COMMONWEALTH DEPARTMENT OF
TRANSPORT AND REGIONAL DEVELOPMENT

Resources, Energy and Waste

Proposal for a Second Sydney Airport
at Badgerys Creek or Holsworthy Military Area

9

Technical Paper

PPK
Environment & Infrastructure

Prepared for:

COMMONWEALTH DEPARTMENT OF
TRANSPORT AND REGIONAL DEVELOPMENT

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Explanatory Statement

This technical paper is not part of the Draft Environmental Impact Statement (EIS) referred to in paragraph 6 of the Administrative Procedures made under the Environment Protection (Impact of Proposals) Act 1974.

The Commonwealth Government is proposing to construct and operate a second major airport for Sydney at Badgerys Creek. This technical paper contains information relating to the Badgerys Creek airport options which was used to assist the preparation of the Draft EIS.

The technical paper also assesses the impacts of developing a major airport at the Holsworthy Military Area. On 3 September 1997, the Government eliminated the Holsworthy Military Area as a potential site for Sydney's second major airport. As a consequence, information in this technical paper relating to the Holsworthy Military Area is presented for information purposes only.

Limitations Statement

This technical paper has been prepared in accordance with the scope of work set out in the contract between Rust PPK Pty Ltd and the Commonwealth Department of Transport and Regional Development (DoTRD) and completed by PPK Environment and Infrastructure Pty Ltd (PPK). In preparing this technical paper, PPK has relied upon data, surveys, analyses, designs, plans and other information provided by DoTRD and other individuals and organisations, most of which are referenced in this technical paper. Except as otherwise stated in this technical paper, PPK has not verified the accuracy or completeness of such data, surveys, analyses, designs, plans and other information.

This technical paper has been prepared for the exclusive use of DoTRD. PPK will not be liable to any party other than DoTRD and assumes no responsibility for any loss or damage suffered by any other party arising from matters dealt with in this technical paper, including, without limitation, matters arising from any negligent act or omission of PPK or for any loss or damage suffered by any other party in reliance upon the matters dealt with and opinions and conclusions expressed in this technical paper.

Acknowledgments

Data used to develop the figures contained in this document have been obtained and reproduced by permission of the Australian Bureau of Statistics, NSW Department of Land and Water Conservation, NSW National Parks and Wildlife Service (issued 14 January 1997), NSW Department of Urban Affairs and Planning and Sydney Water. The document is predominantly based on 1996 and 1997 data.

To ensure clarity on some of the figures, names of some suburbs have been deleted from inner western, eastern, south-eastern and north-eastern areas of Sydney. On other figures, only 'Primary' and 'Secondary' centres identified by the Department of Urban Affairs and Planning's Metropolitan Strategy, in addition to Camden, Fairfield and Sutherland, have been shown.

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CONTENTS

FIGURES

APPENDICES

Part A
Introduction

CHAPTER 1 INTRODUCTION

1.1 INTRODUCTION

This technical paper addresses the potential impacts of the previously proposed development of the Second Sydney Airport at either Badgerys Creek or Holsworthy Military Area in four different areas: mineral resources, agricultue, energy and wastes. It contains information used to prepare the Draft Environmental Impact Statement (EIS) which addresses the overall environmental impacts of the Badgerys Creek airport options.

1.2 A BRIEF HISTORY

The question of where, when and how a second major airport may be developed for Sydney has been the subject of investigation for more than 50 years. The investigations and the associated decisions are closely related to the history of the development of Sydney's existing major airport, located at Mascot.

The site of Sydney Airport was first used for aviation in 1919. It was acquired by the Commonwealth Government in 1921, and was declared an International Aerodrome in 1935. In 1940 the first terminal building and control tower were opened.

In 1945 the airport had three relatively short runways. A major expansion began in 1947, and by 1954 the current east-west runway was opened. The north-south runway was first opened in 1954 and was extended to its current length in 1972. The present international terminal was opened in 1970.

Planning and investigations for a site for a second Sydney airport first started in 1946. A large number of possible sites both within and outside the Sydney Basin have been investigated.

The *Second Sydney Airport Site Selection Program Draft Environmental Impact Statement* (Kinhill Stearns, 1985) re-examined all possible locations for the second airport and chose 10 for preliminary evaluation. Two sites, Badgerys Creek and Wilton, were examined in detail and an EIS was prepared. In February 1986 the then Commonwealth Government announced that Badgerys Creek had been selected as the site for Sydney's second major airport.

The Badgerys Creek site, which is about 46 kilometres west of Sydney's Central Business District and is 1,700 hectares in area, was acquired by the

Commonwealth between 1986 and 1991. A total of $155 million has been spent on property acquisition and preparatory works.

Since 1986, planning for Sydney's second airport has been closely linked to the development of the third runway at Sydney Airport. In 1989 the Government announced its intention to construct a third runway. An EIS was undertaken and the decision to construct the runway was made in December 1991.

At the same time as investigations were being carried out on the third runway, detailed planning proceeded for the staged development of the second airport at Badgerys Creek. In 1991 it was announced that initial development at Badgerys Creek would be as a general aviation airport with an 1,800 metre runway.

The third runway at Sydney Airport was opened in November 1994. In March 1995, in response to public concern over the high levels of aircraft noise, the Commonwealth Senate established a committee in March 1995 to examine the problems of noise generated by aircraft using Sydney Airport and explore possible solutions. The committee's report, *Falling on Deaf Ears?*, containing several recommendations, was tabled in parliament in November 1995 (Senate Select Committee on Aircraft Noise, 1995).

During 1994 and 1995 the Government announced details of its proposed development of Badgerys Creek, and of funding commitments designed to ensure the new airport would be operational in time for the 2000 Olympics. This development included a 2,900 metre runway for use by major aircraft.

The decision to accelerate the development of the new airport triggered the environmental assessment procedures in the *Environment Protection (Impact of Proposals) Act 1974*. In January 1996 it was announced that an EIS would be prepared for the construction and operation of the new airport.

In May 1996, the present Commonwealth Government decided to broaden the environmental assessment process. It put forward a new proposal involving the consideration of 'the construction and operation of a second major international/domestic airport for Sydney at either Badgerys Creek or Holsworthy on a site large enough for future expansion of the airport if required' (Department of Transport and Regional Development, 1996). A major airport was defined as one 'capable of handling up to about 360,000 aircraft movements and 30 million passengers per year' (Department of Transport and Regional Development, 1996).

The Government also indicated that 'Badgerys Creek at this time remains the preferred site for Sydney's second major airport, subject to the favourable outcome of the EIS, while Holsworthy is an option to be considered as an

alternative' (Minister for Transport and Regional Development, 1996). The two sites considered in this technical paper are shown in *Figure 1.1*.

Following the substantial completion of a Draft EIS on the Badgerys Creek and Holsworthy airport options, the Government eliminated the Holsworthy Military Area as a potential site for Sydney's second major airport. The environmental assessment showed that the Badgerys Creek site was significantly superior to the Holsworthy Military Area. As a result a Draft EIS was prepared which examines only the Badgerys Creek site. While this technical paper examines both the Badgerys Creek and Holsworthy airport options, only the parts of the assessment relating to the Badgerys Creek airport options were used to assist the preparation of the Draft EIS.

1.3 THE PROPOSAL

The Commonwealth Government proposes the development of a second major airport for Sydney capable of handling up to 30 million domestic and international passengers a year. By comparison, Sydney Airport will handle about 20 million passengers in 1997. The *Second Sydney Airport Site Selection Program Draft Environmental Impact Statement* anticipated the airport would accommodate about 13 million passengers each year (Kinhill Stearns, 1985).

A stated objective of the Government is the building of a second major airport in the Sydney region to a full international standard, subject to the results of an EIS. In the Government's view, Sydney needs a second major airport to handle the growing demand for air travel and to control the level of noise experienced by Sydney residents (Coalition of Liberal and National Parties, 1996).

Government policy (Coalition of Liberal and National Parties, 1996) indicates:

- that Sydney's second airport will be more than just an overflow airport and will, in time, play a major role in serving Sydney's air transport needs; and

- a goal of reducing the noise and pollution generated by Sydney Airport as much as possible and that the Government would take steps to ensure that the noise burden around Sydney Airport is shared in a safe and equitable way.

The assumptions made on how the Second Sydney Airport would operate and the master plans which set out the broad framework for future physical development of the airport are based on an operational limit of 30 million passengers a year. The main features include parallel runways, a cross wind

runway and the provision of the majority of facilities between the parallel runways.

Consideration has also been given to how the airport may be expanded in the future and the subsequent environmental implications. Such an expansion could not proceed, however, unless a further detailed environmental assessment and decision making process were undertaken by the Government.

Five airport options are considered, as well as the implications of not proceeding with the proposal. Three of the airport options are located at Badgerys Creek and two are located within the Holsworthy Military Area. Generally, the airport options are:

- Badgerys Creek Option A which has been developed to be generally consistent with the planning for this site undertaken since 1986. The airport would be developed within land presently owned by the Commonwealth with two parallel runways constructed on an approximate north-east to south-west alignment;

- Badgerys Creek Option B would adopt an identical runway alignment to Option A, but provides an expanded land area and also a cross wind runway;

- Badgerys Creek Option C would provide two main parallel runways on an approximate north to south alignment in addition to a cross wind runway. Again the land area required would be significantly expanded from that which is presently owned by the Commonwealth;

- Holsworthy Option A would be located centrally within the Holsworthy Military Area and would have two main parallel runways on an approximate north to south alignment and a cross wind runway; and

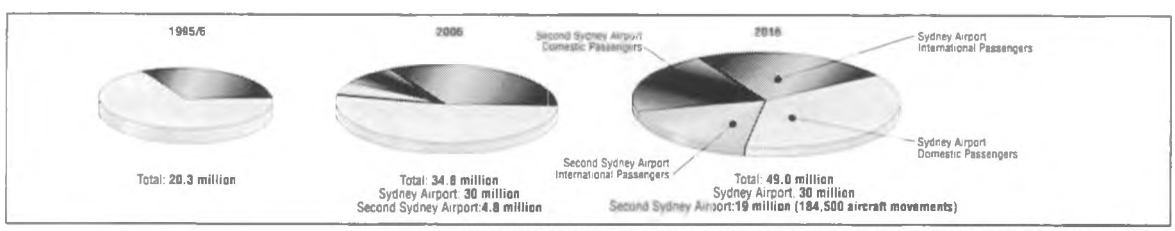
- Holsworthy Option B would be located in the south of the Holsworthy Military Area and would have two main parallel runways on an approximate south-east to north-west alignment and a cross wind runway.

To ensure that the likely range of possible impacts of the airport options are identified a number of different assumptions about how the airport options would be developed and operate have been adopted. These different assumptions relate to the number and types of aircraft that may operate from the airport, the flight paths used and the direction of take offs and landings.

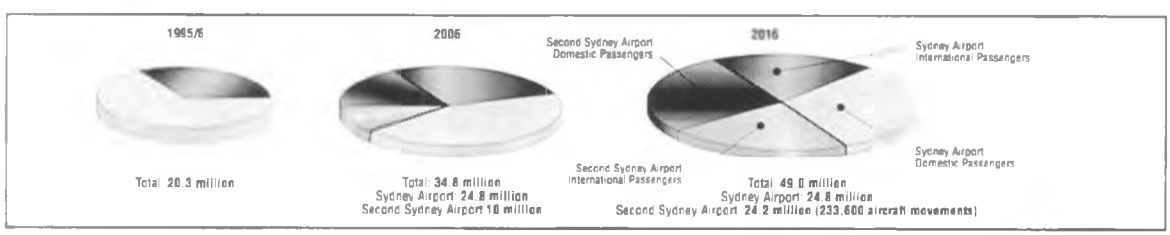
The number of flights into and out of the proposed Second Sydney Airport would depend on a number of factors including the types of aircraft that would use the airport and the associated numbers of passengers in each aircraft. The

Figure 1.1

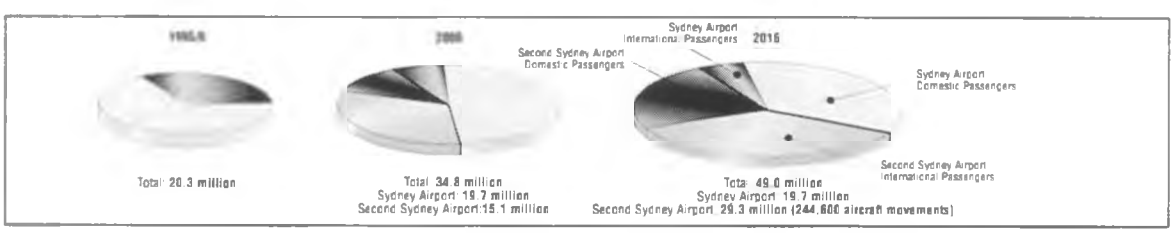
Potential Airport Sites Considered in the Draft EIS



Assumptions about Passenger Movements for Air Traffic Forecast 1



Assumptions about Passenger Movements for Air Traffic Forecast 2



Assumptions about Passenger Movements for Air Traffic Forecast 3

Figure 1.2

Summary of Passenger Movement Forecasts Used for Environmental Assessment

proposal put forward by the Government anticipates a major airport handling 30 million passengers and up to 360,000 aircraft movements per year.

Air traffic forecasts have been developed based on an examination of the number and type of aircrafts that would use the airport as it approaches an operating level of 30 million passengers per year. This examination has shown that if the airport accommodated about 245,000 aircraft movements each year, the number of air passengers would approach 30 million. This assumes a relatively high percentage of international flights being directed to the Second Sydney Airport. Therefore it is appropriate for this Draft EIS to assess the airport operating at a level of 245,000 aircraft movements per year, rather than the 360,000 originally anticipated by the Government. It has been assumed that this level of operation could be reached by about 2016.

1.4 AIR TRAFFIC FORECASTS

Cities around the world which have developed second major airports have responded to their particular needs in different ways. For example, the original airport in Dallas, United States, is now used for short range traffic that does not connect with other flights. Second airports in New York and Washington serve as hubs for particular airlines. In Taipei, Taiwan, smaller domestic aircraft use the downtown airport and larger international flights use a newer airport 40 kilometres from the city.

It is clear that each metropolitan area around the world has unique characteristics and the development of multi-airport systems respond to particular local circumstances. The precise role and consequential staging of development of the Second Sydney Airport would be the subject of future Government decisions. To assist in developing a realistic assessment of the potential impacts of the Second Sydney Airport, three sets of air traffic forecasts for the airport were developed. Each forecast assumes a major airport would be developed, however, this may be achieved at different rates of growth.

The three potential air traffic scenarios considered for the Second Sydney Airport are shown in *Figure 1.2*. They are:

- *Air Traffic Forecast 1* where the Second Sydney Airport would provide only for demand which cannot be met by Sydney Airport. This is an overflow forecast, but would nevertheless result in a significant amount of air traffic at the Second Sydney Airport. The proportion of international and domestic air traffic is assumed to be similar at both airports;

- *Air Traffic Forecast 2* where the Second Sydney Airport would be developed to cater for 10 million passengers a year by 2006, with all

further growth after this being directed to the second airport rather than Sydney Airport. The proportion of international and domestic traffic is also assumed to be similar at both airports; and

- *Air Traffic Forecast 3* which is similar to Forecast 2 but with more international flights being directed to the Second Sydney Airport. This would result in the larger and comparatively noisier aircraft being directed to the second airport. It would accommodate about 29.3 million passengers by 2016.

1.5 OPERATION OF THE AIRPORT OPTIONS

At any airport, aircraft operations are allocated to runways (which implies both the physical runway and the direction in which it is used) according to a combination of wind conditions and airport operating policy. The allocation is normally performed by Air Traffic Control personnel.

Standard airport operating procedures indicate that a runway may not be selected for either approach or departure if the wind has a downwind component greater than five knots, or a cross wind component greater than 25 knots. If the runway is wet, it would not normally be selected if there is any downwind component. This applies to all aircraft types, although larger aircraft would be capable of tolerating relatively higher wind speeds. Wind conditions at the airport site therefore limit the times when particular runways may be selected. However, there would be a substantial proportion of the time, under low wind conditions, when the choice of runways would be determined by airport operating policy.

For the environmental assessment, the maximum and minimum likely usage for each runway and runway direction was estimated and the noise impact of each case calculated. The actual impact would then lie between these values and would depend on the operating policy which is applicable at the time.

The three airport operation scenarios were adopted for the environmental assessment, namely:

- *Airport Operation 1* shown in *Figure 1.3*. Aircraft movements would occur on the parallel runways in one specified direction (arbitrarily chosen to be the direction closest to north), unless this is not possible due to meteorological conditions. That is, take offs would occur to the north from the parallel runways and aircraft landing would approach from the south, travelling in a northerly direction. Second priority is given to operations in the other direction on the parallel runways, with operations on the cross wind runway occurring only when required because of meteorological conditions;

- *Airport Operation 2* shown in *Figure 1.4*. As for Operation 1, but with the preferred direction of movements on the parallel runways reversed, that is to the south; and

- *Airport Operation 3*. Deliberate implementation of a *noise sharing* policy under which seven percent of movements are directed to occur on the cross wind runway (equal numbers in each direction) with the remainder distributed equally between the two parallel runway directions.

Since a cross wind runway is not proposed at Badgerys Creek Option A, only Operations 1 and 2 were considered for that option.

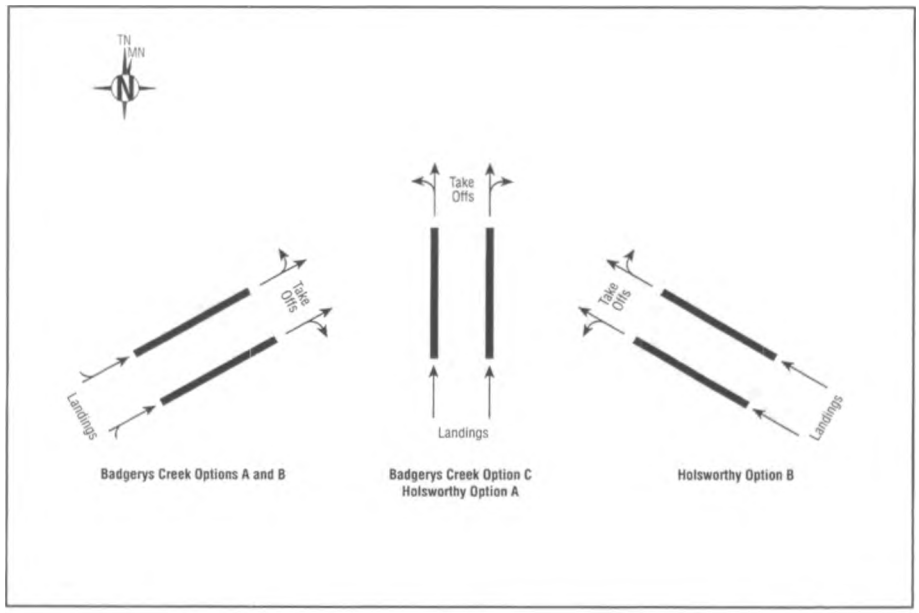


Figure 1.3

Predominant Directions of Movement of Aircraft for Airport Operation 1

Note: Cross wind runway used only when required because of meteorological conditions

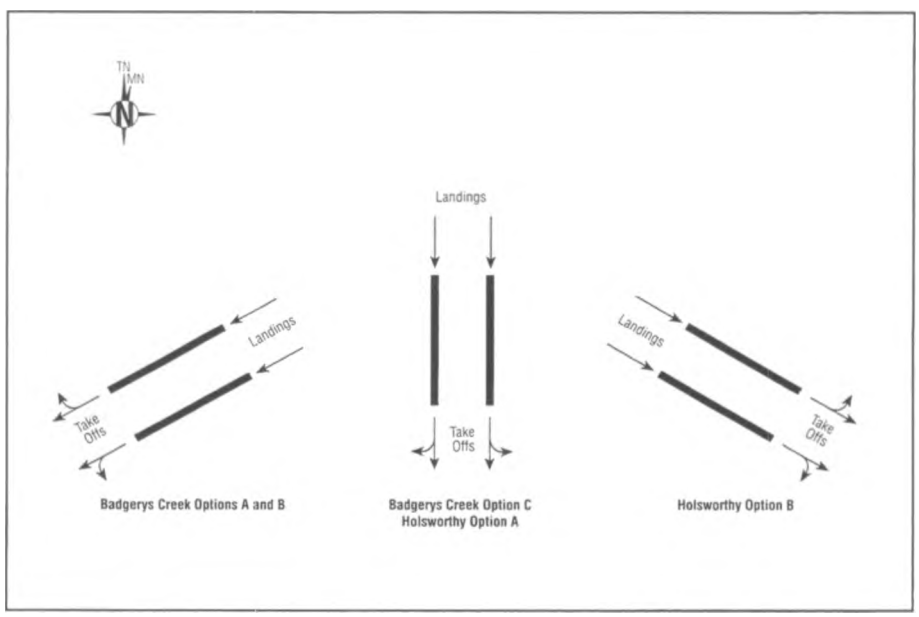


Figure 1.4

Predominant Directions of Movement of Aircraft for Airport Operation 2

Note: Cross wind runway used only when required because of meteorological conditions

CHAPTER 2 CONSULTATIONS

Preparation of this Draft EIS involved consultation with the community, other stakeholders, Commonwealth, State and local Governments and Government agencies.

2.1 COMMUNITY CONSULTATION

The primary role of the consultation process during the preparation of the Draft EIS was to provide accurate, up to date information on the proposals being considered and the assessment process being undertaken. From October 1996 to May 1997, ten separate information documents were released and over 400,000 copies distributed to the community. Four types of display posters were produced and 700 copies distributed. Over 140 advertisements were placed in metropolitan and local newspapers. Non English language documents were produced in 14 languages and over 20,000 copies distributed. Advertisements in seven languages were placed on ethnic radio.

Opportunities for direct contact and two way exchange of information with the community occurred through meetings, information days, displays at shopping centres, telephone conversations and by responding to written submissions. Through these activities over 20,000 members of the community directly participated in the consultation activities.

Written and telephone submissions received were incorporated into a database which grouped the issues in the same way as the chapters of the Draft EIS. The issues raised were progressively provided to the EIS study team to ensure that community input was an integral part of the assessment process.

Further details of consultation with the community and other stakeholders and its outcomes are contained in *Technical Paper No. 1 Consultation.*

2.2 OTHER CONSULTATION

The following organisations and agencies were consulted to gain information and determine concerns in relation to Mineral Resources, Agriculture, Energy and Waste:

Mineral Resources

The NSW Department of Mineral Resources was contacted to obtain information on both surface and underground mineral deposits at the airport sites.

Kembla Coke and Coal was consulted about the extent of existing coal mining in the Holsworthy area.

Agriculture

Hassall Associates was engaged to study potential impacts on the various airport options on agricultural activities in the vicinity of the proposed sites. This included review of existing data plus telephone surveys and field visits.

Organisations that were consulted included:

- Agricultural Bureau of NSW;
- Agricultural Society Council of NSW;
- Australian Agricultural Council;
- Australian Alpaca Association Inc;
- Australian Bureau of Agricultural Research, Information Services;
- Australian Bureau of Statistics, Information Services;
- Australian Chamber of Fruit and Vegetable Industries;
- Australian Chicken Growers;
- Australian Industrial Corporation;
- Australian Mushroom Growers Association Ltd;
- Australian Poultry Ltd;
- Australian Vegetable and Potato Growers' Federation;
- Camden Horse Stud;
- Camden Local Council;
- Campbelltown Local Council;
- Combined Industry Committee, NSW, Flemington Markets;
- Darkes Forest Community Action Group;
- Flower Industry Association, Australia Inc;

- Holsworthy Local Council;
- Inghams Pty Ltd;
- Land and Water Conservation, Penrith;
- Liverpool City Council;
- National Institute of Economy and Industries;
- NSW Agriculture - Sydney, Camden, Cowra, Goulburn, Gosford, Mudgee, Orange, Parkes, and Windsor;
- NSW Dairy Farmers Association;
- NSW Farmers;
- NSW Free Growers;
- Nursery Industry Association of Australia;
- Organic Growers Association of NSW;
- Royal Agricultural Society of NSW;
- Steggles Pty Ltd;
- Sydney Water;
- University of Sydney, Camden Veterinary Clinic; and
- Wollondilly Shire Council.

Energy

Consultation was undertaken with the following organisations to gain information regarding energy usage during airport construction and operations.

- Second Sydney Airport Planners;
- Federal Airports Corporation, Sydney Airport;.

Waste

Consultation was undertaken with the following organisations to gain information regarding waste:

- Federal Airports Corporation, Melbourne Airport;
- Federal Airports Corporation, Sydney Airport;

- Waste Recycling and Processing Service of NSW; and
- Olympic Co-ordination Authority.

CHAPTER 3 METHODOLOGY

3.1 MINERAL RESOURCES

The aim of this part of the study was to assess the potential for sterilisation of mineral resources at Badgerys Creek and Holsworthy as a consequence of construction and operation of the Second Sydney Airport.

The scope of work comprised conducting a desktop study of mineral potential in both areas. This involved providing details of the proposals to seeking the NSW Department of Mineral Resources and seeking its comments on known mineral or coal deposits within the sites of the airport options. A copy of the submission provided by the Department of Mineral Resources (1997) is contained in Appendix A for reference. No field exploration was undertaken specifically for the EIS.

3.2 AGRICULTURE

The aim of this part of the study was to assess the potential for sterilisation of agricultural areas as a consequence of construction and operation of the Second Sydney Airport at the sites of the Badgerys Creek and Holsworthy options.

The scope of work was to undertake:

- a review of local and regional background information on land capability and agricultural production. Information sources included the 1985 EIS, Australian Bureau of Statistics and Australian Bureau of Agricultural Research databases, NSW Agriculture and Department of Land and Water Conservation regional land use maps, and local government land use surveys;

- a review and update of the agricultural land use survey prepared for the 1985 EIS, which covered the original airport site at Badgerys Creek. Past and existing aerial photographs of the site were compared to identify detectable changes in agricultural activities, which were then verified by a follow-up phone interview. Contact details for landholders were sourced by Hassall & Associates;

- a detailed survey of existing agricultural activities within the extended airport boundaries (Options B and C) at Badgerys Creek. Up to 225 agricultural operations were surveyed by phone and/or site visits. The objective of the survey was to determine as accurately as possible the

existing types of agricultural enterprises (for example, market gardens, poultry farms, grazing, etc) being conducted within the proposed airport boundaries and their respective sizes and production. This task also included identification and sourcing of contact details for landholders;

- quantification of the economic value of agricultural production within the proposed airport boundaries and in the region. This task included preparation of estimates on unit enterprise returns and gross margins; and

- assessment of impacts of the proposed airport development on existing and potential agricultural production at both Badgerys Creek and Holsworthy. This task addressed indirect impacts on adjoining agricultural activities including the likely effect of aircraft noise on farm operations and livestock.

The components of the study are set out below. A copy of the report produced by Hassall & Associates is contained in Appendix B for reference.

Determination of Land Use

The Holsworthy Military Area, where both airport options are located, has no agricultural land use. Badgerys Creek Options A, B and C cover an area which has current agricultural uses, so these three options were studied in detail to determine existing agricultural land use.

Badgerys Creek Option A covers the site of the areas studied in the 1985 EIS report (Kinhill Stearns, 1985). This land is currently owned by the Commonwealth Government and is leased to a large number of persons and organisations. In order to assess the land use of this option, the 1985 study was used as a guide and personal contact was made with a number of the leaseholders. Liverpool Council able to provide information about the recent changes in land use.

Landholders in areas directly affected by Options B and C, which extend beyond the land currently owned by the Commonwealth, were personally surveyed with a phone interview. A few landholders could not be contacted as they have silent phone numbers.

The phone survey involved asking the landholder if there was any form of agriculture practiced on their land, even if only for personal use. Once the type of land use was established the landholder was asked details of the production and inputs required.

Information collected about all three options was assessed by use of aerial photographs, Orthophoto maps and on-site visits to the area. The Liverpool Council Map of Landuse was referred to, as was the *Sydney West Airport Sub-Region Strategic Plan, Stage 1 Investigations, Final Report, July Map of Landuse*.

Mapping of Land Use

Ownership of each block in the areas of Options B and C outside Option A was established. Once the land use was established for all landholdings it was mapped with the use of names and addresses from Council and the lot number information provided on the cadastral maps.

Value of Agricultural Production

The value of agricultural production in the areas was established by referring to gross margin budgets for each enterprise in the area. These budgets were sourced from NSW Agriculture standard budgets, personal discussions with NSW Agriculture personnel, operators in the industry and Hassall & Associates enterprise information.

Regional Information

Data on production in the Sydney Region was sourced from Australian Bureau of Statistics (AgStats) from the 1994 census as well as reports by NSW Agriculture and the Wollondilly Shire Council (1996). Information was reviewed with NSW Agriculture officers.

Potential Noise Impacts

Potential impacts of noise on agricultural production were determined from an extensive literature search of recent and past studies.

3.3 ENERGY

The aim of this part of the study was to examine energy aspects of the Second Sydney Airport including:

- an assessment of energy requirements; and
- consideration of available energy conservation measures which can be incorporated into design, construction and operation.

A desktop study of energy required for construction and operations was conducted. Construction fuel requirements were estimated by Second Sydney Airport Planners (1997a). Information on operational energy requirements was obtained from Federal Airports Corporation.

3.4 WASTE

This study aims to provide:

- an assessment of types and quantities of waste produced in the construction and operation of the Second Sydney Airport; and
- an assessment of waste management measures proposed to meet the principles of ecologically sustainable development.

The scope of work consisted of undertaking a desktop study, using information on construction wastes obtained from Second Sydney Airport Planners (1997a) and information on wastes typically generated by major airports obtained from other sources.

Part B

Existing Environment

CHAPTER 4 EXISTING ENVIRONMENT

4.1 MINERAL RESOURCES

4.1.1 EXPLORATION WORK

Badgerys Creek

Borehole information over the Badgerys Creek area is sufficient to indicate the scale of underground coal resources. Three boreholes were drilled a few kilometres to the south, south west and west of the potential airport site. These indicate that three coal seams exist in the general area (Department of Mineral Resources, 1997).

Clay/shale resources at Badgerys Creek were investigated in 1990 in a drilling program conducted by the Department of Mineral Resources (Department of Mineral Resources, 1997).

Holsworthy

Close spaced borehole information is available for the southern part of the southern option. Boreholes are spaced from about three to eight kilometre intervals over the remainder of the two sites. No investigation of surface minerals at the Holsworthy sites has been undertaken by the Department of Mineral Resources (Department of Mineral Resources, 1997).

4.1.2 RESOURCE ASSESSMENT

Badgerys Creek

Three coal seams of the Illawarra Coal Measures that occur in the general area of Badgerys Creek appear to have economic potential according to the Department of Mineral Resources (1997). These seams occur at depths of over 800 metres and are all medium ash thermal and coking or coking blend coal.

Previous investigations found no potentially economic deposits of light firing clay/shale within the Badgerys Creek area and the potential for the discovery of such resources is considered by the Department of Mineral Resources (1997) to be low.

Holsworthy

Coal resources at Holsworthy occur at depths between 560 metres and 775 metres and consist of low to medium ash coking coals. Holsworthy Option B

(southern option) overlies approximately 30 percent of the existing West Cliff Colliery lease.

While no assessment of surface minerals has been made at the Holsworthy sites, the Wollongong-Port Hacking 1:100,000 Geological Sheet indicates the presence of a siltstone (possible Ashfield slate) lens located in the centre of Option A. The resource potential of this is unknown. Whether economic quantities exist could only be determined by a site specific drilling program.

Preliminary investigations by the Department of Mineral Resources (1997) revealed no information that would indicate the presence of significant quantities of light clay/shale deposits at the sites of the Holsworthy Options.

4.1.3 ASSESSMENT OF SIGNIFICANCE

The Badgerys Creek and Holsworthy sites lie generally within the Southern Coalfield region.

Badgerys Creek

While information about the quality of coal deposits beneath Badgerys Creek is sparse, the coal there appears to have a relatively high ash content. While some could be marketed as higher grade coking or coking blend coal, a proportion would only be marketed as thermal coal, which has a lower market value.

The seam thickness of the resources at Badgerys Creek is close to the lower limit of current mining practice. Thinner seams can be costly and difficult to mine.

All the resources beneath the Badgerys Creek site are well beyond the current maximum mining depth in the Southern Coalfield. Mining under such deep cover is likely to encounter more difficult mining conditions and may require more expensive mining technologies not currently in use in Australia.

Badgerys Creek is comparatively remote and well beyond areas of current mining. This reduces its attractiveness for future mining.

Holsworthy

The hard coking coals of the type found beneath Holsworthy command a premium price on the export market. Hard coking coal is also required by the domestic steel industry.

The Southern Coalfield produces the state's only supply of hard coking coal. This is of vital strategic importance not only to the Port Kembla Steelworks but

also to the nation as the coalfield supplies up to 80 percent of Australia's blast furnace feedstock.

Although recent changes in steel making technology in both the domestic and export markets have reduced the need for soft and medium soft coking coals and other coalfields, hard coking coal is and will remain the primary coal feedstock for the foreseeable future.

A significant number of collieries in the Southern Coalfield are experiencing difficulties in maintaining economic viability due to a depletion in remaining reserves, a depletion in the coal quality of those reserves and difficult mining conditions. The remaining unallocated coal reserves beneath Holsworthy will be required to ensure the future of the domestic and export coal industry in the region.

The depth to coal beneath Holsworthy is shallower than the coal beneath Badgerys Creek. All of the resources beneath Option B (southern option) are at depths comparable to the deeper current mining operations in the Southern Coalfield. Much of the resource beneath the northern option is only just beyond maximum current mining depths.

Both Holsworthy options are just to the north and north east of existing mining operations and the area is a logical progression for future extensions to these leases.

However, discussions with Kembla Coal and Coke, the operator of West Cliff Colliery, indicated that expansion into the area beneath Holsworthy Option B would not occur for at least 20 years, based on current projections.

4.2 AGRICULTURE

4.2.1 RURAL LAND CLASSIFICATION

Land throughout Australia is classified by its suitability for agricultural use. The Department of Land & Water Conservation and NSW Agriculture have slightly different systems for classifying the land. The Department of Land & Water Conservation bases its classification on the requirement for different soil conservation practices while NSW Agriculture uses the general productive capacity of the land and the limits of suitability (climate, topography and soil characteristics) to classify the area. For this study, the NSW Agriculture system has been used.

NSW Agriculture uses five classes (NSW Agriculture, 1995). The characteristics of each are set out in *Table 4.1*.

TABLE 4.1 LAND USE CLASSIFICATION DESCRIPTIONS USED BY NSW AGRICULTURE

Class	Description
Class 1	Arable land for intensive cultivation where constraints to sustained high levels of agricultural production are minor or absent.
Class 2	Arable land suitable for regular cultivation for crops but not suited to continuous cultivation. It has a moderate to high suitability for agriculture but edaphic (soil factors) or environmental constraints reduce the overall level of production and may limit the cropping phases to a rotation with sown pastures.
Class 3	Grazing land or land well suited to pasture improvement. It may be cultivated or cropped in rotation with pasture. The overall level of production is moderate as a result of edaphic or environmental constraints. Erosion hazard, soil structure breakdown or other factors including climate may limit the capacity for cultivation and soil conservation or drainage works may be required.
Class 4	Land suitable for grazing but not for cultivation. Agriculture is based on native pastures or improved pastures established using minimum tillage techniques. Production may be seasonally high but the overall production level is low as a result of major environmental constraints.
Class 5	Land unsuitable for agriculture or at best suited only to light grazing. Agricultural production is very low or zero as a result of severe constraints, including economic and environmental factors, which preclude land improvement.

4.2.2 CURRENT AGRICULTURAL ACTIVITIES

Badgerys Creek

Three options for airport siting at Badgerys Creek are considered in this report. The land area for Option A is almost identical to the option previously studied in 1985 and now owned by the Commonwealth Government. The area varies slightly from the area studied in the previous EIS (Kinhill Stearns, 1985), with an access road to the east requiring slightly more land than previously. The area of Option A is approximately 1,700 hectares with the land used for agriculture in this area being 1,526 hectares.

Option B covers an area of approximately 2,900 hectares with 2,444 hectares of agricultural land use. Option C covers an area of approximately 2,850 hectares with 2,222 hectares of agricultural land identified. Both Options B and C include the area of Option A and extend to the south of Badgerys Creek water course. These areas are detailed in *Table 4.2*.

TABLE 4.2 AREA OF AGRICULTURE COVERED BY BADGERYS CREEK AIRPORT SITE OPTIONS

	Option A	Option B	Option C
Total area (hectares)	1,700	2,900	2,850
Area of Agriculture (hectares)	1,526	2,444	2,222
Percentage used for Agriculture	89 percent	84 percent	78 percent

Note: The area of agriculture includes rural small holdings.

Figures quoted in *Table 4.2* are from two sources. The "Total Area" figures for each Option were obtained from Second Sydney Airport Planners (1997a). The "Area of Agriculture" figures were calculated from the current land use maps, and maps of the three options drawn up a result of field surveys and research by Hassall & Associates.

The potential airport site is located in the agricultural fringe of Sydney, in the local government area of Liverpool. The area is primarily used for agriculture with large enterprises of dairy and beef production, as well as rural small holdings with a few cattle and a small area of fruit trees. The location of agriculture in this area is primarily due to the proximity of the Sydney market and the desire of the people (mainly those on rural small-holdings) to live in a peaceful and quiet environment.

Agricultural activities currently operating in the area of Badgerys Creek covered by the Airport options include:

- extensive grazing of beef cattle and agisted horses;
- semi intensive grazing of dairy cattle, training and spelling of trotting horses;
- intensive poultry production (chickens, ducks and turkeys); and
- intensive cropping of vegetables, fruit and nursery products.

Since 1985 the Commonwealth Government has purchased the land covering the original airport site. Many of the previous landholders have remained on this land, leased it back from the government and continued to operate. For many this has meant that they have not replanted or improved areas of land. Some areas purchased by the Government have remained vacant.

Table 4.3 below sets out the area of each option under each land use category.

TABLE 4.3 LAND USE CLASSIFICATION OF EACH BADGERYS CREEK OPTION

Option	Class 1		Class 2		Class 3		Class 4		Class 5	
	percent	ha	percent	ha	percent	ha	percent	ha	percent	ha
A	0	0	8	136	93	1,570	0	0	0	0
B	0	0	10	290	89	2,583	1	29	0	0
C	0	0	9	256	90	2,554	1	28	0	0

Source: NSW Agriculture (1995) Agricultural Land Classification Atlas.

The predominant land class for the areas of the airport sites is Class 3, which is grazing land or land well suited to pasture improvement. Of the areas covered by each option, the greatest land use by area is grazing, either extensive grazing of beef cattle or horses or semi intensive grazing of dairy cattle.

Holsworthy

Both of the Holsworthy options are located within Commonwealth Government owned land currently being used as the Holsworthy Military Area. The land is mainly natural bushland and is not used for any agricultural activities.

The land covered by both Holsworthy options is classified as Class 5 land. This is considered unsuitable for agriculture except possible light grazing. The reason for this classification is that the topography and vegetation of the area are rough and uncleared.

The Holsworthy Military Area is bounded on the south east by Heathcote National Park which is also classified as Class 5 land. To the west, the site is bounded by the Georges River. This, combined with more even topography and a greater extent of clearing, results in predominantly Class 3 land. Pockets of Class 4 land also exist in close proximity to Holsworthy Option B. To the north of the Holsworthy Military Area, the land is primarily residential.

Region

The sites of the Badgerys Creek and Holsworthy options are situated in the Sydney Statistical Division which extends west to the Blue Mountains, north to include Gosford and Wyong and south to include Campbelltown and Cronulla. This area contains suburban, rural residential, rural small holdings and agricultural land holdings. Badgerys Creek is located in the Liverpool Local Government Area and Holsworthy straddles the Campbelltown, Liverpool and Sutherland Local Government Areas.

The immediate region encompassing the Badgerys Creek and Holsworthy sites includes six local government areas. These are Bankstown, Blacktown, Camden, Campbelltown, Liverpool and Sutherland.

Based on the 1994/95 census data accessed through Agstats, the total area of agricultural holdings in these combined local government areas is 25,763 hectares. The total area of cropping excluding pastures and grasses is 1,361 hectares. Of this area horticultural crops take up 819 hectares.

The major cropping, horticultural and other agricultural products from the region include: hay, cultivated turf, nurseries, cut flowers, potatoes, broccoli, cabbages, capsicum, cauliflower, cucumbers, lettuces, marrows, mushrooms, pumpkins, tomatoes, apples, nectarines, peaches, plums, macadamia nuts, strawberries, grapes, sheep, beef cattle, dairy cattle, pigs, deer, stud horses and poultry.

4.2.3 VALUE OF AGRICULTURAL PRODUCTION

The results of present land use and production analysis are presented in this section. Further details are provided in *Appendix B*.

Badgerys Creek

The present agricultural land use of the Badgerys Creek site is set out in *Table 4.4*.

Land use in the Badgerys Creek area is dominated by extensive and intensive grazing industries. Of these, beef cattle is the major extensive industry and horse training and spelling dominates semi intensive grazing.

Behind grazing, rural small holdings are the second largest land use group, occupying on average 16 percent of the land area of the three options.

The intensive livestock and cropping industries make up only a small percentage of total land use, due mainly to the nature of their production systems. This however does not cancel out the fact that intensive cropping in particular makes a valuable financial contribution to the agricultural output of the area.

TABLE 4.4 PRESENT AGRICULTURAL LAND USE AT BADGERYS CREEK

Industry	Option A		Option B		Option C	
	(hectares)	percent	(hectares)	percent	(hectares)	percent
Extensive Grazing						
Beef Cattle	756	50	1,016	42	1,013	46
Horse agistment/thoroughbred horse spelling	150	10	170	7	185	8
Mixed grazing	80	5	80	3	119	5
Semi Intensive Grazing						
Dairying	40	3	275	11	70	3
Trotting horse training/spelling	190	12	200	8	190	9
Intensive Livestock						
Poultry	10	1	185	8	143	6
Intensive Cropping	50	3	155	6	148	7
Rural Small Holdings	250	16	363	15	354	16
Total Agriculture	**1,526**	**100**	**2,444**	**100**	**2,222**	**100**
Other	180		458		616	
Total Area of Options	**1,700**		**2,900**		**2,850**	

Notes:
1. The deer and ostrich farms are included in the Rural Small Holdings as they are not the major source of income for the owners.
2. Other land use includes non-agricultural businesses, vacant land and residential blocks with no agriculture.

Source: Hassall & Associates surveys.

Holsworthy

No agricultural activities are undertaken within the Holsworthy Military Area. This is due in part to the policy of the Department of Defence to maintain natural habitat sites and accordingly not permit grazing.

The region surrounding the Holsworthy Military Area, including Wedderburn and Darkes Forest areas, does however produce a variety of agricultural products. These include a wide range of horticultural and stone fruit products, and livestock grazing enterprises including exotic species such as alpacas.

Region

Animal production is the predominant land use in the Sydney basin. The main crops identified are those of an intensive nature as expected in an area close to a major city. The break up of agricultural industries is shown in *Table 4.5*.

TABLE 4.5 LAND USE IN THE SYDNEY REGION

Land Use	Number
Extensive Grazing	
Beef	33,839
Sheep	24,943
Semi Intensive Grazing	
Dairy	19,485
Horse Stud	2,291
Deer	3,773
Intensive Livestock	
Poultry	
- layers	2,005,243
- broilers	10,519,406
Pigs	46,360
Intensive Cropping	
Turf	1,000
Nurseries and Cut Flowers	846
Vegetables	1,811
Fruit	2,777

Note: Total livestock area is 94,285 hectares and total intensive cropping area is 6,434 hectares.
Source: Australian Bureau of Statistics - AGSTATS - 1994 Census

4.2.4 SIGNIFICANCE OF AGRICULTURAL PRODUCTION

The significance and value of agricultural production are presented in this section. Further details are provided in *Appendix B*.

Badgerys Creek

The areas encompassed by the Badgerys Creek airport options contain a number of large enterprises, including a 1,500 cow dairy and a chicken multiplication unit. These enterprises play a significant part in the regional production of agricultural goods.

There are a large number of market gardens and nurseries located in the area which produce fruit, vegetables and plants for the Sydney market. Extensive grazing of beef cattle and agisted horses also occurs.

The net annual value of production from the area covered by Option A is estimated at $0.6M.

The net annual value for Option B is estimated at $2.3M while the net annual value of Option C is estimated at $1.7M. Tables showing the sources of these estimates are contained in *Appendix B*.

Holsworthy

There is no agricultural production in the areas covered by the Holsworthy airport options.

Region

The *Sustainable Agriculture in the Sydney Basin* report (NSW Agriculture, 1995) says that agricultural land is important not only because of its role in providing Sydney with fresh food but also because of the non-agricultural benefits which can accrue through protection of agricultural land, often simply for its amenity value and non-urban use.

About 90 percent of the perishable vegetables produced in NSW are grown in market gardens in and around Sydney (NSW Agriculture, 1995). The Sydney Region produces 45 percent of the State's lettuce production, 85 percent of fresh mushrooms, 81 percent of spinach, 97 percent of spring onions and 71 percent of the state's fresh tomatoes. There are estimated to be 1,300 vegetable growers in the Sydney region (NSW Agriculture, 1995).

The Sydney region also accounts for 61 percent of the State's total area devoted to nurseries and flower production and 55 percent of the total area under turf. Poultry production in the Sydney region accounts for 61 percent of the State total. The region produces eight percent of the State's milk (NSW Agriculture, 1995). The total Sydney regional output is estimated by NSW Agriculture to be about $1 billion (NSW Agriculture, 1995).

4.3 WASTE

4.3.1 STATUTORY CONTEXT

There are a number of legislative and regulatory documents which have implications for waste minimisation and management for the Second Sydney Airport development.

National Waste Minimisation and Recycling Guidelines

Through its *National Waste Minimisation and Recycling Guidelines*, released in 1991, the Commonwealth has adopted as a national target, a 50 percent reduction by the year 2000 in waste going to landfill (on a weight per capita basis compared to 1990 levels). The Australia New Zealand Environment and Conservation Council adopted this 50 percent target in its November 1995 accord on industry waste reduction agreements.

Waste Minimisation and Management Act, 1995

A document titled *Waste Reforms*, released by the NSW Environment Protection Authority in November 1995, confirmed the NSW Government's commitment to a 60 percent reduction in waste per capita that goes to disposal by the year 2000 (as compared to 1990 levels). The 60 percent reduction target was further formalised as one of the underlying principles to the *Waste Minimisation and Management Act, 1995*. The Act establishes a framework for substantial increases in diversion of waste from disposal throughout NSW by the application of waste avoidance, re-use and recycling strategies.

Draft Green Waste Action Plan

Along with the new Act the NSW Government, through the Environment Protection Authority, has been developing plans for the handling of green waste in NSW. This planning resulted in the release in March 1996 of the Draft Green Waste Action Plan. The Draft Action Plan proposes a comprehensive program to divert green waste from landfill. It foreshadows, as an initial step, the banning of disposal of garden waste to landfill by January 1998, with the proviso that viable systems for its collection, processing and marketing are available.

4.3.2 ENVIRONMENTAL CONTEXT

Principles of ecologically sustainable development require a waste management approach aimed at maximising resource conservation for the proposed airport development. This approach is based on a hierarchy giving the highest priority to waste avoidance, followed by re-use, recycling and reprocessing. Waste residues that cannot be utilised in these processes are then disposed of in an environmentally acceptable manner.

Part C

Assessment of Impacts

CHAPTER 5 IMPACTS OF BADGERYS CREEK OPTIONS

5.1 MINERAL RESOURCES

5.1.1 CONSTRUCTION

The Department of Mineral Resources (1997) has provided estimates of coal resources potentially sterilised by the various airport options. A copy of the submission is in *Appendix A* for reference. These have been calculated for the entire area of each option and for the area of the barriers protecting the runways from mining induced subsidence. This has been done on the basis of a 35 degree angle of draw.

Many other structures would likely require protection from subsidence and therefore much more than the quoted resource beneath the runways could be sterilised. Additional resources are likely to be sterilised due to the inflexibility of the longwall mining method.

Borehole information at Badgerys Creek is sufficient only to indicate the approximate scale of the coal resources affected by construction of an airport. Information on potential coal sterilisation obtained from the Department of Mineral Resources (1997) is shown in *Table 5.1*.

TABLE 5.1 POTENTIAL COAL STERILISATION - BADGERYS CREEK

Site Option	Potential Coal Resource Sterilisation (million tonnes)	
	Runways/Platform	Entire Site
A (original)	57	63
B	64	84
C	63	84

Coal resources at Badgerys Creek have a seam thickness and are at a depth that makes mining difficult and costly, and would require technology not currently used in Australia. They are also beyond areas of current mining. Therefore it appears that sterilisation of all or part of this resource would not have a significant impact.

As previous investigations of deposits of light firing clay and shale by the Department of Mineral Resources (1997) have not found any potential deposits, construction of an airport at Badgerys Creek would not have an impact. However, if such deposits were discovered during construction, they could easily be segregated and economically disposed of.

5.1.2 OPERATIONS

No existing coal mining operations exist in the vicinity of the sites of the Badgerys Creek Options. Therefore there would be no impact due to airport operations.

5.2 AGRICULTURE

5.2.1 CONSTRUCTION IMPACTS

General Impacts

If an airport were developed along the lines of either Option A, B or C, the enterprises currently operating in these areas would either disappear or be relocated over the period of the construction. While this would reduce the agricultural production in the immediate area, valued at between $1 million and $3 million, it is likely that other farms in the Sydney Basin would increase their production to fill this gap in the market or the farmers would move to another area in the Sydney Basin and continue production. Displacement of agricultural activities at Badgerys Creek would be insignificant in terms of Sydney's regional output which is approximately worth $1 billion.

Relocation of activities is not a simple task and it would take some producers considerable time to find a suitable property. Some farmers who wished to remain in farming might have to relocate at a greater distance from markets.

If the land were leased back to producers until airport construction was due to start, this might enable them a chance to find an alternative site. It is likely that many of the operations could continue even after the land was purchased, until construction required the land, as has been the case with the existing land owned by the Commonwealth.

This would depend on the nature of the enterprise and the area in which it is located. For example, broiler production enterprises on small areas and horticulture in sheds would be marginally affected by construction in another part of the area. Grazing cattle on the other hand would be affected if fences were removed for construction, as this would make it difficult to continue grazing operations.

During the construction of the airport, market garden enterprises are likely to suffer from increased dust from vehicle traffic, which could make it impossible for them to remain.

Many of the industries located at Badgerys Creek are situated there because of close proximity to the markets. With the exception of beef cattle, these

industries would be significantly affected by having to relocate. Horse training and spelling are located close to city residents who own the horses and the broiler enterprises are situated near the processing plants.

Market gardens could relocate over the Blue Mountains and with refrigerated transport their product could be delivered to the Sydney market. This would increase transport costs but these might be off set by reduction in other costs associated with being closer to Sydney.

The existing dairy farm, which is part of a much larger operation including another dairy, is likely to be significantly affected by an airport as it is unlikely the whole operation could be moved elsewhere.

Badgerys Creek Option A

Option A has 1,526 hectares of agricultural production which is valued at $0.6M per annum. The details of the calculation are included in tables in *Appendix B*.

Stage 1 of the airport construction involves development of part of the south-eastern area of Option A. The enterprises located to the north and north west will therefore not be directly impacted upon until the Master Plan stage. Approximately 50 percent of the horse and beef grazing area, as well as a couple of horse training operations, the vineyard and one market garden would be affected. The estimated value of this is $0.4M.

The dairy farm has only a small portion of its land used for Stage 1.

Badgerys Creek Option B

Option B has 2,444 hectares of agricultural production which is valued at $23M per annum. The details of this are included in tables in *Appendix B*.

Stage 1 of the airport development involves construction on part of the area set aside for Option B. It would be situated on the north west edge of the Option B area. Enterprises located to the east and south east will therefore not be directly impacted upon until Stage 2 is developed. Approximately half the horse and beef grazing area as well as more than 50 percent of the horse training operations, the vineyard and two market garden operations would be affected. The estimated value of this is $1.9M.

The dairy farm has only a very small proportion of its land used for Stage 1. None of the Ingham's multiplication units would be affected by Stage 1 development.

Badgerys Creek Option C

Option C has 2,222 hectares of agricultural production which is valued at $1.7M per annum. The details of this are included in tables in *Appendix B*.

Stage 1 of the airport development will involve construction in the centre area of the Option C area. The enterprises located to the east, west of the Northern Road and south east will not directly impacted upon until the airport is developed to Master Plan stage. Approximately 50 percent of the horse and beef grazing area as well as more than half the horse training operations, a number of market garden operations and the duck and turkey operations would be affected. The estimated value of this is $1.1M.

Neither the dairy farm nor Inghams multiplication farm is affected by Badgerys Creek Option C.

5.2.2 OPERATION

Potential Impacts of Aircraft Noise

Most of the agricultural activities in the immediate vicinity to the Badgerys Creek airport sites are unlikely to be significantly impacted by aircraft noise, on the basis of research that has been reviewed (*Appendix B*). According to some literature which has been sighted, industries which are most likely to be impacted by aircraft noise are the poultry industries and the pure bred horse industries. There are many horse training businesses around the Badgerys Creek site as well as a poultry multiplication farm to the south of the proposed development.

The impact on poultry or horse establishments would vary. In the most extreme case, these enterprises could relocate to more favourable locations, especially if production is severely impacted.

Other Impacts

The location of a major airport in Western Sydney would need to supported by specialised local infrastructure and developments. It is probable that support industries would purchase agricultural land and, if planning legislation permits, utilise it for industrial and commercial purposes. It is not possible to quantify these additional impacts.

However, agricultural land in the immediate vicinity of the airport runways and operating areas would be unlikely to be used for residential purposes due to high noise levels. If the land is not used for commercial/industrial purposes, as discussed above, it is likely to remain in agricultural production. This may

have the effect of negating the inevitable future urbanisation of these agricultural lands and could maintain agricultural production in the area.

5.3 ENERGY REQUIREMENTS

Energy will be required for all options mainly in the form of electrical power, fuel and explosives in the construction stage and during operations as electrical power, natural gas and aircraft fuel.

A desktop study of energy required for construction and operations was conducted. Construction fuel requirements were estimated by Second Sydney Airport Planners (1997a). Information on operational energy requirements was obtained from Federal Airports Corporation (1997).

5.3.1 CONSTRUCTION

It has been estimated that approximately 40 million litres of fuel (equivalent to 1,440,000 giga-joules of energy) would be expended to construct the airport to Stage 1 capacity (Second Sydney Airport Planners, 1997a) and 90 million litres (equivalent to 3,240,000 gigajoules) to construct it to master plan size. The majority (up to about 70 percent) of the energy would be used in earthworks.

5.3.2 OPERATION

The total connected electrical load is estimated at 95 MVA and the likely maximum demand in the order of 80 MVA.

Annual electrical energy consumption by the proposed airport has been estimated as 830,000 giga-joules at a capacity of 30 million passengers on the basis of energy usage from the existing Sydney Airports. Major energy demand centres would be expected to be the international and domestic terminals (collectively about 50 percent) and the aircraft bases (about 30 percent).

The demand for natural gas would vary depending upon whether the airport would be powered by cogeneration, gas driven equipment or conventional transmission line supply from outside the site.

Cogeneration would make up a major proportion of the gas demand for the airport but would negate or greatly reduce the need for incoming power transmission lines.

Other major gas demands would be catering and food preparation both for the terminal and flight catering facilities, commercial hot water boilers for use at the aircraft maintenance facilities and building heating and cooling systems.

The expected total annual demand based on similar facilities elsewhere and without cogeneration is approximately 150,000 giga-joules for the complete airport development.

A wide range of energy conservation measures are available to produce efficient designs for buildings and lighting and would be adopted.

Substantial quantities of aviation fuel (Jet A1) would be needed by aircraft using the Second Sydney Airport. Jet A1 fuel demand requirements would be approximately 8 million litres per day when the airport reaches the Master Plan capacity (30 million passengers). This figure is based on extrapolation of fuel usage at other airports in Australia and information from Shell and JUHI, the existing operator at Sydney Airport.

For a Stage 1 development of approximately 10 million passengers per annum, Jet A1 fuel demand would be approximately 1.5 million litres per day.

The potential demand for AvGas, for piston engined aircraft (for general aviation and regional airlines) is very small compared to the jet fuel requirements. For the Master Plan development a total of 30,000 to 35,000 litres per day is estimated to be required (Second Sydney Airport Planners, 1997a). On this basis, Stage 1 demand would be some 10,000 to 15,000 litres per day.

Design of airport facilities, such as buildings, would be done in accordance with state-of-the-art energy efficiency principles. This would reduce energy consumption over the operating life of the facilities, and reduce the potential generation of greenhouse gases.

Layout of runways and taxiways to reduce taxiing distances and times and efficient scheduling and control of takeoffs and landings would minimise the amount of fuel wasted by aircraft on the ground.

5.4 WASTE

5.4.1 CONSTRUCTION

Demolition Wastes

Depending on the site option adopted, it has been estimated that up to 120 residential, a large number of farm sheds and 30 commercial buildings, two road bridges, 2,200 metres of pipes, five drainage culverts and 21 kilometres of roads would be removed from the airport construction site (Second Sydney Airport Planners, 1997a). The types of waste materials generated from these

demolition activities would include scrap metal, timber, bricks, tiles, concrete and bitumen debris.

Prior to demolition taking place a detailed survey would be undertaken to identify and locate any potentially hazardous wastes (such as asbestos in buildings) and readily re-useable or recyclable items (such as concrete pipes and culverts). The feasibility of removing and segregating these materials would then be evaluated and an appropriate demolition plan drawn up.

It is expected that inert materials including concrete and bitumen debris could be crushed as necessary and used as fill in temporary haul roads or permanent earth embankments, while unbroken concrete pipes and culverts could be utilised in temporary drainage works. It is estimated that up to 50 percent of the demolition wastes could be recycled either on site in this fashion or off site in a recycling yard. The remaining waste materials would need to be disposed of to an off-site landfill which would be likely to be in Western Sydney.

Earthworks and Clearing

According to the Planning and Design Report (Second Sydney Airport Planners, 1997a), trees and shrubs would be processed on site into wood chip or mulch, which will be stockpiled for subsequent use in re-vegetated areas. Top soil would also be stripped and stockpiled for re-use on site. Any merchantable timber would be harvested and sold.

Preliminary investigations indicate that a balanced "cut-to-fill" approach in bulk earthworks design would be achievable for all site options at Badgerys Creek. It was estimated that up to about 30 to 40 million cubic metres of material would be excavated and placed in embankments on site. This "balanced earthwork" approach would avoid the generation of significant quantities of surplus spoil and would be compatible with the preferred waste management hierarchy.

Table 5.2 indicates the quantities of earthworks for each airport option (Second Sydney Airport Planners, 1997a).

On site use of mulched vegetation and stockpiled topsoil and the balancing cut and fill in bulk earthworks will eliminate waste from these activities. There would be a need to stockpile a large quantity of fill from Stage 1 of Option B for the final airport development.

TABLE 5.2 ESTIMATED QUANTITY OF EARTHWORKS FOR BADGERYS CREEK OPTIONS

		Option A		Option B		Option C	
		Stage 1	Master Plan	State 1	Master Plan	Stage 1	Master Plan
Total volume of earthworks	Cut	11	24	26	36	13	27
(millions of cubic metres)	Fill	14	27	7	36	15	29

Contaminated Soil

Surface soil on certain parts of the site would be expected to contain low levels of agricultural chemical residues. This is discussed in *Technical Paper No.10 - Hazards and Risks*. A detailed soil contamination investigation would need to be conducted prior to airport construction to locate and determine the extent of the contamination and to establish whether contaminant concentrations present are likely to pose health or environmental risks, if soil is used for airport construction.

It is expected that the quantities of soil with unacceptable concentrations of contaminants would be insignificant relative to the earthworks to be undertaken. Any contaminated soil could be readily managed by mixing it with clean excavated materials and safely utilised as fill on site. No off-site disposal of contaminated soil is proposed, however if quantities are small, off-site disposal could be considered.

Sewage Treatment Plant Residues

It is proposed to install a temporary on-site sewage treatment plant to treat sewage generated during airport construction. The plant would be sized to meet the waste load generated by an expected peak workforce of 1,200 persons (Second Sydney Airport Planners, 1997a). Sewage effluent would be treated to a standard compatible with a range of on-site non-potable re-use options including dust suppression and irrigation of landscaped areas. Residual solids from the treatment process would be disposed of in an off-site sanitary landfill.

Building Wastes

These would include mainly garbage and office wastes from site compounds, waste oils and fluids from maintenance workshops, as well as packaging materials and waste building materials.

Off-specification concrete or asphalt would be either recycled into the on-site batching plants or utilised as general fill in bulk earthworks. No off-site disposal of these materials is proposed.

Separate bins would be provided in site offices for general garbage and recyclable materials to facilitate collection and recycling by a waste contractor. Waste oils and fluids would be stored in dedicated tanks for collection by waste contractors. Used drums and containers would be returned to suppliers or collected by a recycling contractor. No garbage or waste oils would be disposed of on site.

5.4.2 OPERATION

Waste is generated in an airport from a range of activities at both "airside" and "landside" locations. For the purpose of this study, airport wastes have been categorised into two distinct components: quarantine and non-quarantine wastes.

Quarantine waste typically comprises material which is of a potentially directly or indirectly infectious nature, which is unsterilised and unwanted (Environment Protection Authority, 1996). This includes waste generated during an aircraft journey outside Australia, as well as materials that originate from Australia and are brought back into the country on the return journey. Examples include food scraps, unconsumed meals, cabin debris and sullage wastes removed from an aircraft originating from an overseas location, as well as foreign organic materials confiscated at Customs checkpoints in the international terminal building.

In essence, any organic material capable of hosting insects, bacteria, fungi and other forms of infestation is regarded as quarantine waste. Because of its nature, quarantine waste is managed in a different manner to non-quarantine waste.

Non-quarantine waste is any unwanted material that is not contaminated by quarantine waste. Examples include garbage generated by commercial tenants and airport administration in the terminal buildings; litter collected in "landside" outdoor areas; waste engine oils, hydraulic fluids and parts generated at aircraft maintenance workshops; as well as grease trap waste from restaurants and food outlets.

Based on a recent waste audit (NSW Waste Service, 1993) of the existing Sydney Airport, it is estimated that the quarantine and non-quarantine components would typically account for 60 and 40 percent of the total solid waste stream respectively.

Quarantine Wastes

Estimates of the likely quantity of quarantine waste generated at the proposed Second Sydney Airport have been derived from available waste data from the existing Sydney Airport. Given that Sydney Airport currently disposes of about 11,000 tonnes per annum of solid waste and handles about 20.5 million passengers each year, and assuming that quarantine waste accounts for 60 percent of the total solid waste stream, this is equivalent to 0.3 kilogram of quarantine waste per passenger per annum.

The proposed Second Sydney Airport would have an ultimate capacity of 30 million passengers per annum, and therefore up to approximately 9,000 tonnes of quarantine waste each year could be expected to be generated. These quarantine wastes would be sterilised to permit co-disposal with general non-quarantine waste in an off-site landfill.

Non-Quarantine Wastes

Based on waste data from Sydney Airport, it is estimated that 0.2 kilograms of general solid waste per passenger per annum could be generated. With an ultimate capacity of 30 million passenger per annum, the Second Sydney Airport would be expected to generate up to 6,000 tonnes of general solid waste per annum.

Findings from the Sydney Airport waste audit (NSW Waste Service, 1993) suggested that general solid waste would comprise mainly food waste from restaurants and fast food outlets in the terminal buildings (up to about 60 percent), cardboard packaging (about 30 percent), a range of paper wastes including office paper, used paper towels and newspapers (about five to six percent) and miscellaneous wastes including glass bottles and aluminium cans.

An on-site sewage treatment plant may be constructed to treat sewage and other wastewater generated at the airport. The capacity of the plant would be designed to meet the ultimate capacity of the airport. Sewage effluent would be treated (and disinfected) to a level compatible with Environment Protection Authority standards for discharge into a local watercourse and/or a range of on-site non-potable re-use options. The latter could include irrigation of landscaped areas, toilet flushing and washdown of aircraft and vehicles. (Refer to *Technical Paper No. 7 - Geology, Soils and Water* for details).

Solid residuals from the plant will comprise sludge, and possibly grit and screenings, depending on the final process selection. Sludge would be a beneficial component to any on-site composting operation by providing a valuable nitrogen source or it could be utilised off site. Screenings and grit would be disposed of to a sanitary landfill.

CHAPTER 6 IMPACTS OF HOLSWORTHY OPTIONS

6.1 MINERAL RESOURCES

6.1.1 CONSTRUCTION

The Department of Mineral Resources (1997) has provided estimates of coal resources potentially sterilised by the various airport options. A copy of the submission is in *Appendix A* for reference. These have been calculated for the entire area of each option and for the area of the barriers protecting the runways from mining induced subsidence. This has been done on the basis of a 35 degree angle of draw.

Many other structures would likely require protection from subsidence and therefore much more than the quoted resource beneath the runways could be sterilised. Additional resources are likely to be sterilised due to the inflexibility of the longwall mining method.

Coal resources at Holsworthy are of high quality and have the potential to be sold principally on the domestic or export coking coal market, with a small proportion sold as export or domestic thermal coal, of lower marketable value.

TABLE 6.1 POTENTIAL COAL STERILISATION - HOLSWORTHY

Site Option	Potential Coal Resource Sterilisation (million tonnes)	
	Runways/Platform	Entire Site
A	66	110
B	76	96

The Southern Coalfield which encompasses the Holsworthy sites supplies up to 80 percent of Australia's blast furnace feedstock and is the state's only supply of hard coking coal. The coal underlying the Holsworthy options is therefore of strategic significance as a source of hard coking coal for the Port Kembla Steelworks and blast furnace feedstock for other Australian operations.

Holsworthy Option B overlies approximately 20 percent of the existing West Cliff Colliery lease and a very small portion of the adjacent North Cliff Colliery as shown in *Figure 6.1*. According to the Department of Mineral Resources (1997), sterilisation of part of the resources within this existing lease could jeopardise the viability of this operation in the long term.

Therefore, Holsworthy Option B has a significant impact in terms of limiting the expansion of an existing mining operation, while both Holsworthy options involve sterilisation of significant amounts of high quality coal resources.

Coal reserves beneath the site of Holsworthy Option A have not yet been mined. They are only just beyond maximum current mining depths (Department of Mineral Resources, 1997).

6.1.2 OPERATION

Land at Holsworthy is essentially unoccupied and there are likely to be minimal land use conflicts with future mining operations. Coal resources beneath the Holsworthy sites are in an area which would be a logical progression from existing mining leases. Impacts of airport operations and associated development could be to increase the potential for land use impacts and restrict future mining operations in the area.

6.2 AGRICULTURE

6.2.1 CONSTRUCTION

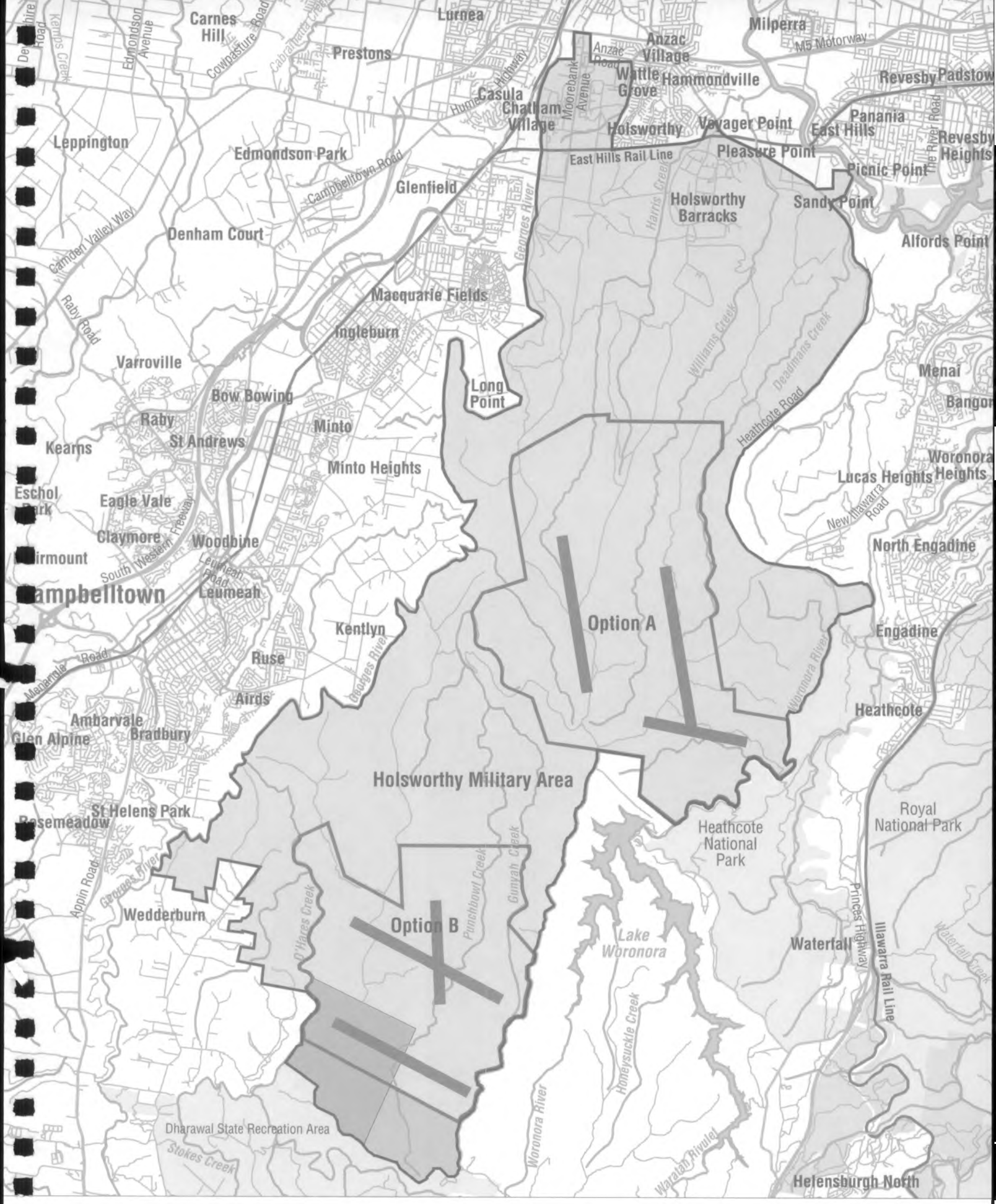
There would be no direct impacts from construction activities at Holsworthy, as there are no agricultural activities within the sites of Options A and B. However indirect impacts in the agricultural areas surrounding the Holsworthy Military Area, including Wedderburn and Darkes Forest could result from dust from airport construction.

6.2.2 OPERATION

There are very few agricultural activities in the vicinity of the sites of the Holsworthy options. Some impacts on agricultural activities could result from aircraft noise in many areas. However, the extent of impact depends upon many factors such as environment and genetics. Insufficient research has been done to determine with any certainty at what noise levels affects of noise on animals occur.

6.3 ENERGY

Energy will be required for all options mainly in the form of electrical power, fuel and explosives in the construction stage and during operations as electrical power, natural gas and aircraft fuel.



Boundary of Airport Options

Part of West Cliff Mining Lease

Part of North Cliff Mining Lease

Figure 6.1

Parts of Holsworthy Military Area Affected by Existing Coal Mining Leases

A desktop study of energy required for construction and operations was conducted. Construction fuel requirements were estimated by Second Sydney Airport Planners (1997a). Information on operational energy requirements was obtained from Federal Airports Corporation (1997).

6.3.1 CONSTRUCTION

The proposed Second Sydney Airport would be a net user of energy. It has been estimated that about 170 million litres of fuel (equivalent to 6,120,000 giga-joules of energy) would be expended to construct the airport to Stage 1 capacity (Second Sydney Airport Planners, 1997a) and 310 million litres of fuel (equivalent to 11,160,000 gigajoules of energy) to construct it to master plan capacity. The majority (up to about 90 percent) of the energy would be fuel and explosives used in earthworks.

6.3.2 OPERATION

Annual energy consumption by the proposed airport is estimated as 830,000 giga-joules at a capacity of 30 million passengers. Major energy demand centres would be expected to include the international and domestic terminals (collectively about 50 percent) and the aircraft bases (about 30 percent).

Aircraft fuel requirements would be approximately 8 million litres per day when the airport reaches a capacity of 30 million passengers.

Design of airport facilities, such as buildings, would be done in accordance with state-of-the-art energy efficiency principles. This would reduce energy consumption over the operating life of the facilities, and reduce the potential generation of greenhouse gases.

Layout of runways and taxiways to reduce taxiing distances and times and efficient scheduling and control of takeoffs and landings would minimise the amount of fuel wasted by aircraft on the ground.

6.4 WASTE

6.4.1 CONSTRUCTION

Preliminary investigations indicate that a shortfall of between 17 and 77 million cubic metres of fill material would be likely for the Holsworthy options (Second Sydney Airport Planners, 1997a). This means that no surplus fill would be disposed of from site.

Wastes generated during airport construction would include cleared vegetation, demolition wastes, contaminated soil, sewage, off-specification

concrete and asphalt, etc. The general strategy for minimising and managing these wastes is as for the Badgerys Creek site options, with any solid waste residues likely to be disposed of to the nearby Lucas Heights Landfill.

Another particular issue requiring further investigation is soil contamination. Apart from unexploded ordnance, surface soil at certain parts of the residues Holsworthy site could potentially contain elevated levels of metals and explosives as a result of past and present military training activities. This is discussed in *Technical Paper No.10 - Hazards and Risks.*

Unexploded ordnance would be cleared prior to airport construction, while a detailed site investigation would be conducted to locate and determine the extent of soil contamination and to establish whether contaminant concentrations are likely to pose health or environmental risks, if soil is used for airport construction.

It is expected that the quantities of soil which have unacceptable concentrations involved would be insignificant relative to the earthworks to be undertaken. Any contaminated soil may be able to be readily managed by mixing it with clean excavated materials and safely utilised as fill on-site. No off-site disposal of contaminated soil is proposed, however if quantities are small, off-site disposal could be considered.

6.4.2 OPERATION

For an airport capacity of 30 million passengers per annum, up to 9,000 tonnes of quarantine waste and up to 6,000 tonnes of general solid waste per annum could be generated.

Quarantine wastes would be sterilised to permit co-disposal with general non-quarantine waste in an off-site landfill. Waste oils and fluids would be stored in dedicated tanks for collection by a recycling contractor. Used drums and containers would be returned to suppliers or collected by a recycling contractor. Discarded machine parts would be returned to manufacturer or collected by a scrap metal recycler.

Solid residuals from the on-site sewage treatment plant will comprise sludge, and possibly grit and screenings, depending on the final process selection. Sludge would be a beneficial component to any on-site composting operation by providing a valuable nitrogen source or it could be utilised off site. Screenings and grit would be disposed of to an off-site sanitary landfill.

Part D

Environmental Management

CHAPTER 7 ENVIRONMENTAL MANAGEMENT

7.1 MINERAL RESOURCES

Coal resources would be sterilised beneath Badgerys Creek and Holsworthy sites unless cost effective techniques can be developed to mine coal beneath the sites without causing subsidence. Sterilising coal resources at Holsworthy would have greater consequences than sterilising coal at Badgerys Creek because of the proximity to existing mining, and the strategic importance of the hard coking coal.

This means that engineering or mining technologies would need to be used which would enable mining to occur simultaneously with construction and operation of an airport at Holsworthy.

Special foundation designs could be necessary for key airport elements such as runways to overcome potential problems with subsidence. However, as this subsidence could have other undesirable effects such as damage to underground services, such engineering solutions may not be practicable.

Mining techniques which would be able to recover coal without causing subsidence could be utilised. Such techniques are not widely used at present and are likely to be uneconomic, because they would reduce the amount of coal that can be extracted.

Therefore, construction of an airport at Holsworthy Option A or B would effectively sterilise these coal resources of strategic importance.

7.2 AGRICULTURE

At Badgerys Creek, direct impacts of building an airport on land currently used for agricultural production would be mitigated to a certain extent by compulsory acquisition payments to farmers and producers who are forced to relocate. Factored into these payments would be the value of the agricultural enterprise which is being acquired. This would enable them to set up elsewhere, and reduce the potential value of lost agricultural production.

At both Badgerys Creek and Holsworthy a major impact of the proposed airport on existing operations could occur during the construction phase, when dust from heavy machinery and vehicular traffic could impair livestock activities and reduce the quality of produce, especially in market gardening and nursery operations down wind of the airport sites. This is discussed in *Technical Paper No.6 - Air Quality*.

Measures would need to be introduced to reduce the level of airborne dust and to reduce "dust drift" from the construction site. These measures could include: use of spray carts to "damp" down construction areas, tree belts, air treatment in livestock sheds and the washing of product prior to sale to reduce potential "price penalties".

Aircraft noise could potentially impact on agricultural activities undertaken in surrounding areas. Long term noise impacts on activities such as animal grazing and egg production are not clear, as current research is not conclusive, but it is expected that noise mitigation measures such as insulation of farm buildings would have limited effectiveness. Producers living on noise affected properties may qualify for relocation in a similar manner to particular residential owners affected by aircraft noise.

7.3 ENERGY

The energy sources for the Second Sydney Airport are derived almost entirely from fossil fuels and will therefore contribute to green house gas emissions. Natural gas contributes to a lesser degree than electricity generated from coal fired power stations, therefore use of natural gas in airport operations should be maximised.

Energy conservation measures would need to be adopted for construction of the airport and for ongoing airport operations. An ongoing energy consumption monitoring program would need to be implemented.

Design of airport facilities, such as buildings, should be done in accordance with state-of-the-art energy efficiency principles. This will reduce energy consumption over the operating life of the facilities, and therefore the potential generation of green house gases.

7.4 WASTE

7.4.1 CONSTRUCTION

Construction and demolition waste minimisation is not limited only to initiatives on the construction site. Considerable waste results from inadequate forward planning and inexact ordering of materials in the design and procurement phases of projects. Therefore initiatives would need to be taken during each of the planning, design, procurement and construction phases of projects.

Material from Olympic Co-ordination Authority (1997a, b), Department of Public Works and Services (1996) and Australian Conservation Foundation et al (1995) was referred in preparing the following discussion on minimising construction wastes.

Project Planning and Design

Airport designers should ensure that waste minimisation principles are given detailed consideration during project planning and design development and are incorporated into the facility design.

To document design outcomes in waste minimisation, designers should provide at the conclusion of the design phase, a Design Waste Minimisation Report for the project incorporating details of all waste minimisation strategies, actions and achievements undertaken during the design phase and/or embodied in the project design. A preliminary report detailing waste minimisation strategies should be prepared at the commencement of design. The Design Waste Minimisation Report may be included as part of the Design Report for the project.

Designers should undertake a range of waste minimisation practices including the following:

- evaluate the project design for buildability, efficient material use and opportunities to generate less waste, for example, in earthworks, structures and finishing materials. Evaluations should occur during the concept and design development phases, as routine elements of design review;

- specify durable materials and components that are appropriate to the particular project and are consistent with the anticipated lifecycle of the project or component;

- specify construction materials on the basis of performance thus providing opportunities to incorporate reused and/or recycled materials into the project;

- adopt, where practical, reused and/or recycled materials that meet performance, cost/value and workability criteria and are compatible with design objectives and standards. This may include the re-use of materials or components from existing site facilities that are to be demolished;

- design for and specify modular and pre-fabricated components and materials wherever practical as this minimises the generation of waste;

- apply dimensional co-ordination where it will practically assist the efficiency of material use, particularly for modular components and materials supplied in set sizes or dimensions or where high levels of wastage have been recognised;

- make provision in project design and programming for the recovery, storage and transfer of re-useable materials from demolition works including their transport from the site to recycling or re-use stations. Consider the use of separable or early works packages for demolition works to improve materials recovery levels;

- give design consideration to the ease and ability to reuse or recycle project materials and components at the time of major refurbishment, renovation or completion of the economic life of facilities (that is, design for disassembly);

- include the constructor and key subcontractors within the design team or design review process, where possible, or include a team member with expertise in construction methods and planning;

- give consideration to the space and equipment requirements for waste management during the project's operations;

- adopt co-ordinated project information between design consultants to ensure consistency, accuracy and clarity of information and so avoid potential variations through conflicting project documentation;

- encourage a culture of waste minimisation within the design team by stressing the financial and environmental costs of unnecessary waste and by supporting staff innovation in this area; and

- minimise paper use during design and documentation by reducing paper sizes, monitoring reproduction of documents and using electronic information transfer where practical.

Project Construction

The contractor is to ensure that construction and demolition waste deriving from the project is minimised by adoption of appropriate waste minimisation practices.

The contractor should prepare a written Waste Minimisation and Management Plan for the construction phase of the project. At the tender/proposal stage the contractor should supply a Preliminary Waste Minimisation and Management Plan. Before works commence on site, the contractor should submit the

detailed Waste Minimisation and Management Plan as part of their project Environmental Management Plan. The plan should:

- document the major waste types and quantities expected on the project under current practices and the method of waste collection, removal and disposal under current practices;

- set out what steps the contractor will take to achieve the following:

  - reduce wastes or keep wastes to a minimum;
  - recover, reuse and recycle wastes;
  - use recycled products;
  - reduce litter; and
  - dispose of wastes that cannot be reduced, reused or recycled to an appropriately designed, licensed waste facility; and

- include details of the mechanism for monitoring and reporting progress.

Contractors should adopt a range of waste minimisation and management measures including the following:

- incorporate recycled materials into projects where recycled materials meet performance specifications;

- provide collection facilities for recyclables on the site by installing clearly labelled containers for the major recyclables for the project;

- maximise the reuse or recycling of recovered material on site;

- sell, exchange or give away recyclable materials which cannot be used on site;

- confine all litter within the site boundaries;

- allocate responsibility for collection and removal of wastes including packaging and protection materials in contracts with subcontractors and suppliers;

- responsibly dispose of any wastes that cannot be reduced, reused or recycled in accordance with the legislation, regulations and policies in New South Wales;

- document the quantities of materials removed from site and their destination, differentiating between materials removed for disposal and materials removed for recycling;

- investigate and implement innovative ways of dealing with site specific waste management problems;

- provide instruction to all site workers, as part of compulsory site induction procedures, detailing the Waste Minimisation and Management Plan and the methods selected to implement the plan;

- adopt ongoing strategies to reinforce workers' commitment to waste minimisation such as through the posting of recycling and disposal targets and progress on notice boards and regular discussion of waste minimisation issues at project meetings.

The contractor should nominate a senior representative of their project team to act as the Waste Minimisation Officer who will be responsible for ensuring that the contractor successfully completes its commitments as stated in its Waste Minimisation Plan. The contractor should assign to the officer the authority needed to carry out this responsibility.

The Waste Minimisation Officer's task would include, for example:

- management of implementation of the Waste Minimisation and Management Plan;

- rectification of waste practices which do not comply with the Waste Minimisation and Management Plan;

- documentation of the types, quantities and destination of wastes generated;

- preparation of regular progress reports; and

- reinforcement of waste minimisation commitment through induction, education and the diffusion of information.

7.4.2 OPERATION

The following sections, which outline a strategy for minimisation and management of wastes generated during airport operation were partly based upon discussions with Federal Airports Corporation (1997). An airport waste management plan would need to be prepared at detailed design stage of the development.

Segregation of Quarantine and Non-Quarantine Wastes

A fundamental component of the proposed airport waste management strategy is secure and effective segregation of quarantine and non-quarantine wastes.

The objective is to minimise the risk of cross-contamination of these two waste streams to an acceptable level and thereby minimise the quantities of quarantine wastes which is more difficult to dispose of. To achieve this, the following strategy is proposed:

- define and identify the sources of quarantine waste in the airport in consultation with Australian Quarantine and Inspection Service;

- design the proposed airport in such a manner to facilitate waste segregation at the earliest available opportunity. Measures to be considered may include separate international and domestic terminals, as well as clear demarcation of quarantine and non-quarantine areas in airport layout;

- educate and train airport personnel in correct handling procedures for quarantine waste;

- provide separate collection and handling systems for quarantine and non-quarantine wastes; and

- review and improve the effectiveness of the segregation system through regular waste audits.

Management of Quarantine Waste

A proposed management strategy for quarantine waste would involve:

- source reduction. A significant source of quarantine waste is food waste including food packaging and unconsumed meals from international aircraft. Other cabin garbage, including unused newspaper and magazines, is also normally disposed of as quarantine waste because of cross-contamination. It is proposed that airport management should evaluate the feasibility of including waste minimisation requirements into contracts with international airlines. Examples of waste minimisation measures may include meal optimisation and in-flight waste segregation;

- re-use, recycling and re-processing. In preference to disposable cutlery, and food and beverage containers which are discarded as quarantine waste, international airlines may consider alternatives which can be cleaned, sterilised and re-used;

- treatment and disposal. It is proposed that all quarantine waste be sterilised in an on-site treatment facility, such as an autoclave. The decontaminated liquid and solid residues would then be disposed of to

an on-site sewage treatment plant and an off-site domestic landfill respectively; and

- benchmarking. This would involve comparing the performance of the Second Sydney Airport in waste minimisation against international best practice. Target performance indicators will be set as part of a waste management plan for the airport. The indicators would be monitored and targets refined as waste data from major international airports are available.

Management of Non-Quarantine Waste

A proposed management strategy for general solid waste would involve:

- source reduction. Both airport management and tenants would be required to implement waste minimisation programs. For example, suppliers of food and beverage products may be asked to consider alternative packaging methods, while restaurants and food outlets would consider ways to avoid food wastes. It is further proposed that agreed waste minimisation targets should be written into contracts with commercial and industrial tenants in the airport;

- re-use, recycling and re-processing. For example, separate receptacles for food, paper, glass, aluminium and other wastes would be provided in the airport to facilitate collection of recyclable materials. The feasibility of on-site composting of food waste (non-quarantine), with products used in airport landscaping works or other beneficial applications, would be evaluated. Cardboard boxes may be baled to facilitate transport to an off-site recycling facility;

- disposal of solid waste residues to an off-site landfill, probably in western Sydney; and

- benchmarking. This would involve comparing the performance of the Second Sydney Airport in waste minimisation against international best practice. Target performance indicators will be set as part of a waste management plan for the airport. The indicators would be monitored and targets refined as waste data from major international airports are available.

A range of wastes would also be generated from aircraft maintenance activities. Waste oils and fluids would be stored in dedicated tanks for collection by a recycling contractor. Used drums and containers would be returned to suppliers or collected by a recycling contractor. Discarded machine parts would be returned to manufacturer or collected by a scrap metal recycler.

Part E

Summary of Impacts

CHAPTER 8 SUMMARY OF IMPACTS

Coal resources would be sterilised beneath Badgerys Creek and Holsworthy sites unless cost effective techniques can be developed to mine coal beneath the sites without causing subsidence. Sterilising coal resources at Holsworthy would have greater consequences than sterilising coal at Badgerys Creek because of the proximity to existing mining, and the strategic importance of the hard coking coal.

Displacement of agricultural activities at Badgerys Creek could potentially cause an annual loss of production of $0.6 million for Option A, $2.5 million for Option B and $1.7 million for Option C. In comparison to the Sydney regional output ($1 billion) this is not significant. Some of the existing agricultural operations could be expected to re-establish elsewhere which would reduce the potential loss of production from the region. Dust and noise from airport construction and operation could affect a number of properties in close proximity to the Badgerys Creek options, and potentially cause losses in production. The value of this cannot be estimated because of lack of research into effects of noise on animals.

No existing agricultural activities would be directly displaced by the Holsworthy options, however dust and aircraft noise could potentially impact on nearby agricultural activities in areas such as Wedderburn.

Construction of the airport involves the unavoidable consumption of a large amount of energy, in spite of energy conservation measures (estimated at 2,160,000 giga-joules for Badgerys Creek and 8,640,000 giga joules for Holsworthy options). A major airport is a large user of energy (approximately 830,000 giga-joules annually, plus 8 million litres of aircraft fuel per day), however energy efficient design of the airport facilities and good ground management of aircraft and of the airport facilities would minimise the amount of energy consumed.

Up to 9,000 tonnes of quarantine waste and 6,000 tonnes of general solid waste could be generated annually by the airport. Quarantine wastes would be sterilised to permit co-disposal with general non-quarantine waste in an off-site landfill.

Adoption of comprehensive waste management strategies aimed at maximising resource conservation from design and construction stage through operation and maintenance would ensure that waste generation is minimised, re-use recycling and reprocessing are maximised and the overall impact of the waste stream is reduced.

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Appendices

Appendix A

Submission from Department of Mineral Resources

MINERAL RESOURCES

0 6 JUN 1997

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L96/0458
2 June 1997

Second Sydney Airport - Environmental Impact Statement

Dear Sir

The Department has examined the two Holsworthy and three Badgerys Creek options for the location of the second Sydney airport and provides the following information to assist you in the compilation of the EIS.

The information is based upon the latest plans made available to the Department on 26 May by yourself together with an examination of geological records in the vicinity of the two areas held by the Department. Many of the comments and all the conclusions are applicable regardless of the precise location of the various options and have been taken directly from our earlier correspondence (L96/0458, 24 December 1996).

Both the Holsworthy and Badgerys Creek proposals overlie concealed coal resources. With regard to surface minerals, Badgerys Creek contains light clay/shale resources but no investigation has been made at Holsworthy.

The clay/shale resources at Badgerys Creek were investigated in a drilling programme at the time of the original proposal to site the second airport there. The conclusion was that no potentially economic deposits of light firing clay/shale were delineated within the proposal and the potential for the discovery of such resources is considered to be low. The results of the drilling programme are set out in Department of Mineral Resources report GS 1990/045 available at the St Leonards office. The Department does not object to Badgerys Creek as an airport site because of any surface extractive resources.

As stated above, concealed coal resources underlie both the Badgerys Creek and Holsworthy proposals.

As requested, estimates of resources are given on the following bases;

a) Beneath the 35° angle of draw to the platform.

b) Beneath the 35° angle of draw to the platform and any major buildings that extend beyond the platform.

c) Beneath the perimeter (excluding access corridors) plus areas outside the perimeter within the 35° angle of draw to the platform.

d) Beneath the perimeter (excluding access corridors) plus areas outside the perimeter within the 35° angle of draw to the platform and any major buildings that extend beyond the platform.

The tonnages quoted are for in situ resources, no estimate is made of in situ mineable or recoverable resources.

Plans supplied by Rust PPK, (Ref. Teik Oh, Rust PPK P/L, dated 24th May 1997) were used to locate the various options and the proposed infrastructure. Copies of relevant parts of these plans are enclosed to illustrate the approximate line of the 35° angle of draw (marked in dark blue in the case of the platform and green to buildings extending beyond the platform).

Holsworthy

All resources have the potential to be sold principally on the domestic or export coking coal market with a small proportion sold as export or domestic thermal coal. Close spaced borehole information is available in the southern part of the southern option but ranges from about 3 - 8 km over the remainder. The depth to seam is the average depth from the plateau; water courses of up to 80m depth transect or occur at the boundaries of the two areas.

Northern Option -

Depth: 620 - 775m

Area	Tonnage (Mt)
a)	66.4
b)	67.3
c)	110.0

Southern Option -

Depth: 560 - 600m

Area	Tonnage (Mt)
a)	76.2
c)	96.3

Badgerys Creek

Borehole information over this proposal is insufficient to more than indicate the scale of the coal resources beneath.

No borehole has been drilled within the area which intersected the Illawarra Coal Measures. Three boreholes drilled a few kilometres to the south, south west and west indicate that three seams in the general area have economic potential. These seams occur at depths of over 800m. Resources are all medium ash thermal and coking or coking blend coal. Information is such that an estimate of the resources in only one of the seams can be done with any degree of confidence until further exploration is carried out.

Option A (Original)

Area	Tonnage (Mt)
a)	57
c)	63

Option B

Area	Tonnage (Mt)
a)	64
b)	73
c)	81
d)	84

Option C

Area	Tonnage (Mt)
a)	63
b)	73
c)	79
d)	84

It should be noted that the above tonnages of affected resources are likely to be conservative because of the combination of geological factors, such as faults and the likely mining method. The resources beneath both sites can only be mined by an underground method and economics dictate that longwall mining equipment or similar will be employed. The longwall mining method requires certain minimum dimensions of available resources to be feasible and is also usually sensitive to direction of mining. In the case where an overlying structure is required to be protected from subsidence, the inflexibility of the longwall mining method together with geological factors may result in resources adjacent to that structure not being recovered because the tonnage is insufficient to warrant the cost of extraction.

Major faults are known to occur in the vicinity of the southern Holsworthy option and are likely to extend into the northern option. Other smaller faults and other geological features are also expected to impact on the mine plan at Holsworthy based on the area's proximity to current mining. Much less information is available at Badgerys Creek but it is unlikely that it would not be affected by some geological features that will impact on the mine plan.

Conclusion

As stated in our previous correspondence to James Chan (Our ref. L96/0458, 24 December 1996), the Department of Mineral Resources continues to favour the second Sydney airport being located at Badgerys Creek in preference to either Holsworthy option for many reasons. No preference is expressed for any of the Badgerys Creek options. The reasons for preferring Badgerys Creek remain as follows:

i) Approximately 20% of the southern Holsworthy option overlies West Cliff Colliery lease and a very small portion of the adjacent North Cliff Colliery. Both collieries are owned by BHP. The location of lease boundaries are illustrated in red on one of the accompanying plans. Sterilisation of part of the resources within West Cliff Colliery could jeopardise the viability of this operation.

ii) The resources beneath Holsworthy are believed to be of higher quality than those beneath Badgerys Creek. The seams beneath both Holsworthy options are essentially low to medium ash hard coking coals which command a premium price on the export market. Hard coking coal is also required by the domestic steel industry. The Southern Coalfield produces the State's only supply of hard coking coal. This is of vital strategic importance not only to the Port Kembla Steelworks but also to the nation as the Coalfield supplies up to 80% of Australia's blast furnace feedstock. Although recent changes in steel making technology in both the domestic and export markets have reduced the need for soft and medium soft coking coals from other coalfields, hard coking coal is and will remain the primary coal feedstock for the foreseeable future.

While coal quality information is sparse beneath Badgerys Creek, the resources there appear to have a higher ash content and while some could be marketed as coking or coking blend coal, a proportion can only be marketed as thermal coal which has a lower market value.

iii) A significant number of collieries in the Southern Coalfield are experiencing difficulties in maintaining economic viability due to a depletion in remaining reserves, a depletion in the coal quality of those reserves and difficult mining conditions. The remaining unallocated coal reserves beneath Holsworthy will be required to ensure the future of the domestic and export coal industry in the region.

iv) The depth to coal beneath Holsworthy is shallower than to the coal beneath Badgerys Creek. All of the resources beneath the southern Holsworthy option are at depths comparable to the deeper current mining operations in the Southern Coalfield. Much of the resources beneath the northern option is only just beyond maximum current mining depths. All the resources beneath Badgerys Creek

are well beyond the current maximum mining depth in the Southern Coalfield. Mining under such deep cover is likely to encounter more difficult mining conditions and may require the utilisation of more expensive mining technologies not currently in use in Australia.

v) The seam thickness of the resources at Badgerys Creek is close to the lower limit of current mining practice. The thinner seams makes them more costly and difficult to mine.

vi) The Holsworthy options are just to the north and north east of existing mining operations and the area is a logical progression for extensions to these leases. Badgerys Creek is comparatively remote and well beyond areas of current mining at present.

vii) Land at Holsworthy is essentially unoccupied and there are likely to be minimal land use conflicts. Preservation of Holsworthy by not constructing an airport there maintains this advantage and helps to ensure that surface constraints are kept to a minimum.

Enclosed are copies of the plans supplied to the Department on 26 May with the approximate 35^{o} angle of draw line to the platform and to large buildings beyond the platform. Also shown is the approximate line of West Cliff Colliery lease boundary in the vicinity of the southern Holsworthy option.

Should you have any further questions regarding this matter please contact myself on 9901 8506 or Bruce Kirby on 9901 8382.

M. Armstrong

Mike Armstrong
Principal Geologist
Coal and Petroleum Geology

Appendix B

Hassall & Associates Report

AGRICULTURAL IMPACT

Second Sydney Airport

Environmental Impact Statement

PREPARED FOR
PPK

JULY 1997

Prepared by
HASSALL & ASSOCIATES PTY LTD
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AUS-694

HASSALL & ASSOCIATES PTY LTD

TABLE OF CONTENTS

LIST OF TABLES

1 EXECUTIVE SUMMARY

The objectives of the study were to assess the impact of airport development at Badgerys Creek and Holsworthy Sites.

The scope of work was to undertake a:

- Review of local and regional background information on land capability and agricultural production. Information sources included the 1985 EIS, ABS and ABARE databases, NSW Agriculture and DLWC regional land use maps, and local government land use surveys.
- Review and update of the agricultural land use survey prepared for the 1985 EIS, which covered the original airport site at Badgerys Creek.
- Detailed survey of existing agricultural activities within the extended airport boundaries (Options B and C) at Badgerys Creek.
- Quantification of the economic value of agricultural production within the proposed airport boundaries. This task included preparation of estimates on unit enterprise returns and gross margins.
- Assessment of impacts of the proposed airport development on existing and potential agricultural production at both Badgerys Creek and Holsworthy.

The study determined that the following areas are involved in agricultural production at varying levels of intensity. These figures are summarised in Table 1, below.

Table A: Area of agriculture covered by Badgerys Creek Airport site options

	Option A	Option B	Option C
Total Area (ha)	1,700	2,900	2,850
Area of Agriculture (ha)	1,526	2,444	2,222
Percentage Agriculture	89%	84%	78%

Note: the area of agriculture includes rural small holdings

The impact of the proposed airport developments has been summarised in the Table below.

Impact	Badgerys Creek			Holsworthy	
	Option A	*Option B*	*Option C*	*Option A*	*Option B*
Loss of Agricultural Land - Stage 1	$409,190	$1,900,370	$1,102,638	$0	$0
Loss of Agricultural Land	$615,710	$2,302,912	$1,656,464	$0	$0
Noise Impact	N/C	N/C	N/C	N/C	N/C
TOTAL IMPACT	N/C	N/C	N/C	N/C	N/C

N/C = not calculated

2 STUDY METHODOLOGY

2.1 OBJECTIVES

The objectives of the study were to assess the impact of airport development at Badgerys Creek and Holsworthy Sites.

The scope of work was to undertake a:

- Review of local and regional background information on land capability and agricultural production. Information sources included the 1985 EIS, ABS and ABARE databases, NSW Agriculture and DLWC regional land use maps, and local government land use surveys.

- Review and update of the agricultural land use survey prepared for the 1985 EIS, which covered the original airport site at Badgerys Creek. Past and existing aerial photographs of the site were compared to identify detectable changes in agricultural activities, which were verified by a follow-up phone interview. Contact details for landholders were sourced by Hassall and Associates.

- Detailed survey of existing agricultural activities within the extended airport boundaries (Options B and C) at Badgerys Creek. Up to 225 agricultural operations needed to be surveyed by phone and/or site visits. The objective of the survey was to determine as accurately as possible the existing types of agricultural enterprises (for example, market gardens, poultry farms, grazing, etc.) being conducted within the proposed airport boundaries and their respective sizes and production. Land use information collected in the survey will be input to the master GIS database being prepared for the EIS. This task also included identification and sourcing of contact details for landholders.

- Quantification of the economic value of agricultural production within the proposed airport boundaries. This task included preparation of estimates on unit enterprise returns and gross margins.

- Assessment of impacts of the proposed airport development on existing and potential agricultural production at both Badgerys Creek and Holsworthy. This task addressed indirect impacts on adjoining agricultural activities including the likely effect of aircraft noise on farm operations and livestock.

2.2 FIELD STUDY METHODOLOGY

There were a number of components to the study. These are set out below:

1. Determination of Landuse. The Holsworthy Options have no agricultural landuse due to their location within an existing army base. The Badgerys Creek Options A, B and C[1] cover an area which has agricultural uses, so these options were studied in detail to determine the current landuse.

[1] Kinhill, 1985

Option A covers the site of the areas studied in 1985 Kinhill Report[2]. In order to assess the landuse of this option, the 1985 study was used as a guide and personal contact was made with a number of the landholders. Personal contact with landholders was more difficult for this option as the Commonwealth Government has purchased the land and there is no cadastral data for the area. The Liverpool Council was also helpful in providing information about the recent changes in landuse.

The landholders of areas of Options B and C, which are outside the Option A proposed site, were personally surveyed with a phone interview. A few people could not be contacted as they have silent phone numbers.

The phone survey asked the landholder if there was any form of agriculture practiced on their land, even if only for personal use. Once the type of landuse was established the landholder was asked details of the production and inputs required.

The information collected about all three options was assessed by use of aerial photographs, Orthophoto maps and on-site visits to the area. The Liverpool Council Map of Landuse was referred to as was the Sydney West Airport Sub-Region Strategic Plan, Stage 1 Investigations, Final Report, July Map of Landuse.

2. Mapping of landuse. Ownership of each block in the areas of Options B and C outside Option A was established. Once the landuse was established for all landholdings it was mapped with the use of names and addresses from Council and the lot number information provided on the cadastral maps.

3. The value of agriculture in the areas was established by sourcing gross margin budgets for each enterprise in the area. These budgets were sourced from NSW Agriculture standard budgets, personal discussions with NSW Agriculture personnel, operators in the industry and Hassall & Associates enterprise information.

4 Regional information. Data on production in the Sydney Region was sourced from Australian Bureau of Statistics (AgStats) from the 1994 census as well as reports by NSW Agriculture and the Wollondilly Lands Study. Information was reviewed with NSW Agriculture officers.

5. The impact of noise on agricultural production was determined from an extensive literature search of recent and past studies.

[2] Kinhill, 1985

2.3 SOURCES OF INFORMATION

Contact with the following organisations was initiated during the preparation of this study:

- Agricultural Bureau of NSW
- Agricultural Society Council of NSW
- Australian Agricultural Council
- Australian Alpaca Association Inc
- ABARE, Information Services
- ABS, Information Services
- Australian Chamber of Fruit and Vegetable Industries
- Australian Chicken Growers
- Australian Industrial Corporation
- Australian Mushroom Growers Association Ltd
- Australian Poultry Ltd
- Australian Vegetable and Potato Growers' Federation
- Camden Horse Stud
- Camden Local Council
- Campbelltown Local Council
- Combined Industry Committee, NSW, Flemington Markets
- Darkes Forest Community Action Group
- Flower Industry Association, Australia Inc
- Holsworthy Local Council
- Inghams Pty Ltd
- Land and Water Conservation, Penrith
- Liverpool City Council
- National Institute of Economy and Industries
- NSW Agriculture-Sydney, Camden, Cowra, Goulburn, Gosford, Mudgee, Orange, Parkes, and Windsor
- NSW Dairy Farmers Association
- NSW Farmers
- NSW Free Growers
- Nursery Industry Association of Australia
- Organic Growers Association of NSW
- Royal Agricultural Society of NSW
- Steggles Pty Ltd
- Sydney Water
- University of Sydney, Camden Veterinary Clinic
- Wollondilly Shire Council

3 EXISTING ENVIRONMENT

3.1 GENERAL

3.1.1 Badgerys Creek

There are three options for airport siting at Badgerys Creek considered in this report - they are referred to as Option A, Option B and Option C. Option A is almost identical to the option previously studied in 1985 and now owned by the Commonwealth Government. The area has varied slightly from the 1985 area with an access road to the east requiring slightly more land. The area of Option A is approximately 1,700 hectares (ha) with the land used for agriculture in this area being 1,526 ha

Option B covers an area of approximately 2,900 ha with 2,444 ha of agricultural landuse. Option C covers an area of approximately 2,850 ha with 2,222 ha of agricultural land identified. Both options B and C include the area of Option A and extend to the south of Badgerys Creek water course. Map 1 shows the location of the options with surrounding roads. The areas are detailed in Table 1. The figures quoted here come from two sources. The 'Total Area' figures for each Option were supplied by PPK. The 'Area of Agriculture' figures were calculated from the current land use maps of the three options drawn up a result of field surveys and research by Hassall and Associates.

These options are located in the agricultural fringe of Sydney in the local government area of Liverpool. The area is primarily used for agriculture with large enterprises of dairy and beef production, as well as rural small holdings with a few cattle and a small area of fruit trees. The location of agriculture in this area is primarily due to the proximity of the Sydney market and the desire of the people (mainly those on rural smallholdings) to live in a peaceful and quiet environment.

The agricultural activities currently operating in the area of Badgerys Creek covered by the Airport options include:

- extensive grazing of beef cattle and agisted horses
- semi-intensive grazing of dairy cattle, training and spelling of trotting horses
- intensive poultry production (chickens, ducks and turkeys)
- intensive cropping of vegetables, fruit and nursery products.

Since 1985 the Commonwealth Government has purchased the land covering the original airport site. Many of the previous landholders have remained on this land, leased it back from the government and continued to operate. For many this has meant that they have not replanted or improved areas of land. Some areas purchased by the government have remained vacant.

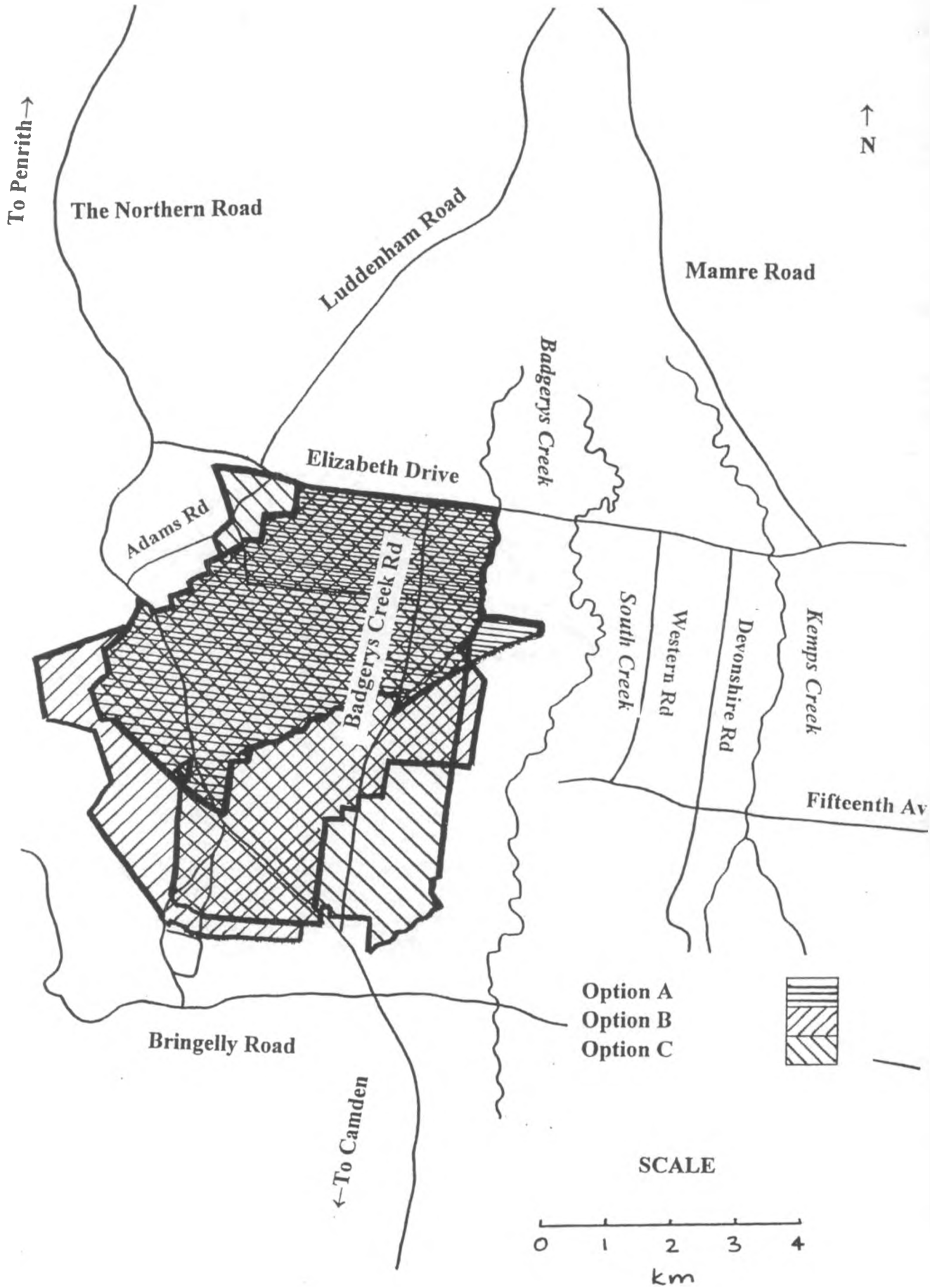
Table 1: Area of agriculture covered by Badgerys Creek Airport site options

	Option A	Option B	Option C
Total Area (ha)	1,700	2,900	2,850
Area of Agriculture (ha)	1,526	2,444	2,222
Percentage Agriculture	89%	84%	78%

Note: the area of agriculture includes rural small holdings

Map 1

LOCATION OF SECOND SYDNEY AIRPORT - BADGERYS CREEK SITES



3.1.2 Holsworthy

There are two options for a second Sydney airport site at Holsworthy. Both of the options are located within Commonwealth Government owned land currently being used for the army base, one near the centre and one near the southern area of the Commonwealth land. The land is mainly natural bushland and not used for any agricultural activities.

3.1.3 Region

Both Badgerys Creek and Holsworthy are situated in the Sydney Statistical Division, which extends west to the Blue Mountains, north to include Gosford and Wyong and south to include Campbelltown and Cronulla. This area contains suburban, rural residential, rural small holdings and agricultural land holdings. Badgerys Creek is located in the Liverpool Local Government Area (LGA) and Holsworthy is located in the Campbelltown, Liverpool and Sutherland LGAs.

The immediate region encompassing the Badgerys Creek and Holsworthy sites includes six local government areas, these are Bankstown, Blacktown, Camden, Campbelltown, Liverpool and Sutherland.

Based on the 1994/95 census data accessed through Agstats, the total area of agricultural holdings in these combined local government areas is 25,763 hectares (ha). The total area of cropping excluding pastures and grasses is 1,361 ha. Of this area horticultural crops take up 819 ha. The major cropping, horticultural and other agricultural products from the region include: hay, cultivated turf, nurseries, cut flowers, potatoes, broccoli, cabbages, capsicum, cauliflower, cucumbers, lettuces, marrows, mushrooms, pumpkins, tomatoes, apples, nectarines, peaches, plums, macadamia nuts, strawberries, grapes, sheep, beef cattle, dairy cattle, pigs, deer, stud horses and poultry.

3.2 RURAL LAND CAPABILITY

Land throughout Australia is classified by its suitability for agricultural use. The Department of Land & Water Conservation (DLWC) and NSW Agriculture have slightly different systems for classifying the land. The DLWC bases its classification on the requirement for different soil conservation practices while NSW Agriculture uses the general productive capacity of the land and the limits of suitability (climate, topography and soil characteristics) to classify the area. For this report, the NSW Agriculture system has been used.

NSW Agriculture uses 5 classes and the characteristics of each are set out below. On the following pages the maps and descriptions refer to these classes [3]

Table 2: Landuse classification descriptions, NSW Agriculture

CLASS	**DESCRIPTION**
Class 1	Arable lands for intensive cultivation where constraints to sustained high levels of agricultural production are minor or absent.
Class 2	Arable land suitable for regular cultivation for crops but not suited to continuous cultivation. It has a moderate to high suitability for agriculture but edaphic (soil factors) or environmental constraints reduce the overall level of production and may limit the cropping phases to a rotation with sown pastures.
Class 3	Grazing land or land well suited to pasture improvement. It may be cultivated or cropped in rotation with pasture. The overall level of production is moderate as a result of edaphic or environmental constraints. Erosion hazard, soil structure breakdown or other factors including climate may limit the capacity for cultivation and soil conservation or drainage works may be required.
Class 4	Land suitable for grazing but not for cultivation. Agriculture is based on native pastures or improved pastures established using minimum tillage techniques. Production may be seasonally high but the overall production level is low as a result of major environmental constraints.
Class 5	Land unsuitable for agriculture or at best suited only to light grazing. Agricultural production is very low or zero as a result of severe constraints, including economic and environmental factors, which preclude land improvement.

3.2.1 Badgerys Creek

The table below sets out the area of each option under each landuse category. Map 2, overpage, illustrates the areas covered by each class of land.

Table 3: Landuse classification of each Badgerys Creek Option [4]

Option	Class 1		Class 2		Class 3		Class 4		Class 5	
	%	ha	%	ha	%	ha	%	ha	%	ha
A	0	0	8	136	93	1,570	0	0	0	0
B	0	0	10	290	89	2,583	1	29	0	0
C	0	0	9	256	90	2,554	1	28	0	0

Source: NSW Agriculture (1995) Agricultural Land Classification Atlas

[3] NSW Agriculture, 1995 - Agricultural Land Classification Atlas
[4] NSW Agriculture, 1995 - Agricultural Land Classification Atlas

The predominant land class for the areas of the airport sites is Class 3 which is grazing land or land well suited to pasture improvement. Of the areas covered by each option the greatest landuse by area is grazing either extensive beef cattle or horses or semi intensive grazing of dairy cattle.

The vast majority of the area surrounding the proposed sites is Class 3 agricultural land and is most suited to grazing.

3.2.2 Holsworthy

The land covered by either of the options for Holsworthy is classified as Class 5 land that is considered unsuitable for agriculture except possible light grazing. The reason for this classification is that the topography and vegetation of the area are rough and uncleared.

The Holsworthy base site is bounded on the south east by Heathcote National Park, which is also, classified Class 5 land. On the west the site is bounded by the Georges River which combined with better quality land, results in predominantly Class 3 land with pockets of Class 4 land in close proximity to the proposed airport site. To the north the land is primarily residential.

LAND CAPABILITY MAP - BADGERYS CREEK AREA

Map 2

3.3 PRESENT AGRICULTURAL LANDUSE

The present agricultural landuse of the Badgerys Creek site is set out in Table 4 and summarised on Map 3. The land use on the Holsworthy site is natural bushland or army uses - there is no agriculture

Table 4: Present Landuse of the Badgerys Creek Options

INDUSTRY	Option A ha	%	Option B ha	%	Option C ha	%
Extensive Grazing						
Beef Cattle	756	*50*	1,016	*42*	1,013	*46*
Horse agistment / thoroughbred horse spelling	150	*10*	170	*7*	185	*8*
Mixed grazing	80	*5*	80	*3*	119	*5*
Semi Intensive Grazing						
Dairying	40	*3*	275	*11*	70	*3*
Trotting horse training/spelling	190	*12*	200	*8*	190	*9*
Intensive livestock						
Poultry	10	*1*	185	*8*	143	*6*
Intensive Cropping	50	*3*	155	*6*	148	*7*
Rural Small Holdings	250	*16*	363	*15*	354	*16*
TOTAL AGRICULTURE	1,526	*100*	2,444	*100*	2,222	*100*
Other	180		458		616	
TOTAL AREA OF OPTIONS	1,706		2,902		2,838	

Source: Hassall and Associates surveys

Notes:

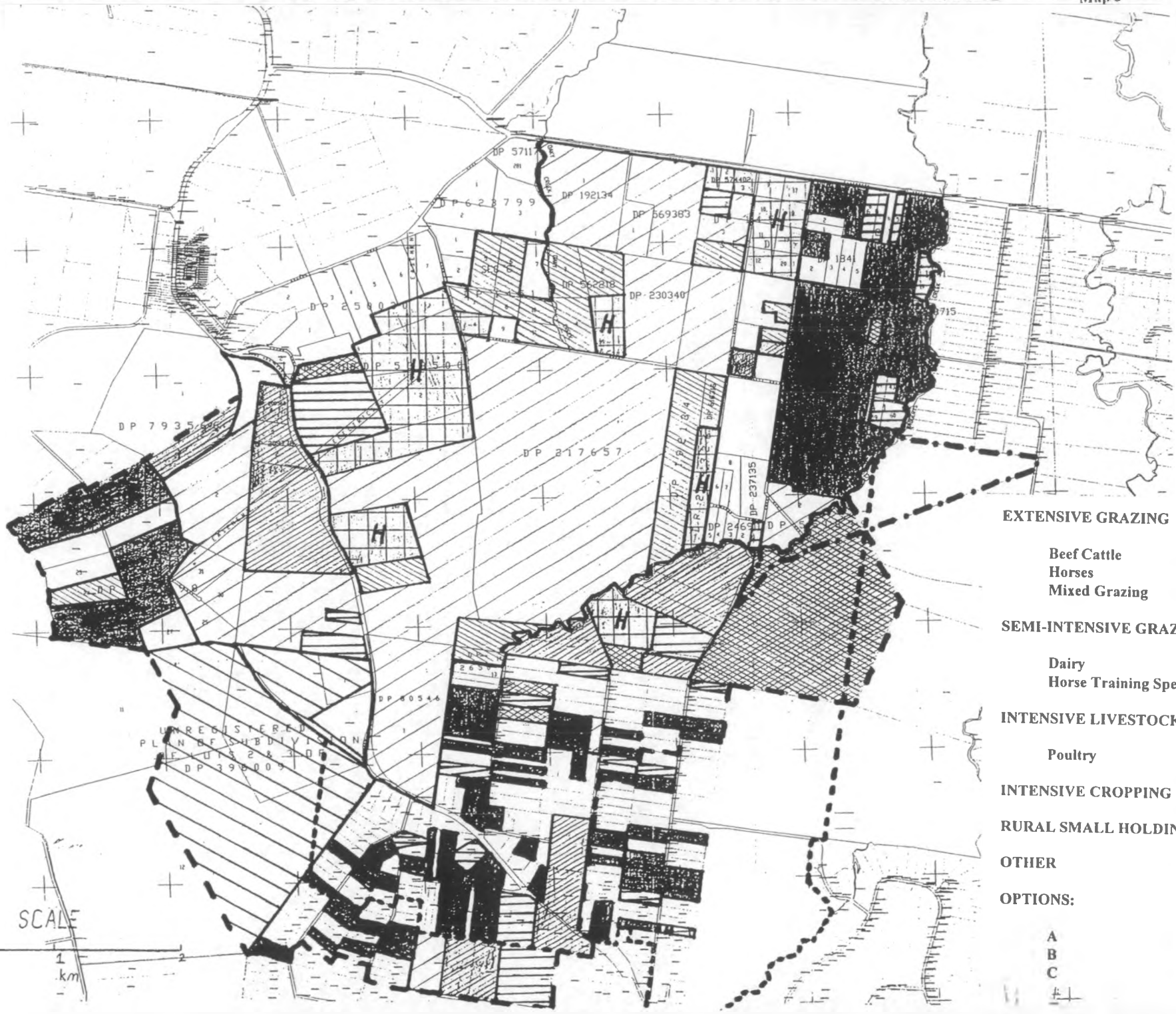
- The deer and ostrich farms are included in the Rural Small Holdings as they are not the major source of income for the owners.
- Other landuse includes non-agricultural businesses, vacant land and residential blocks with no agriculture.

3.3.1 Badgerys Creek

Landuse in the Badgerys Creek area is dominated by extensive and intensive grazing industries. Of these, beef cattle is the major extensive industry and horse training and spelling dominates semi intensive grazing.

Behind grazing, rural small holdings are the second largest land use group occupying on average 16% of the land area of the three options.

The intensive livestock and cropping industries make up only a small percentage of total land use, due mainly to the nature of their production systems. This however does not cancel out the fact that intensive cropping in particular makes a valuable financial contribution to the agricultural output of the area.


DP 571
DP 192134
DP 623799
DP 569383
DP 562818
DP 230340
DP 793596
DP 217657
DP 237135
DP 246
DP 60544
UNREGISTERED PLAN OF SUBDIVISION OF LOTS 2 & 3 DP 398009
SCALE
1
km
2
EXTENSIVE GRAZING
Beef Cattle
Horses
Mixed Grazing
SEMI-INTENSIVE GRAZING
Dairy
Horse Training Spelling
INTENSIVE LIVESTOCK
Poultry
INTENSIVE CROPPING
RURAL SMALL HOLDING
OTHER
OPTIONS:
A
B
C

3.3.2 Holsworthy

Within the base site, which covers both of the Holsworthy options, there are no agricultural activities undertaken. This is due in part to the policy of the Department of Defence to maintain natural habitat sites and accordingly does not permit grazing.

The region surrounding the Holsworthy, including Wedderburn and Darkes Forest areas, do however produce a variety of agricultural products. These include a wide range of horticultural and stone fruit products, livestock grazing enterprises including exotic species such as alpacas.

3.3.3 Region

Animal production is the predominant landuse in the Sydney Basin. The main crops identified are those of an intensive nature as expected in an area close to a major city. The break up of the industries is shown in Table 5 below.

Table 5 Landuse in the Sydney Region

Landuse	Number
Extensive Grazing	
Beef	33,839
Sheep	24,943
Semi Intensive Grazing	
Dairy	19,485
Horse Stud	2,291
Deer	3,773
Intensive Livestock	
Poultry	
- layers	2,005,243
- broilers	10,519,406
Pigs	46,360
Total Livestock Area	94,285
	Area (ha)
Intensive Cropping	
Turf	1,000
Nurseries & Cut Flowers	846
Vegetables	1,811
Fruit	2,777
TOTAL AREA	100,719

Source: Australian Bureau of Statistics - AGSTATS - 1994 Census

3.4 AGRICULTURAL PRODUCTION AT AIRPORT SITE OPTIONS

3.4.1 Extensive Grazing

Extensive grazing includes beef production, thoroughbred horse spelling and horse agistment where the livestock predominantly graze the pasture grown on the property. While the horse enterprises are traditionally not defined as agricultural industries, they are included here as they are commercial enterprises often run in conjunction with beef as they make similar use of the available land.

These extensive industries are based predominantly on natural grass and clover pastures which are top-dressed with single super every 4 years at a cost of $25 per hectare ($6.25 per hectare per year). The carrying capacity of this country is estimated to be 8.5 dse/hectare, based on average carrying capacities defined in NSW Agriculture publications [5]. Dry Sheep Equivalents (dse) is a technical term used to allow comparison between livestock enterprises and is equivalent to the maintenance feed requirement of a 45 kg merino wether.

Beef Production
There are numerous holdings within the proposed airport site on which beef cattle are grazed. The enterprises are generally breeding enterprises with a few rural smallholdings fattening steers. Breeding enterprises have been used as the representative beef cattle enterprise for the purpose of this impact evaluation.

Breeding enterprises maintain a herd of females (cows and heifers) and aim to produce one calf per female each year. The production of beef is not limited to the beef breeds, such as Herefords, but also includes beef-dairy crossbreeds. The breeding enterprises in the area include large businesses as well as small operations with only a few cows.

The gross margin for a self-replacing beef breeding herd is estimated at $198 per cow. This is based on a 100 cow herd on 165 hectares. This stocking rate is comparable to the enterprises operating in the area. For comparative purposes, the enterprise feed requirements are included at 14 dse per cow.

Horse agistment and Thoroughbred horse spelling
The agistment of horses is often run in conjunction with a beef enterprise. Horse agistment requires similar management and inputs to a beef enterprise. The horses on agistment in the area range from pets to broken-down race horses. The intensity of the operations ranges from racehorses spelled in paddocks to housing of the horses in stables or yards.

The horses usually belong to city residents and are spelled, or agisted, for a set weekly fee. If the horse is kept in yards or stables and fed almost entirely with bought in feed, the charge to the owner rises. The cost of bought in feed ranges from $30 to $50 per horse per week.

In the Badgerys Creek area it is estimated from available information that one third of the horses in the area are thoroughbreds being spelled and the remainder are horses agisted for personal use.

[5] NSW Agriculture, 1994 -Pasture Improvement Budgets

3.4.1.1 Badgerys Creek Option A

In the area covered by Option A, 65% of the land is devoted to extensive livestock production. In aggregate, this area runs approximately 500 head of beef cattle and 300 horses.

3.4.1.2 Badgerys Creek Option B

The area of Option B contains 52% extensive grazing made up of a number of beef enterprises with an estimated 570 head of cattle in total. Some of these enterprises are quite small with 5 to 8 breeding cows per 10 hectares being quite common for the holdings south of the Badgerys Creek water course.

There are estimated to be a total of approximately 350 horses being agisted or spelled in the area covered by Option B

3.4.1.3 Badgerys Creek Option C

Option C has 59 per cent of its area devoted to extensive agricultural enterprises. The beef enterprises in Option C include those in option B plus an additional one, bringing the number of cattle on these land holdings to approximately 585 head.

The landholdings with horses in this option are the same as for Option B at 350 horses.

3.4.1.4 Holsworthy

The two options for the Holsworthy site are unsuitable for agricultural enterprises and currently produce no agricultural products.

3.4.2 Semi Intensive Grazing

Semi intensive grazing enterprises are those enterprises that require greater time and cost inputs than other grazing enterprises and generally have a greater return per hectare. The semi grazing enterprises in the proposed airport site are dairying, trotting horse training and spelling and deer production.

These enterprises are generally operated on improved pasture that has an estimated carrying capacity of 10 dse per hectare. The cost of pasture maintenance is estimated at around $52 per hectare per year.

Dairy

There is one dairy farm that falls partially within the boundaries of the Badgerys Creek Airport site. This enterprise is based on highly improved and organically fertilised irrigated pasture. This property is 582 hectares in total.

The operation is very large with approximately 1150 cows being milked at any one time with 350 dry cows. Annually there are estimated to be 1000 calves produced. These are reared to about 6 months of age, then transferred to properties owned by the same company in western NSW. The competitive stocking rate of this enterprise, used in the calculations, has been estimated at 18 dse per dairy cow.

The average production per cow is reported to be 20 litres per head per day giving an annual milk production from the farm of approximately 9 million litres.

Milk is produced to meet a quota and the specified quota amount has to be produced all year round or the quota is lost. The price received for quota milk is substantially greater than that received for non-quota milk which is sold for manufacturing purposes.

Gross margin per dairy cow is estimated at $1,382 per cow, based on NSW Agriculture figures [6].

Trotting horse training and spelling

There are many properties in the area providing trotting training and spelling, generally to city residents for a fee. These enterprises are sometimes run in conjunction with other horse agistment. The establishments usually have a trotting ring, or two, and stables.

The gross margin for an average establishment of 40 hectares with 20 horses has been estimated to be $3,740 per horse.

Deer

There is one deer farming operation in the Badgerys Creek area. This operation is a fallow deer breeding enterprise and is currently in the initial stages and has not yet produced deer old enough for sale.

Deer farming is categorised as semi-intensive grazing due to the high capital costs, especially fencing and stock handling facilities. The industry produces does and bucks, production of venison and other by-products such as velvet.

Grazing is based on improved pastures with supplementary fodder such as hay.

The gross margin for a typical 100 fallow deer breeding operation is estimated to be approximately $60 per doe based on figures supplied by NSW Agriculture [7]

3.4.2.1 Badgerys Creek Option A

40 hectares of the dairy land is in the area covered by Option A. This is 7% of the total area of the dairy so it is estimated that the proportion of cows run on this area would total 103 head.

There are many trotting tracks in this area, especially on the northern side near Elizabeth Drive. It is estimated that there are 100 trotting horses in the area.

3.4.2.2 Badgerys Creek Option B

This option covers 47% or 275 ha of the dairy land holding running approximately 700 cows.

As well as the trotting enterprises in the north of the area there is a horse stud and dressage ring. It is estimated that there are 115 horses in this option.

There is also a newly established deer farm in this option. At present the number of deer on the farm total 15 head.

[6] Pers. comm. - Lloyd Davies, 1997
[7] Pers. comm. - Bruce McKay, 1997

3.4.2.3 Badgerys Creek Option C

70 hectares of the dairy land is in Option C. This is 12% of the holding and is estimated to carry 180 cows.

The number of trotting and other semi intensive horse enterprises in this option is the same as Option B, being 115 horses.

Option C also covers the deer farm in Option B that has 15 deer.

3.4.2.4 Holsworthy

Similarly to the lack of extensive grazing, the Holsworthy site is unsuitable for agricultural production and currently has no semi intensive grazing enterprises.

3.4.3 Intensive Livestock

Poultry

Poultry enterprises in the area of the three airport options include broiler production, a multiplication farm for the chicken industry, a turkey grower enterprise, a duckling breeding unit and a couple of new ostrich businesses.

Broilers

Broiler chickens are raised under contract to processors who generally supply the day old chickens. The chickens are grown in deep litter sheds for between 6 and 9 weeks until they reach the specified weight. The birds are grown in batches and the sheds are left unstocked for a couple of weeks before the new batch of chickens are received. Four to five batches of chickens are raised each year on average.

The proximity of the city is a key factor in the location of these enterprises as the area is close to processing plants. The city provides the market for this highly perishable product as well as the labour. The location of a hatchery nearby is also important in the siting of a broiler enterprise.

The gross margin of a typical, one family broiler farm with an annual production of 300,000 birds has been estimated to be approximately $320 per 1000 birds. The producer is paid $468.20 per 1000 birds produced and his batch costs are estimated to be $150 per 1000 birds, based on figures supplied by the industry [8]

Turkeys

The raising of turkeys is very similar to broiler chicken production. The producer has a 5 year contract to raise 87,000 birds per year. Producers are paid quarterly based on the amount of shed space they produce turkeys in. The cost of the bird and any replacement costs as well as feed costs are paid by the processor. The average wholesale price is $2.90 per square foot. Based on an average density, 44,000 birds are equivalent to 54,000 square feet of shed floor.

The gross margin for the production of turkeys is estimated at $2.53 per bird, based on industry figures

[8] Pers. comm. - Cordina Chicken Farms Pty Ltd, 1997

Ostriches
Neither of the operations identified in the area is commercially viable at present. They are new businesses in the first year of operation. They aim to build the businesses to greater than 10 breeding pairs.

In an ostrich operation with 20 breeding females on 15 hectares has a gross margin of $991 per hen [9]

Duck Hatchery
There is a duck hatchery south of Badgerys Creek that produces 1 million ducks each year (20,000 per week) for sale at one day old. There is also supplementary income from production of fresh eggs. The total gross margin for the operation is approximately $440 per 1000 ducklings sold [10].

Multiplication Farm
Inghams operate a multiplication far to the south west of Badgerys Creek. This farm produces fertilised eggs which are sent to hatcheries from where day old chickens for either broiler or layer production are distributed to producers. This farm is part of Inghams operations which produces fertilised eggs, hatches them out, distributes them to growers and processes, packages and sells the chicken meat.

No financial figures were available from Inghams relating to their multiplication unit. They indicated that the multiplication farm is an integral part of the companies business and no figures would be available for just this one part of a much larger business.

3.4.3.1 Badgerys Creek Option A

There are two poultry operations in this option. They are both broiler producers with approximately 300,000 bird annual combined throughput.

3.4.3.2 Badgerys Creek Option B

The two broiler enterprises in Option A are also in Option B with a total throughput of 300,000 birds per annum [11].

There is also the Inghams multiplication unit that has 56 sheds with 8000 hens each, a total of 448,000 hens producing fertilised eggs [12]. Option B takes in almost 50% of the Inghams facility on Badgerys Creek Road.

There is a duck hatchery that produces 1 million day old ducks per year.

The turkey raising enterprise has an annual throughput of 87,000 birds.
The two ostrich enterprises are just beginning and at present one of the farms has 3 birds, and the other has 9 birds.

[9] Hassall & Associates - Gross margin
[10] Pers. Comm. - Kellers Duck Hatchery, 1997
[11] Pers. Comm. - Inghams, 1997
[12] Kinhill, 1985 Pers. Comm - Inghams, 1997

3.4.3.3 Badgerys Creek Option C

There are 300,000 broilers produced per annum in this option as well as turkeys (87,000), ducklings (1 million) and ostriches (12).

Option C takes in approximately 25% of the Ingham's multiplication farm.

3.4.3.4 Holsworthy

There are no intensive livestock industries undertaken within the proposed Holsworthy sites.

3.4.4 Intensive Cropping Industry

Vineyard

There is one vineyard located in the Badgerys Creek airport site, situated on 16 hectares. This vineyard was established in 1915 and produces grapes on 4.6 hectares of land with 1400 vines per hectare. 650 to 700 litres of wine are produced annually from these vines.

The vineyard also processes grapes from other vineyards in the area. All wine produced at this winery is sold either in their own restaurant, by cellar door sales or through duty free stores.

The gross margin for wine enterprises is estimated to be $8,216 per hectare. The full gross margin budget is included in Appendix 2 [13].

Nurseries

The nurseries in the area produce plants and cut flowers for local markets, the Flemington markets and retail outlets. The plants are produced both in sheds and outside areas. The plants grown include gums, wattles, Japanese maples grown out of doors while gardenias, boganvilleas and indoor plants are grown in sheds. The average production from a 7 hectare block with one third of plants in sheds and 3 hectares of plants grown out of doors is around 5000 plants per annum.

Market Gardens

The production of fruit and vegetables on a 4 hectare block of land is generally a family operation. There are many such enterprises in the area.

A 4 hectare holding might contain 2 hectares of market gardens with a mix of vegetables produced including tomatoes, zucchinis, capsicum, lettuce, spinach, leeks and cabbages. Strawberries are also grown. A number of the enterprises have green houses and some of them produce their vegetables hydroponically. Most of the market garden produce is sold at Flemington Markets.

A 2 hectare farm with 6 green houses produces 3000 boxes of vegetables with a value of $5/box gross giving a gross income of $15,000. Another farm has 2.8 hectares of production with 42,000 plants including cherry tomatoes, zucchinis and capsicum. The production of vegetables varies from season to season.

[13] Hedberg & Doyle, 1993

From discussions with the market gardeners surveyed an average farm has been taken to produce vegetables on 50% of the land holding. The average holding is estimated to produce a gross annual income of $30,183 per hectare cropped. This is based on the production of 1 hectare of each of irrigated tomatoes, egg plant, capsicum, cucumber and lettuce [14].

3.4.4.1 Badgerys Creek Option A

The vineyard has 4.6 of its 16 hectares planted to wine grapes of the varieties Chardonnay, Traminer and Musket. The annual production from the area planted to vines is 21,000 litres of wine. The income from the grapes grown on the property is 10% of the total income. The winery bottles wine from other vineyards and operates a restaurant.

There are a number of market gardens around Badgerys Creek Road, many of which operate with green houses as well as outdoor areas. Only about half of the holding is utilised for production of fruit and vegetables.

It is estimated that of the 34 hectares of market garden, 17 hectares are used for vegetable/plant production.

3.4.4.2 Badgerys Creek Option B

The vineyard and the other intensive crop production areas are in Option B as well as A. There are also and additional four holdings producing market garden produce commercially and two operations with green houses.

There is an additional nursery producing plants for the local Penrith market.

Of the 145 hectares of holdings undertaking production of intensive cropping, 71.8 hectares is estimated to be productive. This includes 4.6 hectares of vines.

3.4.4.3 Badgerys Creek Option C

Option C has all but one of the market garden operations in Option B plus a nursery and a green house.

Of the 138 hectares of holdings undertaking production of intensive crops, 64.8 hectares is estimated to be productive, including 4.6 hectares of vines.

3.4.4.4 Holsworthy

There are no intensive cropping industries undertaken within the Holsworthy site, this is due primarily to policy of the Department of Defence.

[14] Murison & Davies (1995)

3.4.5 Rural small holdings

Rural small holdings have been included as an agricultural landuse to include those people who run a few cattle, a few horses and have vegetable patches or poultry (generally hens producing eggs) for either personal use or as supplementary income which amount to less than 10% of the annual income of the landholder.

Table 6 sets out the details of agricultural landuse on the rural small holdings. The land holders in the area of Option A were not personally interviewed, but by extrapolation from those areas which were surveyed (the areas of B and C not included in Option A) the table below has been estimated.

The horses grazed on the blocks are generally pets according to the survey respondents. The cattle are either kept as a house cow for milk, or a few steers to fatten and sell. The fruit trees were often in a small orchard with approximately 10 trees. The rural small holders surveyed indicated that the sheep and goats are kept to keep the grass down. The vegetable patches are generally small, producing enough vegetables for personal use.

Table 6 Rural Small Holding Landuse

	Option A	Option B	Option C
Number of Holdings	**72**	**139**	**131**
Number of horses	40	78	81
Number of cattle	65	123	132
Number of chickens for eggs	15	30	30
Number of fruit trees	210	403	298
Number of geese	2	4	4
Number of sheep	25	47	46
Number of miscellaneous birds	30	61	61
Number of goats	10	18	18
Number of donkeys	1	2	2
Number of vegetable patches	18	34	31

3.5 AGRICULTURAL PRODUCTION IN THE SYDNEY REGION

As well as containing the largest metropolitan population in NSW, the Sydney region is one of the states most productive and diverse agricultural producers[15]. The Sydney region produces large amounts of fresh and perishable products such as eggs, chicken meat, fruit and vegetables and milk for the Sydney market.

Many of the farm holdings in the Sydney region are small. This is explained in the Sustainable Agriculture report as due to land fragmentation, the intensive nature of the farming activity or the presence of high quality site factors (soils, water, suitable growing season and proximity to markets). Additionally, holdings do not need to be large to be viable because they are close to markets. The high cost of land also tends to promote intensive use.[15]

[15] Sustainable Agriculture in the Sydney Basin. An issues paper for public discussion. August 1995. NSW Agriculture

In the Sydney region all the major and some minor livestock industries are found including beef cattle, dairy cattle, sheep, goats, alpacas and deer, as well as numerous poultry industries such as chickens, turkeys, ducks and ostriches.

The cropping industries in the region include turf farms, nurseries, cut flower production and market garden as well as hay and fodder production.

3.6 SIGNIFICANCE OF AGRICULTURAL PRODUCTION

Agricultural production at the two sites - Badgerys Creek and Holsworthy and the region are presented in Tables 7 and 8.

Table 7 Annual Agricultural Production from Badgerys Creek Airport Options

	Option A			Option B			Option C		
Enterprise	**Total Area (ha)**	**No.**	**Annual Production**	**Total Area (ha)**	**No.**	**Annual Production**	**Total Area (ha)**	**No.**	**Annual Production**
Extensive Grazing									
Beef Cattle	756	500		1,016	570		1,013	585	
Horse agistment / Thoroughbred horse spelling	150	300		170	350		185	350	
Mixed grazing	80	*	*	80	*	*	119	*	*
Semi Intensive Grazing									
Dairying	40	103		275	700		70	180	
Trotting horse training/spelling	190	100		200	115		190	115	
Intensive livestock	10			185			143		
Broiler chickens			300000			300000			300000
Broiler turkeys						87,000			87,000
Hatched ducks						1 mil			1 mil
Intensive Cropping	50	21.6 ha		155	71.8 ha		148	64.8 ha	
Rural small holding	250	#	#	250	#	#	250	#	#
TOTAL AGRICULTURE	1,526			2,444			2,222		

Source: Hassall & Associates Survey

Notes:

* The stock on the mixed grazing area are included in the beef cattle or horse agistment on a 50:50 split.

\# Rural Small Holding figures apart from area are not included or evaluated as the income from these holdings is supplementary and makes up less than 10% of the income of the landholder.

3.6.1 Badgerys Creek

The Badgerys Creek Airport site options contain a number of large enterprises, namely a 1,500 cow dairy and a chicken multiplication unit. These enterprises play a significant part in the regional production of agricultural produce.

There are also a large number of market gardens and nurseries located in the area producing fruit, vegetables and plants for the Sydney market.

3.6.2 Holsworthy

There is no agricultural production in the areas covered by the Holsworthy airport options.

3.6.3 Region

The Sustainable Agriculture in the Sydney Basin report[16] says that such land (agricultural land) is important not only because of its role in providing Sydney with fresh food but also because of the non-agricultural benefits which can accrue through protection of agricultural land, often simply for its amenity value and non-urban use.

About 90% of the perishable vegetables produced in NSW are grown in market gardens in and around Sydney [16] The Sydney Region produces 45% of the State's lettuce production, 85% of fresh mushrooms, 81% of spinach, 97% of spring onions and 71% of the state's fresh tomatoes. There are estimated to be 1300 vegetable growers in the Sydney region. [16]

The Sydney region also accounts for 61% of the State's total area devoted to nurseries and flower production and 55% of the total area under turf. Poultry production in the Sydney region accounts for 61% of the State total. The region produces 8% of the States milk. [16]

Table 8 Livestock Numbers in the Sydney Region

Landuse	Area (ha)	Number
Extensive Grazing		
Beef		33,839
Sheep		24,943
Semi Intensive Grazing		
Dairy		19,485
Horse Stud		2,291
Deer		3,773
Intensive Livestock		
Poultry		
- layers		2,005,243
- broilers		10,519,406
Pigs		46,360
Total Livestock Area	94,285	

Source: Australian Bureau of Statistics - AGSTATS - 1994 Census

[16] Sustainable Agriculture in the Sydney Basin. An issues paper for public discussion, August 1995, NSW Agriculture.

Table 9 Intensive Cropping Production in the Sydney Region

Crop	Area (ha)	Production (T)
Vegetables		
Broccoli	103	467
Cabbages	218	6,422
Capsicum, Chillies and Peppers	41	389
Cauliflowers	183	3,889
Cucumbers	46	342
Lettuces	229	4,194
Zucchini	45	267
Marrows, Squashes and Zucchinis	58	303
Mushrooms	50	10,506
Spring Onions and Shallots	18	798
Parsley	28	1,056
Pumpkins, Triamble, Trombone, etc.	89	983
Tomatoes	129	2,211
Other	574	
Total Vegetables for Human Consumption	1,811	
Fruit Tree Crops	2,777	
Turf Farming	1,000	
Nurseries	479	
Cut Flowers	367	

Source: Australian Bureau of Statistics - AGSTATS 1994 Census

3.7 VALUE OF AGRICULTURAL PRODUCTION

Estimates have been made of gross margins and annual net incomes for the various agricultural activities in the area.

No attempt has been made to put a value on the output from the Ingham's multiplication farm as it is part of the chain in egg and meat production and the company was not willing to divulge any economic information.

Table 10 below summarises the enterprise gross margins used in the calculation of agricultural impacts, dividing net from income into gross income, variable costs, gross margins and overheads.

Table 10 Annual Net Farm Income

	Number of units	Unit	Gross Value of Production ($)	Variable Costs excluding labour ($)	Total Gross Margin ($)	Overhead Costs ($)	Net Farm Income ($)	Net Farm Income per Unit ($)
EXTENSIVE GRAZING								
* beef cattle breeding enterprise	100	hd	22,254	2,442	18,783	11,450	7,333	$ 73 /cow
* thoroughbred horse agistment/spelling	100	hd	312,000	172,850	89,150	122,000	-32,850	-$ 329 /horse
SEMI INTENSIVE GRAZING								
* dairying	200	hd	699,486	423,112	269,638	61,619	208,019	$ 1,040 /cow
* trotting horse training	100	hd	754,000	380,000	324,000	288,100	35,900	$ 359 /horse
INTENSIVE LIVESTOCK								
Poultry								
* broilers	300,000	birds	140,460	45,145	95,315	56,641	38,673	$ 129 /1000 birds
* duck breeding	1,040,000	birds	910,400	457,000	#REF!	129,380	324,020	$ 312 /1000 birds
* turkey production	87,000	birds	156,600	45,451	#REF!	57,025	54,124	$ 622 /1000 birds
INTENSIVE CROPPING								
Vegetables	10.0	ha	301,830	124,800	177,030	49,400	127,630	$ 12,763 /hectare
Wine production	10.0	ha	120,000	37,840	82,160	26,200	55,960	$ 5,596 /hectare

3.7.1 Badgerys Creek Options

From the calculations shown in Table 11, the net value of production from the area of Option A is estimated at $615,710.

The net value of Option B is estimated at $2,302,912 and is shown in Table 12, overpage.

The net value of Option C is illustrated in Table 13, overpage, and is estimated at $1,656,464.

3.7.2 Holsworthy

There is no agricultural production in the Holsworthy military area due to the presence of the military base.

Table 11 Current Annual Value of Agricultural Production in the Survey Area - Option A

	Number of units	Unit	Gross Value of Production ($)	Variable Costs ($)	Aggregate Gross Margin ($)	Overhead Costs ($)	Net Value of Production ($)
	500	hd	111,271	12,208	99,063	57,250	41,813
EXTENSIVE GRAZING	300	hd	936,000	518,550	417,450	366,000	51,450
* beef cattle breeding enterprise							
* thoroughbred horse agistment/spelling	103	hd	360,235	217,903	142,332	31,734	110,598
* dairying	100	hd	754,000	380,000	374,000	288,100	85,900
* deer							
* trotting horse training							
INTENSIVE LIVESTOCK	300,000	birds	140,460	45,145	95,315	56,641	38,673
* ostriches							
* turkey production							
Vegetables	21.6	ha	651,953	269,568	382,385	106,704	275,681
Wine production	4.6	ha	55,200	17,406	37,794	26,200	11,594
TOTAL			**3,009,119**	**1,460,780**	**1,548,339**	**932,629**	**615,710**

Table 12 Current Annual Value of Agricultural Production in the Survey Area - Option B

	Number of units	Unit	Gross Value of Production ($)	Variable Costs ($)	Aggregate Gross Margin ($)	Overhead Costs ($)	Net Value of Production ($)
EXTENSIVE GRAZING							
* beef cattle breeding enterprise	570	hd	126,849	13,917	112,932	65,265	47,667
* thoroughbred horse agistment spelling	350	hd	1,092,000	604,975	487,025	427,000	60,025
SEMI INTENSIVE GRAZING							
* dairying	700	hd	2,448,200	1,480,893	967,307	215,667	751,640
* trotting horse training	115	hd	867,100	437,000	430,100	331,315	98,785
INTENSIVE LIVESTOCK							
Poultry							
* broilers	300,000	birds	140,460	45,145	95,315	56,641	38,673
* duck breeding	1,040,000	birds	910,400	457,000	453,400	129,380	324,020
* turkey production	87,000	birds	156,600	45,451	111,149	57,025	54,124
INTENSIVE CROPPING							
Vegetables	71.8	ha	2,167,139	896,064	1,271,075	354,692	916,383
Wine production	4.6	ha	55,200	17,406	37,794	26,200	11,594
TOTAL			7,963,949	3,997,852	3,966,097	1,663,185	2,302,912

Table 13 Current annual value of agricultural production in the survey area - Option C

	Number of units	Unit	Gross Value of Production ($)	Variable Costs ($)	Aggregate Gross Margin ($)	Overhead Costs ($)	Net Value of Production ($)
EXTENSIVE GRAZING							
* beef cattle breeding enterprise	585	hd	130,187	14,283	115,904	66,983	48,922
* thoroughbred horse agistment/spelling	350	hd	1,092,000	604,975	487,025	427,000	60,025
SEMI INTENSIVE GRAZING							
* dairying	180	hd	629,537	380,801	248,736	55,457	193,279
* trotting horse training	115	hd	867,100	437,000	430,100	331,315	98,785
INTENSIVE LIVESTOCK							
Poultry							
* broilers	300,000	birds	140,460	45,145	95,315	56,641	38,673
* duck breeding	1,040,000	birds	910,400	457,000	453,400	129,380	324,020
* turkey production	87,000	birds	156,600	45,451	111,149	57,025	54,124
INTENSIVE CROPPING							
Vegetables	64.8	ha	1,955,858	808,704	1,147,154	320,112	827,042
Wine production	4.6	ha	55,200	17,406	37,794	26,200	11,594
TOTAL			5,937,343	2,810,766	3,126,577	1,470,113	1,656,464

3.7.3 Region

NSW Agriculture estimates annual farmgate production in the Sydney region alone to be worth approximately $1 billion with flow-on effects to the economy estimated at in excess of $2 billion to $3 billion.[17] Table 14 sets out the value as estimated by NSW Agriculture.

Table 14 Value of agricultural production in the Sydney Basin

Product	Value ($ m)
Poultry	298
Beef	36
Dairy	28
Vegetables	99
Mushrooms	28
Fresh Flowers	100
Plant Nurseries	200
Turf	50
Fruit and tree crops	90
TOTAL	**929**

Source: Sustainable Agriculture in the Sydney Basin. An issues paper for public discussion. August 1995, NSW Agriculture.

[17] Sustainable Agriculture in the Sydney Basin. An issues paper for public discussion. August 1995, NSW Agriculture.

4 CONSTRUCTION IMPACTS

Construction impacts include the loss of valuable agriculture from the region at the airport site as well as the impact the infrastructure development will have on those enterprises and those surrounding the area.

4.1 IMPACT OF INFRASTRUCTURE DEVELOPMENT

4.1.1 Badgerys Creek

If an airport were developed along the lines of either Option A, B or C, the enterprises currently operating in these areas would either disappear or be relocated over the period of the construction. While this will reduce the agricultural production in the immediate area, valued at between $1 million and $3 million, it is likely that other farms in the Sydney Basin will increase their production to fill this gap in the market. Alternatively, the farmers will move to another area in the Sydney Basin and continue production. The relocation of activities is not a simple task and it would take considerable time to find a property on to which the current operation could be operated. Some farmers who wished to remain in farming might have to relocate at a greater distance from markets.

If the land were leased back to farmers until construction was to start this would give the farmers a chance to find an alternative site. It is likely that many of the operations could continue even after the land was purchased, until construction required the land, as has been the case with the Option A land. This would depend on the nature of the enterprise and the area in which it is located. For example, broiler production enterprises on small areas and horticulture in sheds would be marginally affected by construction in another part of the Option area. Grazing cattle on the other hand would be affected if fences were removed for construction as this would make it difficult to continue grazing operations.

During the construction of the airport the market garden enterprises are likely to suffer from increased dust from vehicle traffic which could make it impossible for them to remain.

Many of the industries located at Badgerys Creek are situated there because of close proximity to the markets. With the exception of beef cattle, these industries would be affected by having to relocate. The horse training and spelling are located close to city residents who own the horses and the broiler enterprises are situated near the processing plants.

Market gardens could relocate over the Blue Mountains and with refrigerated transport their product could be delivered to the Sydney market. This would increase transport costs but these might be off set by reduction in other costs associated with closer location to Sydney.

The dairy farm, which is part of a much larger operation including another dairy, is likely to be affected by the airport as it is unlikely the whole operation would be moved elsewhere.

Badgerys Creek Option A

Option A has 1,526 hectares of agricultural production that is valued at $615,710 per annum. The details of the calculation are included in Table 12.

Stage 1 of the airport construction involves development of part of the southeastern area of Option A. The enterprises located to the north and northwest will therefore not be directly impacted upon until stage 2 of the development. The operations affected are approximately half the horse and beef grazing area as well as a couple of horse training operations, the vineyard and one market garden. The estimated value of this is $409,190.

The dairy farm has only a small portion of its land used for Stage 1.

Badgerys Creek Option B
Option B has 2,444 hectares of agricultural production which is valued at $2,302,912 per annum. The details of this are included in Table 14.

Stage 1 of the airport development involves construction on part of the area set aside for Option B and will be situated on the north west edge of Option B The enterprises located to the east and south east will therefore not be directly impacted upon until stage 2 is developed. The operations affected are approximately half the horse and beef grazing area as well as more than half the horse training operations, the vineyard and two market garden operations. The estimated value of this is $1,900,370.

The dairy farm has only a very small proportion of its land used for Stage 1. One of the Inghams multiplication unit is included at this stage.

Badgerys Creek Option C
Option C has 2,222 hectares of agricultural production which is valued at $1,656,464 per annum. The details of this are included in Table 15.

Stage 1 of the airport development will involve construction in the centre area of Option C. The enterprises located to the east, west of the Northern Road and southeast will not directly impacted upon until stage 2 is developed. The operations affected are approximately half the horse and beef grazing area as well as more than half the horse training operations, a number of market garden operations and the duck and turkey operations. The estimated value of this is $1,102,638.

Neither the dairy farm nor Inghams multiplication farm is affected.

4.1.2 Holsworthy

There will be no impact as there are no agricultural activities at the proposed site options.

5 OPERATIONAL IMPACTS

5.1 IMPACT OF AIRCRAFT NOISE ON AGRICULTURE

The effects of aircraft noise on livestock have not been extensively researched in Australia, with most studies relating to the effects on sheep and cattle. There have, however, been several important studies conducted overseas, which include the effects of noise on poultry.

Much of the research carried out into aircraft noise relates to sonic booms. These studies provide us with valuable insight into the impact of noise on livestock. Several recent studies investigated the effects of not only sonic booms but also jet and subsonic flight noise and reported that domestic animals responded more to noise from low altitude aircraft than to sonic booms.[18]

Overall, most of the studies show that the impact of noise varies according to its intensity. As a general guide, the sound threshold expected to cause a behavioural response in animals is 85 to 90 dB.[19]

The lack of relevant international studies makes the determination of concrete findings and conclusions difficult. This is compounded by the fact that animal behaviour and response under stress will vary between, and within, species according to the following factors: [20]

- The previous experience of the animal with sudden loud noises;
- Their inherent nervousness (laying hybrids based on Leghorn stock compared with heavy breeds of poultry, Thoroughbreds compared with common-bred horses);
- The level of ambient background noise;
- Whether the animal is housed in a building;
- Whether the animal is with others of its own species;
- What the animal is doing at the time; and
- Variation in the responses of individual animals.

Behavioural responses to sonic booms in domesticated animals such as horses, cattle, sheep and poultry are discussed in a literature synthesis by *Espmark*[21]. Whether the studies have been performed with real or simulated booms, the authors came to the same general conclusions that:

- Overall sonic booms and subsonic flight noise, have very little effect on an animals' behaviour;
- Avian species seem to be more affected than mammals;
- Low-flying subsonic aircraft are said to cause stronger reactions than sonic booms; and
- The animals develop adaptation to the disturbances.

[18] Weisenberger, M.A., et al. 1996. Effects of simulated jet aircraft noise on heart rate and behaviour of desert ungulates. Journal of Wildlife Management. 60(1):52-61.
[19] Head, H.H., *et al.* 1993. Milk yield, milk composition, and behaviour of Holstein cows in response to jet aircraft noise before milking. Journal of Dairy Science. 76:1558-1567.
[20] Ewbank, R. 1976. The effects of sonic booms on farm animals. The Veterinary Annual 17:296-306.
[21] Espmark, Y., Falt, L., and Falt, B. 1974. Behavioural; responses in cattle and sheep exposed to sonic booms and low altitude subsonic flight noise. Veterinary Record. 94:106-113.

5.1.1 Cattle

The report by *Head etal* 1993[19] found that while milk yield, rate of milk release and feed intake by dairy cows was reduced at 105 dB, there were no observed effects at 80 dB. The same study showed that at milking, unexpected high intensity noise, such as low altitude jet aircraft overflights (greater than 110 dBA) could increase milk retention and lead to overall reduction in milk yield per cow.

Also, cows would show an initial response to jet noise greater than 100 to 105 dB but that the response would decrease to zero as the cows became more experienced with the stimulus. The article concluded that the results of this, and previous studies, suggest that the response of dairy cows to jet noise around milking would be subtle and that no averse behaviours or decreased productivity would occur in response to recorded jet aircraft noise of low altitude aircraft overflights [19]

5.1.2 Sheep

Grandin [22] quoted the work of *Ames*, where sheep exposed to the 75 dB levels gained weight faster during a feed trial than either the controls or the sheep exposed to 100 dB. Animals exposed to 100 dB appeared more stressed and had the lowest weight gains.

Earlier studies concluded that sheep reacted more readily to noise exposures and displayed stronger reactions than cattle, although the impact of the exposures upon the animals in this investigation was considered minimal [21]. It was also found that there appeared to be no reports of panic, injury or impaired reproduction in sheep exposed to noise [20]

5.1.3 Horses

It has been suggested that horses, when compared with other grazing species, may show a more violent response to impulse noise and do not readily adapt. At the same time there is some thought that pure bred horses adapt to noise less readily than half breeds. Furthermore there is a danger that horses confined in a building may show an exaggerated response to noise[20]

5.1.4 Pigs

There is limited work completed on the effect of noise on pigs.

Fright reactions have been observed in pigs by *Grandin* [22]. Pigs failed to move away from the source of a pulsed tone at 120 dB indicating a fright reaction. It is also believed that the impact of loud noise on pigs may be exaggerated because pigs communicate vocally and greater background noise reduces their ability to communicate.

Straunch [23] investigated the responses of pigs to noise and found that 120 dB was the limit of tolerance for pigs and that young pigs exposed to 90 dB for a 10 day duration suffered from muscle degeneration.

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[22] Grandin, T. 1983. Livestock handling from farm to slaughter. Canberra: Australian Government Publishing Service.

[23] Straunch, D. ed. 1987. Animal production and environmental health. Elsevier.

5.1.5 Poultry

When examining the impact of noise on poultry, the effect on both eggs and birds is considered. *Ewbank* [20] reports that fertile eggs from domesticated hens have been repeatedly exposed in an incubator to boom overpressures of up to 5000 N/m^2 without deleterious effects on either the shells or the developing embryos. The study of grown birds indicated that the birds were variously described as 'flying', 'running', 'crowding', and 'cowering' in response to sonic booms and it was suggested that there may have been a drop of egg production in the pheasantry. There were, however, no significant changes in turkey egg production or feed consumption.

Ewbank [20] confirms the results of several other studies that find that most comparative accounts of the behaviour of domesticated animals in response to sonic booms - real or simulated - show the pronounced reactions of poultry when contrasted with farm mammals. However the study also found that the birds soon adapted and that there were no deaths or drops in overall egg production due to increased noise.

The more pronounced responses of poultry were investigated in several studies and found that:

- Long lasting excessive noise depresses activity and this can lead to cannibalism and the pulling of feathers [25], and
- Noise at 95 dB as opposed to 80 dB depressed growth by 6% and that chicks from different genetic stocks may respond differently to loud noise [24].

5.1.6 General

Straunch [23] found that the knowledge of the influence of noise on animals is incomplete. Of all farm animals, ruminants are least affected by noise and in contrast, pigs and poultry are highly sensitive. The impact of noise on livestock is difficult to quantify as tests of stress on animals must indicate that a particular stimulus or stressor is resulting in a biological change that impacts on the animals' well-being [25].

A 1993 study [19] found that routine US Air Force training flights in rural areas can expose receivers on the ground to sound levels up to 125 dB, for a few seconds at a time, and that noises greater than threshold (85-90 dB) have provoked retreat, freezing or strong startle response in animals. Aversive behaviours were less likely for sound less than 90 dB and that response by animals would be expected to vary with noise type, level and frequency. Intensity and duration of noise are important when determining the effects on animals. *Head*[19] found that domestic animals appear to adapt to some sound disturbances including jet noise after repeated exposures.

Adaptation is mentioned in most studies. Although repetition of stimuli commonly leads to adaptation, vulnerable animals generally adapt reluctantly to stimuli that would indicate a possible threat. The animals in *Weisenberger's* [18] study adapted rapidly to noise from simulated jet aircraft and probably did not view this stimuli as a threat. However additional or interactive effects may result from the visual stimulus of actual aircraft. According to *Weisenberger*[18] the potential for additional effects from visual stimuli are not included in the majority of studies as they use simulated noise.

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[24] McFarlane, J.M. et al. 1989. Multiple concurrent stressors in chicks. 1. Effect on weight gain, feed intake, and behaviour. Poultry Science. 68:501-509.

[25] Moberg, J.P. 1987. A model for assessing the impact of behavioural stress on domestic animals. Journal of Animal Science. 34(6):994-998.

Prior to adaptation, noise may have a negative effect on livestock. An animal that has not encountered a sonic boom before is likely to move by reflex when exposed for the first time. Groups of animals may panic and in the process of being startled the animal may damage itself or its young. These responses are not limited to jet aircraft noise; other sudden loud noises may affect farm animals, e.g. sporting guns, thunderstorms and mining.[20]

Straunch [25] demonstrated that animals usually cannot react in a natural way to a noise when confined, and found that the effect of noise (i.e. the fright reaction) can be negative and lead to abscesses in the stomach and gut.

Stress may be reduced through proper environmental design of husbandry systems to allow animals the opportunity to mobilise adaptive, stress-reducing behaviours, according to *Fraser*[26]. In addition, animals may be bred to react more or less to stress on the basis of genetic susceptibility. Stereotyped behaviour in animals, in certain contexts, may be a useful indicator of f ration or anxiety.

5.1.7 General Conclusions

In investigating the impact of both sonic booms and low altitude sub-sonic flight noise, *Espmark* [21] found that no adverse effects were observed, and behavioural reactions were considered minimal in both cattle and sheep. The animals were less disturbed towards the end of the test period, thus indicating that adaptation had taken place. Espmark also discusses that it is also possible that the effects of disturbances could be more severe for animals under differing physiological states, such as gestation.

The following points are identified as key findings in the research undertaken:

- The research done and information available are minimal;
- The threshold for response of animals to noise is 85-90 dB, but depends on many factors including the environment and genetics;
- That birds are more affected than mammals, and pigs more so than ruminants;
- That species adapt when there is repetition of a stimuli; and
- That noise related stress can be reduced by management practices.

5.1.8 Conclusion: Impact of Aircraft noise on Agriculture

Most of the agricultural activities in the immediate vicinity to either the Badgerys Creek of Holsworthy Airport Sites are unlikely to be impacted by aircraft noise given the research reviewed.

The industries which are most likely to be impacted by aircraft noise are the poultry industries and the pure bred horse industries as discussed in the research. There are many horse training businesses around the Badgerys Creek Site as well as a poultry multiplication farm to the south of the proposed development.

[26] Fraser, A. 1987. Ethology of Farm Animals. Elsevier.

The impact on poultry or horse establishments will vary and, in the most extreme case, would see these enterprises relocate to more favourable locations, especially if production is impacted. It is likely that enterprises located in proximity to the Holsworthy sites would be impacted to a similar degree.

In each case, the decision to relocate would be a management decision, based on the economics of relocation versus the potential production losses incurred in remaining inn the current position.

5.2 OTHER IMPACTS FROM AIRPORT LOCATION

The location of a major airport in Western Sydney will need to supported by specialised local infrastructure and developments. It is probable that support industries would purchase agricultural land and, if planning legislation permits, utilise it for industrial and commercial purposes. Given the information provided as part of this study, it is not possible to quantify these additional impacts.

However, agricultural land in the immediate vicinity of the airport runways and operating areas is unlikely to be used for residential purposes due to high noise levels. If the land is not used for commercial/industrial purposes, as discussed above, it is likely to remain in agricultural production. This may have the effect of negating the inevitable future urbanisation of these agricultural lands and could maintain agricultural production in the area.

The land around the airport is unlikely to become residential and the land is likely to either remain agricultural or be used for industrial purposes which are not affected by the aircraft.

6 ENVIRONMENTAL MANAGEMENT

The major impact of the proposed airport on existing operations will be during the construction phase when dust from heavy machinery and vehicular traffic could impair livestock activities and reduce the quality of produce, especially in market gardening and nursery operations.

Measures will need to be introduced to reduce the level of dust contamination and to reduce "dust drift" from the construction site. These measures could include: use of spray carts to "damp" down construction areas, tree belts, air treatment in livestock sheds and the washing of product prior to sale to reduce potential "price penalties".

7 CONCLUSIONS AND COMPARISON

7.1 CONCLUSION OF STUDY

The Holsworthy options have no direct agricultural impact since no agricultural activities would be displaced within the Holsworthy Military area.

The Badgerys Creek option is predominantly situated on land which is currently used for agricultural purposes. These agricultural enterprises have an estimated annual current production value of $615,710 for Option A, $2,302,912 for Option B, and $1,656,464 for Option C.

The loss from the Sydney Basin of agricultural production in the land resumed in the proposed options will be reduced by the relocation of some of these establishments within the region. The large poultry enterprise could be expected to relocate along with the higher quality horse establishments.

For both the Badgers Creek and Holsworthy Options, the impact of noise from aircraft on agriculture will predominantly affect the poultry and neighbouring horse industries in areas not resumed for the airport. This would most likely cause their relocation to another area in the Sydney region.

7.2 COMPARATIVE IMPACTS OF THE FIVE AIRPORT OPTIONS

Impact	Badgerys Creek			Holsworthy	
	Option A	*Option B*	*Option C*	*Option A*	*Option B*
Loss of Agricultural Land - Stage 1	$409,190	$1,900,370	$1,102,638	$0	$0
Loss of Agricultural Land	$615,710	$2,302,912	$1,656,464	$0	$0
Noise Impact	N/C	N/C	N/C	N/C	N/C
TOTAL IMPACT	N/C	N/C	N/C	N/C	N/C

N/C = not calculated

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