Pindone are also used to control rabbits. Brodifacoum is used to control rat and mice populations, typically on islands. Both DOC and Animal Health Board (AHB) have Standard Operating Procedures (SOP's) that are required to be met in any 1080 operation.

Definition of vertebrate toxic agents

Vertebrate toxic agents (VTA's) means any substance, whether inorganic, human made or naturally occurring, modified or in its original state, that is used to eradicate, modify or control vertebrate animals, including possums, rats and mustelids. VTA's are regulated under the Hazardous Substances and New Organisms Act 1996 and includes vertebrate pest control products as identified (but not defined) in NZS 8409:2004 Management of Agrichemicals.

8.2 Legislation

The application of VTA's is a discharge to air, land or water under the RMA and needs to be provided for in Regional Plans.

VTA's are also regulated as hazardous substances under the Hazardous Substances and New Organisms Act 1996 (HSNO) and agricultural compounds in the Agricultural Compounds and Veterinary Medicines (ACVM) Act. The Health and Safety in Employment Act also applies.

Because of the hazards associated with VTA's ERMA (now EPA) undertook a reassessment of 1080 in 2007 which provides full information on the product, risks and controls which must be met by operators. The reassessment report on 1080 noted that existing hazardous substance controls are adequate to control the adverse effects on public health and also recommended that more effort should be put into ensuring that the existing controls are complied with by all users of 1080 through implementation of best practice guidelines and standards.

The EPA risk assessment requires controls on the use of 1080, such as a controlled substance license (CSL), mean that the use of such substances is highly regulated through HSNO and therefore provisions in RMA plans should align with, and rely on, the HSNO controls to avoid duplication of regulation.

8.2 Best practice

The Code of Practice for the Aerial Application of Vertebrate Toxic Agents provides guidance on the safe and responsible aerial application of 1080 cereal and carrot baits and pindone. The Code forms part of the AIRCARE™ Accreditation programme.

While both VTA's and agrichemicals are classed as pesticides under HSNO, because of the nature of the products they require different management regimes so regional and district plans should have separate requirements for VTA's and agrichemicals. Management of VTA's is not included within NZS8409: 2004 Management of Agrichemicals so the Standard is not an appropriate management tool for VTA's.

8.3 Risk Factor

The level of risk can be determined by combining the likelihood described in the following table with the magnitude (minimal /minor/moderate/major/massive) of the adverse effect (See EPA 1080 reassessment Table C1 pg 203).

Hazard classifications for sodium fluoroacetate (1080) and formulated substances containing 1080 are given in Section 7 pg 33 of the 1080 reassessment (www.epa.govt.nz and www.nzaaa.co.nz)

Table 8.1 Likelihood

Descriptor	Description
Highly improbable	Almost certainly not occurring but cannot be totally ruled out
Improbable (remote)	Only occurring in very exceptional circumstances
Very unlikely	Considered only to occur in very unusual circumstances
Unlikely (occasional)	Could occur, but is not expected to under normal operating conditions
Likely	A good chance that it may occur under normal operating conditions
Very likely	Expected to occur if all conditions met
Extremely likely	Almost certain

Table 8.2 Level of Risk

Magnitude of effects					
Likelihood	*Minimal*	*Minor*	*Moderate*	*Major*	*Massive*
Highly improbable	A	A	B	C	D
Improbable	A	B	C	D	E
Very unlikely	B	C	D	E	E

Unlikely	C	D	E	E	F
Likely	D	E	E	F	F
Very likely	E	E	F	F	F
Extremely likely	E	F	F	F	F

The following table is taken from the ERMA/EPA reassessment of 1080.

Table 8.3 Risk management approach for VTA (1080) use

Potential adverse effects	Risk factor Refer Level of risk table	Exposure pathway (Nature of risk)	Management options
Adverse human health effects (both short and long term).	B Minor/ Improbable	Exposure of occupationally exposed persons during the handling of soluble concentrate during the manufacture and handling of treated carrot and apple baits in the field. Nature of risk: a) The risk is voluntary; b) The risk will not persist over time (exposure us not on-going and the effect will not persist across generations since 1080 is not mutagenic); c) The risk in not uncontrolled in scope and location; d) The potential effects may be irreversible but information was incomplete on this aspect; e) There is good understanding in the occupational setting for managing exposure (e.g. protective equipment) and little risk of public exposure.	Compliance with HSNO controls will prevent excessive exposure.
Effects following direct exposure to pellets during aerial operations and coated baits on: a) native birds. b) native mammals (bats) c) native herpetofauna (frogs and lizards	A – D* D A-C	Nature of risk: a) Exposure of organisms to the substance is involuntary. b) The risk will not persist over time as 1080 is biodegradable c) The effects are not uncontrollable (or controllable?) and would be irreversible only in the event of the loss of a species or a significant population; d) Risks are generally well understood by users of formulated substances containing 1080 and can be managed, but are less well understood by the general public.	Given the existing and new HSNO controls and recommendations, all users of substances containing 1080 shall follow and adopt best practice.

Source: The ERMA/EPA reassessment of 1080

8.4 Management controls and provisions in plans

Application of VTA's is tightly regulated by EPA so the provisions for discharge in a regional plan should not duplicate the requirements that already apply. Any additional controls should be because of a resource management issue that is not addressed in the EPA controls.

Suggested conditions in rules

- The pilot shall hold a HSNO Controlled Substance License issued by EPA.
- The discharge shall not contravene any requirement specified in the Ministry of Health Permit and any other consent.
- For aerial discharges the discharge shall comply with AIRCARE™ Code of Practice for The Aerial Application of Vertebrate Toxic Agents 1st November 2011 or relevant Standard Operating Procedures (DOC).

Permitted Activity Rule for vertebrate toxic agents

The discharge of vertebrate toxic agents into air, onto land, or onto land where it may enter water is a permitted activity subject to the following conditions:

1. All discharges:
    a) The discharge must comply with requirements covering the person in charge, training, signage, storage, emergency management and all other requirements under the Hazardous Substances and New Organisms Act 1996 and pursuant Regulations.
    b) The discharge must not exceed rates of application or contravene any requirement specified on the label.

2. Applications by hand or ground based equipment:
    a) There must be no discharge beyond the boundary of the subject property;
    b) There must be no direct discharge into any water body;
    c) Where the discharge occurs in an amenity area or public place signs shall be erected prior to the application commencing and maintained until the application has ceased and all baits removed or have become non-toxic.
3. Applications from aircraft:
    a) All 'reasonable measures' must be taken to prevent any discharge of vertebrate toxic agents:
        (i) Beyond the boundary of the subject property and;
        (ii) Within 10 m of any lake or wetland which has an area of 1 ha or more and;
        (iii) Within 10 m of the wetted bed of a river, lake or artificial watercourse that is more than 3 m wide and;
        (iv) Within a coastal marine area; and
        (v) Within a group or community drinking water supply protection area
    b) Where the discharge is located within 50 metres of a sensitive area listed in x in this plan notice of the discharge must be provided to adjacent landowners and occupiers at least 7 days and not more than 20 days before application and must include the following information:
        (i) the period when the application will occur
        (ii) the trade name and the chemical name to be used
        (iii) method of application (Fixed wing or helicopter)
        (iv) safety precautions to be taken
        (v) the name and contact phone number of those carrying out the application

A record of this notification must be kept and made available to the council upon request.

c) Where the discharge occurs in an amenity area or public place signs shall be erected prior to the application commencing and maintained until the application has ceased and all baits removed or have become non-toxic.

Under condition (a) "reasonable measures" may include the use of GPS technology, positive airflow indicators on boundaries or direct boundary supervision by qualified personnel.

NOTE: The discharge of vertebrate toxic agents is subject to specific requirements under the Hazardous Substances and New Organism Act 1996 and may require the approval of the Medical Officer of Health and the Department of Conservation.

If one or more of these conditions cannot be met then the use of VTA's becomes a restricted discretionary activity and resource consent will be required from Council.

Restricted Discretionary Rule

Application of vertebrate toxic agents not complying with rule xxx is a Restricted Discretionary Activity Discretion is restricted to:

(a) The location, nature, scale, timing and duration of the activity
(b) The nature of the sensitive area adjacent to the discharge
(c) Any beneficial effects of the discharge
(d) Any effects on those species which are not the target of the discharge
(e) Any adverse effects or risks to human health or public use of the area
(f) Any relevant national regulations or nationally-accepted guidelines or codes of practice.
(g) Duration of consent and consent conditions
(h) Compliance monitoring

Resource Consent applications under this rule will not be publicly notified.

9. Amenity and land issues

9.1 Aircraft noise

The main area of potential adverse effect on amenity is from the aircraft noise, which, in the rural area, is generally a reverse sensitivity issue. That is: there can be objection to the noise of the aircraft operating in the area. The RMA does not control noise of aircraft in the air. (Nor does CAA).

There are more than 3300 aeroplanes and 800 helicopters in New Zealand. All of the aircraft are operated near noise sensitive areas at times. Additionally all the helicopters and some of the aeroplanes will routinely use unlicensed landing areas that we call Informal Airports. In addition, agricultural aircraft in particular will be flown continuously at low level to achieve predictable positioning of the products being discharged, but this requirement creates another challenge in that low flying aircraft contribute to noise nuisance more than aircraft flying more than 1000 feet above ground level.

Unless an aircraft is taking off or landing the RMA jurisdiction can only be applied when amenity values of an area are diminished. See Noise management in mixed-use urban environments Because the aviation sector is conscious of the limited cover of legislation, it has itself developed a best practice standard that reduces the adverse effects from aircraft noise.

If a district plan seeks to manage the potential noise impacts of aerial operations then consideration needs to be given to areas where the aircraft operate. It is important in the rural context to recognise that use of aircraft for applications of agrichemicals, fertilisers and baits are intermittent activities – the farmer, grower or forester is not using aircraft every day. Therefore adequate provision needs to enable the use of rural airstrips and landing areas for such intermittent use. A council may seek to include provisions for aircraft bases which are used on an on-going basis. A means to manage potential complaints about aircraft noise are to ensure that the plan includes provisions relating to reverse sensitivity in the rural area.

The AIRCARE™ accreditation includes noise abatement which provides measures for an operator to reduce the effects of noise. Requiring that an operator is AIRCARE™ accredited is a means to ensuring that noise abatement methods are used.

Table 9.1 Risk assessment approach for rules and conditions for noise abatement

Potential adverse effects	Risk factor	Exposure pathways	Pilot Management options	Options for plan provisions
Noise nuisance for rural inhabitants Offensive and/or objectionable effects such as excessive noise	No direct risk to rural inhabitants Direct risk to aircraft operators by limiting activities	Noise	Identify sensitive areas and avoid these where possible Minimise potential noise nuisance by varying the flight path, operating quiet aircraft types, operating aircraft as quietly as possible.	Provide for agricultural aviation operations as part of primary production activities. Include provisions for reverse sensitivity.
Noise nuisance to stock when aircraft operating at low level Offensive and/or objectionable effects such as excessive noise	Stock may take fright and become injured	Direct – stock see and hear aircraft	Identify sensitive areas and avoid these where possible Minimise potential noise nuisance by varying the flight path, operating quiet aircraft types, operating aircraft as quietly as possible, Notify effected parties when possible.	
Noise nuisance for rural inhabitants – small holdings Amenity values: Offensive and/or objectionable effects such as excessive noise	No direct risk to rural inhabitants Direct risk to aircraft operators by limiting activities Aircraft operating	Noise	Identify sensitive areas and avoid these where possible Minimising potential noise nuisance by varying the flight path, operating quiet aircraft types, operating aircraft as quietly as possible, operate aircraft at times landowners are absent (at work) Notify effected parties when possible Plan provisions relating to reverse sensitivity in rural areas – including noise, drift of fines to benchmark what is to be reasonably expected	Provide for agricultural aviation operations as part of primary production activities. Include provisions for reverse sensitivity.

Potential adverse effects	Risk factor	Exposure pathways	Pilot Management options	Options for plan provisions
			in the rural area.	
Noise Nuisance for Public or Crown Land Amenity values: Offensive and/or objectionable effects such as excessive noise	No direct risk to visitors Direct risk to aircraft operators by limiting activities Aircraft Operating	Noise	Identify sensitive areas and avoid these where possible Minimising potential noise nuisance by varying the flight path, operating quiet aircraft types, operating aircraft as quietly as possible Notify effected parties when possible Get agreement from entity with jurisdiction where it is acceptable to operate	Provide for agricultural aviation operations as part of primary production activities. Include provisions for reverse sensitivity. Classify public areas as *sensitive areas*
All potential adverse effects			Competent to assess noise abatement methods for operation.	Require pilot competency through pilot having Certificate in Aircraft Noise abatement and the operator to be AIRCARE™ accredited for noise abatement.

9.2 Land use

9.2.1 Storage

Storage of hazardous substances is a land use issue managed by district councils. Some councils have taken a prescriptive approach of specifying thresholds over which storage of a substance would require resource consent. Fertilisers are approved under the HSNO Group Standards for Fertilisers so it is considered appropriate that storage complies with these requirements.

A possible provision for a district plan is:
Permitted activity for the storage and use of fertiliser in accordance with Fertiliser Group Standards

NZS8409:2004 Management of Agrichemicals includes requirements for agrichemical storage which are best practice and consistent with HSNO. If storage complies with these requirements additional requirements should not be necessary through a district plan.

9.2.2 Loading and mixing sites

Care needs to be taken with loading and mixing sites. Refer to NZS8409:2004 Management of Agrichemicals.

9.2.2 Reverse sensitivity

Reverse sensitivity is the term used to describe the sensitivity of some activities to other lawfully established activities in the vicinity.

The Environment Court has provided a clear interpretation of reverse sensitivity in the case *Winstone Aggregates v The Matamata - Piako District Council* (W0055/2004, Environment Court, Auckland):

It is when sensitive activities [usually, but not always, residential activities] seek to establish within a range of a lawfully established, effect emitting, industry or activity, so that management may become difficult. This is the concept known as reverse sensitivity.

In terms of agricultural aviation activities some people are sensitive to the noise, dust and spray effects that are generated by the aerial operations. Such sensitivity can lead to complaints and attempts to restrict or curtail the operation. Often complaints are directed at the aerial operator as the name or number of the aircraft can be determined, rather than to the landowner who has engaged the aerial operator.

A pilot will use best practice and comply with relevant codes of practice and take measures to ensure that the adverse effects of the activity are minimised. However for some people that is not sufficient, especially those who are not traditional rural residents and see the operations as an imposition on their lifestyle.

In addressing such complaints it is important to recognise that the aerial operation is usually short term and only occurs on a limited number of days in any year.

Many regional and district plans include provisions relating to reverse sensitivity, especially in the rural area. It is important that noise, including aircraft noise, is listed in such provisions and that there is a benchmark as to what is to be reasonably expected in the rural area. Some plans include a description of rural character to establish what can be anticipated in the rural area.

Within the rural provisions there should be a policy framework that establishes that rural production activities, including aerial airstrips and operations, are part of normal rural production activities and reasonably anticipated

in the rural area. Such an approach then enables the activity and any complaints to be assessed in the context of the policy framework.

Councils can also use non-regulatory methods such as information to landowners and notices on LIMs to draw landowners attention to activities that can reasonably be expected in rural areas.

A definition of the concept of reverse sensitivity is given in an article by Bruce Pardy and Janine Kerr: Reverse Sensitivity - the Common Law Giveth and the RMA Taketh Away:

Reverse sensitivity is the legal vulnerability of an established activity to complaint from a new land use. It arises when an established use is causing adverse environmental impact to nearby land, and a new, benign activity is proposed for the land. The "sensitivity" is this: if the new use is permitted, the established use may be required to restrict its operations or mitigate its effects so as not to adversely affect the new activity."

One plan has used the following definition to describe the concept in simple terms:
Reverse sensitivity is when an activity complains about the effects of an existing lawfully established activity. This can have the effect of imposing economic burdens or operational limitations on the existing activity thereby reducing their viability.

The key is that any definition used in a plan is clear about where the sensitivity lies and the effect that it can have on lawfully established activities. It is also important that plans include agricultural aviation operations as part of primary production activities so that it is clear that they are part of the established activity.

10 Glossary

Accreditation	Officially recognised as meeting a specified standard.
Agrichemical	"Any substance, whether inorganic or organic, man-made or naturally occurring, modified or in its original state, that is used in any agriculture, horticulture or related activity, to eradicate, modify or control flora and fauna. For the purposes of this Standard, it includes agricultural compounds but excludes fertilisers, vertebrate pest control products and oral nutrition compounds."
ACVM	Agricultural compounds and Veterinary Medicines Act
Agricultural compound	The legal definition of an agricultural compound, as stated in the ACVM Act, is: ... any substance, mixture of substances, or biological compound, used or intended for use in the direct management of plants and animals, or to be applied to the land, place, or water on or in which the plants and animals are managed, for the purposes of: 1. managing or eradicating pests, including vertebrate pests; or 2. maintaining, promoting, or regulating plant or animal productivity and performance or reproduction; or 3. fulfilling special nutritional requirements; or 4. the manipulation, capture, or immobilisation of animals; or 5. diagnosing the condition of animals; or 6. preventing or treating conditions of animals; or 7. enhancing the effectiveness of an agricultural compound used for the treatment of plants and animals; or 8. marking animals; and includes a. any veterinary medicine, substance, mixture of substances, or biological compound used for post-harvest pest control or disinfestation of raw primary produce; b. anything used or intended to be used as feed for animals; and c. and any substance, mixture of substances, or biological compound declared to be an agricultural compound for the purposes of this Act by Order in Council made under subsection (2).
Atmospheric stability	Likelihood of an inversion layer forming indicated by temperature change with increasing altitude – stable conditions = inversion layer likely
Boom	The "pipe" on which spray nozzles are mounted
Buffer Zone	The distance between an identified sensitive area and the downwind edge of where an application is occurring.
Bunded	An area which has a raised perimeter to prevent the escape of any spills
Controlled swath width	Defined distance across the spray pattern from a single pass
Exposure pathways	The ways that a risk could occur
Fertiliser	Fertiliser means: a) any material (whether in solid or liquid form) which is described as, or held out to be for, or suitable for, sustaining or increasing the growth, productivity, or quality of plants or, animals through the application of the following essential nutrients to plants or soil:— (i) nitrogen, phosphorus, potassium, sulphur, magnesium, calcium, chlorine, and sodium as major nutrients; or

	(ii) manganese, iron, zinc, copper, boron, cobalt, molybdenum, iodine, and selenium as minor nutrients; or (iii) additives; and (b) any other product which is considered to meet identified soil or plant nutrient deficiencies and is applied with this as the principal objective and (c) the material shall be free from pathogens or any other agents which could affect disease and pest transmission.
GROWSAFE®	Registered trade name of the NZ Agrichemicals Education Trust and name of the training course associated with NZS8409:2004 Management of Agrichemicals
Notification	Advising an affected party that an application or operation is to occur
NZS8409	New Zealand Standard 8409:2004 Management of Agrichemicals
Off target drift	The movement of airborne substances as droplets, vapour, solid particles or dust away from the target area.
Operator	The organisation undertaking an operation. The operator may be a sole operator/ pilot or a larger organisation with a number of pilots.
PPE	Personal Protective Equipment (e.g. gloves, respirator)
PSC	Product Safety Card – describes properties and use of a substance
Reverse sensitivity	Reverse sensitivity is when occupants of an activity complain about the effects of an existing lawfully established activity. This can have the effect of imposing economic burdens or operational limitations on the existing activity thereby reducing their viability.
Risk factor	The possible reasons why an adverse effects could occur
SDS	Safety Data Sheet – describes the properties and uses of a substance, identifies chemical and physical properties, health hazard information, precautions for use and safe handling information.
Sensitive areas Based on Appendix G NZS8409:2004	Sensitive areas include: • Residential buildings • Educational facilities • Public places and amenity areas where people congregate • Domestic and community water supplies • Water bodies and associated riparian vegetation • Crops which are sensitive to agrichemicals or faming systems (eg organic farms, greenhouses) • Wetlands, indigenous vegetation habitat areas and reserves • Public roads
Spray quality	The spray droplet size dependent on the nozzle used. Nozzle manufacturers will provide information on spray quality while the technical specifications are set out in Spray Nozzle Classification by Droplet spectra ANSI/ASAE S572.1 March 2009
Spray plan	Spray plan means: a Spray plan prepared consistent with NZS8409: 2004 Management of Agrichemicals Section 5.3 and Appendix M4. A template can be found on the GROWSAFE website www.growsafe.co.nz
Swath	
Volatility	The degree to which a substance changes from a liquid or solid state to a gas at ordinary temperatures when exposed to air.
Waterbodies	RMA definition – means fresh water or geothermal water in a river, lake, stream, pond wetland or aquifer or any part thereof that is not located within the coastal

	marine area.
VTA's	Vertebrate toxic agents (VTA's) means any substance, whether inorganic, human made or naturally occurring, modified or in its original state, that is used to eradicate, modify or control vertebrate animals, including possums, rats and mustelids. VTA's are regulated under the Hazardous Substances and New Organisms Act 1996 and includes vertebrate pest control products as identified (but not defined) in NZS 8409:2004 Management of Agrichemicals.

Acknowledgments

Related/relevant GN and other publications