

PLANNING GUIDELINES

Separating Agricultural and
Residential Land Uses



Planning Guidelines

Separating Agricultural and Residential Land Uses

Department of Natural Resources, Queensland
Department of Local Government and Planning, Queensland
DNRQ 97088

These planning guidelines are to be read in association with State Planning Policy 1/92: Development and the Conservation of Agricultural Land

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Preface

State Planning Policy 1/92: Development and the Conservation of Agricultural Land was approved by the Queensland Government in December 1992, under the *Local Government (Planning and Environment) Act 1990-1992*.

State Planning Policy 1/92 addresses key principles for the protection of agricultural land. The policy is supported by planning guidelines which provide detailed advice on implementing the policy.

Planning Guidelines: The Identification of Good Quality Agricultural Land was released in 1993 and addressed the definition and identification of good quality agricultural land and appropriate planning approaches to achieve the protection of such land.

Planning Guidelines: Separating Agricultural and Residential Land Uses provides technical advice and guidance to local government, developers, consultants and landholders on minimising conflicts between farming activities and residential uses (Policy Principle No. 8 of State Planning Policy 1/92). The planning guidelines are a product of extensive public consultation: two drafts were published (1993 and 1995), and the document has been substantially amended in response to comments received. In particular, the document advocates a flexible approach that is responsive to specific circumstances.

Planning Guidelines: Separating Agricultural and Residential Land Uses has been prepared by the Department of Natural Resources and the Department of Local Government and Planning in consultation with a reference group formed from representatives of the following bodies:

Local Government Association of Queensland

Queensland Farmers' Federation

CANEGROWERS

Australian Cotton Foundation

Queensland Pork Producers' Organisation

Queensland Dairy Farmers' Organisation

Queensland Fruit and Vegetable Growers

Queensland Grain Growers' Council

Queensland Conservation Council

Australian Sugar Milling Council

Urban Development Institute of Australia

Royal Australian Planning Institute

Land Resource Consultants

Department of Environment

Department of Primary Industries

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1. Introduction

1.1 *The Queensland Government considers that good quality agricultural land is a finite national and state resource that must be conserved and managed for the longer term.*

State Planning Policy 1/92: Development and the Conservation of Agricultural Land (SPP1/92) was introduced in December 1992 as an instrument to protect good quality agricultural land through local government planning. SPP1/92 Principle No 8 states:

Local Authority planning provisions should aim to minimise instances of incompatible uses locating adjacent to agricultural operations in a manner that inhibits normal farming practice. Where such instances do arise, measures to ameliorate potential conflicts should be devised wherever possible.

Purpose

1.2 The purpose of the planning guidelines is to provide technical advice and guidance on reducing the potential for conflict between farming activities and residential development in accordance with Principle No. 8 of State Planning Policy 1/92. The planning guidelines are intended to assist local governments, developers, landholders and consultants. In particular, the planning guidelines contain provisions which local governments should consider including in their planning schemes or adopting as local planning policies.

1.3 Although intended to support the protection of good quality agricultural land in accordance with State Planning Policy 1/92, the principles in the planning guidelines could be used to assist decision-making on other land where agricultural/residential conflicts could arise. Also, the principles can be applied to situations where conflicts are likely to arise between industrial, tourist, commercial or other urban uses and nearby agricultural uses.

1.4 It should be noted that conflict due to intensive animal industries is not specifically covered in these planning guidelines. Detailed guidance on dealing with the impact from these activities is provided in industry-specific codes of practice and guidelines which are listed in the reference section of this document.

Background

1.5 Conflict between residential development and agricultural land uses is likely to occur where residential land uses directly abut, or are sufficiently close to, farmland such that they are likely to be affected by agricultural activities.

1.6 Such conflict can arise from the use of agricultural chemicals, and noise, dust and odour generating activities. Adverse impacts of residential development on farmland include sediment and stormwater run-off. These planning guidelines outline planning measures to reduce such land use conflict.

The Environmental Protection Act

1.7 The *Environmental Protection Act 1994* (EP Act) was introduced by the Queensland Government primarily to protect the environmental values of air, noise and water. Under the EP Act and associated Environmental Protection Policies (EPPs), everyone has a general environmental duty of care to the environment and their neighbours.

1.8 Advice in the planning guidelines is based on certain assumptions:

- (a) All agricultural activities incorporate reasonable and practicable measures to protect the environment in accord with the Environmental Code of Practice for Agriculture (prepared under the provisions of the EP Act) and associated industry specific guidelines.
- (b) All agricultural activities are legally conducted as required by other legislation covering workplace health and safety, and the use and handling of agricultural chemicals.
- (c) Nevertheless, certain activities practised by even the most careful and responsible farmer may result in a nuisance to adjacent residential areas through, for example, unavoidable odour drift and noise impacts.

1.9 The separation distances recommended in this document are drawn from relevant State and Commonwealth legislation and guidelines, notably the EP Act, relevant research and the sources cited.

The Use of Buffer Areas

1.10 Buffer areas are legitimate planning tools. They are used to separate land uses to ensure long-term protection of both areas impacted upon and areas used for the conflict generating activity. Examples of such activities include sewage treatment works, abattoirs, tanneries, composting plants and rendering works; and intensive animal and plant production facilities (such as feedlots, piggeries and poultry sheds). The principle of separating conflicting uses is also applied to the protection of natural resource areas (such as nature conservation reserves, streams, water supply storage areas and forest reserves).

1.11 By separating agricultural uses from residential and other urban uses, buffer areas can reduce conflict and the resulting complaints. Complaints about agricultural practices are often based as much on perception as reality, particularly in relation to chemical spray drift. Seeing or smelling the source of nuisance may heighten the perception of that nuisance. Buffer

areas can contribute to the screening of agricultural activities from the view of residential areas. Thus a suitable visual barrier between the development and agricultural land in the form of a vegetation screen can significantly reduce the level of complaint by minimising both the cause and the perception of a nuisance.

1.12 Nevertheless, buffer areas designed in accordance with these planning guidelines will not totally eliminate all impacts of activities. Also, the planning guidelines do not limit the rights of individuals to take action under the common law or such legislation as the *Health Act 1937*, *EP Act 1994*, *Work Place Health and Safety Act 1995* or the *Agricultural Chemicals Distribution Control Act 1966*, if they believe their rights to enjoy a safe environment and the use of their land are restricted. Appendix 1 outlines existing controls and administering agencies for a range of issues.

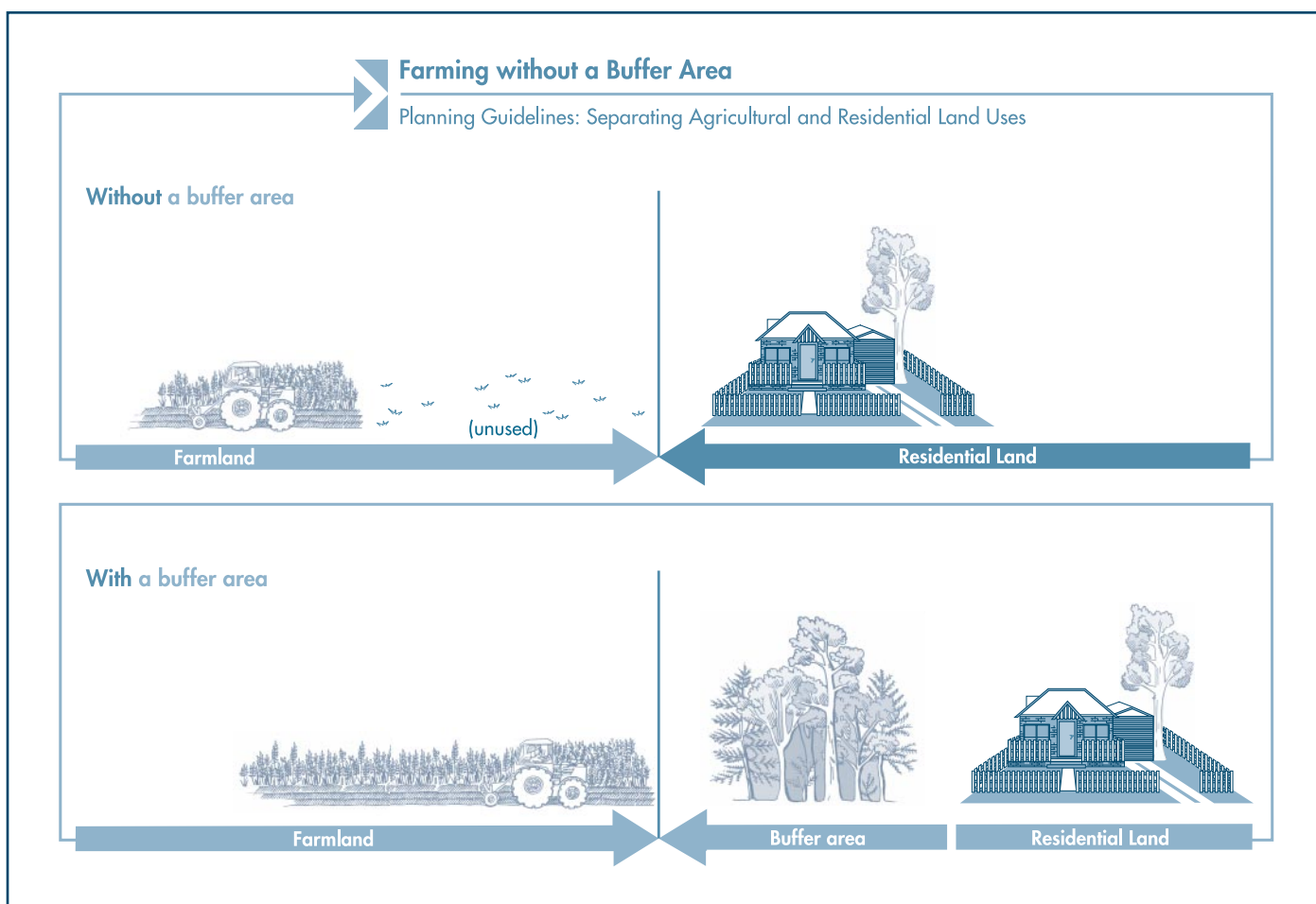


Figure 1. Farming without a buffer area

Principles

1.13 The planning guidelines should be applied with consideration to the following principles:

1. Provided agricultural practices are legally practised according to existing codes of practice, it is unreasonable for new adjacent uses to demand a modification of these practices to an extent which threatens efficient agricultural operations.
2. When preparing planning schemes, local governments should avoid, as far as practicable, locating residential development in close proximity to agricultural land. Where this is not possible, mechanisms such as buffer areas should be used to minimise conflicts.
3. Buffer areas should be determined on the basis of the sustainable agricultural land use with the potential to have the most impact on adjacent land uses and which is reasonably likely to be practised, regardless of current use.
4. Buffer areas should be located within the site being developed for residential purposes, and be provided/funded by the proponent of that development. This principle protects the prior rights of agricultural producers to practice agriculture on rural land.
5. Where conflicts already exist between agricultural and residential land uses, mechanisms including mediation, source controls and public education should be encouraged.

Objectives

1.14 The planning guidelines seek to achieve the following objectives:

1. To protect the use of reasonable and practicable farming measures that are practised in accordance with the Environmental Code of Practice for Agriculture and associated industry-specific guidelines.
2. To minimise scope for conflict by developing, where possible, a well-defined boundary between agricultural and residential areas and not interspersing agricultural and residential areas.
3. To minimise the impacts of residential development on agricultural production activities and land resources.
4. To minimise the potential for complaints about agricultural activities from residential areas.

5. To provide residents with acceptable environmental conditions in residential areas that are located adjacent to agricultural production areas.

Structure of the Planning Guidelines

1.15 The contents of these planning guidelines are as follows:

- **Section 2** provides advice on forward planning to prevent and/or minimise conflicts.
- **Section 3** details how to assess the need for buffer areas as part of development assessment and provides a performance based approach to planning scheme provisions.¹
- **Section 4** deals with issues of use, ownership and maintenance of buffer areas.
- **Section 5** provides advice on situations where conflict may already exist.
- **Section 6** identifies roles and responsibilities.
- **Appendixes** provide information on existing controls and technical data to assist in the design of effective buffer areas.

Definitions and Abbreviations

1.16 For the purpose of these planning guidelines, the following abbreviations are used:

DLGP	- Department of Local Government and Planning
DNR	- Department of Natural Resources
DPI	- Department of Primary Industries
ESD	- Ecologically Sustainable Development
EP Act	- <i>Environmental Protection Act 1994</i>
EPP	- Environmental Protection Policy
$L_{Amax,T}$	- The average maximum A-weighted sound pressure level in a specified time interval (T) or event
LG(P&E) Act	- <i>Local Government (Planning and Environment) Act 1990</i>
SPP1/92	- State Planning Policy 1/92: Development and the Conservation of Agricultural Land

¹ The performance based approach is explained in paragraph 2.27

1.17 The following definitions have been adopted in the planning guidelines:

Agricultural land use—the use of land for the production of food, fibre and timber; including grazing, cropping, horticulture and forestry². Agricultural land use is subject to constraints imposed by:

- climate
- slope, soil and water limitations
- processing requirements
- economic conditions.

Buffer area—an area of land separating adjacent land uses that is managed for the purpose of mitigating impacts of one use on another. A buffer area consists of a separation distance and one or more buffer elements.

Buffer element—a natural or artificial feature within a buffer area that mitigates an adverse impact. A buffer element may include open ground, a vegetation buffer and/or an acoustic barrier.

Building envelope—A diagram drawn on a subdivision plan, or other plan that forms part of a development application, defining the limits for the siting of buildings (and associated services and facilities e.g swimming pools).

Drift—airborne movement of agricultural chemicals onto a non-target area with the potential for risk of injury or damage to humans, plants, animals, environment or property³.

Residential development—urban subdivision, low density residential subdivision (including rural residential) and rural allotments created primarily for residential purposes (residential excisions, concessional allotments, retirement blocks etc.), and other places used as human accommodation excluding dwellings associated with bonafide agricultural holdings.

Sensitive receptor

- a dwelling, mobile home or caravan park, residential marina or other residential place in a residential development;
- a motel, hotel, or hostel;
- a childcare centre, kindergarten, school, university or other educational institution; or
- a medical centre or hospital.

Separation distance—the total linear distance between a source and a sensitive receptor.

³ The detection of odour does not necessarily correspond to the presence of an active chemical ingredient.

² Guidelines for the separation of residential uses from intensive agricultural production establishments including cattle feedlots, piggeries and poultry farms are available in separate publications listed in the references.

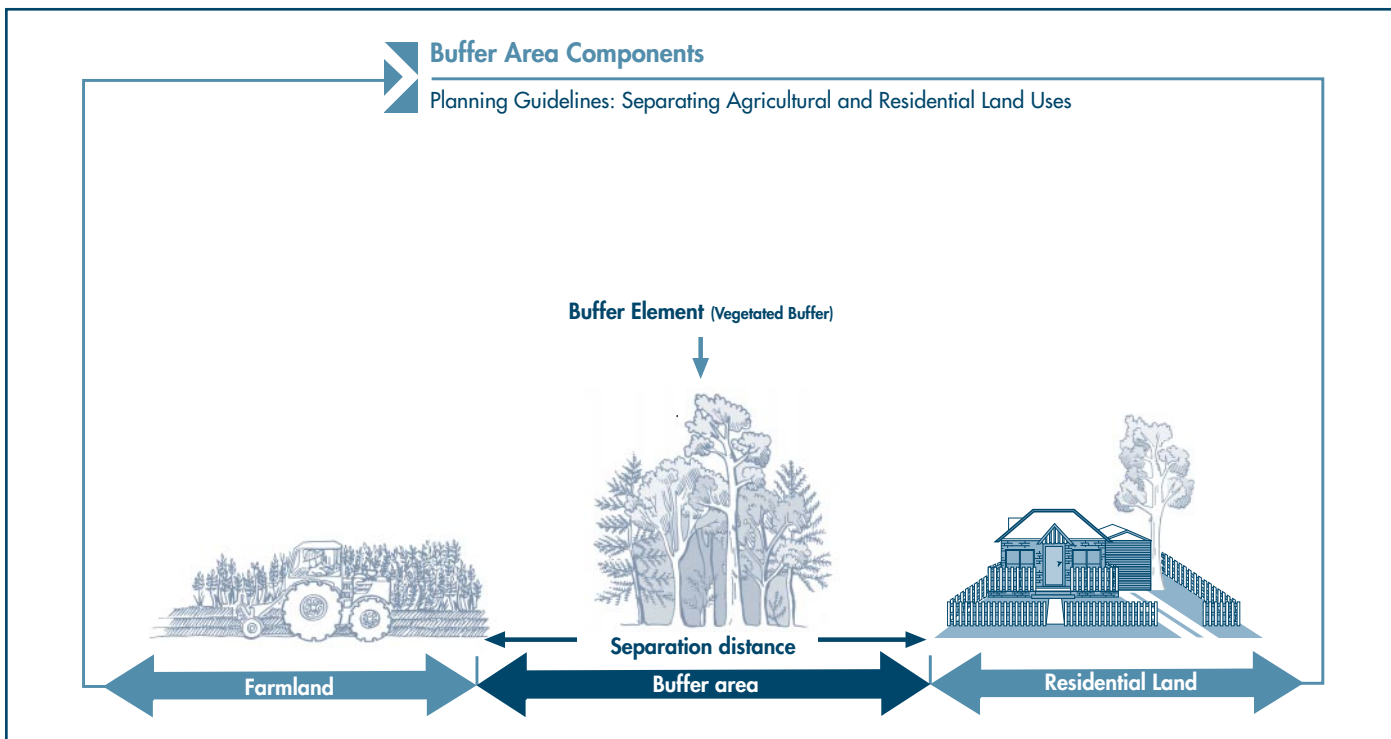


Figure 2. Buffer area components

2. PLANNING SCHEMES

2.1 Planning schemes provide local governments with the opportunity to minimise the potential for conflict between agricultural and residential land uses by separating those uses, thereby providing more certainty for land holders.

Methods of Achieving Separation

2.2 The main ways of achieving separation through planning decisions and the use of planning controls are as follows:

- As far as possible, isolate good quality agricultural land from uses likely to conflict with nearby farming activities.
- On the edges of urban areas, retain natural features (e.g. watercourses and ridge lines) free from development to act as buffer areas between newly developing areas and farmland.
- Ensure that, as far as practicable, newly developing areas are designed so that features such as public open spaces, road reserves or purpose-designed buffer areas provide the required separation.
- Require individual developments to be designed in ways that incorporate buffer areas.

2.3 Some or all of these methods will be appropriate, depending on the local circumstances. The rest of Section 2 describes how these various methods can be used when preparing planning schemes and assessing development applications.

Overview

2.4 Planning schemes comprise a forward-looking land use/development strategy complemented by development assessment provisions. These have been known respectively as the Strategic Plan and the Planning Scheme Provisions in the *Local Government (Planning & Environment) Act 1990*.

2.5 Preventing and/or minimising conflict between agricultural land uses and residential development will involve:

- determining the potential for conflict through investigations conducted as part of the preparation or review of planning schemes;
- reducing the opportunity for land use conflict by adopting appropriate planning strategies in the Planning Scheme;

- adopting provisions that are consistent with these planning guidelines and appropriate to local circumstances.

Strategic Planning

2.6 Strategic planning, supplemented as necessary by local area planning, establishes the broad framework to guide future land use and development. Therefore, when preparing or reviewing strategic plans, areas of good quality agricultural land should be identified and protected through appropriate land use designations⁴.

2.7 These designations should include additional areas considered essential for the protection of good quality agricultural land and its productive potential. Additional areas may need to include buffer areas or areas containing essential agricultural infrastructure (e.g. sugar mill tramways, irrigation pump stations, farm packing sheds and cool rooms).

2.8 Any analysis of future development options and settlement patterns should include an assessment of the potential for conflict between agricultural and other land uses. Areas designated for residential and other urban uses should be clearly delineated thereby providing some certainty about the intended boundaries between urban and rural areas. Designations should be based upon an assessment of future development needs for a reasonable time scale (approximately 15 years). This approach avoids blighting agricultural land long before it may be required for development.

Isolating Good Quality Agricultural Land from Incompatible Uses

2.9 Land use strategies in strategic plans and any supporting local area plans should, as far as practicable, aim to isolate good quality agricultural land from uses likely to conflict with certain farming activities.

2.10 Areas of poorer quality agricultural land, when used for purposes that will not cause land use conflicts, may serve to isolate more intensively farmed land from encroaching incompatible uses. Farm forestry and grazing are examples of rural land uses that are compatible with either adjoining areas of intensive agriculture or adjacent residential uses.

2.11 Where achieving isolation is not possible through forward planning, separation should be achieved in other ways.

⁴ Advice on this is contained in *Planning Guidelines: The Identification of Good Quality Agricultural Land*.

Using Retained Natural Features as Buffer Areas

2.12 Boundaries of urban designations should, where practicable, take opportunities to follow natural features that will be retained undeveloped, such as watercourses, ridge lines, steeply sloping ground and areas for nature conservation (see 4.9). All these features can act as natural buffer areas between farmland and urban areas.

Designing Urban Areas to Provide Buffer Areas

2.13 Certain facilities and uses, such as public open spaces, road reserves and golf courses, can also be located and designed to act as buffer areas.

2.14 Public open spaces and recreational uses should only be located at the edge of development and used as buffer areas if:

- the location is appropriate for satisfying the open space needs of the community;
- the use of the buffer area as public open space is compatible with adjoining uses,
- the impacts from the adjoining agricultural use do not preclude recreational use of the open space.

2.15 In many of the smaller towns in Queensland, a strip or a tract of Crown land is set aside as a town reserve or common that can act as a buffer area between agricultural and residential land. As well as a buffer area, such town reserves provide a 'land store' dedicated for various public purposes, including parks.

Designing Developments to Provide Buffer Areas

2.16 Despite designing land use strategies to minimise potential for conflict, there will be areas where residential and other urban uses have to locate adjacent to good quality agricultural land. Policies and measures to reduce the potential for conflict should therefore be set out in strategic plans or elsewhere in planning schemes.

2.17 Broad criteria should be included for determining the need for buffer areas and for the design of features such as vegetated buffers. In areas where potential for conflict is identified, each development application should be required to include an assessment of the need for buffer areas and design measures to ensure their effectiveness. Appropriate design requirements are described in Section 3.

2.18 Strategic plan maps can depict an 'area of investigation' where proposed residential uses adjoin existing agricultural areas (see Figure 3). The size of the area of investigation should be determined by:

- the potential agricultural activities in the area concerned (see paragraph 1.13, Principle 3);
- the minimum separation distances appropriate to the likely sources of conflict (see Table 2).

2.19 Planning schemes should provide scope for required separation to be achieved in different ways. A purpose-designed buffer area is one method. Alternatively, the buffer area could be incorporated into the design of the particular development.

2.20 For example, with residential development, large residential allotments incorporating the required buffer area could be located on the boundary between the residential subdivision and agricultural land. Planning schemes should allow for this approach by specifying minimum lot sizes sufficiently large to incorporate the desired buffer area into the allotment while allowing an adequate balance of the lot to be available for the house and normal residential use. To minimise any loss of development potential, a higher allotment yield could be offered over the balance of the development site to offset the use of the larger lots incorporating the buffer area.

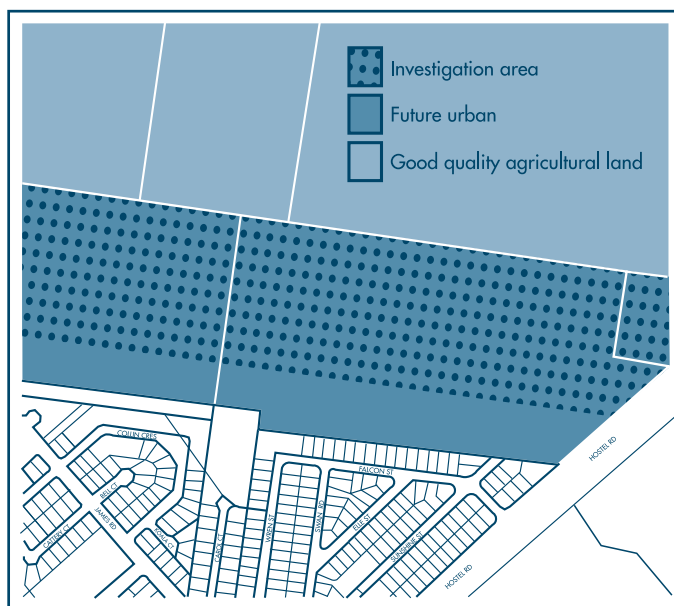


Figure 3. Strategic plan map

2.21 Designing and providing an adequate buffer as part of each residential allotment should enhance the prospect of the buffer areas being effective and well managed.

Temporary Buffers

2.22 In areas experiencing high levels of urban growth, relatively large areas of land might need to be designated for urban development. Situations will arise where good quality agricultural land is necessarily designated for development, but that development may be some years away. In such cases, consideration should be given to the need for temporary buffers at particular development stages to protect continuing farm operations until that farmland is developed.

2.23 Strategic plans or another part of the planning scheme should identify where the need for such buffer areas should be considered. Normally, the temporary buffer area should be incorporated in the future subdivision design, and planning schemes should include such a requirement. However, as the need for a buffer area is only short term, it need not be designed as a permanent feature, unless that feature has a desired role in the urban area (e.g. public open space or large residential allotments as described in 2.20).

2.24 Alternatively, land in the next development stage could still be farmed until required for development, but a buffer area incorporated into the farm management. This approach can only be required when the development approval includes the farmland concerned.

2.25 Depending on the degree of conflict and the lifespan of the buffer area, such temporary buffer areas may be considered unnecessary by council. Temporary buffer areas should be subject to the same design criteria as permanent buffer areas to ensure effectiveness at reducing conflict.

Development Assessment Provisions

2.26 Planning schemes should contain development assessment provisions to support the land use strategy and policies. Such provisions should be designed to achieve the appropriate protection of good quality agricultural land and reduce the potential for conflict between agricultural and residential land uses.

2.27 Development assessment provisions should preferably be performance based⁵. Such provisions focus on achieving specific outcomes, but allow flexibility in the means of achieving these outcomes rather than relying only on prescriptive requirements. Performance-based provisions can therefore ensure that agricultural

impacts on adjoining residential and other urban uses are minimised, but allow for differing approaches and responsiveness to local circumstances. Examples of such provisions are provided in Section 3.

2.28 For local governments without a planning scheme, a policy⁶ should be prepared to detail the mechanisms required when land use and subdivision approvals are being assessed in close proximity to agricultural land.

Appropriate Development

2.29 Minimising the potential for land use conflict can be achieved by limiting those uses regarded as inappropriate in areas of good quality agricultural land and immediately adjoining areas. The planning scheme should therefore aim to limit development in such areas to agricultural uses and other uses required to support agricultural activities. Such uses may include saleyards, grain drying facilities, animal husbandry services, storage for fresh produce, custom machinery operators.

2.30 In buffer areas between farmland and urban development, the planning scheme should aim to limit development to uses that do not detract from the effective operation of the buffer area. Such uses should therefore be compatible with the adjoining agricultural areas and adjacent residential development.

2.31 Examples of compatible uses (depending on the agricultural uses) include farm forestry, plant nurseries, horse trails, walking/cycling tracks, sport fields or other recreational activities. However, if the buffer area is created primarily to reduce conflict from agricultural chemical spray drift, some of these uses may not be compatible. In certain cases of land use conflict, it may be appropriate that minor loss of amenity is tolerated if the intrusion occurs on an infrequent basis without associated health risks.

2.32 In urban areas, the close proximity of any agricultural land should be a major consideration when deciding upon the type and design of development, including the need for buffer areas.

⁵ Such an approach involves clearly stated objectives and offers a choice of following prescribed development standards ('acceptable solutions'), or varying those standards in accordance with the objectives and performance criteria:

Objectives: describe the preferred outcomes for development and provide the opportunity for a variety of innovative solutions

Performance Criteria: the means of achieving the objectives—what is to be achieved rather than how this should be done

Acceptable solutions: set out some ways that guarantee the objectives can be met to the desired standards.

⁶ Local planning policies under the *Local Government (Planning & Environment) Act 1990* or planning scheme policies under the *Integrated Planning Act*.

Subdivision of Land

2.33 SPP 1/92 requires local government to give due consideration to the protection of good quality agricultural land when assessing applications for subdivision.

Residential or Rural Residential Areas

2.34 Where residential areas have to abut farmland, adequate separation can be achieved through subdivision design (*see 2.20 and 2.21*).

2.35 If the required buffer area is incorporated in large residential allotments, the buffer portion of the lot should be suitably designed and protected through conditions of development approval. These include requiring the provision and maintenance of planted areas in the buffer area, defining building envelopes for the location of houses outside the buffer area, or applying vegetation protection controls. The larger residential lots could be designed in such a manner as to allow redevelopment should the buffer area become redundant.

2.36 If buffer areas are proposed as one component of the public open space contribution, the issues set out in 2.14 above should be considered.

2.37 The ownership and maintenance of buffer areas are discussed in Section 4.

Single Residential Allotments

2.38 The creation of residential allotments in productive rural areas often fragments farmland and may lead to land use conflict, particularly when the occupants of the new dwelling have no direct connection with the surrounding agricultural activities. Where possible therefore, single residential allotments (such as 'concessional lots' or 'family excisions') should not be located on or adjacent to good quality agricultural land.

2.39 Local governments are encouraged to review and amend any subdivision provisions that permit residential allotments in rural areas to ensure that appropriate buffer areas are required adjacent to good quality agricultural land.

Conditions of Approval

2.40 Conditions should be set by local governments according to the relevant requirements of the planning legislation to ensure that on going maintenance and effectiveness of the buffer areas are binding upon successors in title.

3. Conflict assessment and buffer area design

3.1 Adequate consideration of possible conflict is necessary during development assessment. Development proponents should be required to assess the potential for land use conflict in areas of investigation (*see 2.13*), or in proximity to good quality agricultural land. This should be done regardless of whether or not the good quality agricultural land is being utilised for agriculture at the time of an application.

3.2 Councils may require reports from suitably qualified consultants to address each element of conflict and accompany an application where:

- the proposed development is within the area of investigation; or
- the planning scheme has not resolved or is silent on the issue of land use conflict; or
- the proposed development is contrary to the planning scheme.

3.3 In investigating the need for appropriate buffer areas, the following steps should be taken:

- Determine the sustainable agricultural land use with the potential of causing most problems for adjacent residential uses and which is reasonably likely to occur on the subject land.
- Identify the elements that may cause conflict and the extent of the conflict. The elements should be quantified, where possible, in terms of frequency and duration of activities to determine the element's impacts.
- Explain how the proponent intends to address each element to achieve acceptable outcomes in terms of residential area design, size of lots, separation widths, tree planting, acoustic barriers etc.
- Propose the means by which the proposed measures will be monitored and maintained. This should include responsibility for implementing and maintaining specific features of the buffer areas to ensure continued effectiveness.

3.4 When assessing development applications, local governments will need to consider the information submitted, and ensure that the mechanisms proposed to ameliorate land use conflict address all elements. The mechanisms must be flexible enough to accommodate possible changes in agricultural practices on the adjacent

land and be able to be implemented through the planning approval process. DNR is available to assist local governments in determining likely agricultural land uses.

3.5 The following provisions are provided for guidance in development assessment and for adoption by local government. Solutions other than those described may be acceptable to councils to meet the performance criteria.

Element: Agricultural chemical spray drift

Overview

3.6 The off-target movement of agricultural chemicals can be a cause for concern to residents in proximity to farming areas. These concerns are largely based on fears of exposure to agricultural chemicals but also due to detection of odours associated with the chemical (*see Appendix 5*). It should be noted that the guidelines treat chemical spray drift and odour as separate elements for the design of buffer areas (*see section 3.15–3.20*).

3.7 A Federal Government working group has conducted a review of agricultural chemical spray drift (CSIRO 1993). It concluded that 'there is insufficient knowledge to settle on a single distance for a buffer zone and that evidence indicates that buffer zones need to be chemical/formulation specific, based on supporting data.'

Available information

3.8 Studies at Emerald in 1990–91 concluded that the estimated average seasonal exposure for an adult or child of the five aerially applied insecticides detected did not exceed 0.2% of the World Health Organisation Acceptable Daily Intake. These studies did not measure the distance of measurement points from agricultural areas, but generally were in excess of 300 m from areas of chemical applications. However the perception of risk in the community associated with chemical spray drift persists.

3.9 Research and subsequent modelling has indicated negligible chemical drift at a range 300 m downwind from the release point of a chemical spray application (Spillman 1988). This research suggests a 300 m separation distance downwind of agricultural spraying is an acceptable minimum distance for adoption. It should be noted that the perception of 'negligible drift' may be influenced by the toxicity of the chemicals involved and may pose an unacceptable risk to some members of the community.

Other research and field trials have shown vegetated buffers are effective in capturing up to 80% of pesticide spray drift from an application upwind of a single row of trees (Harden 1992). Several Queensland councils now require vegetated buffers as a condition of development approval at the interface between agricultural and residential land use. Specific design criteria for vegetated buffer elements are presented in Appendix 2. Revegetation or thinning of existing stands of vegetation to the specifications in Appendix 2 may also be appropriate.

Buffer Area Width

3.10 From a planning perspective, it is not considered practical to base buffer area dimensions on individual chemicals or formulations. Based on the available research on chemical spray drift, the planning guidelines have adopted a minimum width of 300 m where open ground conditions apply; and a minimum width of 40 m where a vegetated buffer element can be satisfactorily implemented and maintained. These dimensions may vary according to local topographical or climatic conditions or as further knowledge is obtained.

3.11 Farm management can influence the effectiveness of buffer areas. The advice provided in the planning guidelines in relation to agricultural chemical use assumes farmers and their employees and contractors carry out their activities in accordance with reasonable and practicable measures as set out in the Environmental Code of Practice for Agriculture, and the *Agricultural Chemicals Distribution and Control Act 1966*. The Advisory Standard For the Storage and Use of Chemicals at Rural Workplaces provides additional guidance to persons with obligations under the *Workplace Health and Safety Act 1995*. It should be noted that currently there is no acceptable ambient air standard for agricultural chemical spray drift.

3.12 It should be noted that the recommended vegetated buffer (which includes multiple rows of trees) will not capture 100% of the chemical spray drift, but may reduce spray drift to less than 1% at a sensitive receptor when managed in terms of porosity, litter build up and noxious weed control to ensure effectiveness.

3.13 Factors affecting buffer area requirements for reducing agricultural chemical spray drift include:

- chemical composition/formulation e.g. toxicity, evaporation rates;
- method of application/release height e.g. aerial application, airblast mister etc.;
- spray technology e.g. nozzle type, droplet size;
- frequency of application;
- ability of the vegetation to capture spray droplets;
- target structure;
- weather conditions e.g. wind speed and direction, air turbulence, inversions;
- microclimate;
- geographical conditions and barriers e.g. topography.

3.14 Further information and advice on the use and effects of agricultural chemicals is available from:

Department of Primary Industries Agricultural Standards
Ph: 07 3239 3936

Department of Training and Industrial Relations
Division of Workplace Health and Safety
(Rural Officers) Ph: 1800 177 717

Queensland Farmers Federation (Workplace Health and Safety Officers) Ph: 1800 818 006

Department of Environment district or regional offices

Element: Agricultural Chemical Spray Drift

Objective: To locate new residential areas so that the impact of agricultural chemical spray drift on amenity and health is avoided and complaints from residents regarding the use of agricultural chemicals is unlikely.

Performance Criteria

Residential development to be located or incorporate measures such that chemical spray drift does not adversely affect community public health and safety.

Acceptable Solutions

- (i) The separation distance between a sensitive receptor and agricultural land is a minimum of 300 m.
- or:
- (ii) A vegetated buffer designed by a consultant acceptable to council and incorporating the criteria shown in Appendix 2 is located between the sensitive receptor and adjacent agricultural land. The vegetated buffer should:
- be provided with a suitable watering system;
 - include access strips on either side which are kept clear of vegetation and other flammable materials;
 - be of a height, density and width (40 m min) acceptable to council prior to the development of residential areas within 300 m of the agricultural land.
- or
- (iii) Other measures which meet the performance criteria and which are acceptable to council.

Overview

3.15 Odour in rural areas can arise from use of agricultural chemical sprays, fertilisers (inorganic and organic), effluent disposal and intensive livestock (e.g. feedlots, piggeries and poultry farms) and composting plants. Such detrimental odours can impact on residential amenity and have the potential to affect public health.

3.16 Odour is often a major factor in many complaints about off-site chemical spray drift where there is sometimes no objective evidence of toxic exposure. Some agricultural chemicals contain 'markers' (strong odours) to allow easy identification and these markers or mixing agents are sometimes detected at a distance from the target area and cause concern even though in some circumstances extremely low levels of the active ingredients may be present. Residents' association of the odour with the chemical is sufficient to raise fears of exposure (see Appendix 5).

3.17 Factors affecting complaints from odour are influenced by the frequency, intensity, duration and offensiveness of the odour. An objectionable odour may be tolerated if it occurs infrequently at a high intensity, however a similar odour may not be tolerated at lower levels if it persists for a longer duration.

Available information

3.18 Odour can be emitted from a variety of sources and dispersed by the atmosphere. Ground level concentrations of odour have been reported as being inversely related to wind speed and atmospheric conditions, i.e. the lower the wind speed and the more stable the conditions, the higher the concentration. The subjective nature of conflict resulting from exposure to odour makes the determination of design goals difficult (Holmes et al. 1996).

3.19 Industry-specific guidelines have been developed to determine suitable separation distances to deal with odour for feedlots, piggeries and poultry farms. Factors influencing the separation distance required include the number of livestock, site factors and levels of management. The siting of such industry and other development should be carefully considered in areas with poor dispersion conditions e.g. valleys. The buffer area between a proposed residential development and existing or approved intensive livestock facilities or composting facilities should

conform with standards specified in the relevant industry specific guidelines. The separation distance will be determined by consideration of the licence conditions applying to individual facilities set by DPI, DoE and/or local government.

3.20 While detection of odours may be instantaneous, often several hours are needed to confirm the presence and source of such odours. Odours from intermittent sources, such as chemical applications in rural areas, may only reach nuisance levels when exposure at a sensitive receptor exceeds a duration threshold. This is supported by research conducted by Holmes et al. (1996) who nominate 1% of time as an appropriate threshold.

Odour Duration Threshold

3.21 For the purpose of the planning guidelines and the design of effective buffer areas, the following odour duration threshold has been adopted:

- Odour from intermittent agricultural activities (e.g. fertiliser spreading, effluent disposal or chemical spraying) should not exceed nuisance levels outside any affected sensitive receptor for greater than 1% of the time (or 88 hrs/yr).

3.22 The duration threshold allows for some detectable odour levels provided they occur for less than 88 hrs/year. For the purposes of the planning guidelines, the following formula can be used to determine the potential time of odour impact upon a sensitive receptor:

$$t = n \times o$$

where:

t = potential hours of nuisance level odour per year

n = number of cropped hectares within 500 m of the receptor (40 ha max)

o = hours of operation per hectare per year of odour producing activity (a...z) (see tables in Appendix 4)

If the time 't' is greater than 88 hrs/year then the design goal has been exceeded and a buffer area may be required.

Buffer Area Width

3.23 Information on odours from poultry farms (DoE, 1994) indicate that 500 m would be an acceptable separation distance for odour mitigation should the duration threshold be exceeded.

3.24 Applicants who wish to propose alternative odour reduction measures should consider the following factors that influence odour dispersion:

- atmospheric stability wind speed and direction;
- terrain/topography and drainage flows;
- vegetation density;
- impact location;
- odour source, e.g. composting, chemical formulation, effluent disposal etc.

3.25 Information on odours associated with some agricultural chemicals is provided in Appendix 5. Additional advice should be sought from agricultural chemical suppliers, AVCARE and other sources to determine the nature and odours likely to be encountered in particular instances.

Element: Odour from agricultural activities

Objective: To locate new residential areas so that the impact of odour generated by agricultural activities on residential areas is minimised.

Performance Criteria

Residential development to be located or incorporate measures to minimise the impact of odour in excess of the duration threshold generated by intermittent agricultural activities at dwellings within the development.

Acceptable Solutions

- (i) The separation distance between a sensitive receptor and agricultural land is a minimum of 500 m.
or:
- (ii) A buffer area design based on a report consistent with the draft EPP (Air) from a qualified consultant acceptable to council detailing relevant factors and verifying that odour design goals in the EPP (Air) will be met at sensitive receptors within the development.
or:
- (iii) Other measures which meet the performance criteria and which are acceptable to council.

Element: Noise

Overview

3.26 There are four types of noise associated with agricultural activity which may lead to land use conflict. These are the noises associated with intensive livestock facilities, aircraft activities, constant or long-term noise, (e.g. pumps or refrigeration plants), and intermittent noise from tractors and other machinery.

3.27 The draft EPP (Noise) and associated guidelines allows agricultural practices to generate noise provided the activity is in accordance with reasonable and practicable industry measures as described in the Environmental Code of Practice for Agriculture and other industry specific guidelines. Under the code, it is not a breach of the general environmental duty of care if noise is generated in circumstances where it can be shown that the activity is not frequent or that there are no practicable alternatives.

3.28 The Code of Practice and other industry specific guidelines, further advises that rural industry practices should seek to avoid causing excessive noise at night-time (10 p.m.–6 a.m.) which may affect residential areas. Modification of farm machinery and management practices may reduce noise levels, but there will be instances when the generation of noise due to agricultural practices is unavoidable and may result in conflicts between land uses. Planning may also reduce conflict arising from noise by requiring appropriate buffer areas.

3.29 Many noisy activities associated with agriculture are intermittent and may only affect a particular adjacent residence for a few hours several times a year. For example, small cropping on a two crop per year basis for potatoes generally requires approximately 25 hours of machinery activity per hectare per year; sugar cane production requires less than 5 hours machinery activity per hectare per year.

Noise Level and Duration Thresholds

3.30 For the purpose of the planning guidelines the following noise levels and cumulative time thresholds have been adopted to determine whether noise is likely to be excessive outside a noise-sensitive receptor. The noise source is classed as intermittent if the specified noise level in the following table is exceeded for a cumulative total of 10 hours per year. If this cumulative time threshold is not exceeded, the noise source is considered not sufficient to require a buffer area. The noise source is classed as long term if the specified

noise level in the following table is exceeded for a cumulative total of 50 hours per year. Furthermore, stricter design goals are applied to night time operations between 10 p.m. and 6 a.m.

Table 1. Noise design goals

	Intermittent >10 hrs/yr	Long term >50 hrs/yr
Day-time 6 a.m.–10 p.m.	75 dB(A) ($L_{Amax,T}$)	60 dB(A) ($L_{Amax,T}$)
Night-time 10 p.m.–6 a.m.	55 dB(A) ($L_{Amax,T}$)	45 dB(A) ($L_{Amax,T}$)

3.31 The following formulae outline the steps for calculating cumulative hours of noise which exceed the design goals per year from agricultural activities. The formula for deriving hours per year of excessive noise from intermittent day-time activities is as follows:

$$x = \sum \{ (c \times f \times h) \times (\pi \times d^2 / 2) \}$$

where:

$$x = \text{hours/year when noise exceeds 75 dB(A) } (L_{Amax,T})^7$$

c = crops per year

f = frequency of activity (a...z) per crop

h = hours of noise per hectare for activity (a...z)

$$d = 10^{((N-60.47)/16.6)} \text{ where}$$

N = noise measured as $L_{Amax,T}$ at 7.5 m for activity (a...z)

NB: For long-term day-time activity, use

$$d = 10^{((N-45.47)/16.6)}$$

The formula for deriving hours per year of excessive noise from intermittent night-time activities is as follows:

$$y = \sum (c \times f \times h \times n)$$

where:

$$y = \text{hours/yr when noise exceeds 55 dB (A) } (L_{Amax,T})^7$$

c = crops per year

f = frequency of night-time activity (a...z) per crop

n = hours of activity per night (prior to 6am) when noise levels exceed 55dB(A)
($L_{Amax,T}$)

⁷ $L_{Amax,T}$ is the average maximum A-weighted sound pressure level in a specified time interval or event.

Buffer Area Width

3.32 In cases where the duration thresholds are likely to be exceeded, the planning guidelines use the noise design goals in Table 1 for determining effective separation distances. Minimum separation distances have been determined on the basis of noise attenuation rates of 5 dB(A) for each doubling of distance from the noise source. This attenuation rate assumes open ground conditions. The existence of natural barriers, broken topography or other features would increase attenuation and affect the separation distance required. A standard noise source of 90 dB(A)($L_{Amax,T}$), measured at 7.5 m from the source has been used. For example a day-time noise level attenuates to 75 dB(A) ($L_{Amax,T}$) by a distance of 60 m from the source. A night-time noise level attenuates to 55 dB(A) ($L_{Amax,T}$) by a distance of 1000 m from the source. These distances have been adopted in the planning guidelines as the minimum buffer width for intermittent day and night-time activities that occur more than 10 hrs/yr but less than 50 hrs/yr.

3.33 If a noise source operating at 90 dB(A)($L_{Amax,T}$) were to exceed the noise design goals for >50 hrs/yr, a distance of 500 m to attenuate the noise level to 60 dB(A) ($L_{Amax,T}$) for day-time noise, would be required. Night-time noise at this level may exceed 45 dB(A) ($L_{Amax,T}$) up to 4 km away. Such noise occurrence between 10 p.m.–6 a.m. is likely to be considered intrusive and therefore unreasonable. In circumstances where there are existing long term noise sources close to a proposed residential development, the proponent may consider funding measures such as machinery enclosures, mufflers, noise barriers and /or house design elements such as double glazing to complement subdivision layout and design measures to meet the performance criteria.

3.34 Appendixes 3 and 4 provide technical data on noise issues and worked examples of using these formulae to determine whether noise duration thresholds have been exceeded.

3.35 Applicants who wish to propose alternative noise reduction measures should determine noise levels at specific representative sites and demonstrate that the noise design goals for residential areas as set out in the draft EPP (Noise) and associated guidelines are not exceeded.

3.36 Factors affecting noise from agricultural activities which should be considered in designing buffer areas include:

- type of engine (diesel or petrol; 2- or 4-stroke);
- number of cylinders;
- cooling system (air or liquid);
- load;
- timing, frequency and duration of operations;
- geographical conditions and barriers e.g. topography and inversions;
- weather conditions e.g. wind speed and direction;
- typical industry machinery and practices.

3.37 It should be noted that while noise barriers can reduce noise by 10–16 dB(A) they may prove costly and have long term maintenance implications. Earth mounds to control noise must be carefully engineered to ensure minimum impacts on natural drainage patterns or the effectiveness of vegetated buffers. Noise attenuation devices may reduce the minimum separation distance for 90 dB(A) ($L_{Amax,T}$) intermittent day-time activities from 60 m to 15 m and for intermittent night-time activities from 1000 m to 250 m using a 10 dB(A) reduction as a guide.

Aircraft Noise

3.38 In areas of aerial spraying, the separation distance between the development and agricultural land must be a minimum of 100 m to comply with Air Navigation Order 20.21. This distance is based on operational safety and noise considerations.

Element: Noise from agricultural activities

Objective: To locate new residential areas so that noise from agricultural activities is attenuated to safeguard amenity in noise sensitive places.

Performance Criteria

- a) Residential development to be located or incorporate designs to minimise the impact of noise in excess of the duration threshold from **day-time** agricultural activities at dwelling within the development.

- b) Residential development to be located or incorporate designs to minimise the impact of noise in excess of the duration threshold from **night-time** agricultural activities at dwellings within the development.

- c) In areas of **aerial** agricultural activity, development should be located to minimise noise from aircraft.

Acceptable Solutions

- a) (i) The separation distance between the sensitive receptor and agricultural land is a minimum of 60 m for intermittent noise and 500 m for long-term noise.

or:
 - (ii) A buffer width and design based on a report from a qualified acoustic consultant acceptable to council detailing relevant factors and verifying that noise design goals consistent with the draft EPP (Noise) will be met at sensitive receptors within the development.

- or:
 - (iii) Other measures which meet the performance criteria and which are acceptable to council.

- b) (i) The separation distance between the sensitive receptor and agricultural land is a minimum of 1000 m.

or:
 - (ii) A buffer width and design based on a report from a qualified acoustic consultant acceptable to council detailing relevant factors and verifying that noise design goals consistent with the draft EPP (Noise) will be met at sensitive receptors within the development.

- or:
 - (iii) Other measures which meet the performance criteria and which are acceptable to council.

- c) The separation distance between the sensitive receptor and agricultural land to be a minimum of 100 m to comply with Air Navigation Order 20.21 which prohibits air craft flying closer than 100 m to a private dwelling.

Element: Dust, Smoke and Ash

Overview

3.39 Some agricultural activities including cultivation prior to planting, tractor and transport movements, cane fires and harvesting can generate dust, smoke and ash.

3.40 Contemporary farming practices incorporate measures to minimise loss of soil, but at times it is necessary to leave land unplanted for extended periods, which can lead to the movement of dust. Local conditions, including wind strength and direction, rainfall, humidity and ambient temperatures, soil type, vegetative cover and type of on site activity determine the extent of the nuisance.

3.41 The Environmental Audit of the Queensland Cane Growing Industry identifies cane fires as a source of smoke and ash nuisance for residents adjacent to farms but the continuing adoption of green cane harvesting will help to reduce the impacts from cane fires.

Buffer Area Design

3.42 In the absence of quantitative research data, the planning guidelines recommend a separation distance of 150 m where dust, smoke or ash from agricultural activities have been identified as a potential nuisance. In most cases, a vegetated buffer designed to capture chemical spray drift (*see Appendix 2*) will also be effective in reducing conflict resulting from dust, smoke and ash.

Element: Dust, smoke and ash from agricultural activities

Objective: To locate new residential areas so that the impact of dust, smoke and ash generated by agricultural activities on residential areas is minimised.

Performance Criteria

Residential development to be located or incorporate measures to minimise the impact of dust, smoke and ash generated by agricultural activities.

Acceptable Solutions

- (i) The separation distance between the sensitive receptor and agricultural land is a minimum of 150 m.
or:
 - (ii) A vegetated buffer designed by a consultant acceptable to council is located between the sensitive receptor and adjacent agricultural land. The vegetated buffer should:
 - be provided with a suitable watering system;
 - include access strips on either side which are kept clear of vegetation and other flammable materials;
 - be of a height, density and width (40 metres min) acceptable to council prior to the development of residential areas within 150 m of the agricultural land.
- or:
- (iii) • Other measures which meet the performance criteria and which are acceptable to council.

Element: Sediment and stormwater run-off

Overview

3.43 Residential development affects land surface characteristics and the hydrological balance, with the impacts often occurring on farmland located lower in the landscape. The increase of impermeable surfaces and changes to drainage patterns can accelerate soil erosion, siltation and sedimentation; and increase the risk of flooding. Techniques to alleviate conflict due to downstream effects of residential development include suitable erosion, sediment and stormwater control during the construction and operational stages of a development.

3.44 Soil erosion can be a major problem due to the highly dispersive and unstable nature of many soils in

Queensland. Proper subdivision and infrastructure design to minimise soil movement and silt loads entering drainage lines should be implemented. Temporary sediment control works should be constructed on sloping ground or near drainage lines during construction.

Buffer Area Design

3.45 Options available for council can include provisions for an erosion control plan for the construction and operation phases of the development, and management of stormwater run-off. Buffer areas can also be designed to utilise techniques such as water spreading and water diversion to reduce conflicts from stormwater run-off between residential development and adjacent farmland. Ongoing maintenance and enforcement must be identified and incorporated into conditions of approval.

Element: Sediment and stormwater run-off from residential development

Objective: To design new residential areas so that the impact of run-off and sediment from residential development areas on agricultural land is minimised.

Performance Criteria

Residential development to be located or incorporate measures to minimise the impact of sediment and storm water run-off on agricultural enterprises.

Acceptable Solutions

- (i) Residential development proposals to include the following:
- an erosion control plan for the construction and operation phases of the development which meets the standards set out in the Guidelines for Soils Erosion and Sediment Control for Construction Sites (1996);
 - stormwater run-off from all hard surfaces (including roads, roofs, driveways etc.) to be carried to stable waterways;
 - measures such as water spreading and water diversion implemented within the buffer area.
- or:
- (ii) Other measures which meet the performance criteria and which are acceptable to council.

Summary of Buffer Area Design Criteria

3.47 The design and adoption of a buffer area for a particular development proposal will reflect an analysis of all the elements likely to cause conflict and the final buffer area and component elements should reflect the

most intrusive element. Table 2 gives an overall summary of each element's duration threshold and design criteria for acceptable solutions. See also Appendix 6 for examples of effective buffer areas.

Table 2. Summary of buffer area design criteria

	Duration threshold	Min. default distance (m)	Min. design distance with buffer element(m)
Chemical spray drift	None	300	40
Intermittent odour	>88 hrs/yr	500	500*
Intermittent noise**	>10 hrs/yr<50 hrs/yr	60 (d) 1000 (n)	15 (d) 250 (n)
Long term noise **	>50 hrs/yr	500 (d) 1000# (n)	120 (d) 1000# (n)
Dust, smoke and ash	None	150	40

* Minimum design distance for an odour buffer area may be reduced on consideration of site factors and nature of odour

** Based on source noise level of 90 dB(A) ($L_{Amax,T}$) at 7.5 m

d = Noise occurring in day-time (6 a.m.–10 p.m.)

n = Noise occurring in night-time (10 p.m.–6 a.m.)

= Long-term noise occurring between 10 p.m.–6 a.m. is likely to be considered intrusive and therefore unreasonable. Such noise sources may be ameliorated by a combination of enclosing or muffling the source of the noise, by provision of a buffer area and attention to residential design.

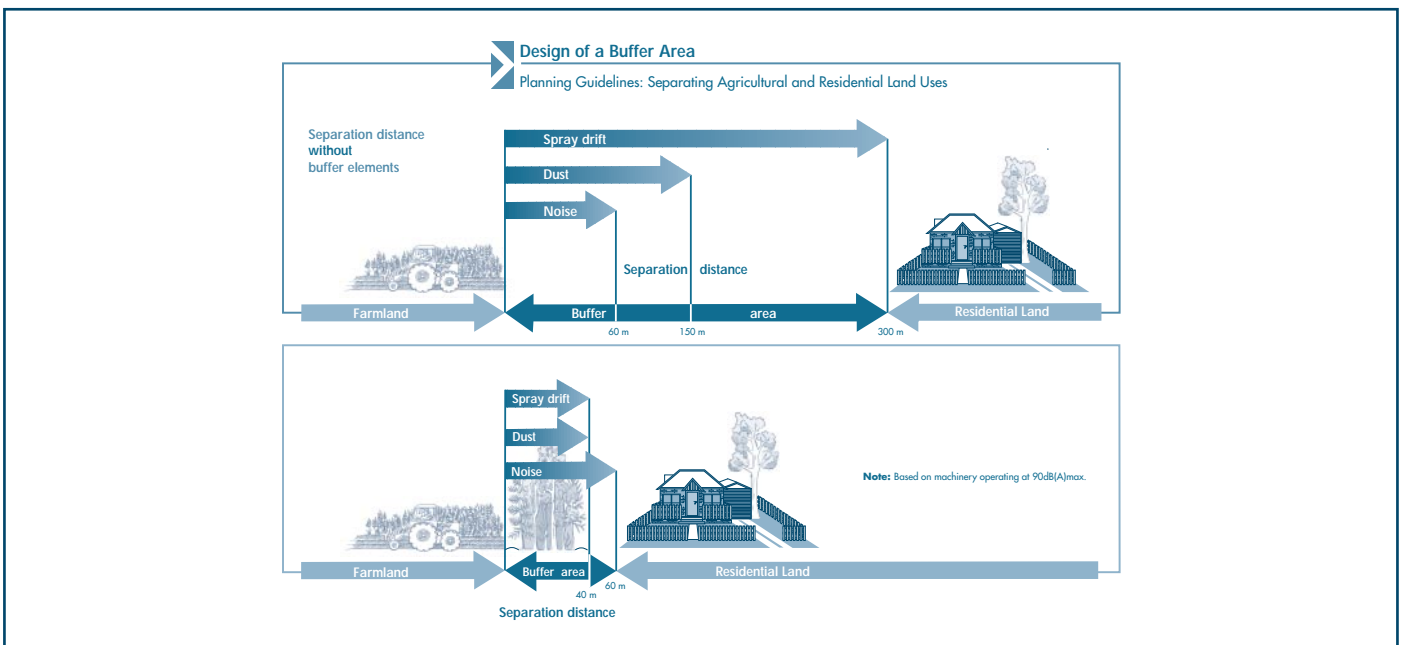


Figure 4. Design of a buffer area

4. Ownership and Maintenance of Buffer Areas

Ownership

4.1 Ownership and tenure may vary depending on the circumstances, and can be mixed over the area. For example, council parks, State land (e.g. roads), leasehold land, freehold land and easements may combine to form a continuous buffer area. An area designated as a 'buffer area' does not need to change tenure. However it should be managed in ways that reduce conflict between land uses.

Private land—single tenure

4.2 Private land refers to freehold and leasehold land. A buffer area on privately-owned land can be created through:

- planning controls such as building envelopes and other reasonable and relevant conditions attached to a development approval;
- Vegetation Protection Orders or other tree clearing controls to protect vegetation where existing vegetation is contributing to an effective buffer area;
- voluntary provision of a buffer area by the rural landholder when initiating an intensification of rural land use.

4.3 The owner will retain the rights to use the land forming the buffer area, subject to the controls and agreements put in place at the time of creation of the buffer area. Vegetation protection orders may need to be revoked if the separation area becomes redundant.

4.4 Where the buffer area is provided voluntarily by the rural land holder on rural land, it should remain in private ownership and may support productive rural uses which will not affect residential amenity, for example grazed pasture or farm forestry. Where the buffer area consists of natural vegetation with conservation values, the landholder may enter a voluntary agreement under the *Nature Conservation Act 1992* to create a nature refuge.

Private land—joint tenure

4.5 Common property areas of land which are often included as part of a community title form of development, may be used as a buffer area where the location is suitable. The land use and management must be consistent with the reduction of land use conflict.

4.6 The common property to be incorporated as the buffer area would be owned by the members of the joint tenure arrangement, usually the body corporate.

Public land

4.7 Buffer areas in public ownership will usually be under the control of local governments but may also include land under the control of State instrumentalities such as the Main Roads Department, Transport Department or Department of Natural Resources. Depending on the circumstances, parks, public open space, road and drainage reserves may be used as buffer areas. The permitted uses of the area may need to be varied if it is to function as a buffer area.

Maintenance

4.8 As a general rule, buffer areas should be properly designed to avoid special maintenance requirements whilst achieving their maximum desired effect of separating conflicting land uses. However, it will be necessary to ensure ongoing maintenance of buffer areas, including replanting, thinning, management for fire protection, herbicide damage, noxious weeds, feral animals, litter build-up etc. so that the buffer areas continue to be effective in reducing conflict. Vegetated buffers may require ongoing attention to maintain a porosity of 0.5 with suitable lower and upper storey vegetation to ensure their effectiveness in capturing spray drift.

4.9 Vegetated buffers may serve as components of wildlife corridors and improve opportunities for conserving wildlife habitat. Expert advice on effective wildlife corridors should be obtained from the Department of Environment. Where natural vegetation is used as a buffer element, management should meet objectives of both nature conservation and buffer performance. Where nature conservation objectives preclude thinning to achieve porosity specifications, an increased buffer width may be necessary.

4.10 To achieve effective management, clear responsibilities for maintenance should be determined before the buffer areas are implemented.

Responsibilities for maintenance will be largely determined by ownership. If in public ownership, local government and other agencies would be responsible for overseeing maintenance in conjunction with their usual town planning/health inspection and parks/gardens operations. In general, maintenance of buffer areas in private ownership will be the responsibility of the proprietor, as controlled by development conditions, local laws, or environmental protection agreements. The recommended mechanism is through planning conditions imposed on a development approval. These conditions attach to the land and are binding on successors in title. The necessary controls to ensure this maintenance is carried out must be in place at the time the buffer area is created.

4.11 Under joint tenure arrangements, the body corporate is responsible for the maintenance of the common area which would include the roads and any dams or buildings which exist on the common area. Control of fire, noxious weeds and feral animals should be the responsibility of the body corporate, as outlined in the body corporate management plan. This would need to be presented to the local government for approval at the time of the development application.

5. Dealing with Existing Conflicts

5.1 It should be noted that while this section does not deal with planning issues, it has been included for the benefit of councils and their local communities.

5.2 Where the opportunity to implement buffer areas is limited due to existing patterns of development, other options to reduce conflict can be explored. Mechanisms should aim to minimise conflict while not restricting existing legitimate farming operations.

Mediation and Negotiation

5.3 Many disputes arise as a result of a lack of information and understanding of why certain practices are carried out, or their effects on nearby residents. Councils should bring the conflicting parties together to discuss their concerns and focus on finding solutions. Often parties in dispute can reach agreement amongst themselves when given the opportunity.

5.4 The Department of Justice provides an alternative dispute resolution mechanism for the resolution of community disputes. It is a free, confidential mediation service that can be accessed from anywhere within the State via a toll free number. The department handles a wide range of disputes and issues. Disputes handled to date have involved neighbours on issues such as trees, boundaries, children and noise, and public issues disputes involving government departments, residents groups, conservation groups, industry representatives etc. The use of this mediation service does not limit an individual's right to use other legal avenues. This service can be reached by telephoning 1800 017 288.

5.5 The National Disputes Centre also offers a mediation service for conflict resolution, and can be reached by telephoning 029 223 1044.

Source Controls and Agricultural Practices

5.6 With the implementation of the EP Act, all persons now have a general duty of care to protect the environment. Rural producers are required to adopt reasonable and practicable measures to avoid environmental harm. These measures are set out in the Environmental Code of Practice for Agriculture. This may mean that some primary producers may need to modify some current practices to comply with the code.

5.7 Local governments will be responsible for administering sections of the EP Act. In some situations, councils may have no alternative other than to impose appropriate source controls on offending activities. An example of this may be that a farmer needs to operate a stationary pump adjacent to residences, for extended periods. In this case a cover, mounding or muffler that reduces the noise emitted by the pump to EPP Noise Design Goals would be required. Farmers can modify their practices or voluntarily forego agricultural production adjacent to residential areas to reduce conflict. Residential land holders may also choose to voluntarily forego the use of land adjacent to agricultural land for a buffer area to reduce conflict.

Education

5.8 Persons intending to live in or adjacent to an agricultural production area need to be fully informed of the likely agricultural practices that may impact on their residential amenity before they settle in such an area.

5.9 Local governments and primary industry bodies can play a role in the education process. Councils can include a 'Notice to Intending Purchasers' (see Figure 5) when providing information to persons conducting conveyancing searches. Figure 5 provides an example of such a notice. This could be combined with media releases and other methods of disseminating information to inform people from non-agricultural backgrounds. Government departments can also assist. The Department of Primary Industries produces farmer publications (Farmnotes, Guidelines for producers etc.) that can aid in educating the public; and the Department of Natural Resources provides advice on sustainable land management practices.

(EXAMPLE ONLY)

NOTICE

TO PURCHASERS OF LAND IN RURAL AREAS IN (...) SHIRE

(...) Shire Council supports the right of persons in rural areas to carry out agricultural production using reasonable and practicable measures to avoid environmental harm. An Environmental Code of Practice for Agriculture has been prepared under the *Environmental Protection Act 1995* and provides guidance on reasonable and practicable measures.

Intending purchasers are advised that agricultural production practised in accordance with the Code of Practice may include some of the following activities and some activities may have implications for occupiers of adjacent land :

- Logging and milling of timber
- Dairies
- Intensive livestock production (feedlots, piggeries and poultry farms)
- Vegetation clearing
- Cultivation and harvesting
- Bushfire hazard reduction burning
- Construction of firebreaks
- Construction of dams, drains and contour banks
- Fencing
- Use of agricultural machinery (tractors, chainsaws, motor bikes etc.)
- Pumping and irrigation
- Pesticide spraying
- Aerial spraying
- Animal husbandry practices
- Droving livestock on roads
- Silage production
- Construction of access roads and tracks
- Slashing and mowing vegetation
- Planting of wood lots

Intending purchasers of land in rural areas may have difficulty with some of these activities or the impact of these activities when they are being carried out on land near their proposed purchase. If so, they should seek independent advice and consider their position.

This notice is not intended to affect the rights of individuals to take action under the common law or legislation (including the *Health Act 1937*, *Environmental Protection Act 1994*, *Agricultural Chemical Distribution Control Act 1966* or the *Work Place Health and Safety Act 1995*).

This notice is provided for information purposes only.

Figure 5. Sample notice to intending purchasers

6. Roles

Proponents/Consultants

- Submit planning applications to local government.
- Provide accurate information which addresses each element of conflict and submit, a residential design which minimises land use conflict.
- Determine the sustainable agricultural land use with the potential for causing most problems for adjacent residential uses and which is reasonably likely to occur adjacent to the subject land.
- Identify the elements that may cause conflict and the extent of the conflict. The elements should be quantified where possible in terms of frequency and duration of activities to determine the element's impacts.
- Explain how the proponent intends to address each element to achieve acceptable outcomes in terms of residential area design, size of lots, separation distances, tree planting acoustic barriers etc.
- Propose the means by which the proposed measures will be implemented, monitored and maintained to ensure continued effectiveness.

Local Government

- Prepare strategic plans indicating areas of good quality agricultural land, investigation areas (areas of potential conflict), policies for the protection of such areas; and the avoidance of land use conflict.
- Provide applicants with detailed information as set out in *Planning Guidelines: Separating Agricultural and Residential Land Uses*.
- Determine applications, based on independent advice if necessary, and set appropriate conditions.
- Supply site data from planning applications to DNR and/or DoE (if advice from these agencies is required).

Department of Natural Resources

- Provide advice to local government and comment on available broad-scale land resource information for strategic planning.
- Define what constitutes good quality agricultural land within a local government area.

- Assist consultants and local government staff in the interpretation of the elements of land use conflict in rural areas.
- Assist local governments in checking submitted information, if required, and ensure appropriate standards are met.
- Provide advice to DLGP relevant to the implementation of State Planning Policy 1/92.

Department of Local Government and Planning

- Review planning schemes and amendments (rezonings) submitted by local governments.
- Provide policy guidance to local governments.

Department of Environment

- Set standards and provide advice on noise and air quality under the *Environmental Protection Act 1994*.
- Assist local governments in checking submitted information, if required, and ensure appropriate standards are met.
- Provide advice to DLGP and/or DNR relevant to the implementation of State Planning Policy 1/92.

Department of Primary Industries

- Assist local governments in checking submitted information, if required, and ensure appropriate standards are met.
- Provide relevant information on licence conditions for approved intensive animal production facilities to local government.
- Provide advice to DLGP and/or DNR relevant to the implementation of State Planning Policy 1/92.
- Provide advice on the most suitable agricultural land use for an area.

Agricultural Producers

- Carry out agricultural practices in accordance with the Environmental Code of Practice for Agriculture and relevant industry guidelines.

Residents

- Understand agricultural workplace practices.
- Maintain buffer areas and buffer elements located on private land.

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Department of Natural Resources

Telephone (07) 3224 8392

APPENDIX 1: Existing controls

Issue	legislation/regulations	Guidelines/	Contact Codes of Practice
Agricultural Chemicals	<ul style="list-style-type: none"> • <i>Agricultural Chemicals Distribution and Control Act, 1966</i> • <i>Chemical Use (Agricultural and Veterinary) Act, 1988</i> 	<i>Environmental Code of Practice for Agriculture</i>	Department of Primary Industries*
Aircraft	Civil Aviation Order 20.21	Civil Aviation Authority	
Air Quality	<ul style="list-style-type: none"> • <i>Environmental Protection Act, 1994</i> • EPP (Air) 	<i>Environmental Code of Practice for Agriculture</i>	Department of Environment**
Environmental Health	<i>Health Act</i>		Department of Health
Feedlots	<i>Stock Act, 1989</i>	<i>Guidelines for the Establishment and Operation of Cattle Feedlots</i>	Department of Primary Industries*
Fire	<i>Qld Fire Services Act, 1990</i>	Qld Fire Service	
Noise	<ul style="list-style-type: none"> • <i>Environmental Protection Act, 1994</i> • EPP (Noise) 	<i>Environmental Code of Practice for Agriculture</i>	<ul style="list-style-type: none"> • Department of Environment** • Local governments
Piggeries		<i>Draft Environmental Code of Practice for Piggeries in Qld</i>	<ul style="list-style-type: none"> • QPPO, Department of Primary Industries*
Poultry Farms		<i>Guidelines for Poultry Farming in Queensland</i>	Department of Primary Industries*
Water Quality	<ul style="list-style-type: none"> • <i>Environmental Protection Act, 1994</i> • EPP (Water) 	<i>Environmental Code of Practice for Agriculture</i>	<ul style="list-style-type: none"> • Department of Environment** • Local governments
Waterways	<i>Water Resources Act, 1989</i>	<i>Water Quality Council of Queensland Guidelines</i>	<ul style="list-style-type: none"> • Department of Natural Resources*** • Local governments
Work Practices	<i>Workplace Health and Safety Act, 1995</i>	Advisory standards for: <ul style="list-style-type: none"> • Storage and Use of Chemicals at Rural • Use of Rural Plant at a Rural Workplace 	Department of Training and Industrial Relations

* Contact local offices of the Department of Primary Industries listed in local telephone directories.

** Contact district or regional offices of the Department of Environment listed in local telephone directories.

*** Contact district offices of the Department of Natural Resources listed in local telephone directories.

APPENDIX 2: Vegetated buffer element design

While buffer areas of 300 m width are recommended for forward planning between residential and agricultural areas, ‘vegetated buffers’ can offer an alternative to this separation requirement. Research into the behaviour of pesticide spray drift has shown that vegetation screens can prove effective barriers to spray drift where they meet the following criteria:

- are of a minimum total width of 40 m;
- contain random plantings of a variety of tree and shrub species of differing growth habits, at spacings of 4–5 m for a minimum width of 20 m;
- include species with long, thin and rough foliage which facilitates the more efficient capture of spray droplets;
- provide a permeable barrier which allows air to pass through the buffer. A porosity of 0.5 is acceptable (approximately 50% of the screen should be air space);
- foliage is from the base to the crown;
- include species which are fast growing and hardy;
- have a mature tree height 1.5 times the spray release height or target vegetation height, whichever is higher;

- have mature height and width dimensions which do not detrimentally impact upon adjacent cropped land;
- include an area of at least 10 m clear of vegetation or other flammable material to either side of the vegetated area;

Vegetated buffers have other advantages in that they:

- create habitat and corridors for wildlife;
- increase the biological diversity of an area, thus assisting in pest control;
- favourably influence the microclimate;
- are aesthetically pleasing;
- provide opportunities for recreational uses;
- contribute to the reduction of noise and dust impacts.

Applications for development, where vegetated buffers are proposed, should include a landscape plan indicating the extent of the buffer, the location and spacing of proposed and existing trees and shrubs and a list of tree and shrub species to be planted. The application should also contain details concerning proposed ownership of the vegetated buffer and the means by which the buffer is to be maintained. Information on appropriate vegetation species is available in the publication *Trees and Shrubs* or from DNR forestry extension officers.

Based on research by Centre of Pesticide Application and Safety, University of Queensland, Gatton College.

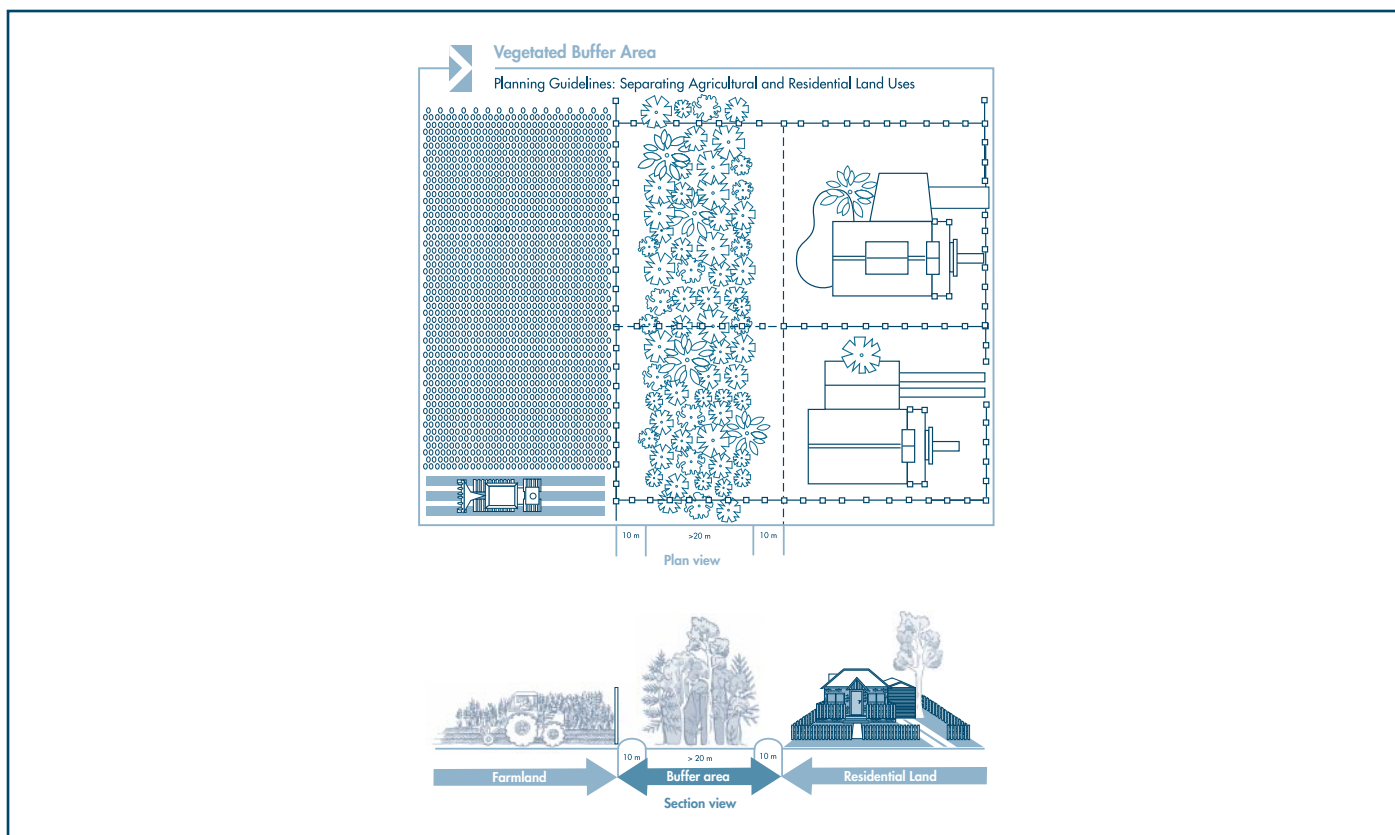
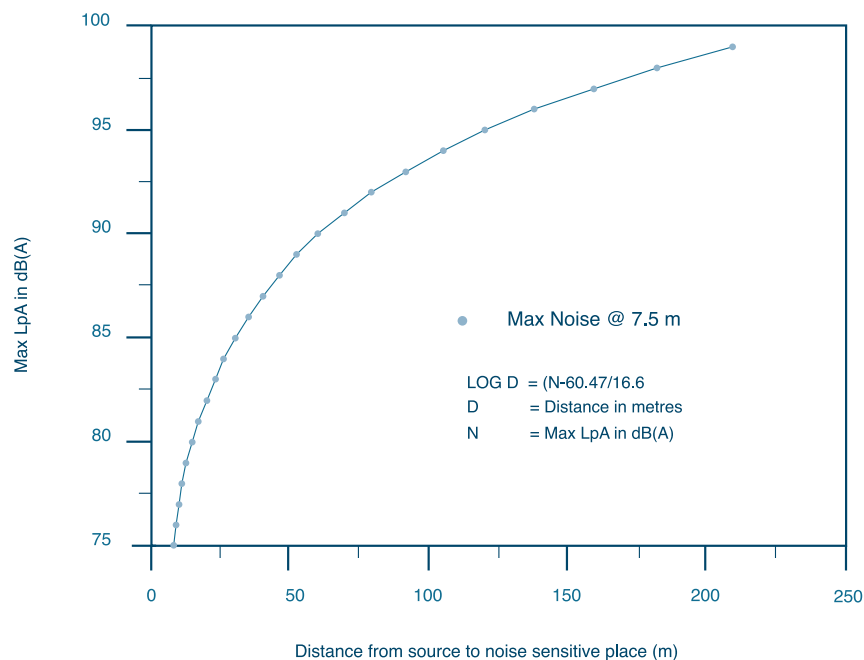


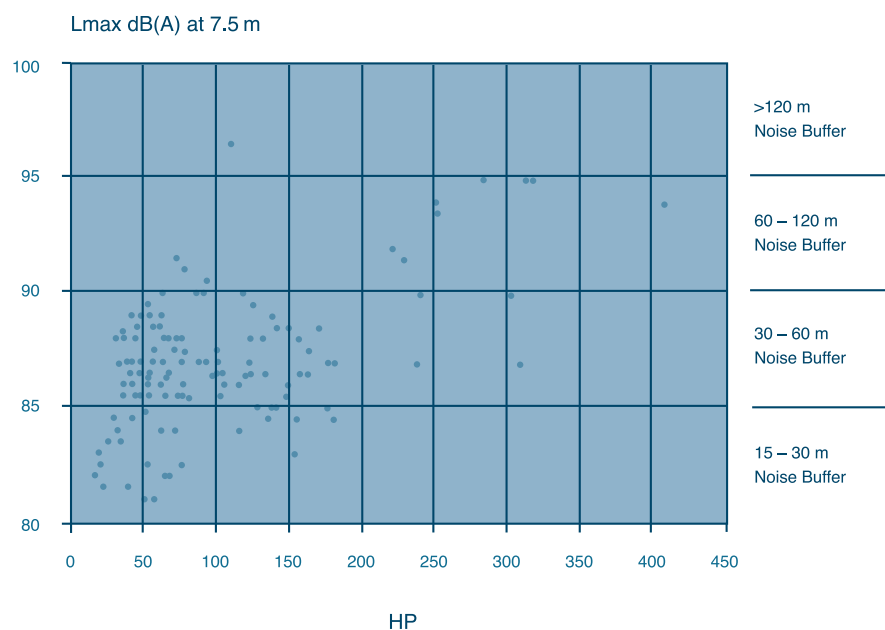
Figure 6. Vegetated buffer element

APPENDIX 3: Noise levels and separation distances

Noise levels and separation distance required to reduce noise levels to 75 dB(A) ($L_{Amax,T}$)



Tractor HP and Noise Levels



Source: Leviticus and Morgan (1993)

APPENDIX 4: Examples and formulae for duration thresholds

The following formula and examples demonstrate the duration thresholds of intermittent noise generating activities by crop type. For day-time activities the formula for determining the number of hours of noise from agricultural activities per year is:

$$x = \sum\{(c \times f \times h) \times (\pi \times d^2/2)\}$$

where:

x = hours/year when noise exceeds 75 dB(A) ($L_{Amax,T}$)

c = crops per year

f = frequency of activity (a...z) per crop

h = hours of noise per hectare for activity (a...z)

d = $10^{[(N-60.47)/16.6]}$

N = noise measured as ($L_{Amax,T}$) at 7.5 m for activity (a...z)

The results indicate that of all crops tested, tomatoes (25 hrs) and beetroot (15 hrs) have more than 10 hours of day-time activity per year when noise will exceed 75 dB(A) ($L_{Amax,T}$). The other crops conform with the duration threshold for noise which allows for up to 10 hours of day time activity per hectare per year. The separation distance required would be 69 m.

For night-time activities the formula is:

$$y = \sum(c \times f \times n)$$

where:

y = hours/yr when noise exceeds 55 dB(A) ($L_{Amax,T}$)

c = crops per year

f = frequency of night-time activity (a...z) per crop

n = hours of activity per night (prior to 6 a.m.) when noise levels exceed 55dB(A) ($L_{Amax,T}$)

The results indicate that while some crops do not require any night-time activities, beetroot (12 hrs), avocado (28 hrs), potatoes (32 hrs), tomatoes (96 hrs) and lucerne (48 hrs) require nighttime activities which exceed 10 hr/year when noise will exceed 55 dB(A) ($L_{Amax,T}$). The other crops conform with the duration threshold for noise which allow for up to 10 hours of night-time activity per year without the need for a buffer area.

The separation distance required without other amelioration measures would be 500 m for beetroot and lucerne and 1000 m for avocado, potatoes and tomato.

Crop	Crops/yr {c}	Activity	Day /Night	Freq/ crop {f}	Freq/ yr	Hrs/ ha {h}	Hrs/ ha/yr {o}	dB(A) @ 7.5 m {N}	Impact dist.(m) {d}	Impact area (ha) { $\pi \times d^2/2$ }	Hrs/yr> 75 dB(A) {x}	Hrs/yr> 55 dB(A)
Beetroot	2	plough	D	3	6	1.67	10.00	91.00	69	0.75	7.49	
	2	cultivate	D	3	6	0.50	3.00	87.00	40	0.25	0.74	
	2	plant	D	1	2	1.00	2.00	87.00	40	0.25	0.49	
	2	fertilise	D	2	4	1.00	4.00	87.00	40	0.25	0.99	
	2	spray	N	3	6	0.40	2.40 ^o	87.00	40/500	0.25	0.59	12.00
	2	harvest	D	1	2	3.33	6.67	91.00	69	0.75	4.99	
Total				13	26	7.90	28.07				15.29	12.00

o = hours of operation per hectare per year of odour producing activity

Crop	Crops/yr {c}	Activity	Day /Night	Freq/ crop {f}	Freq/ yr	Hrs/ ha {h}	Hrs/ ha/yr {o}	dB(A) @ 7.5 m {N}	Impact dist.(m) {d}	Impact area (ha) { $\pi*d^2/2$ }	Hrs/yr> 75 dB(A) {x}	Hrs/yr> 55 dB(A)
Sugar cane	0.25	plough	D	1	0.25	1.00	0.25	95.00	120	2.27	0.57	
	0.25	plant	D	1	0.25	1.00	0.25	91.00	69	0.75	0.19	
	1	cultivate	D	4	4	0.25	1.00	91.00	69	0.75	0.75	
	1	fertilise (N)	D	1	1	0.33	0.33	91.00	69	0.75	0.25	
	1	fertilise (P)	D	1	1	1.00	1.00	91.00	69	0.75	0.75	
	1	spray	D	2	2	0.17	0.33 ^o	91.00	69	0.75	0.25	
	1	harvest	D	1	1	1.00	1.00	96.00	138	3.00	3.00	
Total		aerial spray		11	9.5	4.75	4.16				5.76	0.00

Crop	Crops/yr {c}	Activity	Day /Night	Freq/ crop {f}	Freq/ yr	Hrs/ ha {h}	Hrs/ ha/yr {o}	dB(A) @ 7.5 m {N}	Impact dist.(m) {d}	Impact area (ha) { $\pi*d^2/2$ }	Hrs/yr> 75 dB(A) {x}	Hrs/yr> 55 dB(A)
Avocado	1	slashing	D	10	10	0.33	3.33	90.00	60	0.57	1.89	
	1	weed spraying	D	4	4	0.40	1.60	90.00	60	0.57	0.91	
	1	pesticides	N	14	14	0.40	5.60 ^o	90.00	60/1000	0.57	3.18	28.00
	1	harvesting	D	3	3	1.00	3.00	85.00	30	0.14	0.43	
Total				31	31	2.13	13.53				6.41	28.00

Crop	Crops/yr {c}	Activity	Day /Night	Freq/ crop {f}	Freq/ yr	Hrs/ ha {h}	Hrs/ ha/yr {o}	dB(A) @ 7.5 m {N}	Impact dist.(m) {d}	Impact area (ha) { $\pi*d^2/2$ }	Hrs/yr> 75 dB (A) {x}	Hrs/yr> 55 dB(A)
Irrigated	1	chisel plough	D	1	1	1.67	1.67	91.00	69	0.75	1.25	
Cotton	1	rip	D	1	1	1.67	1.67	91.00	69	0.75	1.25	
	1	bed preparation	D	3	3	1.00	3.00	91.00	69	0.75	2.25	
	1	fertiliser	D	1	1	0.42	0.42	87.00	40	0.25	0.10	
	1	plant	D	1	1	1.00	1.00	87.00	40	0.25	0.25	
	1	boom spray	D	7	7	0.40	2.80 ^o	87.00	40	0.25	0.69	
	1	aerial spray	D	8	8	0.10	0.80 ^o	100	1.57	1.26		
	1	picking	D	2	2	1.00	2.00	91.00	69	0.75	1.50	
	1	stick pulling	D	1	1	1.00	1.00	91.00	69	0.75	0.75	
Total				25	25	8.26	14.36				9.30	0.00

Crop	Crops/yr {c}	Activity	Day /Night	Freq/crop {f}	Freq/yr	Hrs/ha {h}	Hrs/ha/yr {o}	dB(A) @ 7.5 m {N}	Impact dist.(m) {d}	Impact area (ha) { $\pi*d^2/2$ }	Hrs/yr> 75 dB(A) {x}	Hrs/yr> 55 dB(A)
Dryland	1	chisel plough	D	1	1	1.67	1.67	91.00	69	0.75	1.25	
Cotton	1	cultivation	D	2	2	1.67	3.33	91.00	69	0.75	2.50	
	1	bed preparation	D	2	2	1.00	2.00	91.00	69	0.75	1.50	
	1	fertiliser	D	1	1	0.42	0.42	87.00	40	0.25	0.10	
	1	plant	D	1	1	1.00	1.00	87.00	40	0.25	0.25	
	1	boom spray	D	3	3	0.40	1.20 ^o	87.00	40	0.25	0.30	
	1	aerial spray	D	4	4	0.10	0.40 ^o	100	1.57	0.63		
	1	picking	D	1	1	1.00	1.00	91.00	69	0.75	0.75	
	1	stick pulling	D	1	1	1.00	1.00	91.00	69	0.75	0.75	
Total				16	16	8.26	12.02				8.03	0.00

Crop	Crops/yr {c}	Activity	Day /Night	Freq/crop {f}	Freq/yr	Hrs/ha {h}	Hrs/ha/yr {o}	dB(A) @ 7.5 m {N}	Impact dist.(m) {d}	Impact area (ha) { $\pi*d^2/2$ }	Hrs/yr> 75 dB(A) {x}	Hrs/yr> 55 dB(A)
Wheat	1	chisel plough	D	1	1	1.67	1.67	91.00	69	0.75	1.25	
Sorghum	1	cultivate	D	2	2	0.33	0.67	87.00	40	0.25	0.16	
Maize	1	plant	D	1	1	1.00	1.00	87.00	40	0.25	0.25	
	1	spray	D	1	1	0.40	0.40 ^o	87.00	40	0.25	0.10	
	1	harvest	D	1	1	1.00	1.00	91	69	0.75	0.75	
Total				6	6	4.4	4.74				2.51	0.00

Crop	Crops/yr {c}	Activity	Day /Night	Freq/crop {f}	Freq/yr	Hrs/ha {h}	Hrs/ha/yr {o}	dB(A) @ 7.5 m {N}	Impact dist.(m) {d}	Impact area (ha) { $\pi*d^2/2$ }	Hrs/yr> 75 dB(A) {x}	Hrs/yr> 55 dB(A)
Potatoes	2	plough	D/N	1	2	1.67	3.33	91.00	69/1000	0.75	2.50	4.00
	2	cultivate	D/N	2	4	0.50	2.00	87.00	40/500	0.25	0.49	8.00
	2	plant	D	1	2	2.50	5.00	87.00	40	0.25	1.23	
	2	fertilise	D	2	4	0.50	2.00	87.00	40	0.25	0.49	
	2	spray	D/N	5	10	1.00	10.00 ^o	87.00	40/500	0.25	2.47	20.00
	2	harvest	D	1	2	1.67	3.33	91.00	69	0.75	1.50	
Total				12	24	7.84	25.66				8.68	32.00

Crop	Crops/yr {c}	Activity	Day /Night	Freq/ crop {f}	Freq/ yr	Hrs/ ha {h}	Hrs/ ha/yr {o}	dB(A) @ 7.5 m {N}	Impact dist.(m) {d}	Impact area (ha) { $\pi*d^2/2$ }	Hrs/yr> 75 dB(A) {x}	Hrs/yr> 55 dB(A)
Tomatoes	2	plough	D/N	1	2	1.67	3.33	91.00	69/1000	0.75	2.50	4.00
	2	disc/tyne	D	3	6	1.67	10.00	91.00	69	0.75	7.49	
	2	bed forming	D	1	2	2.50	5.00	91.00	69	0.75	3.74	
	2	lay plastic	D	1	2	2.50	5.00	91.00	69	0.75	3.74	
	2	plant	D	1	2	2.50	5.00	91.00	69	0.75		
	2	rip	D/N	1	2	1.67	3.33	91.00	69/1000	0.75	2.50	4.00
	2	rotary hoe	D/N	1	2	0.33	0.67	87.00	40/500	0.25	0.16	4.00
	2	fertilise	D	1	2	0.42	0.83	87.00	40	0.25	0.21	
	2	spray	N	21	42	0.40	16.80 ^o	87.00	40/500	0.25	4.15	84.00
2	harvest	D	2	4	1.00	4.00	87.00	40	0.25	0.99		
Total				33	66	14.66	53.96				25.48	96.00

Crop	Crops/yr {c}	Activity	Day /Night	Freq/ crop {f}	Freq/ yr	Hrs/ ha {h}	Hrs/ ha/yr {o}	dB(A) @ 7.5 m {N}	Impact dist.(m) {d}	Impact area (ha) { $\pi*d^2/2$ }	Hrs/yr> 75 dB(A) {x}	Hrs/yr> 55 dB(A)
Lucerne	0.6	chisel plough	D	1	0.6	1.67	1.00	91.00	69	0.75	0.75	
	0.6	cultivation	D	3	1.8	0.33	0.60	87.00	40	0.25	0.15	
	0.6	plant	D	1	0.6	1.00	0.60	87.00	40	0.25	0.15	
	0.6	fertilise	D	1	0.6	0.42	0.25	87.00	40	0.25	0.06	
	1	spray	D	10	10	0.40	4.00 ^o	87.00	40	0.25	0.99	
	1	cut	N	8	8	1.00	8.00	87.00	40/500	0.25	1.97	16.00
	1	raking	D/N	16	16	1.00	16.00	85.00	30/500	0.14	2.27	32.00
	1	bailing	D	8	8	1.00	8.00	85.00	30	0.14	1.13	
Total				48	45.6	6.82	38.45				7.47	48.00

Crop	Crops/yr {c}	Activity	Day /Night	Freq/ crop {f}	Freq/ yr	Hrs/ ha {h}	Hrs/ ha/yr {o}	dB(A) @ 7.5 m {N}	Impact dist.(m) {d}	Impact area (ha) { $\pi*d^2/2$ }	Hrs/yr> 75 dB(A) {x}	Hrs/yr> 55 dB(A)
Peanuts	1	chisel plough	D		2	1.67	3.33	91.00	69	0.75	2.50	
	1	cultivation	D	2	2	0.33	0.67	87.00	40	0.25	0.16	
	1	plant	D	1	1	1.00	1.00	87.00	40	0.25	0.25	
	1	fertilise	D	1	1	0.42	0.42	87.00	40	0.25	0.10	
	1	spray	D	2	2	0.40	0.80 ^o	87.00	40	0.25	0.20	
	1	IR cultivation	D	2	2	0.33	0.67	87.00	40	0.25	0.16	
	1	digging	D	1	1	1.00	1.00	85.00	0	0.14	0.14	
	1	threshing	D	1	1	1.00	1.00	85.00	30	0.14	0.14	
Total				12	12	6.15	8.89				3.65	0.00

APPENDIX 5: Examples of agricultural pesticides and odours

	Chemical	Trade Names	Odour
Organophosphates	azinthos-methyl dichlorvos chlorpyrifos	Gusathion, Azithion, Benthion, Cotnion Mafu, Vapona, Insectigas-D, Chlorban Dursban, Argenstem, Lorsban, Grubkil Deter, Antkil, Chlorfos, Predator, Pyrinex Suscon Blue	sulphurous or garlic-like odour due to 'mercaptans' impurities
	chlorpyrifos-methyl diazinon	Nucidol, Reldan, diazinon, Gesapon Diacap, Pennside, Diazamin, Knox-out Neocid	
	dimethoate	Rogor, Gomite, Roxion, Saboteur Perfekthion, Danadim	
	fenitrothion	Folithion, Sumithion, Synergen F, Tugon Fenitrogard	
	methamidophos	Nitofol, Monitor	
	methidathion mevinphos	Supracide Phosdrin	
	maldison*	Malathion, Hy-Mal, Ulvomal	* low odour formulations marketed at various times
	monocrotophos	Azodrin, Cronofos, Nuvacron	
	parathion (parathion-ethyl)	Novafos, E-605	
	parathion-methyl	Folidol M, Pennicap M	
	profenofos**	Curacron, Sabre	** deodoriser added to prepared spray
	phorate	Thimet, Umet	
temephos	Abate, Lypor, Assassin, Tempor		
terbufos	Counter, Hunter		
Phenoxy type (‘hormone’) herbicides	2,4-D (dimethylamine salt)	Amicide 500, Aminoz, D-500, 500, Shirweed	ammoniacal/phenolic ‘fishy’
	dichlorprop	AF-302, Lantana DP-600	
	MCPA,	Agritox, Thistle, MCPA 500, Killen	
	2,4-D (diethanolamine salt)	Amicide lo-500A , Baton, Zephyr,	‘low odour’ formulations
Miscellaneous	phosphine	various (e.g. Phostoxin)	rotting fish
	paraquat	Gramoxone, Shirquat	stench agent added to formulation
	endothal	Accelerate, Endothal	ammoniacal odour
	dithianon	Delan	musty
	dithiocarbamates (e.g. mancozeb)	Dithane, Manzate, Dek, Penncozeb	moderately sulfurous/musty
	methomyl	Lannate, Methomex, Marlin, Nudrin	sulfurous
	metribuzin	Lexone, Sencor	sulfurous mercaptan-like odour
	EDB	EDB	chloroform-like odour
	chloropicrin	Larvacide	pungent odour

Source: DPI

Note: This table is not a complete list of available agricultural pesticides

APPENDIX 6: Examples of minimum effective separation distances

This table provides examples of effective minimum separation distance for each of the elements described in Section 3. Design of individual buffer areas must take account of specific conditions and sources of conflict. In these examples it is assumed that a noise buffer will result in a reduction of noise level of 10 dB(A).

Sources of conflict	Minimum effective distance of open ground (metres)	Minimum effective distance with vegetated and noise buffer elements (metres)
1. Agricultural chemical spray Night-time tractor use with mister (90 dB(A) $L_{Amax,T}$) (>10 hrs) Odour (>88hrs/yr) Effective width	300 1000 * 500 1000	40 250 500 *# 500
2. Agricultural chemical spray Night-time tractor use (80 dB (A) $L_{Amax,T}$) (>10hrs) Odour (>88 hrs/yr) Effective width	300 250 500 * 500	40 60 500 *# 500
3. Aerial spray application Agricultural chemical spray Tractors (95 dB(A) $L_{Amax,T}$) (>10hrs) Dust generation Odour (<88 hrs/yr) Effective width	100 300 * 120 150 0 300	100 * 40 30 40 0 100
4. Agricultural chemical spray Tractors (85 dB(A) $L_{Amax,T}$) (>10 hrs) Day time irrigation pump (85 dB(A) $L_{Amax,T}$) (>50 hrs) Dust generation Odour (<88 hrs/yr) Effective width	300 * 30 250 150 0 300	40 10 60 * 40 0 60
5. Agricultural chemical spray Tractors (90 dB(A) $L_{Amax,T}$) (>10 hrs) Dust generation Odour (<88 hrs/yr) Effective width	300 * 60 150 0 300	40 * 50 40 * 0 40
6. Tractors (90 dB(A) $L_{Amax,T}$) (>10 hrs) Dust generation Odour (<88 hrs/yr) Effective width	60 150 * 0 150	15 40 * 0 40

Note: * Most limiting factor to determine minimum separation distance
Minimum design distance for odour buffer area may be reduced on consideration of site factors and nature of odour.

This table should be read in conjunction with the text of Section 3.

- The separation distances in this table are not definitive distances for individual agricultural activities.
- Long-term noise sources operating >50 hrs/yr particularly between 10 p.m. and 6 a.m., such as pumps and cooling units, may require acoustic muffling to reduce noise to acceptable levels.

APPENDIX 7: Sample report

NEED FOR AND DESIGN OF A BUFFER AREA BETWEEN RESIDENTIAL AND AGRICULTURAL LAND USES AT SMITHVILLE

INTRODUCTION

Property Description:	Lot 111 on RP 23702, Parish of Tropicana Smith Street, Smithville
Site Description:	The site consists of 40 ha, and is an undulating area with gentle northerly slopes ranging from 5–10%. The subject land comprises 24 ha of good quality agricultural land which are not to be developed, and 16 ha of rocky poor quality soils in the southern portion of the lot. The farming areas to the north and east of the site are used for mixed tree cropping enterprises of avocados, lychees and pineapples. There is a grazing property to the west of the site, and the Smithville township to the south.
Local Government:	Black Stump Shire Council
Proposed development:	The proposal involves a part urban expansion on 16 ha of unproductive rural land, with the remaining 24 ha of good quality agricultural land to remain in production.

SUSTAINABLE CROPPING USE OF THE LAND

The subject land has been mapped at a scale of 1:100 000 in the report *Black Stump Horticultural Land Suitability Study* (by Jones, M.A), published by the Department of Primary Industries in 1987. The report classifies part of the land as being suitable for most tree and vine crops with minor limitations (Class 2), and part as unsuitable for agriculture (Class 5). Class 2 land has been identified by *Planning Guidelines: The Identification of Good Quality Agricultural Land* (DPI/DHLGP 1993) as Class A, Crop land. This classification is not disputed.

The property has been mapped into two land types. Land type 1 consisting of 24 ha has been classified as a red ferrosol (ASC) or krasnozem (GSG). Land type 2 consists of red and yellow kurosol and tenosols (ASC) or gravelly red and yellow podzolics and lithosols (GSG) (*See attached map*).

The most intrusive cropping use that the subject land is capable of sustaining consists of tree crops. In Black Stump Shire, the most common crops for this land type are avocados and lychees (the current land use). Table 1 outlines a range of farming activities associated with avocado and lychee production in Black Stump Shire.

The subject land utilises a piped irrigation system, allowing fertiliser application with the irrigation water. Therefore, foliar spraying of fertilisers is unlikely.

The majority of the activities on the subject farm are carried out during the period from October to April. The main activities throughout this period are inter row weed control and grass slashing, and insecticide and fungicide spraying. Machinery will be used in the orchard for approximately 31 events per year.

Stationary pumps on the property will operate for more than 50 hr/year (day and night).

Table 1. Typical farming activities for tree crops

Activity	Expected frequency	Machinery
Inter-row weed and grass slashing	2–10 times per annum depending on canopy size	60 hp tractor and slasher
Weed spraying around tree bases	up to 4 times per annum	60 hp tractor and spray pack
Insect and disease control	up to 14 times per annum depending on the season	60 hp tractor and air blast mister
Picking	1–3 times per annum	utility and/or cherry picker

POTENTIAL FOR CONFLICT

Land use conflict can occur in situations where agricultural activities impact on residential amenity. There is potential for conflict along the interface of the proposed northern and eastern residential boundaries, as the proposed residential land will abut agricultural land where the farming activities listed in Table 1 can be expected.

ELEMENTS LIKELY TO CAUSE CONFLICT**Agricultural chemical spray drift**

- Avocado and lychee production entails regular spraying of pesticides (herbicides, insecticides and fungicides) which are recognised to release a moderate to strong odour. This is particularly an issue during summer when the majority of the activities on the subject farm are carried out.
- The off target movement of chemical sprays is unlikely to remain airborne greater than 300 m from the release area. However associated odour may be detectable at greater distances from the source.

Noise

- Noise from airblast misters and tractors utilised in pesticide spraying and general weed and grass control is anticipated to be in the vicinity of 85 dB(A) ($L_{Amax,T}$) when measured 7.5 m from the noise source.
- Day-time activity ie between 6 a.m. and 10 p.m. the same day is likely to occur up to 31 occasions per year. Using the formula as per *Planning Guidelines: Separating Agricultural and Residential Land Uses* (DNR/DLGP 1997), results in less than 7 hours of day-time activity per year for which noise will exceed 75 dB(A). This conforms with the design goals for noise which allows for up to 10 hours of day-time activity per year.
- Night-time activity i.e. between 10 p.m. and 6 a.m. the next day (as defined by the EP Act) is likely to occur on this farm up to 14 occasions per year for up to 2 hours at a time (given that spraying is likely to commence at 4 a.m., and that noise from such an activity is likely to exceed 55 dB(A) up to 500 m from the source). This will result in up to 28 hours of night-time activity per farm per year which will exceed 55 dB(A). This fails to conform with the Design Goals for Noise which allow up to 10 hours of night time activity per farm per year.

Dust

- It is considered that due to tree crop production, and the limited amount of bare earth exposed, dust generation will occur only on rare occasions, and should not be considered as a factor contributing to conflict in this situation.

Odour

- It is considered that due to the nature of tree crop production and the regular spraying of agricultural chemicals, that the generation of odour will occur up to 5.6hr/ha/yr. Using the formula as per *Planning Guidelines: Separating Agricultural and Residential Land Uses* (DNR/DLGP), the time of potential odour impact is 134 hrs/yr. This level exceeds the duration threshold for odour and therefore odour is likely to impact upon the proposed residential area.
- Prevailing wind direction will carry odour away from the residential area for approximately 50% of time. This will reduce the time of odour impact to 67 hrs/yr and below the duration threshold.

Sediment and stormwater run-off

- The proposed residential area is of higher elevation than the agricultural land.
- There is also potential for the residential area to impact on the agricultural land through increased runoff and sedimentation, particularly during the construction phase of the development.

RECOMMENDED MEASURES TO ADDRESS EACH ELEMENT

Chemical spray drift

- The south easterly prevailing winds on the subject land will assist in directing residual chemical spray away from the residential areas.
- The minimum vegetated buffer (40m width) designed to the criteria set out in Appendix 2 of *Planning Guidelines: Separating Agricultural and Residential Land Uses* (DNR/DLGP 1997) to reduce conflict in this situation is recommended (*See attached plan*).
- DNR Forestry Extension Officers have recommended the following species as being suitable to capture spray droplets for this particular site:

Casuarina cunninghamiana, river she-oak (outer rows)

Syzygium luehmannii, small-leaved lillipilly (inner rows)

Acmena smithii, lillipilly satinash (inner rows)

Melaleuca bracteata, river tea-tree (inner /outer rows)

Melaleuca leucadendra, white paperbark (inner/outer rows)

Melaleuca quinquenervia, broad-leaved tea-tree (inner/outer rows)

Waterhousia floribunda, weeping satinash (inner rows)

Grevillea baileyana, Findlay's silky oak (inner/outer rows)

Callitris columellaris, coastal cyprus pine (outer rows)

Araucaria cunninghamii, hoop pine (inner/outer rows)

Noise

- The south easterly prevailing winds on the subject land will not be a factor affecting noise levels.
- A maximum distance of 500 m of open ground will reduce the night time noise level from tractors and farm machinery to 55 dB(A) which is recognised in *Planning Guidelines: Separating Agricultural and Residential Land Uses* (DNR/DLGP 1997) as an acceptable design goal for intermittent night-time agricultural activities. An appropriately designed noise mound put in place at 50 m from the resource boundary will reduce the overall separation distance required to meet the noise design goals to 120 m.
- It is recommended that the developer provide a pump enclosure to eliminate night-time noise from stationary pumps.

Odour

While odour impacts are within the duration threshold, the following will further assist in the reduction of odour impacts:

- The south-easterly prevailing winds on the subject land will assist in directing odour from chemical spray away from the residential areas.
- Not all the chemicals used or likely to be used on activities possible on this farm contain a strong odour.
- The presence of a vegetated buffer element may also assist in reducing the impacts from odour associated with chemical spray.

Sediment and Stormwater run-off

- Erosion control measures will be necessary during the construction phase of the residential development, and, should meet the standards set out in *Guidelines for Soil Erosion and Sediment Control for Construction Sites* (IEA/AIAS, 1996).
- Stormwater runoff from all hard surfaces should be designed to ensure that all runoff is drained or piped to Black Stump Township's existing storm water drainage system.
- Water spreading devices should be utilised within the buffer area to minimise impacts on the adjacent farmland.

IMPLEMENTATION

W. Anonymous Consultants recommend the establishment of a 120 m wide buffer area incorporating the buffer elements of a 40 m vegetated buffer and noise mound along the northern and eastern boundaries of the subdivision. In this situation, the buffer area will be provided on private land of single tenure, utilising a series of larger lots along the agricultural land boundary. See attached map.

The proponent has agreed to provide an acoustic enclosure for stationary pumps on the adjacent agricultural property to reduce noise from these sources to acceptable levels. Additionally, it is recommended that council set the following conditions if the proposed development is approved, to take account of the agricultural conflict issues. These conditions must be continuous with all subsequent owners of the affected lots until such time as the buffer area is no longer required.

Conditions on development

1. Building envelopes to be specified on the affected lots to ensure that residences do not encroach into the required buffer area.
2. The buffer area will consist of a 120 m area along the northern and eastern boundaries of the development.
3. A vegetative buffer element of 40 m width within the buffer area, designed according to Appendix 2 of the *Planning Guidelines: Separating Agricultural and Residential Land Uses* (DPI/DHLGP, 1997) is to be established by the applicant to the satisfaction of council prior to any building approval within 300 m of the good quality agricultural land, i.e. land type 1.
4. The land owner is to be responsible for on-going maintenance of the vegetative buffer element to ensure that the buffer area complies with the criteria of Appendix 2 of *Planning Guidelines: Separating Agricultural and Residential Land Uses* (DNR/DLGP, 1997). This includes:
 - replacement of dead or dying vegetation;
 - management for fire protection, including reduction in litter build-up;
 - ensuring access to the 10m maintenance strips either side of vegetation;
 - ensuring that the buffer element does not shade adjacent cropping land for a significant period in the afternoon;
 - control of noxious weeds.

5. The vegetated buffer is to be protected by the tree clearing controls applicable to a 'Vegetation Protection Area' which are identified in the Planning Scheme of Black Stump Shire Council.
6. Prior to the sealing of the plan, a noise barrier acceptable to the engineering department of Black Stump Shire Council to be constructed by the applicant within 120 m of the good quality agricultural land ie Land Type 1. The noise mound must be of a height which is at least equal to the direct line of site of the noise source.
7. The land owner is to be responsible for on going maintenance of the noise barrier.
8. An erosion control plan which meets the standards of the Guidelines for Erosion and Sediment Control for Construction Sites is to be submitted by the applicant and complied with throughout the construction phase of the development.
9. Stormwater run-off from all hard surfaces is to be designed to ensure that all runoff is drained or piped to Black Stump township's existing stormwater drainage system.
10. Water spreading devices to be installed within the buffer areas by the applicant. Maintenance of these devices will be the land owner's responsibility.

W. Smith

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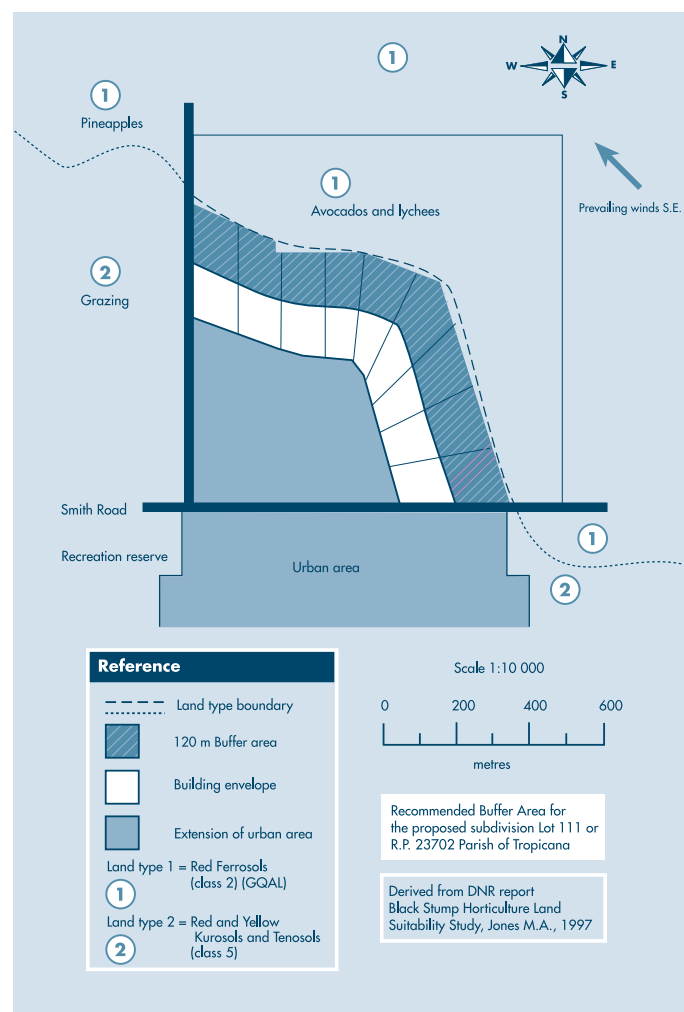


Figure1. Site Plan

