



# LOCAL STRUCTURE PLAN

## LOT 311 FIFTY ROAD, BALDIVIS CITY OF ROCKINGHAM

### VOLUME 1 OF 2 PARTS ONE & TWO & ANNEXURES A TO H

Prepared for: The Estate of GDR Lilburne  
Prepared by: Allerding and Associates

SEPTEMBER 2015

**Allerding  
& Associates**

Town Planners, Advocates  
and Subdivision Designers

125 Hamersley Road, Subiaco WA 6008  
T: (08) 9382 3000 F: (08) 9382 3005 W: [allerdingassoc.com](http://allerdingassoc.com)

Commercial  
DEPARTMENT OF PLANNING

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**CERTIFICATION OF AGREED LOCAL STRUCTURE PLAN**

Certified that this Local Structure Plan for Lot 311 Fifty Road, Baldvill  
was approved by  
Resolution of the Western Australian Planning Commission on

10 April 2015

Date

Signed for and on behalf of the Western Australian Planning Commission

An officer of the Commission duly authorised by the Commission pursuant to section 24  
of the *Planning and Development Act 2005* for that purpose, in the presence of:

M. Wiecla

Witness

22 September 2015

Date

And adopted by  
Resolution of the City of Rockingham *on under delegated authority*

Date

~~And pursuant to the Council's resolution hereunto affixed  
in the presence of:~~

~~Mayor, City of Rockingham~~

~~Chief Executive Officer, City of Rockingham~~

30/9/2015

~~Date~~

This Structure Plan is prepared under the provisions of the City of  
Rockingham Town Planning Scheme No.2

Expiry Date: 19 October 2035

## EXECUTIVE SUMMARY

This Local Structure Plan (**Structure Plan**) has been prepared to guide subdivision and development of Lot 311 Baldivis Road, Baldivis, being a total of 15.11 hectares within the City of Rockingham.

The subject site will create an urban subdivision of approximately 200 lots, which will house a new community of approximately 400 people with land that, together with the adjacent Structure Plan area, will provide for a new neighbourhood shopping centre.

The Structure Plan has been prepared in accordance with the provisions of Part 4 of the City of Rockingham Town Planning Scheme No. 2 and provides the planning framework to guide and facilitate urban development of the subject land.

The Structure Plan is submitted to the City of Rockingham and the Western Australian Planning Commission for endorsement.



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# *PART 1 - STATUTORY SECTION*



### Change or Departure from Structure Plan

Change or Departure No.	Description of Change or Departure	Date Adopted by the Council	Date Approved by the WAPC (if required)	Date Structure Plan Commences

## 1.0 STRUCTURE PLAN AREA

This Structure Plan shall apply to Lot 311 Fifty Road, Baldivis, being the land contained within the inner edge of the line denoting the Structure Plan boundary on the Structure Plan map (Plan 1).

## 2.0 STRUCTURE PLAN CONTENT

This Structure Plan comprises:

- a) Part 1 - Statutory section  
This section contains the Structure Plan map and statutory planning provisions and requirements.
- b) Part 2 – Non-statutory (explanatory) section. This section to be used as a reference guide to interpret and justify the implementation of Part One.
- c) Appendices – Technical reports and supporting plans and maps.

## 3.0 INTERPRETATION AND RELATIONSHIP WITH THE SCHEME

Unless otherwise specified in this part, the words and expressions used in this Structure Plan shall have the respective meanings given to them in the City of Rockingham Town Planning Scheme No. 2 (**the Scheme**) including any amendments gazetted thereto.

The Structure Plan map (Plan 1) outlines land use, zones and reserves applicable within the Structure Plan area. The zones and reserves designated under this Structure Plan apply to the land within it as if the zones and reserves were incorporated into the Scheme.

Pursuant to clause 4.2.9.2 of the Scheme:

- a) The provisions, standards and requirements specified under Part One of this Structure Plan shall have the same force and effect as if it were a provision, standard



or requirement of the Scheme. In the event of there being any variations or conflict between the provisions, standards or requirements of the Scheme and the provisions, standards or requirements of Part One of this Structure Plan, the Scheme prevails to the extent of any inconsistency.

#### **4.0 OPERATION**

This Structure Plan commences operation on the date it is adopted by Council pursuant to Clause 4.2.6.15 of the Scheme.

Clause 4.2.7 of the Scheme outlines the manner in which a change to or departure from a Structure Plan is determined.

#### **5.0 LAND USE**

The Structure Plan Map (Plan 1) outlines land use, zones and reserves applicable within the Structure Plan area. The zones and reserves designated under this Structure Plan apply to the land within it as if the zones and reserves were incorporated into the Scheme.

##### **5.1 Residential**

###### **5.1.1 Dwelling Target**

###### **Objective**

To provide for a minimum of 190 dwellings within the Structure Plan area.

###### **5.1.2 Density**

The Residential Densities applicable to the Structure Plan shall be in accordance with that shown on the Structure Plan Map (Plan 1).

## 6.0 SUBDIVISION / DEVELOPMENT

### 6.1 Notifications on Title

In respect of applications for the subdivision of land the Council shall recommend to the Western Australian Planning Commission that a condition be imposed on the grant of subdivision approval for a notification to be placed on the Certificate(s) of Title to advise of the following:

- a) Lots deemed to be affected by a noise impact is identified in the *Lot 311 Fifty Road, Baldivis SPP5.4 Acoustic Assessment*, May 2015 by Herring Storer (as updated) within Annexure M.
- b) Lots deemed to be affected by a Bushfire Hazard as identified in the *Bushfire Management Plan, Lot 311 Fifty Road, Baldivis* June 2014 by Bushfire Prone Planning (as updated) within Annexure J.

### 6.2. Detailed Area Plan Requirements

Detailed Area Plans (DAP), are required to be prepared and implemented pursuant to clause 4.23 of the Scheme for lots comprising one or more of the following site attributes:

- a) Lots with rear loaded vehicle access; and/or
- b) Lots with direct boundary frontage (primary or secondary) to an area of Public Open Space; and/or
- c) Lots zoned 'Commercial'; and/or
- d) Lots deemed to be at risk from a recognised bush fire hazard as identified spatially in the *Bushfire Management Plan, Lot 311 Fifty Road, Baldivis* June 2014 by Bushfire Prone Planning (as updated) within Annexure J; and/or

- e) Lots deemed to be affected by noise as identified spatially in the *Lot 311 Fifty Road, Baldivis SPP5.4 Acoustic Assessment* May 2015 by Herring Storer (as updated) within Annexure M.

### **6.3 Other Provisions / Standards / Requirements**

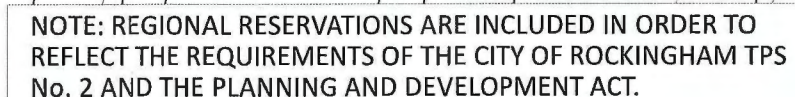
#### **Bushfire Construction Standards**

This Structure Plan is supported by a Bushfire Hazard Level Assessment (BFHA) and a Bushfire Management Plan (BMP). Regardless of whether the land has been formally designated as bushfire prone, any buildings to be erected on land identified as falling within 100 metres of a bushfire hazard shall comply with the requirements of *Australian Standard 3959* under the *Building Code of Australia*.



**PLAN 1: STRUCTURE PLAN**





125 Hamersley Road, Subiaco WA 6008  
T: (08) 9382 3000 | F: (08) 9382 3005 | W: [allerdingassoc.com](http://allerdingassoc.com)



## *PART 2 - EXPLANATORY SECTION*

## 1.0 INTRODUCTION

The following report has been prepared by Allerding & Associates on behalf of the estate of GDR Lilburne the registered proprietor of Lot 311 Fifty Road, Baldivis (the subject site). This report has been provided to the City of Rockingham in support of the proposed Local Structure Plan (**Structure Plan**) over the subject site, the purpose of which is to provide the general planning framework to guide future development into an integrated residential estate.

Given the strategic location of Baldivis, a significant opportunity exists to create a fully integrated residential community that will build on the development currently underway in the Baldivis (North) District Structure Plan area.

This report provides an overall context to this Structure Plan as amended, and justification for the purpose of advertising and subsequent endorsement by the City of Rockingham and the Western Australian Planning Commission (**WAPC**).



## 2.0 SITE DETAILS

### 2.1 Description of the Land

The subject site is 15.115 ha in area and described as Lot 311 Fifty Road, Baldivis on Deposited Plan 202704.

The site is formally identified on Certificate of Title: Volume 1170/Folio 618. Please refer to the Certificate of Title included as **Annexure A**.

### 2.2 Site Context

The subject site is located within the municipal boundary of the City of Rockingham and within the locality of Baldivis. The subject site is located approximately 42 km south of the Perth CBD and approximately 10 km west of the Rockingham City, refer to **Annexure B**.

To the north the subject site fronts Fifty Road, Baldivis and to the east fronts Eighty Road, Baldivis. To the west exists Lot 312 Fifty Road, which abuts the Rockingham Lakes Regional Park. To the immediate north-east of Fifty Road is the original Baldivis settlement and adjoining nature reserve. The general locality is bounded by Mandurah and Baldivis Road with the Kwinana Freeway providing the major North-South movement within 1km of the subject site.

The nature of the surrounding locality is such that the traditional rural pursuits on the land are being replaced by the rapid development of residential and associated land uses.

### 3.0 SITE ANALYSIS

#### 3.1 Land Use Context

The subject site is uncleared and contains no formal access roads, in addition unlike the surrounding land, the site does not appear to have been used for intensive horticultural activities and is clear of any structures including residential dwellings or associated outbuildings.

The adjoining land to the north is currently undergoing urban development in accordance with the Baldivis North Structure Plan and residential lots immediately adjacent to Fifty Road have been created.. Other land to the north of the subject Structure Plan Area, includes the Baldivis Primary School and community and recreation facilities, including the Baldivis Recreation Centre. The Structure Plan Area at its western, south western and eastern boundaries is bound by land subject to the approved Spires Estate Structure Plan. That Structure Plan will facilitate the future residential and commercial development of approximately 54.57 ha of land on Lots 312 & 313 Fifty Road, Lots 2, 4, 7 & 8 Eighty Road and Lot 5 Baldivis Road, Baldivis.

Land to the east, being Lot 2 on the corner of Eighty Road and Fifty Road is presently used for rural purposes, but forms part of the Spires Estate and will ultimately be developed for residential purposes. Land to the south east (south of the hatchery) being one of the first stages of the Spires Estate, is currently being progressively developed and subdivided for Residential purposes.



Figure 1: Lot 311 and surrounds Source: nearmap.com

The Layertech Chicken Hatchery is located on Lot 3 Eighty Road to the immediate east of the subject site. WAPC Statement of Planning Policy No. 4.3 – Poultry Farms Policy provides guidance on this matter. The Policy indicates that an assessment may be required to show that the operation of the poultry farm will not adversely affect the amenity of the new residents in the proposed residential and rural-residential area. As such the proposed local Structure Plan has been prepared so as to comply with the relevant requirements. Further information with respect of separate distance of the poultry farm on Lot 3 Eighty Road to the proposed development of the Structure Plan Area is provided at section 3.10 of this report.



### 3.2 Topography

The subject site has gently undulating gradients with elevations ranging from 6.0m to 15.8m AHD. The highest point occurs in the north near Fifty Road and the lowest point occurs near the south west corner of the site.

Topography mapping is provided in **Attachment 4** of the Local Water Management Strategy.

### 3.3 Soils

The Dept. of Agriculture identifies the soils in the locality as comprising land unit S2a - moderately deep to deep siliceous yellow-brown sands or pale sands with yellow-brown sub-soils, and minor limestone outcrop.

Soil mapping is provided in **Attachment 4** of the Local Water Management Strategy.

### 3.4 Acid Sulphate Soils

The site exhibits some areas with moderate to low risk of Acid Sulphate Soils (ASS) occurring within 3 metres of natural soil surface. Therefore, development on this land can be undertaken with minimal adverse future risk of acid sulphate soils.

The impact arising from acid sulphate soils and any management measures required to address them will be explored further prior to subdivision and will be subject to more detailed engineering and environmental advice at that time.

Acid Sulphate Soil mapping is provided in **Attachment 5** of the Local Water Management Strategy.



### 3.5 Groundwater

Advice contained in the Perth Groundwater Atlas confirms that groundwater across the site ranges between 2 to 3 metres AHD and that the groundwater flows in westerly direction.

Mapping of Groundwater Contours is provided in **Attachment 7** of the Local Water Management Strategy.

### 3.6 Wetlands

The lot is not identified to contain any areas of wetland in the Department of Environment and Conservation Swan Coastal Plain Geomorphic Wetlands Database or under the Environmental Protection (Swan Coastal Plain Lakes) Policy 1992. Furthermore the site does not adjoin any wetland areas.

Wetland mapping is provided in **Attachment 6** of the Local Water Management Strategy.

### 3.7 Aboriginal Heritage

The Aboriginal Heritage Act 1972 (AHA) was introduced in Western Australia in 1972 to protect Aboriginal heritage. Under the Act, it is an offence for anyone to excavate damage, destroy, conceal or in any way alter an Aboriginal site without the Minister's permission.

Original investigations of the Department of Indigenous Affairs Heritage Sites Database identified that the database does not include any sites within lot 311. However as part of formal advertising, comment was provided by the Department of Indigenous Affairs in regard to the property containing Aboriginal Heritage Site DIA 4323 (Gas Pipeline 2).

The investigation of the file revealed the following findings in "A report of an Aboriginal Heritage Assessment of a proposed clay borrow pit, Mundajong Road, Wellard" dated June 2001 states:

*"The site is located on Dog Hill immediately on the south-eastern corner of the junction of St Albans Road and Dog Hill Road. ... However the Aboriginal Affairs Department has determined that the location information in the site file is insufficient to accurately or confidently determine the location of the site. ... The site is described as being concentrated on a 9m high and 200 m long crescent shaped sand slope immediately on the north-east side of a large swamp area and the WANG pipeline to Dongara runs 50m to 100m to the east of this slope. It is not entirely clear from the information contained in the site file, but it would appear that all of the artifactual material was collected from this site at the time of recording (February 1979) such that this side also probably no longer exists."*

Figure 2 shows the relationship of the Structure Plan area (yellow on the left hand side), the intersection of Dog Hill Road and St Albans Road, the Gas Pipeline to Dongara/Dampier gas pipeline and the swamp. It is considered most likely that Registered site 4323 is located east of Baldivis Road (and possibly east of the Kwinana Freeway), between the swamp and the pipeline and therefore this does not impact upon this property.

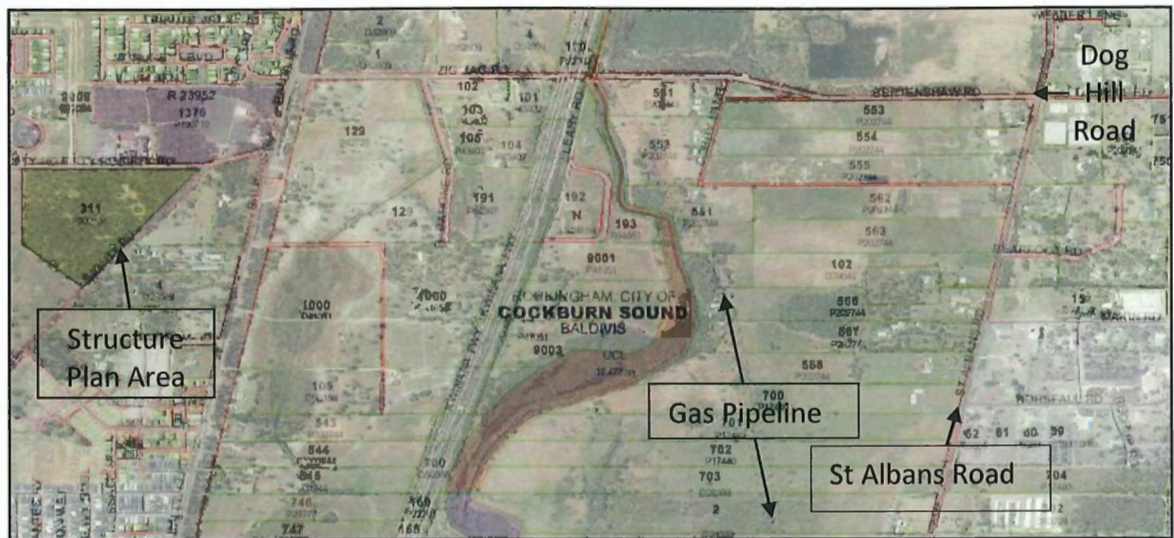


Figure 2: Relationship of Structure Plan Area to detailed description of Aboriginal Heritage place Source: [landgate.wa.gov.au](http://landgate.wa.gov.au)

Notwithstanding, the landowner is aware of their obligations under Section 15 of the Aboriginal Heritage Act 1972 and in the event that cultural material or a new site is discovered during construction work, the landowner will report this information to the Registrar of Aboriginal Sites.

### 3.8 Flora

A review of the Bush Forever site database has not identified any Bush Forever sites on the subject land. It is however, noted that the site is uncleared and contains remnant native vegetation. The natural vegetation of the Bassendean system typical of this area consists of low woodland of Banksia with scattered Jarrah; in areas which collect water it merges into Marri-Jarrah woodland. The Pinjarra system has very little original vegetation and consists of open Marri forest with Wandoo component and some Jarrah on higher areas.

It is intended that part of the remaining bushland will be incorporated as part of the open space to be provided in the development of the land.



### **3.9 Fauna**

The subject land is not part of an interconnected area of bushland, it contains no wetland areas and the 15.1ha of land is of a relatively limited size. As such, although remnant bush remains within the lot, the locality is not conducive to fauna habitat.

The obligations under the Environmental Protection and Biodiversity Conservation Act (EPBC Act) are noted with respect to clearing of existing vegetation and as such it will be dealt with having regard to those processes. However the EPBC Act is Commonwealth legislation that we contend ought to be independent of the Structure Plan considerations by the City of Rockingham. Accordingly whilst we acknowledge this is a matter that we will be required to address with the respective Commonwealth Authorities, it is not, however, a matter that ought to prevent the consideration of the Structure Plan as proposed.

### **3.10 Contaminants / Odour Report**

The site has not been utilised for agricultural or commercial purposes that have involved the introduction of contaminants. In relation to the Layertech Services Poultry farm on Lot 3 Eighty Road, the 100m buffer recommendation of the Odour Report commissioned by RPS Environmental in conjunction with The Odour Unit (refer to **Annexure G**) has been supported for the surrounding adopted Spires Estate Local Structure Plan, and the recommendations of the report are incorporated here (that is, use of public land and/or recreational areas bordering Eighty Road).



The report states in the Discussion of Results, Pg. 43:

*[The Odour Unit] TOU is of the belief that the odours observed during the FAOA surveys are non problematic with respect to Lot 311 Fifty Road.*



**Figure 3: Sensitivity Modelling undertaken by The Odour Unit**

The odour sensitivity model projection, **Figure 3**, shows a distance of off-site odour impacts up to approximately 100 metres in any direction from the shed locations at the Layertech Services Poultry Farm. This distance is supported by TOU's field observations. The report recommends that the proposed residential land development at Lot 311 Fifty Road retain some public land and/or recreational areas that would border Eighty Road.

## 4.0 STRATEGIC AND STATUTORY PLANNING CONSIDERATIONS

### 4.1 Metropolitan Region Scheme

Under the provisions of the Metropolitan Region Scheme (MRS) the land is zoned 'Urban'. It also contains an 'Other Regional Road' bisecting the property in a north south direction. A copy of the relevant MRS mapping is included as **Annexure C**.

### 4.2 Directions 2031

Directions 2031 is a high level spatial framework and strategic plan that establishes a vision for future growth of the Metropolitan Perth and Peel region. In addition Directions 2031 provides a framework to guide the detailed planning and delivery of housing, infrastructure and services necessary to accommodate a range of growth scenarios. Directions 2031 replaces all previous metropolitan strategic plans for both the Perth Metropolitan area and Peel and supersedes the draft Network City policy.

Directions 2031 incorporates a number of key themes along with applicable strategies to be applied to urban growth in the context of a growing population. The key themes of directions 2031 and select strategies to achieve the themes, are as follows:

#### **Liveable:**

- *Promote good urban design and development to enhance people's experience of the city.*
- *Provide quality passive and active public open space.*
- *Plan for increased housing supply in response to changing population needs.*
- *Promote and increase housing diversity, adaptability, affordability and choice.*
- *Ensure urban expansion occurs in a timely manner in the most suitable locations.*
- *Promote high densities in greenfield development.*

#### **Prosperous:**

- *Provide a hierarchy of places and locations for a range of economic activities and employment across the metropolitan Perth and Peel region.*
- *Plan for a diverse mix of services, facilities, activities, amenity and housing types.*



**Accessible:**

- *Plan and develop urban corridors to accommodate medium-rise higher density housing development.*

**Sustainable:**

- *Protect our natural and built environments and scarce resources;*
- *Respond to social change and optimise the land use and transport conditions that create vibrant, accessible, healthy and adaptable communities.*

**Responsible:**

- *Maximise essential urban infrastructure efficiency and equity; and develop a coordinated approach to infrastructure and land use planning and development;*
- *Allow for the strategic expansion of the urban area, with priority on the development and use of land that is already zoned urban or urban deferred.*

Furthermore the subject site is contained within the South-West Metropolitan sub-region encompassed within Directions 2031 which includes the areas of City of Kwinana, Cockburn and Rockingham. The sub-region has experienced considerable population and economic growth and is well serviced by road and rail infrastructure enabling connection to the Perth CBD. Rockingham is the principle centre of the region and of mixed use activity and as such is identified as a Strategic Metropolitan Centre under Directions 2031. Other major employment generators within the region are the Kwinana and Henderson industrial areas.

The Structure Plan Area is contained within the BA1 cell in Directions 2031, forecasted to provide approximately 3900+ dwelling across the cell by 2031. This Structure Plan will contribute to this target by allowing for the development of a minimum of 190 dwellings.

Given the strategic location, infrastructure and employment within the area, it is expected by 2031 that the population will grow by 34% to 278,000.

The proposed local Structure Plan has been prepared based on the key themes and strategies of Directions 2031 and within the context of population growth within the South-West Metropolitan sub-region.

#### 4.3 Liveable Neighbourhoods

Liveable Neighbourhoods has been prepared to implement the objectives of the State Planning Strategy, which aims to guide the sustainable development of Western Australia to 2029.

Liveable Neighbourhoods has been adopted by the WAPC as an operational policy for the design and assessment of Structure Plans and subdivision for new urban areas in the metropolitan area and country centres. The Structure Plan is consistent with the principal aims of this document, acknowledging it's following salient features:

1. This Structure Plan caters for a safe universal pedestrian and cyclist environment with pathways linking the neighbourhood and associated local parks, as well as providing for external connectivity to areas outside of the site. Accordingly, the Structure Plan will provide for an urban structure of walkable neighbourhoods and reduce car dependence;
2. Pathways within the Structure Plan are designed to ensure that the walkable Structure Plan area will provide access to services and facilities for all users, including those with disabilities;
3. The Structure Plan has been designed to foster a sense of community and strong local identity and sense of place;
4. The Structure Plan provides interconnected network of streets which facilitate safe, efficient and pleasant walking, cycling and driving;
5. The Structure Plan ensure active street-land interfaces, with building frontages to streets to improve personal safety through increased surveillance and activity;



6. The commercial zoned land within this Structure Plan Area and the adjacent Spires Estate Structure Plan, and a range of residential densities, will provide for a wide range of living and employment opportunities, capable of adapting over time as the community changes. Such a design reflects appropriate community standards of health, safety and amenity;
7. The varied residential densities provided for in the Structure Plan Area will facilitate a variety of lots sizes and housing types to cater for the diverse housing needs of the community;
8. The Structure Plan includes an integrated design of open space and urban water management; and
9. The design of the Structure Plan maximises land efficiency.

## 5.0 BALDIVIS (NORTH) DISTRICT STRUCTURE PLAN

The Structure Plan is located within Precincts 1 and 2 of the Baldivis (North) District Structure Plan, which was adopted by Council in 2000. That District Structure Plan outlines the preferred broad land use and district road framework for the area and identifies land in the plan for R20 and R40 residential development.

The Council has adopted the Baldivis (North) District Structure Plan ("District Structure Plan") over a large area which are identified for future urban development and held in multiple ownership. The purpose of the District Structure Plan is to ensure that coordinated development occurs across the landholdings by identifying infrastructure such as main roads, commercial nodes and regional open space. A copy of the District Structure Plan is included as **Annexure D**.

The District Structure Plan is used as a basis to assess the more detailed Local Structure Plans which are required prior to subdivision and development as provided for under clause 4.2.4(a) of TPS2.

The subject land falls within part of the site designated for a neighbourhood centre with a floor space of 5,500m<sup>2</sup>. The site for the neighbourhood centre has also been identified within the City of Rockingham Local Commercial Strategy with a maximum floor space of 4,500m<sup>2</sup> proposed.

However, in considering the Spires Structure Plan for the adjacent land, Council supported relocation of the majority of the commercial floorspace from a location on Fifty Road on the intersection with the proposed Nairn Road extension to a location on Nairn Road, immediately south of the area subject of this Structure Plan. Accordingly, the commercial floorspace for this Structure Plan has been similarly relocated to abut the remainder of the relocated commercial floorspace.

Consistent with the Baldivis (North) District Structure Plan, the Structure Plan provides an area of public open space (POS), on Eighty Road opposite the chicken hatchery on the adjoining land to the east.

Overall, subject to the modifications detailed in this section of this report, this Structure Plan is consistent with the Baldivis (North) District Structure Plan.

### 5.1 City of Rockingham Local Commercial Strategy (2004)

The City of Rockingham Local Commercial Strategy ("Commercial Strategy") was prepared as part of the City review of Town Planning Scheme 1. The Commercial Strategy aims to give effect to the Metropolitan Centres Policy (2000) and the Community Design Codes. It aims to promote the development of a hierarchy of centres which are viable, sustainable and which provide maximum benefit to the community.

The purpose of the Strategy is as follows:

- *Establish the objectives, principles and key strategies for retailing and commercial development in Rockingham.*
- *Apply the strategic planning policies set out in the State Government's Metropolitan Centres Policy Statement (2000)<sup>2</sup>.*
- *Provide a context for the review of the City of Rockingham Town Planning Scheme No 2 in respect of provisions for retail and commercial development.*
- *Guide private sector investment and the City's capital works expenditure.*
- *Provide Council with a sound basis for decision making on development applications, rezoning proposals and the provision and location of future Council services and facilities.*
- *Identify centres and commercial locations requiring particular action, for example, where new ideas such as Community Design Codes<sup>3</sup> may change the urban form of existing structure plans or for the restoration and improvement of established centres.*

The Commercial Strategy identifies a future neighbourhood commercial centre at the intersection of Nairn and Fifty Roads identified as North Baldivis. As detailed above, the proposed commercial zone has been relocated and the City of Rockingham is presently considering an amendment to the District Structure Plan to show the relocated commercial land.

The Commercial Strategy recommends in accordance with the Metropolitan Centres Policy (2000) that the Nairn Road centre should be limited to 4,500m<sup>2</sup>.

## **5.2 City of Rockingham Town Planning Scheme No. 2**

The City of Rockingham Town Planning Scheme No. 2 (TPS2) was gazetted on 19 November 2002.

In accordance with the City of Rockingham TPS2 the subject site is zoned 'Development'.

In reference to the 'Development' Zone, TPS2 states:

*The Council requires a Structure Plan for a Development Area, or for any particular part or parts of a Development Area, before recommending subdivision or approving the development of land within the Development Area.*

An existing District Structure Plan applies to the site, being the Baldivis North District Structure Plan. In discussions with Council staff however, for residential subdivision and development to occur, a local Structure Plan is required applying to the site (refer clause 4.2.4(c) of TPS2).

The land surrounding the subject site is also zoned 'Urban' under the MRS and 'Development' under the City of Rockingham TPS2.



## 6.0 LOCAL STRUCTURE PLAN

### 6.1 Design Rationale

Underlying the subdivision layout proposed in this Structure Plan are the principles and objectives expressed in Liveable Neighbourhoods. Particular attention has been given to Element 1 – Community Design as it states:

*For structure plans and larger subdivisions, the primary measure of compliance is achieving the objectives and requirements of Element 1 - community design. Compliance with the balance of the element objectives and requirements should follow.*

The Structure Plan incorporates a design which seeks an integration of and balance between urban and environmental sustainability outcomes through a functional pattern of residential subdivision with strategically located and usable POS, an efficient movement network which takes into account the existing road hierarchy, transport infrastructure, nearby community facilities and schools, and provides a cyclist and pedestrian friendly street environment.

A copy of the Structure Plan is included as **Annexure E**.

With respect to the staging of development, the detail will be determined at the subdivision stage however indicatively staging is to be in accordance with the plan included as **Annexure F**. Staging is such that a steady release of lots is available to the market and development is undertaken in an orderly manner.

## **6.2 Interface with Existing Site & Surrounding Land**

Element 1 of Liveable Neighbourhoods addresses Community design, in particular R5 outlines the requirement of integration with adjoining development. The requirements detail the need for a proposed Structure Plan area to connect well with existing, committed or proposed development and provide for a sustainable urban structure.

The proposed Structure Plan is consistent with the overall North Baldivis Structure Plan. Further the road design provides east-west road connections through to the recently approved Spires Structure Plan. The Structure Plan has been amended to include opportunity for further road connection surrounding the commercial site. Whilst the Structure Plan for the adjacent Spires Estate may not show all such connections, this Structure Plan provides that opportunity for those connections to be provided.

## **6.3 Commercial Centres**

The proposed District Structure Plan incorporates a proposed Neighbourhood Centre within the north-west portion of the subject site. The approved Spires Structure Plan effectively relocated the neighbourhood centre to Nairn Road being the southern portion of this site. The proposed Structure Plan addresses the Neighbourhood Centre as designated in the District Structure Plan by including development site and higher density grouped dwellings surrounding the original commercial site (on Fifty Road) and the newly located commercial site on Nairn Road. In addition the centre is within walking distance of all the residential zoned land within the Structure Plan area, one of the key elements of liveable neighbourhoods in accordance with Element 7.

#### **6.4 Natural Features**

As stated previously in the report, the site is uncleared and consists of remnant vegetation. It is noted that the Bush Forever site database does not identify any sites on the subject land. The natural vegetation which does exist reflects that of the Bassendean system typical of this area and consists of low woodland of Banksia with scattered Jarrah.

The designated POS area of approximately 1.2 ha is to be located on Eighty Road which is consistent with the proposed location under the District Structure Plan. It is proposed, at the time of subdivision, to undertake a survey of trees on site to enable carriageway locations to be selected which provide the opportunity to preserve significant trees.

#### **6.5 Street Block Layout & Street Network**

The design of streets is a key element in integrating the neighbourhood as it is pivotal in encouraging social interaction, public safety and amenity and is also a determinant of the level of quality thereof. Developments maintain frontage to the street in order to facilitate passive surveillance of activity within streets, create visual interest and also provide exposure for commercial viability in the proposed local centre.

The arrangement of streets and lot layout have also been designed to encourage energy efficiency by enabling the orientation of lots in a north-south and /or east-west direction.



The proposed street layout has largely been determined by the major north-south running road bisecting the Structure Plan area; the limited access onto this District Distributor bisecting the site has resulted broadly in two confined residential pockets which are linked internally. A north-south running pedestrian access way linking northern lots with the south will increase pedestrian connectivity and access to the POS. In addition in accordance with discussions with the City portions of path have been upgraded to 'shared use' paths.

A Transport Assessment Report was prepared for this site and has been included in **Annexure H**.

#### **6.6 Transport Corridors for Pedestrians & Cyclists**

This Structure Plan further caters for a safe universal pedestrian and cyclist environment with pathways linking the neighbourhood and associated local park, as well as providing for external connectivity to areas outside of the site.

Pedestrian-friendly measures by way of cul-de-sacs, regularly spaced junctions, and controlled access to residential pockets on either side of the District Distributor will facilitate the reduction in traffic and speeds of vehicles to promote a more walkable and cyclist friendly residential neighbourhood.

This Structure Plan, as included in **Annexure E** illustrates the proposed pedestrian/cycle network. The plan provides for residents to have direct pedestrian and cycle routes connecting the Baldivis Primary School, local parks and adjoining residential areas.

## 6.7 Public Transport

Bus services are provided by the Southern Suburbs Railways at Wellard, Rockingham and Warnbro Stations. Wellard and Rockingham stations also provide an integrated interchange with surrounding bus services. These stations provide park and ride facilities and are 4-5kms from the Baldivis site however they are linked to the Transperth bus network which will in future be linked with Fifty Road and Nairn Road.

Currently bus services are not available on Fifty or Eighty Roads. Access to Rockingham by bus is available from Safety Bay Road which is approximately four kilometres to the south. It is anticipated that bus services will be extended to Fifty Road and Nairn Road as the area becomes further urbanised.

## 6.8 Traffic Movement

The subject land is centrally divided by the proposed Nairn Road, which is described as an "Other Regional Road" under the Metropolitan Region Scheme.

Access points on to Eighty Road Baldivis have been provided, similarly, access points on to adjoining Lot 312 have also been provided following consultation with the consultants representing that landowner.

A Transport Assessment has been prepared by Tarsc, refer **Appendix H**. The traffic assessment concludes that:

- Traffic flows are not expected to exceed the indicative maximum acceptable daily flow rates on any of the roads bordering the proposed development.
- Investigation of the Nairn Drive and East West Road intersection during the AM peak flow revealed that the queues on the western approach are expected to be 13m/2 vehicles at worse, this being acceptable.

- Investigation of the intersection of Fifty Road and Eighty Road was that the intersection is expected to operate at a level of service B/E on the Eighty Road approach with vehicles able to undertake right turns through the intersection in a single stage through an assumed 2m wide median incurring a 28s delay and queue length of about 3 vehicles.
- In regard to the impact of the development on the local area, based upon the assessment it was concluded that the development will have an acceptable impact on the surrounding roads and intersections.
- Most traffic flows on internal roads are in the order of 100 to 400 vehicles per day, with the only exception near the commercial centre development site where volumes are expected higher due to the commercial development.
- The proposed development will generate in the vicinity of 2,000 vehicle trips per day.
- There are good pedestrian footpaths currently and proposed on all sides of the proposed development with access to public transport.
- The impact of the traffic volumes associated with the development are considered acceptable in the longer term with increases in traffic flows to 2031.

## **6.9 Residential Densities and Population**

The subdivision predominantly features a minimum Residential Density Coding of R20 across the site whilst also allowing for R25, R30 and R40 densities as shown by Plan 1. The provision of a diversity of housing choices in locations suited to medium density development has been contemplated in this design in recognition of population differences in respect of housing affordability, lifestyle and age differences.



The locations for medium density development to the south of the site, includes a site adjacent to the local neighbourhood centre as well as to the southeast surrounding the public open space and adjacent to the public open space and Fifty Road to the north. Lots are designed in either a north-south or east-west orientation for the purposes of maximising solar access to dwellings. Lots are also orientated to directly front the area of POS to the southeast of the site. The Structure Plan Area will house approximately 215 to 250 new dwellings. Based on an average household size of 2.91 persons per dwelling (per 2011 ABS Census Data) the Structure Plan Area will house approximately 600-700 new residents. This will go some way in assisting the South-west sub-region's target under Direction 2031 to provide an additional 41,000 new dwellings for an additional 70,000 new residents by 2031.

The Structure Plan is within area "BA1" of the *Outer Metropolitan Perth and Peel Sub-Regional Strategy* and this total area of "BA1" is projected to accommodate 3,900+ dwellings assuming a 'Connected City' development model of 15 dwellings per gross urban zoned hectare or 3,100 dwellings based on a 'business as usual' scenario of 10 dwellings per gross urban zoned hectare.

In regard to this Structure Plan

Structure Plan area	15.11 hectares
Gross Urban zoned land (excluding the land designated as 'Other Regional Roads')	13.522 ha

<b>Directions 2031 scenario</b>	
Connected City @ 15 dwellings per gross urban zone	202 dwellings
Business as usual @ 10 dwellings per gross urban zone	135 dwellings
Estimated dwelling yield 215-250 dwellings	Targets achieved

<b>Liveable Neighbourhoods</b>	
Urban hectare (excluding all roads, open space and centres)	8.6 hectares
Minimum of 15 dwellings per urban hectare	129 dwellings
Target of 22 dwellings per hectare	189 dwellings
Estimated dwelling yield 215-250 dwellings	Targets achieved

#### 6.10 Schools & Community Facilities

There are several schools and other existing community facilities servicing the Baldivis area; as such there are no additional schools and community facilities required to be included as part of this Structure Plan. The Structure Plan area is conveniently located within walking distance to the north of the existing Baldivis Primary School on Fifty Road, and is also in close proximity to other nearby secondary and tertiary institutions, including Tranby College, Mandurah Christian Community School, Kolbe Catholic College, as well as Challenger Institute of Technology, Rockingham (formerly TAFE) and Murdoch University Campuses.

The scope of choice and high degree of access enjoyed by future residents to these education facilities will be a significant contributor to achieving a sustainable urban development as it reduces the need for commuting across the Perth metro area to other institutions. The proximity of the site to a primary school, for instance, will reduce the need for the private vehicle during peak traffic periods and instead encourage walking, cycling and use of public transport.

## 6.11 Public Open Space

The provision of a minimum of 10 per cent public open space being provided in accordance with the WAPC's Liveable Neighbourhoods. Public open space is to be provided generally in accordance with Plan 1 (Appendix E) and Table 1 below. For reference purposes a public open space plan is provided in Figure 4 which identifies each of the reserves and the drainage basins/swales within the public open space reserves.

Public open space will be developed to a high standard to ensure high levels of amenity for both surrounding residents as well as to generally enhance the area for other park users.

As illustrated in **Annexure E** and Figure 4, a large POS reserve is proposed to the southeast of the site in addition to a pocket of POS in the north-west serving a secondary purpose of accommodating drainage. In addition, the Structure Plan provides another reserve in the southwest corner, which serves a primary purpose of accommodating drainage. However the POS reserve in the south-west corner is not proposed to be credited as public open space, rather, it is proposed that this would be ceded as a drainage reserve.

As illustrated in Table 1, and pursuant to R4 of Element 4 of Liveable Neighbourhoods, a minimum of ten per cent (10%) open space is provided including restricted use public open space comprising dry drainage basin/swales on the eastern park (DB1) and North West public open space (DB3). In accordance with R33 of Element 4, those two land aspects are appropriately classified as 'restricted use public open space' as they comprise urban water management drainage areas, and:

- the areas are not subject to inundation more frequently than a one year average recurrence interval rainfall event and do not present a safety hazard;
- Their respective areas are contoured, unfenced and grassed; and
- Their respective areas form part of an appropriate management plan (refer to **Annexure L** being the Local Water Management Strategy).



**Table 1: Public Open Space Schedule**

Site Area			15.11 ha
Net Site Area			15.11 ha
<b>Deductions</b>			
Commercial Southern extent of Structure Plan area	0.2040 ha		
POS/Drain Reserve (DB2) South-west corner of Structure Plan area	0.1049 ha		
Arterial Road (Proposed Nairn Road – MRS: Other Regional Road)	1.5880 ha		
<b>Sub total</b>		<b>1.8969 ha</b>	
<b>Gross Subdivisible Area</b>			<b>13.2131 ha</b>
Public Open Space @ 10%			1.3213ha
<b>Public Open Space contribution</b>			
May comprise			
• Minimum 80% unrestricted public open space		1.0570 ha	
• Maximum 20% restricted use public open space		0.2640 ha	
<b>Unrestricted POS</b>			
North – west park (1038m <sup>2</sup> – 340m <sup>2</sup> drainage being DB3)		0.0698 ha	
Eastern Park (12300m <sup>2</sup> – 1845m <sup>2</sup> drainage being DB1)		1.0455 ha	
<b>Total Unrestricted POS</b>			<b>1.1153 ha</b>
<b>Restricted POS</b>			
Drainage on eastern park (DB1)		0.1845 ha	
Drainage on North West park (DB3)		0.0340 ha	
<b>Total Restricted POS</b>			<b>0.2185 ha</b>
<b>TOTAL POS</b>			<b>1.3338 ha</b>
<b>% Public Open Space</b>			<b>10.09%</b>

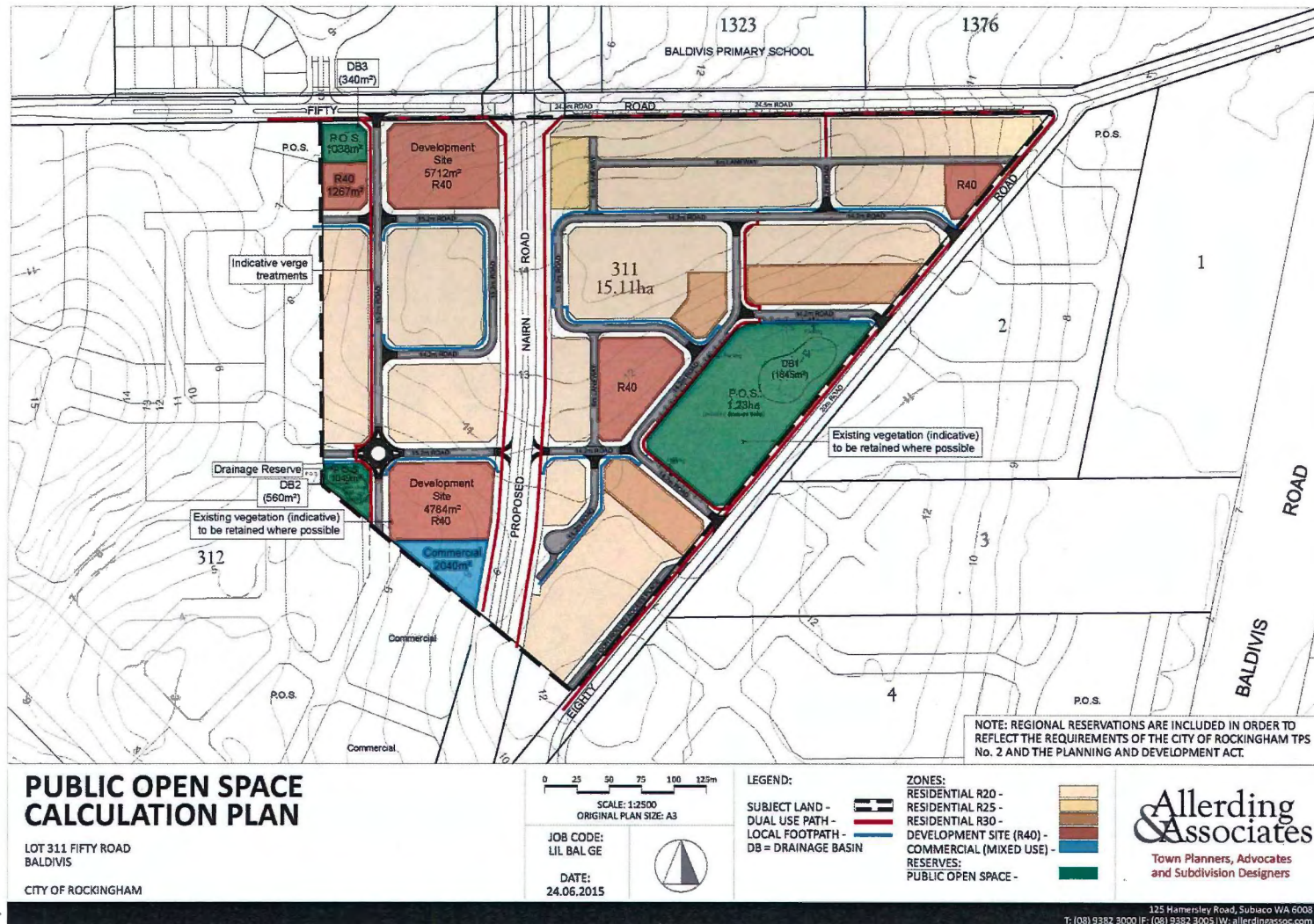


Figure 4: Public Open Space Calculation Plan

In accordance with R14 of Element 4, the Structure Plan will provide a neighbourhood park of 1.23ha, within safe walking distance of all dwellings. The park will contain stands of retained native vegetation and be grassed and reticulated and the size of the proposed reserves will allow for a combination of both passive and active recreational needs of future residents.

The public open space will be contributed free of cost by the developer at the subdivision stage and landscaped accordingly. POS is an important community feature of the Structure Plan in terms of enhancing local amenity in providing for locally accessible active and passive recreational needs of future residents.

The area of open space will be surrounded by adjacent lots orientated to face the park which will promote a high degree of safety through passive surveillance, and is conveniently located for the residents it is intended to serve. As already noted in previous sections, part of the remaining bushland will be incorporated as part of the open space to be provided in the development of the land, thereby facilitating the conservation of remnant vegetation.

Furthermore, notwithstanding the environmental assessment of the potential impact of the operations of the Layertech Chicken Hatchery confirmed there will be no adverse impact on the amenity of the future residents in the proposed residential and rural-residential area, the strategic location of the proposed POS area will act as an additional buffer between future residential dwellings and the hatchery.

In summary the required 10% public open space has been identified in the Structure Plan. The reserves provided allows for both passive and active public open space within the Structure Plan area. The areas to be used for drainage in two of the reserves will be landscaped and their drainage function will be temporary in nature and therefore they have been included as restricted public open space. The south-western reserve has not been identified as public open space and accordingly will be ceded as a drainage reserve, with no credit as public open space.



The public open space provided is consistent with the requirements and objectives of *Liveable Neighbourhoods*.

## **6.12 Planning for Bushfire Protection**

A Bushfire Hazard Assessment (FirePlan WA) was prepared as part of the Structure Plan and a copy of this is included as **Annexure I**.

As requested by the Western Australian Planning Commission a subsequent Bushfire Management Plan was also prepared and a copy of this is included in **Annexure J**.

Whilst the site does contain vegetation, as the site is developed, the vegetation is removed in advance of the subdivision and accordingly the bushfire hazard will reduce.

The Bushfire Attack Level (BAL) has been calculated for the site and is divided into three distinct areas. The highest BAL applicable is BAL 29 for the lots in the north east corner that are opposite the existing native vegetation on the recreation/parkland reserve on the northern side of Fifty Road. As noted in the Assessment, the distance of the proposed dwellings to retained vegetation is to be managed to the Bushfire Protection Zone standards detailed in the Bushfire Management Plan.

The Assessment identifies that the distance of the proposed dwelling to retained vegetation can consist of the front setback of a lot to the dwelling and the road reserve. In the areas adjoining the POS reserve, areas with retained vegetation can achieve the 20 metres from the front setback and the road reserve and a narrow strip within the POS providing it is landscaped to achieve the required distance and compliance with the Building Protection Zone standards.

Following the Structure Planning, where retained vegetation influence the BAL rating, all dwellings within 100 metres of the vegetation must be constructed to AS 3959, giving due consideration to when adjoining areas to the west, south and east of Fifty Road are to be developed as urban residential.

Each stage of land release is to have two access/egress public roads. Fire hydrants are to be installed in each stage of land release in accordance with the Bushfire Management Plan.

The Bushfire Management Plan details implementation and responsibilities for ensuring that the subdivision and development of the Structure Plan area meets the minimum criteria of the WAPC Bushfire Protection Guidelines, Edition 2, 2010. These guidelines will be implemented as part of the future subdivision of the Structure Plan area.

Part 1 of The Structure Plan includes specific requirements relating to notifications on Title, Detailed Area Plan requirements and other requirements in accordance with the Bushfire Management Plan.

## **7.0   SERVICING OVERVIEW**

VDM consultants have been appointed and have prepared an Engineering Services Report which is included as **Annexure K** of this report.

This report includes a site evaluation and description and will and details regarding bulk earthworks and supply for water, power, street lighting telecommunications and gas supply.

### **7.1   Sewer Connection**

The site falls within the catchment area of the Baldivis North Pumping station, Water Corporation has a sewer line running along Fifty Road. The Water Corporation has also advised that a 375mm high pressure pipeline will be constructed through Lot 311 along the Nairn Ave. road reserve. This main will connect between the Brownell Crescent Sewerage Pump Station and the Baldivis Sewerage Pump Station.

Provision has been established for wastewater from the locality to be treated at the Water Corporation's Thomas Road treatment facility. Detailed future investigations will be required at the time of subdivision to determine engineering and design requirements to accommodate the development of the site.

### **7.2   Water Reticulation**

Water Corporation plans highlight that the Baldivis North Structure Plan area is serviced by mains water. A water main currently runs along Eighty Road, it is proposed that the site will be serviced from the Water Corporation's Tamworth Hill reservoir on Eighty Road.



### **7.3 Power**

Power will be extended within the Structure Plan area during subdivision development.

### **7.4 Westnet Energy Gas Network**

We are advised that there are no WA Gas Networks underground assets / pipes present in the vicinity of the site.

### **7.5 Drainage**

The principles to be implemented with respect to drainage are outlined in the VDM Engineering Report included as **Annexure J**. This is to be read in conjunction with the Local Water Management Strategy included in **Annexure L**. More detailed consideration will be given, where required, as part of an Urban Water Management Plan at the subdivision stage.

Section 4 of the report deals with stormwater management and should be read in conjunction with the Local Water Management Strategy which is more detailed in regard to this matter:

Comment raised by the City in the advertising period request revision to the soakage overflow into the Rockingham Lakes Regional Park be revised. This matter was discussed with the City's Environmental Planning Services who advised that this was raised in error and that the City's Environmental Planning Services was satisfied with the stormwater strategy and management system.

In regard to the Engineering Services Report (dated 2013) concern was raised by the Department of Water (DoW) in regard to the non potable irrigation source for the public open space. After discussion with the DoW staff, a licence application to Take Groundwater was lodged with the Department of Water and a licence has been issued for irrigation of the public open space and dust suppression measures for the subdivision works. Therefore this demonstrates that there is sufficient groundwater allocation to support the POS irrigation within this development.

#### **7.6 Roadworks**

The future Nairn Road bisects the site and has been accommodated in the Structure Plan design. This road will be major local distributor and access to the road has been minimised.

No existing roads exist within the site. The future internal roads will be constructed to current urban standard in accordance with City of Rockingham requirements.

## 8.0 LOCAL WATER MANAGEMENT STRATEGY

The Peritas Group consultants were appointed and prepared a Local Water Management Strategy which is included as **Annexure L** of this report.

### 8.1 Water Sensitive Urban Design (WSUD) Initiatives

As mentioned previously WSUD can be achieved through several initiatives surrounding water conservation, stormwater management and groundwater management. The following initiatives are proposed to be:

#### *Water Conservation*

- Upon subdivision and development of the Structure Plan area waterwise landscaping packages for residential lots could be implemented incorporating waterwise plants, increased soil quality improving water and nutrient retention, and efficient irrigation techniques; and
- Education of the future residents in waterwise measures.

#### *Stormwater Management*

- The implementation of drainage design ensuring storage and infiltration onsite; and
- Maximising the infiltration onsite through the incorporation of infiltration basins within the POS areas where practical and reasonable to do so. These areas will consist of planted vegetation to encourage nutrient and suspended soils uptake.

#### *Groundwater Management*

- Ensuring adequate treatment of inundation areas and/or infiltration basins in regards to landscaping so as to strip the nutrients prior to infiltration;
- Limiting fertiliser use within POS areas; and
- Educate future landowners at a later stage to ensure responsible and limited use of fertilisers.



## **8.2 Total Water Cycle Management – Principles and Objectives**

Total Water Cycle Management within an urban context is also referred to as Water Sensitive Urban Design (WSUD). WSUD within the proposed local Structure Plan is achieved through design and the development and maintenance of the urban water system with the following WSUD principles in mind as per the Better Urban Water Management Guidelines:

- Protection and enhancement of natural water systems within urban developments;
- The integration of stormwater management within the urban landscape;
- Protecting the quality of urban water runoff to minimise the spread of pollutants as well as managing the amount of urban water runoff through local detention measures; and
- Minimise drainage infrastructure costs.

## **8.3 Surface Water quantity and quality**

There are no permanent water bodies on the subject site. The nearest wetlands are Kerosene Lane Swamp and Lake Cooloongup, both are conservation category wetlands identified within the Environmental Protection (Swan Coastal Lakes) Policy 1992. The proposed Structure Plan will not have an adverse impact on either wetland.

## **8.4 Urban Water Management Plan**

The matters proposed to be considered at the subdivision stage within a Urban Water Management Plan (UWMP) include:

### *Water Conservation*

- The provision of further details on waterwise landscaping to be implemented on residential lots and information packages for landowners;

*Stormwater Management*

- Detailed drainage design and planning of the subdivision area; and
- Details of landscaping in regards to POS areas.

*Groundwater Management*

- Confirmation of finished lot levels;
- Details of landscaping and education packages provided to landowners;
- Detailed designs in regards to swale and basin design, landscaping, vegetation and soils within the POS area;
- Undertake further site investigations including contamination if required to the satisfaction of the DEC; and
- Consideration of the soil types and amendments if required.

Furthermore any modelling to be undertaken onsite will occur at the Subdivision Stage and addressed by an Urban Water Management Plan (UWMP) and may include groundwater monitoring as well as stormwater modelling, dependant on DoW requirements.

## 9.0 Road Transport Noise and Noise Mitigation

In accordance with the Western Australian Planning Commission's Statement of Planning Policy 5.4 *Road and Rail transportation Noise and Freight Considerations in Land Use Planning* (SPP5.4), an acoustic assessment of traffic noise has been carried out for the Structure Plan. The purpose of this assessment was to assess noise received at future dwellings within the Structure Plan area from vehicles travelling on the surrounding road network, specifically the proposed extension to Nair Road.

SPP5.4 identifies a 'noise limit' which sets out acceptable noise levels for residential use. Noise modelling indicates that without any noise amelioration, noise received at the residence located adjacent to Nairn Road would exceed the 'noise limits.' In order to address this, a 2.2m high barrier located at the boundary of the Nairn Road reserve is recommended, together with lots requiring "quiet house" design and notifications on title. Specific details of the extent and location of the barrier fence is provided in Appendix B of the Acoustic Assessment (which is contained in Appendix M of the Structure Plan.) Specific details of those dwellings requiring quiet design is provided in Appendix D of the Acoustic Assessment (which is contained in Appendix M of the Structure Plan.)

It is noted that under SPP5.4 that for those dwellings where noise would exceed the 'noise limit,' notification of this will be identified on the titles, provision is made for this is Part 1 of this Structure Plan.

Dwellings located in areas that exceed the 'noise limit' will also have to comply with construction standards (glazing, fencing, fittings) as explained in the Acoustic Assessment (Appendix M) and such standards are provided in Appendix E of the Acoustic Assessment.



## 10.0 CONCLUSION

This document provides the general planning framework for guiding the future subdivision and development of the Lot 311 Fifty Road, Baldivis into an integrated residential estate.

We understand that Lot 311 Fifty Road, Baldivis, unlike surrounding land, has not been utilised for intensive horticultural activities and does not present issues associated with contamination from such activity. The site is zoned Urban under the MRS and subject to a regional road reserve, at a local scheme level it is designated for future development within a Development zone.

Comprehensive predevelopment planning for the area, such as the Baldivis North Structure Plan, provides for residential development on the site, as well as designating a significant portion of the land for a local neighbourhood centre with overall potential for 5,500m<sup>2</sup> of floor space.

The site is strategically well located, with high access to infrastructure services due to urban development which has taken place to the north of Fifty Road. There are no identified environmental aspects posing constraints on the development potential of the land. There are no wetlands present, and although a significant amount of original vegetation remains on site, it has not been designated as a Bush Forever site.

It is noted that the Layertech Chicken Hatchery on Lot 3 Eighty Road is located opposite the subject site. As outlined in this report and the attached odour report by The Odour Unit, a buffer area is required around this site which marginally intrudes into Lot 311 and places some constraints on the development of the site.

However this has been responded to by the location of the POS where such a buffer has been identified. No residential land is therefore identified in the buffer area. Further details are provided in the RPS / The Odour Unit, Odour Impact Assessment report associated with this Structure Plan.

It is not anticipated that the presence of acid sulphate soils will constrain the structure planning process, measures will however be required to be put in place to address this issue upon subdivision/development of the land.

A Bushfire Hazard Assessment was undertaken and at the request of the Western Australian Planning Commission a Bushfire Management for the site has been prepared and now forms part of the technical reports for the Structure Plan.

VDM were appointed and have prepared an engineering services report with drainage details. In addition a Local Water Management Strategy has also been prepared by the Peritas Group, as requested by the Western Australian Planning Commission.

Lastly an acoustic assessment has been prepared which addresses SPP5.4 in relation to Road noise from future Nairn Road and the recommendations from that assessment are reflected in this Structure Plan.

This Structure Plan Report provides an overall context for the development of Lot 311 as a fully integrated residential locality. The report provides justification for the purpose of advertising and subsequent endorsement of the Structure Plan by the City of Rockingham and the Western Australian Planning Commission (WAPC).

**ANNEXURE A**  
**CERTIFICATE OF TITLE**

WESTERN



AUSTRALIA

REGISTER NUMBER	
311/DP202704	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
1	8/3/2007

**RECORD OF CERTIFICATE OF TITLE**  
UNDER THE TRANSFER OF LAND ACT 1893

VOLUME 1170  
FOLIO 618

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

*R. Roberts*

REGISTRAR OF TITLES

**LAND DESCRIPTION:**

LOT 311 ON DEPOSITED PLAN 202704

**REGISTERED PROPRIETOR:**  
(FIRST SCHEDULE)

LEO ANTHONY TSAKNIS OF 27 FORTVIEW ROAD, MOUNT CLAREMONT  
AS EXECUTOR OF THE WILL OF GEOFFREY DOUGLAS ROLAND LILBURNE WHO DIED ON 25/7/2006  
LEAVE BEING RESERVED FOR DAVID DOUGLAS ROLAND LILBURNE TO COME IN AND PROVE  
(TA K103790 ) REGISTERED 28 FEBRUARY 2007

**LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:**  
(SECOND SCHEDULE)

1. K103789 THIS EDITION WAS ISSUED PURSUANT TO SECTION 75 OF THE TLA. REGISTERED 28.2.2007.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.  
\* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.  
Lot as described in the land description may be a lot or location.

-----END OF CERTIFICATE OF TITLE-----

**STATEMENTS:**

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND: 1170-618 (311/DP202704).  
PREVIOUS TITLE: This Title.  
PROPERTY STREET ADDRESS: LOT 311 FIFTY RD, BALDIVIS.  
LOCAL GOVERNMENT AREA: CITY OF ROCKINGHAM.

- NOTE 1: A000001A LAND PARCEL IDENTIFIER OF PEEL ESTATE LOT 311 (OR THE PART THEREOF) ON SUPERSEDED PAPER CERTIFICATE OF TITLE CHANGED TO LOT 311 ON DEPOSITED PLAN 202704 ON 09-MAY-02 TO ENABLE ISSUE OF A DIGITAL CERTIFICATE OF TITLE.
- NOTE 2: THE ABOVE NOTE MAY NOT BE SHOWN ON THE SUPERSEDED PAPER CERTIFICATE OF TITLE OR ON THE CURRENT EDITION OF DUPLICATE CERTIFICATE OF TITLE.





Superseded - Copy for Sketch Only

EASEMENTS AND ENCUMBRANCES REFERRED TO.

*allative to Mortgage stamped in all 1-2-6.*  
*Mortgage 6971/1956 Kenneth John Smith*  
*Registered 1<sup>st</sup> August 1956 at 9.17.0*

**DISCHARGED**

*English Scottish and Australian Bank Limited*

*Discharge 8680/1961 of Mortgage 6971/1956 Registered 18<sup>th</sup> September 1961 at 9.17.0*

ASSISTANT REGISTRAR OF TITLES

*R. J. Brown*

*Mortgage 8361065 to Bank of New South Wales Registered 29<sup>th</sup> June 1977 at 9.07.0*



CT 1170 0618 B



CROWN GRANT

Vol..... Fol.....

**ANNEXURE B**  
**LOCATION PLAN**





## LOCATION PLAN

LOT 311 FIFTY ROAD  
BALDIVIS  
CITY OF ROCKINGHAM

0 2 4 6km

SCALE: 1:160 000  
ORIGINAL PLAN SIZE: A4

JOB CODE:  
LIL BAL GE

DATE:  
18.08.2011



**Allerding  
& Associates**

Town Planners, Advocates  
and Subdivision Designers

125 Hamersley Road, Subiaco WA 6008

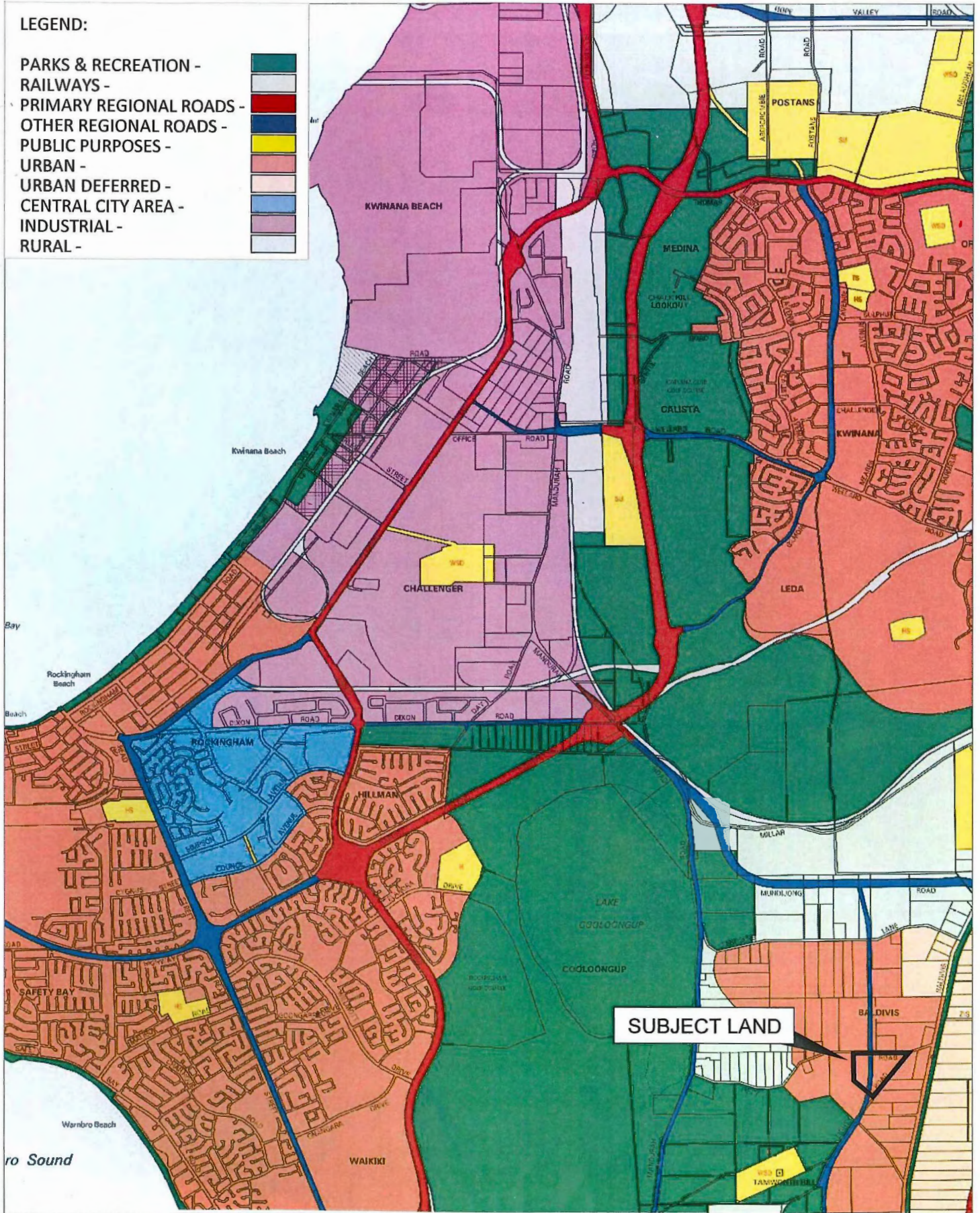


**ANNEXURE C**  
**MRS PLAN**



# LEGEND:

- PARKS & RECREATION -
- RAILWAYS -
- PRIMARY REGIONAL ROADS -
- OTHER REGIONAL ROADS -
- PUBLIC PURPOSES -
- URBAN -
- URBAN DEFERRED -
- CENTRAL CITY AREA -
- INDUSTRIAL -
- RURAL -



## METROPOLITAN REGION SCHEME

LOT 311 FIFTY ROAD  
BALDIVIS

CITY OF WANNEROO

0 50 100 150 200m

SCALE: 1:50 000  
ORIGINAL PLAN SIZE: A4

JOB CODE:  
LIL BAL GE

DATE:  
21.05.2013



Allerding  
& Associates

Town Planners, Advocates  
and Subdivision Designers

125 Hamersley Road, Subiaco WA 6008



**ANNEXURE D**

**BALDIVIS NORTH DISTRICT STRUCTURE PLAN**



## Precinct 2

400m walkable catchment

Proposed primary school and associated active public open space

Walkable Catchment Node

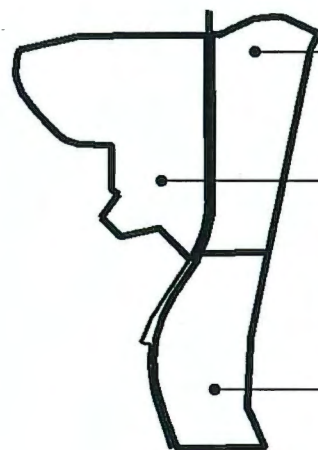
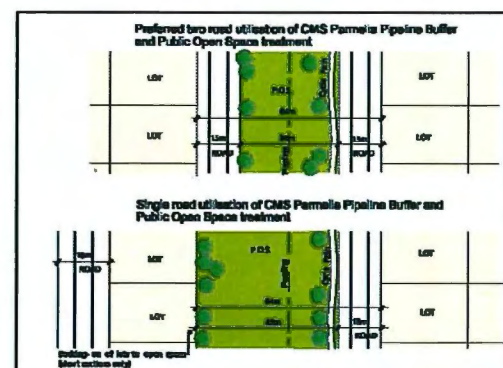
Dress Circle Lots - opportunity to design to capture long distance rural aspects

400m walkable catchment to Neighbourhood Centre

Neighbourhood Centre 5500m<sup>2</sup> n/a max.

Significant Tuart trees to be protected, widen road reserve to accommodate in verge

Existing wetland to be modified to create permanent lake and drainage feature encompassed within Public Open Space



PRECINCT 1.	
Total Area	123.21ha
Deductions	
Baldyvis Primary School	1.17ha
Wetland Buffer	2.20ha
Neighbourhood Centre	0.30ha
Community Facilities	0.30ha
MD	0.30ha
TOTAL	117.04ha
Total Developable Area	117.04ha
Public Open Space Requirement (10%)	11.71ha
Public Open Space Provided	11.71ha (100%)
PRECINCT 2.	
Total Area	184.75ha
Deductions	
Primary School	1.17ha
Wetland Buffer	2.20ha
Neighbourhood Centre	0.30ha
Community Facilities	0.30ha
MD	0.30ha
TOTAL	171.44ha
Total Developable Area	171.44ha
Public Open Space Requirement (10%)	17.14ha
Public Open Space Provided	17.14ha (100%)
Note: 50% credit only for areas within CMS 32m buffer subject to development. Refer section 8.3	
PRECINCT 3.	
Total Area	114.18ha
Deductions	
Wetland Buffer	2.20ha
MD	0.30ha
TOTAL	108.79ha
Total Developable Area	108.79ha
Public Open Space Requirement (10%)	10.88ha
Public Open Space Provided	13.33ha (12.2%)
Note: 50% credit only for areas within CMS 32m buffer subject to development. Refer section 8.3	

### LEGEND

- NEIGHBOURHOOD CENTRE - RETAIL CORE
  - NEIGHBOURHOOD CENTRE - MIXED USE
  - COMMUNITY FACILITIES
  - MEDIUM DENSITY HOUSING
  - WALKABLE CATCHMENT NODE
- Potentially includes a retail (corner store) max. 150m diam, medical centre, day care centre, community facility etc.

# See Modified Plan on Page 2

## Precinct 1

Suggested location of Lunch Bar in proposed Light Industrial Area

Potential Rural Service Store site

Dress Circle Lots - opportunity to design to capture rural aspect to east

Design on south side of Kerosene Lane should recognise use of land north of Kerosene Lane for Light Industry Landmark Public Open Space site. Public viewpoint on high point

400m walkable catchment to potential Rural Store

Community Facilities site

Public Open Space encompassing high point

Walkable Catchment Node

Approved subdivision area, western half affected by poultry farm buffer and pending reconsideration request

Existing Public Open Space containing District Level active and organised recreation

400m walkable catchment to local shopping

Pedestrian link between Tramway reserve and Tamworth Hill

400m walkable catchment

Public Open Space to preserve remnant bushland

Retain section of Fifty Road as services corridor

## Precinct 3

Walkable Catchment Node

Proposed Coastal Christian Church community facilities site

400m walkable catchment

Former "Tramway" reserve

Walkable Catchment Node

Unconstructed road. Reserve to be closed

800m walkable catchment to Baldyvis District Centre

Tamworth Hill Swamp Wetland is 'conservation' category wetland protected in public open space and utilised for drainage incorporating water sensitive design techniques

Public Open Space to preserve some remnant bushland and provide centrally located recreation opportunity for residential catchment

Walkable Catchment Node

Roads and road reserves and public open space within CMS buffer (see detail diagram insert)

400m walkable catchment

0 100 200 300 400 m



Fig.No.16

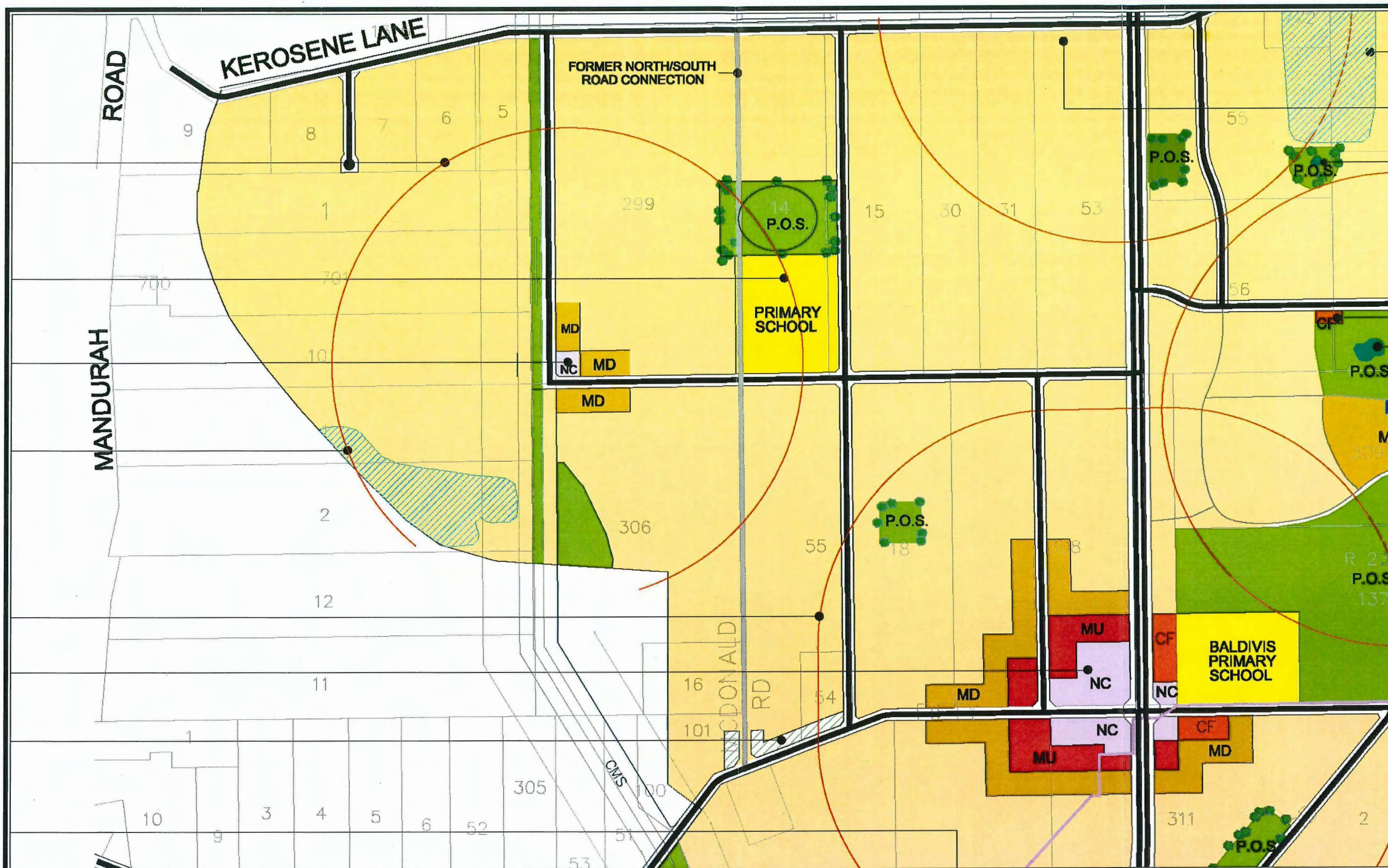


Taylor Burrell

Town planning and design

187 Roberts Road Subiaco  
WA 6008 West Perth  
Western Australia 6007  
Telephone (09) 382 5911  
Facsimile (09) 382 4586





Allerding  
Associates

0 50 100 150 200 250 300m  
SCALE 1:6000  
ORIGINAL PLAN SIZE: A3

DRAWING NUMBER:  
NLV ROC SP

DATE:  
26.09.2006

310A Newcastle Street, Perth W.A. 6000  
PH: (08) 9328 5555 FAX: (08) 9328 5559  
www.planningwa.com



apcc  
Australian Association of Planning Consultants

**PROPOSED MODIFICATIONS TO  
BALDIVIS (North) DISTRICT  
STRUCTURE PLAN - Option 2**

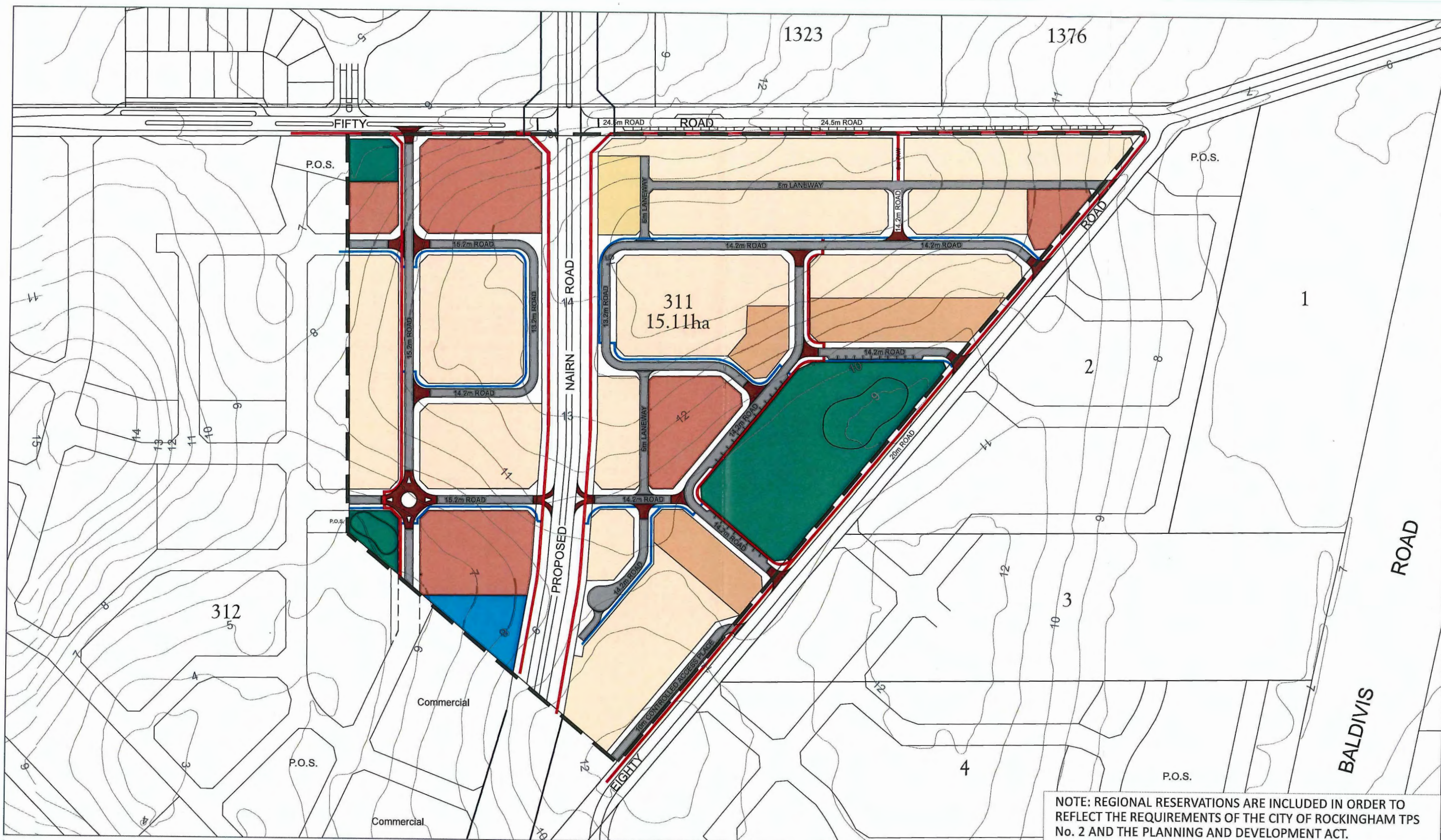
**LOTS 1, 3, 700 & 703 MANDURAH ROAD  
BALDIVIS  
for National Lifestyle Villages**



**ANNEXURE E**

**PROPOSED LOCAL STRUCTURE PLAN**

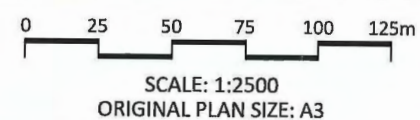




## PROPOSED STRUCTURE PLAN

LOT 311 FIFTY ROAD  
BALDIVIS

CITY OF ROCKINGHAM



JOB CODE:  
LIL BAL GE

DATE:  
02.09.2015



LEGEND:

Other elements that inform the LSP

SUBJECT LAND - 

DUAL USE PATH - 

LOCAL FOOTPATH - 

**ZONES:**

RESIDENTIAL R20 -  
RESIDENTIAL R25 -  
RESIDENTIAL R30 -  
RESIDENTIAL R40 -  
COMMERCIAL -  
RESERVES:  
PUBLIC OPEN SPACE -



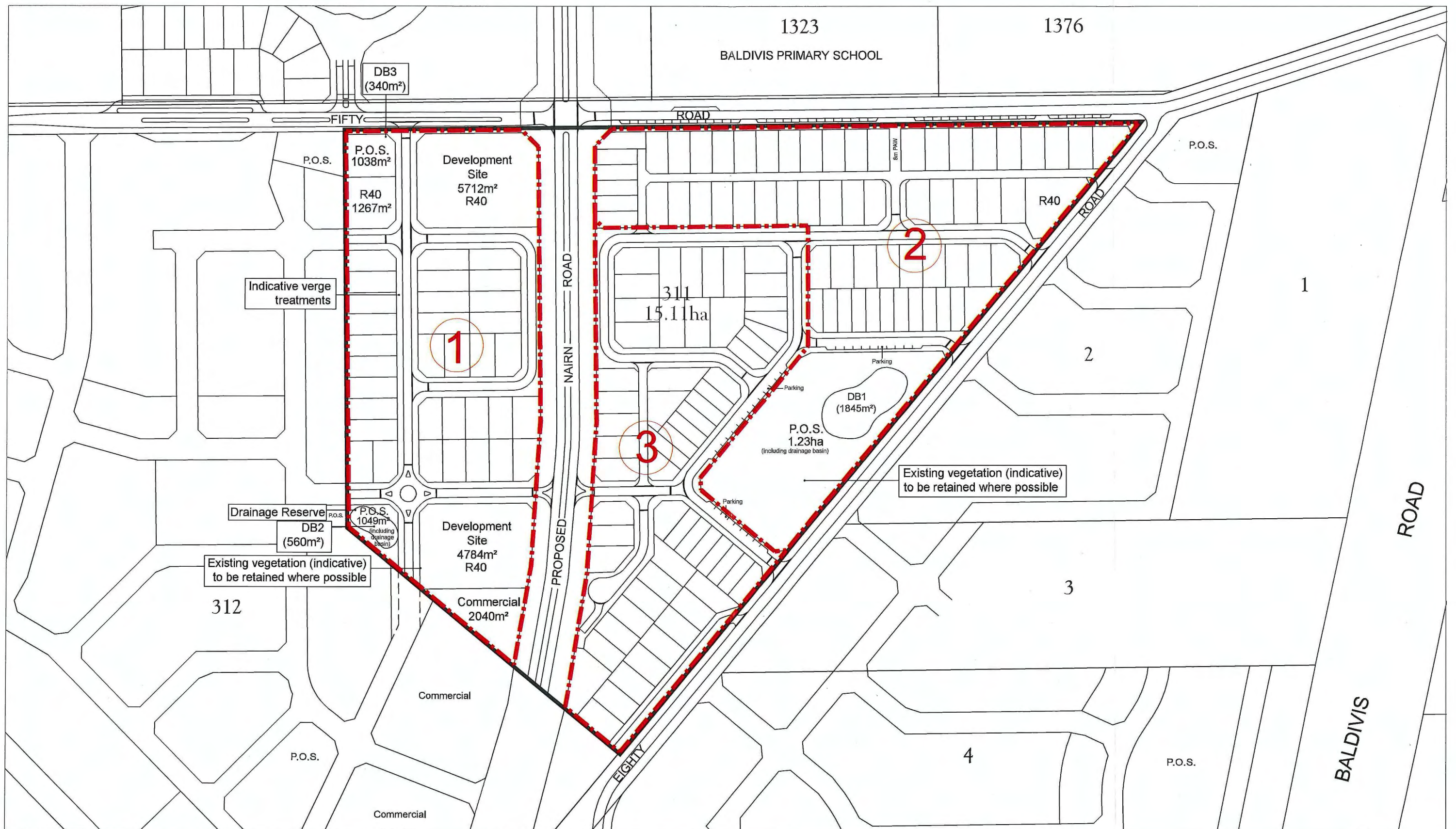
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& Associates

## Town Planners, Advocates and Subdivision Designers

125 Hamersley Road, Subiaco WA 6008  
T: (08) 9382 3000 | F: (08) 9382 3005 | W: [allerdingassoc.com](http://allerdingassoc.com)



**ANNEXURE F**  
**PROPOSED STAGING PLAN**



# STAGING PLAN

LOT 311 FIFTY ROAD  
BALDIVIS

CITY OF ROCKINGHAM

0 25 50 75 100 125m

SCALE: 1:2500  
ORIGINAL PLAN SIZE: A3

JOB CODE:  
LIL BAL GE

DATE:  
25.09.2014



## LEGEND:

SUBJECT LAND -  
STAGING BOUNDARY -  
STAGING NUMBER -



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Town Planners, Advocates  
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125 Hamersley Road, Subiaco WA 6008  
T: (08) 9382 3000 | F: (08) 9382 3005 | W: allerdingassoc.com



## **ANNEXURE G**

### **THE ODOUR UNIT REPORT**



THE ODOUR  
UNIT 

**RPS**

---

**Odour Impact Assessment &  
Dispersion Modelling Study**

---

Layertech Services  
Baldivis W.A.

**Final Report**  
**April 2010**



**THE ODOUR UNIT (WA) PTY LTD**

**ACN 126 439 076**

**Perth, Western Australia  
Showroom 1  
16 Hulme Court  
Myaree, WA, 6154**

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Project Number: W1542L

Report Revision		
Revision Number	Date	Description
Draft Report (version 1)	09.02.2010	Internal Review by The Odour Unit
Draft Report (version 1)	19.02.2010	Draft Report for Review by RPS
Final Report	14.04.2010	Final Report
Report Preparation		
Report Prepared By: J. Hurley		Approved By: T. Schulz
Report Title: Odour Impact and Dispersion Modelling Study of Baldivis Egg Layer and Hatchery		





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## 1 INTRODUCTION

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In January 2010, RPS commissioned The Odour Unit WA Pty Limited (TOU) to conduct an Odour Investigation and Dispersion Modelling Study of potential odorous emissions emanating from the Baldivis Layertech Services Poultry (LSP) Farm, with a view to determining the resulting ground level off-site odour impacts by way of both Field Based Ambient Odour Surveys (FAOA's) and Dispersion Modelling.

The investigation was initiated in response to RPS seeking a more definitive description of the currently placed "generic" odour contour that applies to the LSP Farm operation.

RPS represents a land holding at Lot 311 Fifty Road, Baldivis which is proposed for residential development. The land holding is North-West of the LSP Farm (refer Figure 1).





**Figure 1:** Aerial Plot Illustration of Proposed Residential Land Developments.





The Western Australian generic buffer distance in place for intensive farming in the Poultry Industry is 300m – 1000m depending on size. The size of the LSP Farm suggests that a 300m buffer may apply based on the Western Australian Environmental Protection Agencies document *"Guidance for the Assessment of Environmental Factors: Separation Distances between Industrial and Sensitive Land Uses No.3: June 2005"*.

The LSP Farm however may not be perceived as an intensive farming practice as the animals are free-range. Additionally, the LSP Farm is not a meat producer and therefore a basis for a reduction in this 300m buffer range is being investigated herein.

The LSP Farm operation is an egg layer and hatchery facility located in a semi-rural land setting, on an area of approximately 40,000m<sup>2</sup>. Multiple sheds are visible at the LSP Farm along with office facilities. Based on TOU's knowledge of shed layouts for poultry farm operations, TOU identified three sheds as potential odorous sources.

The assessment of potential odorous impacts was undertaken utilising two study methodologies. These study methods were Field Based Ambient Odour Assessments according to a modified version of the German VDI Standard 3940, and Dispersion Modelling assessments utilising the Victorian EPA's AUSPLUME modelling software. A total of five (5) field based ambient odour surveys (FAOA's) were conducted by TOU field technicians over the duration of the project. These FAOA's were undertaken over varied conditions and time of day.

The investigation of odorous impacts utilising a dispersion modelling approach requires, at best, site-specific emission data. Given that TOU were unable to gain access to the LSP Farm facility, and with a current lack of industry published data for Poultry Egg Layer and Hatchery Facilities, TOU sought the advise of the WA DEC. TOU was advised by the WA DEC that the LSP Farm facility should be conservatively viewed as a Poultry Broiler operation, although the LSP Farm is clearly not a broiler operation.



This advice essentially elevates the LSP Farm facility into a 'worst case' category for poultry odour emissions, as previous studies by Jiang and Sands (1998) on broiler farms suggest odour emission rate are approximately 2.5 times greater than Layer Shed and Hatchery operations.

TOU utilised odour emission data for input into the dispersion modelling study from the Jiang & Sands (CWWT, 1998) Technical Report entitled "Odour Emissions from Poultry Farms in Western Australia". The broiler (meat birds) odour emission rate, per bird, as reported by Jiang & Sands (1998) is  $0.205 \text{ ou.m}^3 \text{ sec}^{-1} \text{ bird}^{-1}$ . The reported odour emission rate for layershed farms was  $0.079 \text{ ou.m}^3 \text{ sec}^{-1} \text{ bird}^{-1}$ .

The results of the TOU field based ambient odour assessments were used to compare to the overly conservative odorous impact predictions of the dispersion modelling. This 'ground truthing' calibration is extremely valuable in validating the predicted odour contour/s from dispersion modelling.

To predict the potential odorous impacts emanating from the LSP Farm operation, TOU adopted the current Queensland Environmental Protection Agency (QEPA) 'Ecoaccess' odour performance criterion (OPC), in lieu of the now defunct WA DEC guidelines (Guidance 47). The QEPA OPC is currently accepted by the WA DEC as an 'interim' guidance whilst the WA DEC prepares a formal OPC.

This report documents the findings of both the field based ambient odour surveys and the plume dispersion modelling study. It describes the method used to undertake these field based ambient odour surveys, details the assumptions for odour emissions data, and presents the relevant WA DEC OPC and results of the odour dispersion modelling study.





## 2 REVIEW OF POULTRY INDUSTRY EMISSIONS DATA

The Poultry industry in Western Australia is a long-standing economic contributor. However, the extent of reliable peer-reviewed research undertaken into potential emissions from these poultry farms is not yet widespread. As a result of this lack of published information, TOU sought to review those guidelines and known publications that relate specifically to the LSP Farm operation.

### 2.1 WA DEC RECOMMENDED POULTRY EMISSION RATE

TOU liaises regularly with EPA bodies throughout Australia. At the commencement of this investigation, TOU discussed the requirements of this study with the WA DEC, specifically Mr. Dave Griffith. Mr. Griffith advised TOU that the WA DEC would currently accept published data by Jiang & Sands (1998) entitled 'Odour Emissions from Poultry Farms in Western Australia'.

The findings of the Jiang & Sands (1998) paper reports odour emission rate (OER) data for Poultry Broiler Farms as  $0.205 \text{ ou} \times \text{m}^3 \text{ sec}^{-1} \text{ bird}^{-1}$ . This emission rate is based on an average stocking density of 17.4 birds per  $\text{m}^2$  of floor area. Given that the LSP Farm is a Layershed and Hatchery facility, the emission data prescribed by the WA DEC is highly conservative. The Jiang & Sands (1998) paper also investigated Layershed and Hatchery emissions reporting a single OER of  $0.079 \text{ ou} \cdot \text{m}^3 \text{ sec}^{-1} \text{ bird}^{-1}$ . The ratio of OER's for Broiler farms is therefore approximately 2.5 times greater than those from Layershed and Hatchery farms.

The  $0.079 \text{ ou} \cdot \text{m}^3 \text{ sec}^{-1} \text{ bird}^{-1}$  is however largely insufficient for use in this study. The reasoning for this is that the Jiang & Sands (1998) study only collected one data point. Since TOU is not aware of other known data published for the Layershed and Hatchery industry relevant to the Western Australian climate, TOU will adopt the WA DEC prescribed  $0.205 \text{ ou} \cdot \text{m}^3 \text{ sec}^{-1} \text{ bird}^{-1}$  as its basis for this study. The advantage of this however is that the scenario for predictive dispersion modelling will be highly conservative and hence 'worst-case'.



## 2.2 AUSTRALIAN MODEL CODE OF PRACTICE – POULTRY (4TH ED.)

The Australian Animal Welfare Committee (AWF) prescribes guidelines and ethical conducts for the welfare and husbandry of domestic poultry. Specifically, the AWF has published a report for the welfare of poultry entitled 'The Australian Model Code of Practice for the Welfare of Animals – Domestic Poultry'. The Primary Industries Ministerial Council (PIMC) endorsed this code in May 2002. The report advises that a review of the code will take place in 2010 providing that no new technologies offering significant welfare benefits are available prior to this review date. The 2010 review is yet to be formalised.

This Code of Practice (COP) reports various data for minimal acceptable standards for poultry stocking densities. This data is based on industry changes to 'caged' floor space allocation per bird.

This study has been structured to accommodate for a caged system of poultry housing at the LSP Farm.

To ensure a rigorous assessment of the LSP Farm facility, TOU has reviewed the COP and included the data in its dispersion modelling scenarios. This data differs from the WA DEC prescribed data in that it reports marginally greater stocking densities for facilities operating at best industry practices.

### 2.1.1 Stocking Densities for Cage Systems – Minimum Acceptable Standards

The following text has been extracted from Appendix 1 of the "Australian Model Code of Practice for the Welfare of Domestic Poultry (4<sup>th</sup> Edition)".

1. All new cage systems commissioned (i.e. point when the contract to purchase or lease the cages was signed) from 1 January 2001 (i.e. post 1 Jan 2001 cages) must provide a minimum floor space allowance of 550 cm<sup>2</sup> per layer for cages with three or more birds per cage where the birds weigh less than 2.4 kg.





2. Where a producer signed a contract to purchase or lease cages before 1 January 2001, to provide a space allowance of less than 550 cm<sup>2</sup> per bird, installation of these cages must be completed by 30 June 2001, or when legislation is operative after 1 January 2001, within six months of the legislation becoming operative. If these deadlines are not met, the cages will be designated as "post 1 Jan 01 cages" for the purposes of stocking density.
3. Cages other than "post 1 Jan 01" cages are designated as **"pre 1 Jan 01" cages and must provide a minimum floor space allowance of 450 cm<sup>2</sup> per layer** for cages with three or more birds per cage.
4. Minimal acceptable space allowances for caged laying or breeding fowls weighing up to 4.5 kg live weight are presented in the following table:

Pre January 2001 cages	Post 1 January 2001 cages
minimum cage floor area/bird	
3 or more fowls (<2.4 kg) per cage	
450 cm <sup>2</sup>	550 cm <sup>2</sup>
3 or more fowls (> 2.4 kg) per cage	
600 cm <sup>2</sup>	600 cm <sup>2</sup>
2 fowls per cage	
675 cm <sup>2</sup>	675 cm <sup>2</sup>
Single fowl cages	
1000 cm <sup>2</sup>	1000 cm <sup>2</sup>

\* These figures are recommended for inclusion into statute law of States and Territories as the minimum space allowance for layer hens in cages.

5. Minimal acceptable space allowances for laying or breeding fowls weighing more than 4.5 kg live weight are presented in the following table:





Birds per Cage	Maximum live weight per unit of floor area from 1 January 1995
3 or more fowls per cage	46 kg / m <sup>2</sup>
2 fowls per cage	40 kg / m <sup>2</sup>
Single fowl cages	26 kg / m <sup>2</sup>

6. Floor area is measured in a horizontal plane and includes the area under the egg/waste baffle and the area under the drinking nipples and vee-trough for water.
7. Maximum acceptable live weight density for rearing layer pullets or layer breeders is 40kg live weight per m<sup>2</sup> cage floor area.

The recommendations of the COP relate to the LSP Farm on the basis of stocking densities as either PRE2001 or POST2001.

- The **PRE2001** data for stocking densities recommends a minimum of 450cm<sup>2</sup> (0.045m<sup>2</sup>) per bird, which translates into **22.2 birds per m<sup>2</sup> of floor space**, and
- The **POST2001** data for stocking densities recommends a minimum of 550cm<sup>2</sup> (0.055m<sup>2</sup>) per bird, which translates into **18.2 birds per m<sup>2</sup> of floor space**.

TOU has utilised both the PRE2001 and POST2001 stocking densities, along with the WA DEC prescribed data to simulate three dispersion modelling scenarios. Each odour source (i.e. layer shed or litter storage/layer shed) was evaluated for maximum surface area available for livestock based on Appendix 1, point 6 of the COP.



### 3 LAYERTECH SERVICES POULTRY (LSP) FARM

The Layertech Services Poultry (LSP) Farm is located approximately 50kms south west of the Perth Metropolitan CBD. The facility occupies approximately 40,000m<sup>2</sup> and maintains three operational sheds of which TOU has identified as potential odour sources. One of these sheds (Shed 3) may be utilised as a litter storage facility as many operators house their used litter and have it removed at designated intervals annually. **Figure 3.1** below illustrates the layout of the LSP Farm.



**Figure 3.1:** Layertech Services Poultry (LSP) Farm Layout.

The Storage Warehouse and Hatchery Shed were identified by TOU on the basis of their respective construction and layouts. The Warehouse (white roof) is surrounded by a hardstand and looks to facilitate the throughput of transport vehicles/trucks. The assumed hatchery (brown roof) was identified by TOU as such due to the apparent lack of feeder towers and roof ventilation. Hatcheries must be temperature maintained to ensure welfare and growth of the poultry chicks. TOU's experience with hatcheries would suggest that hatchery odours are largely minimal when compared to egg layer odours. For the purpose of this investigation, TOU has omitted the anticipated hatchery shed as a problematic odour source.



Both Shed 1 and 2 were identified by TOU as the principal Layersheds based largely on their layout and construction. Shed 3 however, although similar in construction to sheds 1 and 2, may be utilised as a storage facility for used Layershed litter to be disposed of at annual intervals. Irrespective of this, TOU has treated Shed 3 as a problematic emission source and modelled it as a functional Layershed. The designated offices/sales building has in part a shed that houses hens/chicks. This is clearly visible from Eighty Road (west side of LSP). TOU's observations downwind of this shed suggest that odours from this source are extremely low. The use of this shed is not clearly understood, however, it is anticipated that hens are held here for sale purposes, or as an intermittent holding shed for hens and chicks.

There are no other known or identified odour sources at the LSP Farm. The LSP Farm land itself is very clean and well managed and is well established for forestry and native shrub, which may serve as effective natural barriers for odour dispersion.





---

## 4 ODOUR SAMPLING METHOD

---

### 4.1 FIELD BASED AMBIENT ODOUR SURVEYS

The Odour Unit (TOU) uses a method for assessing the ground level impacts of odour emissions from a source that utilizes a modified version of the German standard VDI3940 – “Determination of Odorants in Ambient Air by Field Inspections”. TOU’s previous experience with ambient odour sampling and subsequent olfactometry analyses indicates that accurate and useful ambient odour concentration data is difficult to obtain using conventional techniques. Therefore, TOU has adopted a more practical approach based on the field measurement of odour intensity.

With this method, calibrated and experienced odour specialists traverses the downwind surrounds of the odour source/s in a strategically mapped pattern, assessing the presence, character and intensity of any odours both from the odour source/s, and those sources impacting on adjacent and adjoining sites, and records these observations along with wind speed and direction.

Five (5) field surveys were conducted over the study period, and were approximately two hours in duration.

Once the assessor/s had determined the wind direction across the locale, he/she would attempt to move around the surrounding areas, downwind of any odorous sources, and covering as much territory as possible. Assessment locations were numbered for each individual survey.



At each assessment location the following data was logged.

- ♦ Location reference position
- ♦ Time
- ♦ Wind direction
- ♦ Wind velocity
- ♦ Odour present (yes/no)
- ♦ Odour character
- ♦ Odour Intensity (rating 0-6)
- ♦ Comments

Prior to the commencement of each survey, the TOU technician would first survey local meteorological data to determine if the conditions were suitable for conducting a survey of the locale. Once the local weather conditions had been assessed, the assessor would spend up to ten minutes at each assessment location in order to gauge the effects of the odour impact. At each location, wind velocity was measured using a TSI Model Velocicheck hotwire anemometer, while wind direction was determined using a compass. During gusty, highly fluctuating wind conditions, the average velocity and/or a minimum/maximum range was recorded. The average was determined by the technician's observations.

TOU attempted to conduct each field based ambient survey when wind velocity was low to moderate. That is, when wind velocity was less than, or averaging 10.0 – 15.0km/h ( $2.78\text{m s}^{-1}$  –  $4.17\text{m s}^{-1}$ ).

If an odour was detected at a location, the trained assessor attempted to characterize it and define its source. Odours that were determined to be clearly unrelated to the LSP Farm were recorded in the comments section of the log sheets. Odours originating from the LSP Farm were rated in accordance with the VDI3882/3940 odour intensity scale.



The general aim was to determine the extent of the impact of odours at the LSP Farm boundary, and off-site of the LSP Farm, and rank their intensity. The ranking scale used by the German standard for Determination of Odour Intensity (VDI3882) and "Determination of Odorants in Ambient Air by Field Inspections" (VDI3940) was used.

The standard's ranking system is based on the following seven-point intensity scale:

TABLE 4.1: GERMAN INTENSITY STANDARD VDI3882/3940 SCALE	
Intensity Scale	Description
0	Not detectable
1	Very Weak
2	Weak
3	Distinct
4	Strong
5	Very Strong
6	Extremely Strong





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## **5 FIELD BASED AMBIENT ODOUR SURVEY RESULTS**

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The results of these surveys are depicted in two principal ways.

Firstly, odour observations from the field logs are statistically processed to derive the frequency of odour observations according to the odour intensity ranking system. The frequency of odour intensity observations is based on a 10-minute assessment interval at a given observation location.

The log sheets completed by the technician contain the unprocessed data for each location on each survey occasion. This data is quite extensive and, while valuable in examining the odour impacts at specific locations, does not enable a general visual assessment of the extent of the odour nuisance.

Secondly, the processed results of the individual field surveys are contained in the following odour impact maps, which are based on the log sheets for each survey. Each map illustrates the locations visited, and the frequency of odour intensity detected from the odour source (represented by a colour coded pie chart). Locations visited that recorded an odour intensity score of '0' (not detectable) were still recorded in order to outline the extent of the plume's limit. The location numbers that correspond to the locations where the survey was concentrated don't necessarily represent the order of locations surveyed for each day of survey. Where duplicate numbers are illustrated on the odour impact maps, the TOU field assessor has assessed that location multiple times to verify suspected odours, or a nil result at that location.

The results are as follows:



### Survey #1:

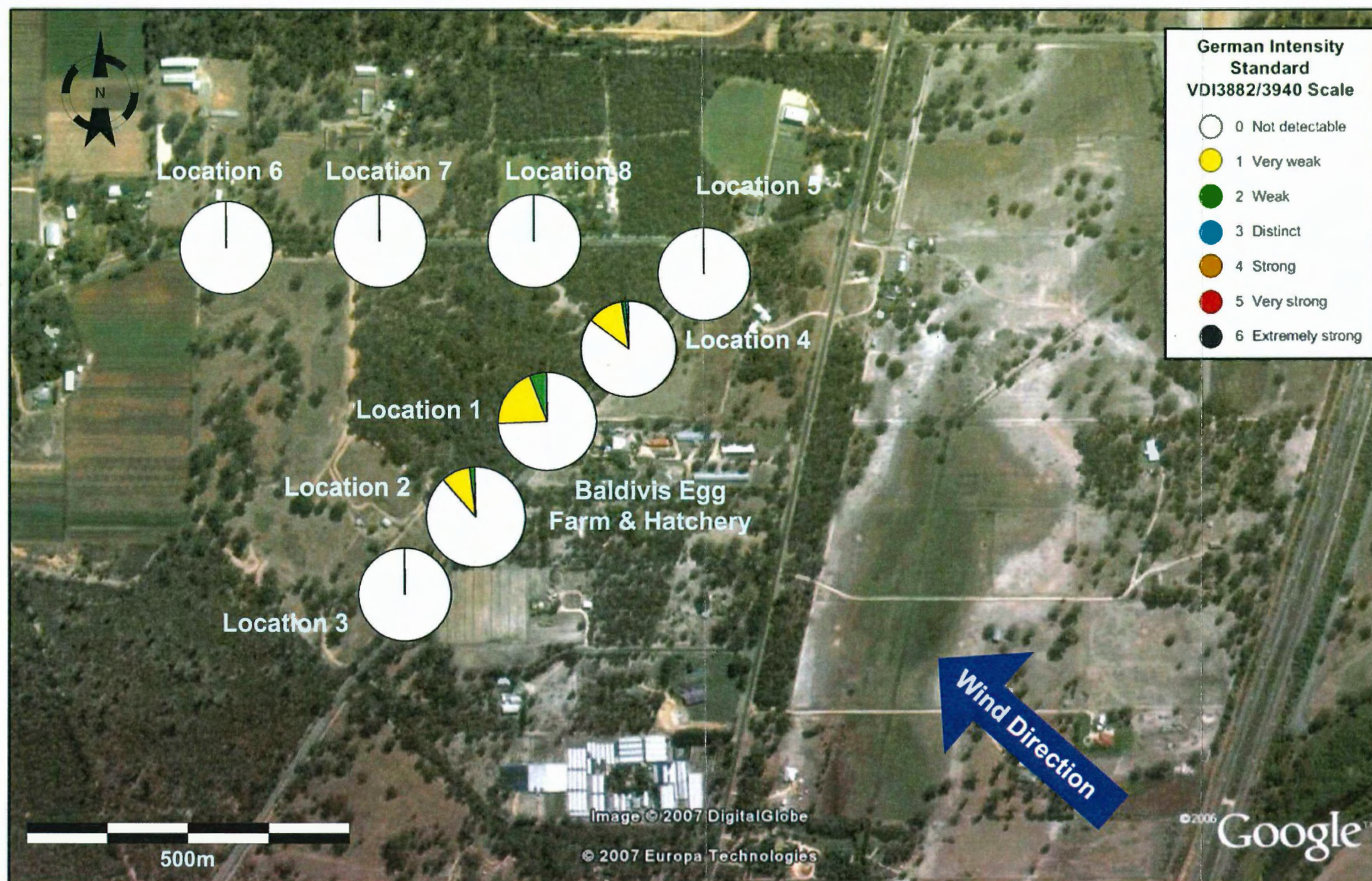
- Tuesday 19<sup>th</sup> January 2010
- 08:00hrs to 11:00hrs
- Temperature = 30°C to 36°C
- Wind velocity 1m/s - 2.5m/s
- Wind direction SE to ESE

An initial traverse on Eighty Rd was performed to determine the optimal locations for assessors. This showed, with the wind coming from the SE, only slight odours (of intensity ranking 2 and less) were detected directly at the LSP Farm entrance gate on Eighty Rd. The intensity decreased to a ranking of 1 within 70m (from the entrance) in the northern direction along Eighty Rd, and 30m in the southern direction. Past this there were no odours detected (including Fifty Rd).

Survey Location	Intensity Frequencies (%) - Baldivis FAOA 19/01/2010						
	0	1	2	3	4	5	6
1	74.0	20.0	6.0	0	0	0	0
2	87.0	11.0	2.0	0	0	0	0
3	100	0	0	0	0	0	0
4	85.0	12.5	1.7	0.8	0	0	0
5	100	0	0	0	0	0	0
6	100	0	0	0	0	0	0
7	100	0	0	0	0	0	0
8	100	0	0	0	0	0	0

Odour impacts on this survey day were not considered problematic. An illustration of the odour frequencies and location is depicted below. The illustrated size of the frequency pie charts doesn't reflect the 'extent' of the impact. That is, for those frequency pie charts on Eighty Road, the observations are on the road itself and not within the adjoining land to the north-west.





**RPS Group**

Assessment Location: Baldvis Egg Layer and Hatchery  
Weather Conditions: Fine & Sunny, 33°C, SE to ESE winds at 1 - 3 m/s  
Date & Time: Tuesday 19th January, 08:00 - 11:00hrs



**Figure 5.1:** Field Based Ambient Odour Survey Result (19<sup>th</sup> January, 2010).





### Survey #2:

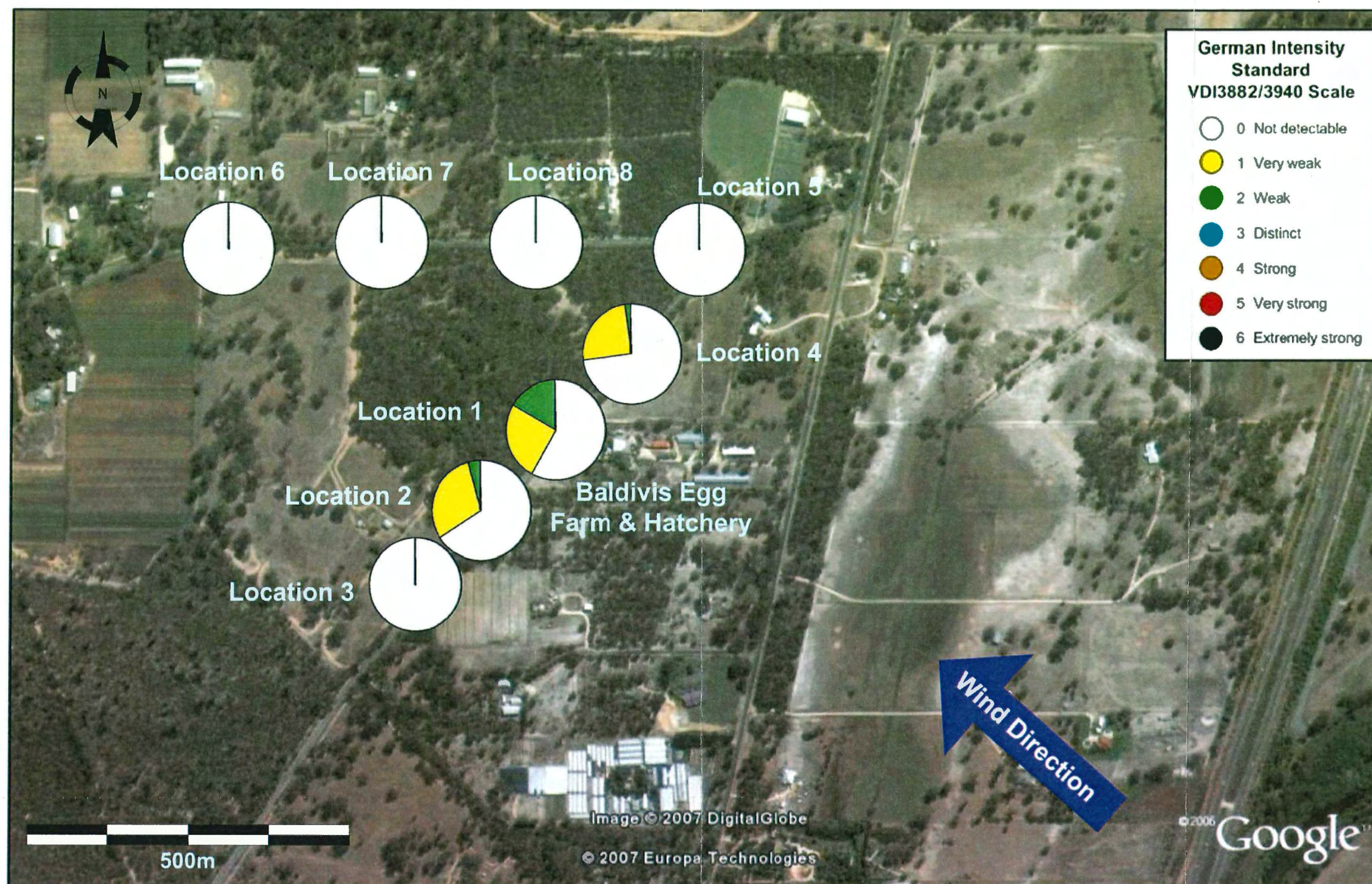
- Wednesday 20<sup>th</sup> January 2010
- 13:00hrs to 16:00hrs
- Temperature = 26°C
- Wind velocity 2.5m/s - 5m/s
- Wind direction S to E

The assessors were set in the same initial locations as the first survey, as the wind conditions were similar. On Eighty Rd the highest intensity rank was 2, with greater frequency than the first survey. The highest frequency of 2's was located, again, directly at the Eighty Rd entrance gate. North on Eighty Rd, the plume was just detectable approximately 100m from the entrance at intermittent odour intensity of less than 2. Odour observations south of the Eighty road entrance were intermittently detectable up to 40m. No odours were detected on Fifty Rd.

Survey Location	Intensity Frequencies (%) - Baldivis FAOA 20/01/2010						
	0	1	2	3	4	5	6
1	60.0	25.0	15.0	0	0	0	0
2	66.0	30.0	4.0	0	0	0	0
3	100	0	0	0	0	0	0
4	74.0	24.0	2.0	0	0	0	0
5	100	0	0	0	0	0	0
6	100	0	0	0	0	0	0
7	100	0	0	0	0	0	0
8	100	0	0	0	0	0	0

Odour impacts on this survey day were not considered problematic. An illustration of the odour frequencies and location is depicted below. The illustrated size of the frequency pie charts doesn't reflect the 'extent' of the impact. That is, for those frequency pie charts on Eighty Road, the observations are on the road itself and not within the adjoining land to the north-west.





**RPS Group**

Assessment Location: Baldvis Egg Layer and Hatchery  
Weather Conditions: Fine & Sunny, 26°C, S to E winds at 2.5 - 5 m/s  
Date & Time: Wednesday 20th January, 13:00 - 16:00hrs



**Figure 5.2:** Field Based Ambient Odour Survey Result (20<sup>th</sup> January, 2010).





### Survey #3:

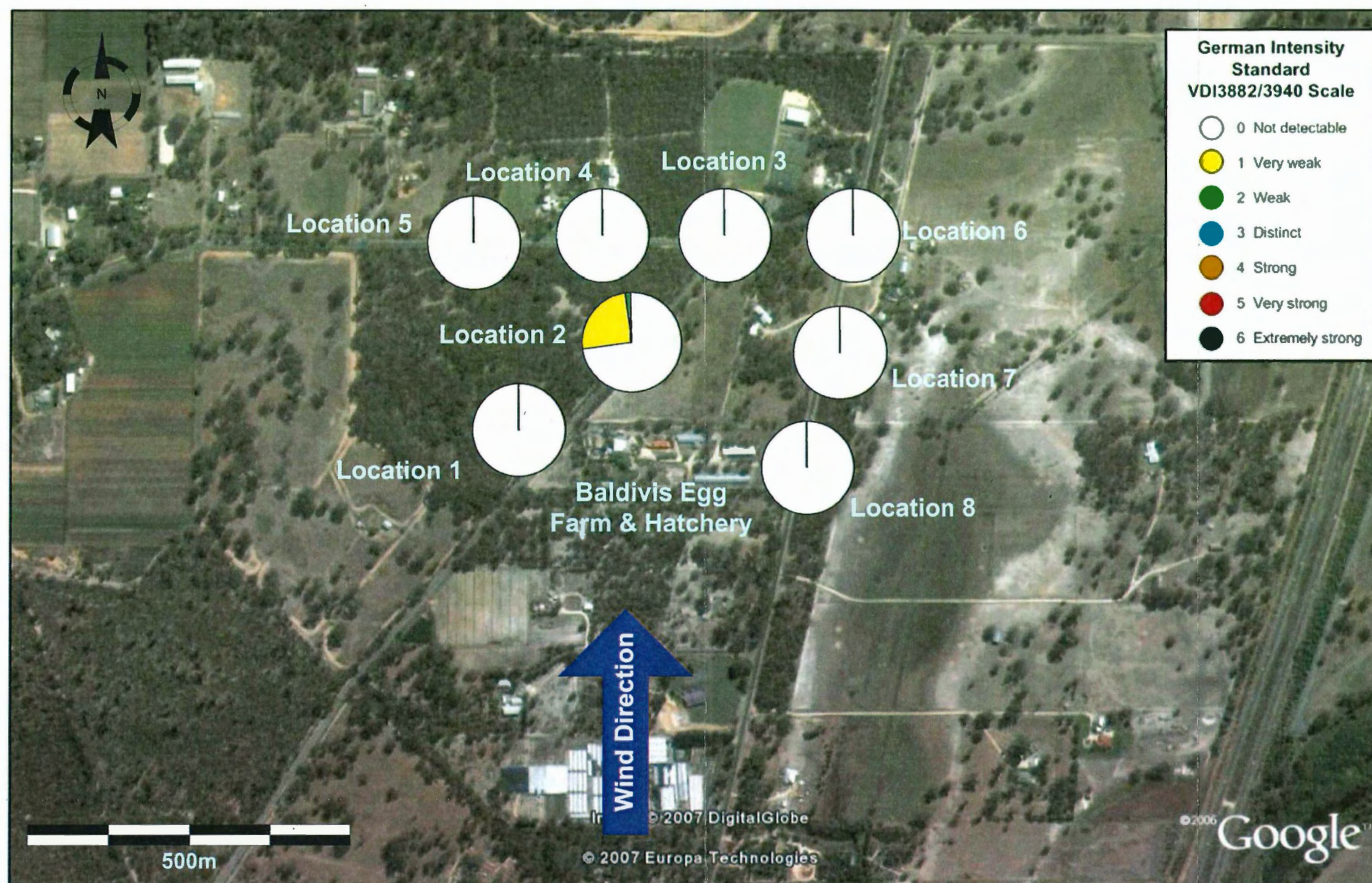
- Thursday 21<sup>st</sup> January 2010
- 09:00hrs to 12:00hrs
- Temperature = 20°C to 26°C
- Wind velocity 2.5m/s - 4.5 m/s
- Wind direction S

With the wind coming from the south no odours were detected at the Eighty Rd entrance location. Approximately 70m north (still on Eighty Rd) intensity rankings of 1 and infrequent 2's were recorded. Assessors were located at various positions north of the facility on Fifty Rd and east on Baldivis Rd. No odours were detected at these locations.

Survey Location	Intensity Frequencies (%) - Baldivis FAOA 21/01/2010						
	0	1	2	3	4	5	6
1	0.0	0	0	0	0	0	0
2	74.0	24.0	2.0	0	0	0	0
3	100	0	0	0	0	0	0
4	100.0	0	0	0	0	0	0
5	100	0	0	0	0	0	0
6	100	0	0	0	0	0	0
7	100	0	0	0	0	0	0
8	100	0	0	0	0	0	0

Odour impacts on this survey day were not considered problematic. An illustration of the odour frequencies and location is depicted below. The illustrated size of the frequency pie charts doesn't reflect the 'extent' of the impact. That is, for those frequency pie charts on Eighty Road, the observations are on the road itself and not within the adjoining land to the north-west.





**RPS Group**

Assessment Location: Baldivis Egg Layer and Hatchery  
Weather Conditions: Fine & Sunny, 23°C, S winds at 2.5 - 4.5 m/s  
Date & Time: Thursday 21st January, 09:00 - 12:00hrs



**Figure 5.3:** Field Based Ambient Odour Survey Result (21st January, 2010).



**Survey #4:**

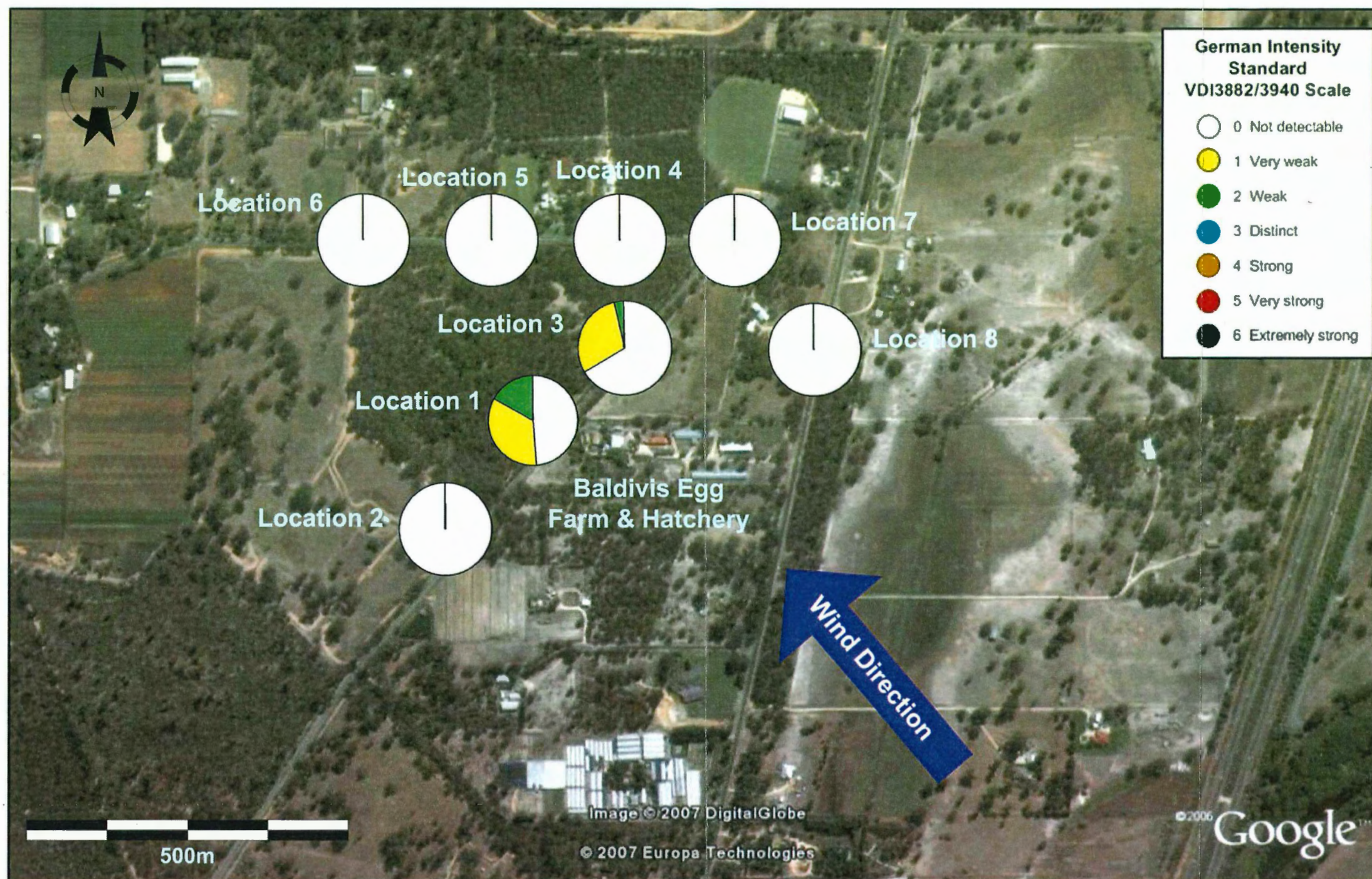
- Friday 22<sup>nd</sup> January 2010
- 09:00hrs to 12:00hrs
- Temperature = 22°C to 28°C
- Wind velocity 1m/s - 3 m/s
- Wind direction E to S

Intensity rankings of 1 and 2 were recorded at the Eighty Rd entrance and also approximately 70m north of the entrance. No odours were detected south of the entrance. Assessors were spaced approximately 200m apart along Fifty Rd, no odours were detected. As with all surveys the direct surrounds, including Baldivis and Ingram Rd, were traversed to detect any possible effects of swinging winds. No odours observed.

Survey Location	Intensity Frequencies (%) - Baldivis FAOA 22/01/2010						
	0	1	2	3	4	5	6
1	49.0	35.0	16.0	0	0	0	0
2	100.0	0	0	0	0	0	0
3	63.0	33.0	4.0	0	0	0	0
4	100.0	0	0	0	0	0	0
5	100	0	0	0	0	0	0
6	100	0	0	0	0	0	0
7	100	0	0	0	0	0	0
8	100	0	0	0	0	0	0

Odour impacts on this survey day were not considered problematic. An illustration of the odour frequencies and location is depicted below. The illustrated size of the frequency pie charts doesn't reflect the 'extent' of the impact. That is, for those frequency pie charts on Eighty Road, the observations are on the road itself and not within the adjoining land to the north-west.





**RPS Group**

Assessment Location: Balddivis Egg Layer and Hatchery  
Weather Conditions: Fine & Sunny, 25°C, E to S winds at 1 - 3 m/s  
Date & Time: Friday 22nd January, 09:00 - 12:00hrs



**Figure 5.4:** Field Based Ambient Odour Survey Result (22<sup>nd</sup> January, 2010).



**Survey #5:**

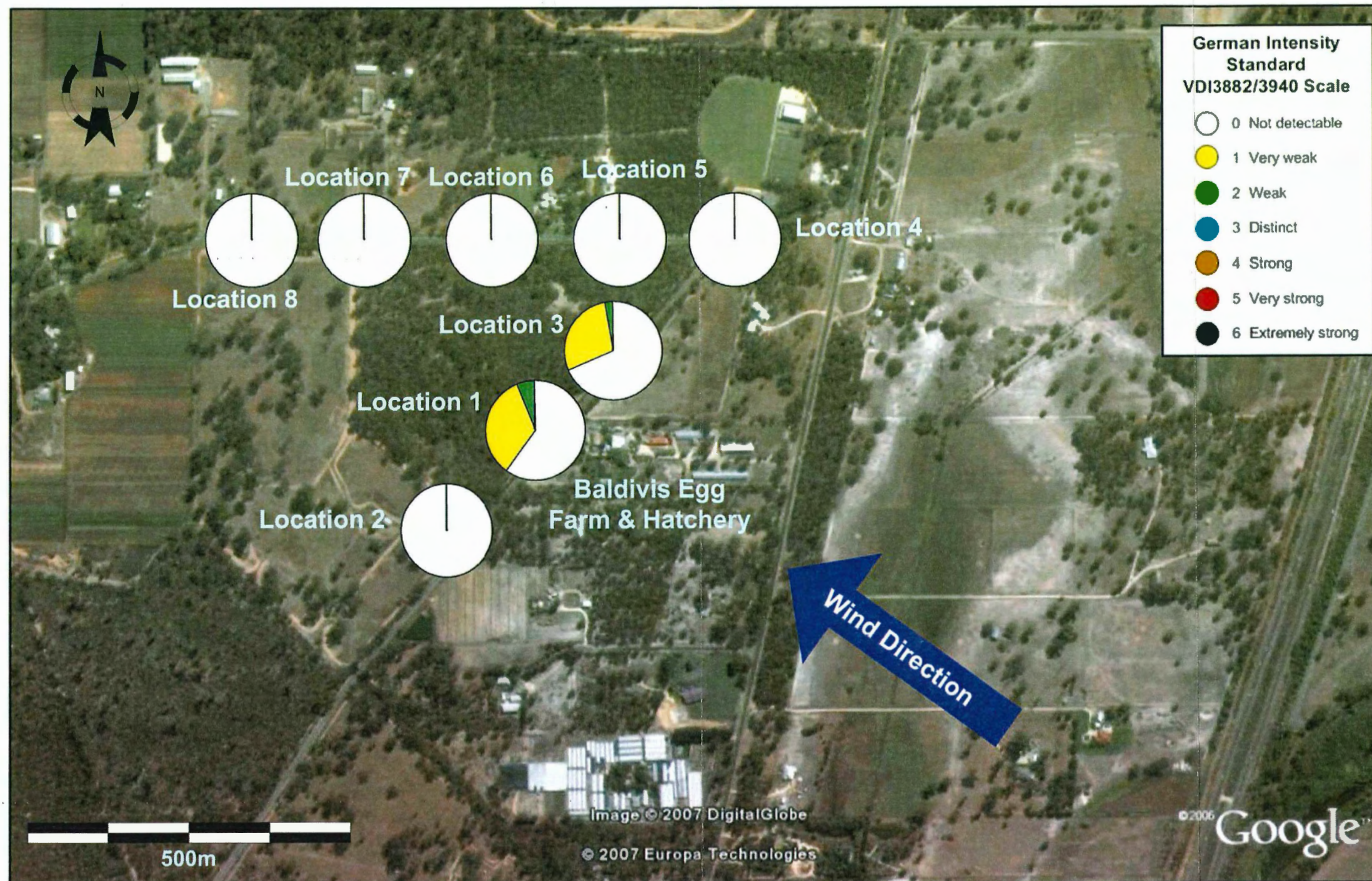
- Monday 25<sup>th</sup> January 2010
- 09:00 to 12:00hrs
- Temperature = 25°C to 28°C
- Wind velocity 1m/s - 3 m/s
- Wind direction SE to ENE

As the wind was initially coming from the SE direction, the assessors were positioned at the Eighty Rd entrance gate. The LSP poultry odours detected were given rankings of 1 with a small number of 2 rankings. Approximately 50m to the north, intensity rankings of 1 and a small number of 2's were recorded. When assessors were positioned along Fifty Rd, approximately 200m apart, no odours could be detected. Baldivis and Ingram roads were traversed, which showed no upwind odour sources.

Survey Location	Intensity Frequencies (%) - Baldivis FAOA 25/01/2010						
	0	1	2	3	4	5	6
1	60.0	34.0	6.0	0	0	0	0
2	100.0	0	0	0	0	0	0
3	63.0	33.0	4.0	0	0	0	0
4	100.0	0	0	0	0	0	0
5	100	0	0	0	0	0	0
6	100	0	0	0	0	0	0
7	100	0	0	0	0	0	0
8	100	0	0	0	0	0	0

Odour impacts on this survey day were not considered problematic. An illustration of the odour frequencies and location is depicted below. The illustrated size of the frequency pie charts doesn't reflect the 'extent' of the impact. That is, for those frequency pie charts on Eighty Road, the observations are on the road itself and not within the adjoining land to the north-west.





**RPS Group**

Assessment Location: Baldivis Egg Layer and Hatchery  
Weather Conditions: Fine & Sunny, 26°C, **SE to ENE** winds at 1 - 3 m/s  
Date & Time: Monday 25th January, 09:00 - 12:00hrs



**Figure 5.5:** Field Based Ambient Odour Survey Result (25<sup>th</sup> January, 2010).





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## 6 ODOUR CRITERIA AND DISPERSION MODEL GUIDELINES

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Regulatory authority guidelines for odorous impacts of gaseous process emissions are not designed to satisfy a 'zero odour impact criteria', but rather to minimise the nuisance effect to acceptable levels of these emissions to a large range of odour sensitive receptors within the local community.

In Australia, each state and territory's environmental protection agency has developed its own unique odour performance criteria (OPC) for new and existing odour emitting facilities. In Western Australia, the DEC has withdrawn their OPC guideline document *No. 47: Guidance for the Assessment of Environmental Factors – Assessment of Odour Impacts from New Proposals (2002)*, but has yet to replace it. A suitable new OPC is currently being discussed.

In the absence of a current OPC guideline, the DEC notified TOU that the Queensland EPA's *Ecoaccess – Guideline: Odour Impact Assessment from Developments (2004)* is currently acceptable as an 'interim' OPC. The detail of the relevant QEPA OPC is as follows;

1. 2.5ou, 1-hour average, 99.5<sup>th</sup> percentile for ground-level sources and down-washed plumes from short stacks, and
  - Where a facility does not operate continuously, the 99.5<sup>th</sup> percentile must be applied to the actual hours of operation.

The WA DEC have also indicated an additional criterion for use in dispersion modelling of ground level volume and area sources. The additional criterion is:

2. 8ou, 1-hour average, 99.9<sup>th</sup> percentile.

Both criteria will be investigated in this study.





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## 7 ODOUR DISPERSION MODELLING METHOD

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The odour dispersion modelling study for the LSP Farm was carried out using AUSPLUME Version 6.0, a Gaussian, steady-state, plume dispersion model developed by the Victorian Environmental Protection Authority (EPA Victoria). Ausplume is the approved dispersion model recommended by all of the EPAs in Australia.

The AUSPLUME V6.0 atmospheric dispersion model is used to project downwind ground level concentrations of air contaminants by taking into consideration various factors including:

- Odour emissions data - odour emission rate and source dimensions;
- Site specific meteorology;
- Geophysical impact (topography); and
- Building wake effects.

For this study, the air contaminant was odour and ground level concentrations in odour units (ou) have been projected. It should be noted that terrain effects are incorporated within the model for point sources such as stacks and vents only, but not for area and volume sources. All of the sources input into this model were ground-level area sources.

### 7.1 METEOROLOGICAL DATASET

Available meteorological data in the area is not readily obtainable, nor do current meteorological weather stations exist in the area with suitable data. Previously, the Hope Valley station was an acceptable dataset, however, the WA DEC has withdrawn its support of this Hope Valley data. The DEC does however endorse the Caversham dataset (ca94-b) for metropolitan assessments west of the Darling Scarp. This dataset was developed from the WA DEC approved Caversham weather station which is situated approximately 21 kilometres inland from the coast and approximately 7



kilometres from the base of the Darling Scarp. The modelling results from ca94-b dataset can be considered to be representative of a "poor dispersion" year.

The Caversham site is approximately 50 kilometres north-north west of the LSP Farm. Additionally, the LSP Farm is approximately 10 kilometres inland from the coast, whereas the Caversham site is approximately 21 kilometres inland. The Caversham site represents meteorological observations near the Darling Scarp. Prevailing problematic winds are typically easterly, compounded by winds drainage flows from the escarpment. As such, the dataset is conservative in the westerly direction (i.e. from easterly winds).

Given the location of the LSP Farm it may not be affected by these strong easterly wind drainage flows and hence problematic easterlies may be less prevalent at this location. Summer prevailing winds at the LSP Farm are easterlies in the morning and south-westerlies in the early afternoon. The south-westerlies are generally strong and represent favourable conditions for dispersion. The early morning easterlies generally exist in stable conditions and therefore may represent poor dispersion.

Adverse odour impacts are likely to be more prevalent during warmer months, as elevated temperatures tend to result in higher odour emissions. It is also important to note that, while calm to light wind conditions are the most problematical in terms of poor dispersion and odour nuisance, the standard Gaussian dispersion formulation intrinsic to the Ausplume model fails to adequately cope with wind velocities below  $0.5 \text{ m s}^{-1}$ . As a result, all winds  $< 0.5 \text{ m s}^{-1}$  are treated as  $0.5 \text{ m s}^{-1}$  by the model.

In addition to wind direction and speed, atmospheric stability is an important factor in odour transport and dispersion. Stability refers to the vertical movement of the atmosphere and subsequently the dispersion of pollutants vertically within the atmospheric boundary layer. Atmospheric stability is classified under the Pasquill-Gifford scheme where seven stability classes have been defined as: A – very unstable; B – unstable; C – slightly unstable; D – neutral; E – slightly stable; F – stable; and G – very stable. F and G tend to be grouped together as F in dispersion models. When the atmosphere is stable, vertical movement is suppressed and





dispersion is poor. This is the case for classes E and F, which are apparent during temperature inversions. Neutral conditions also result in poor vertical dispersion for ambient temperature or cool plumes.

Table 7.1 below represents meteorological observations from the Hope Valley dataset. Although the dataset is not used in the dispersion model, it is useful to 'interrogate' the data to understand the local conditions. Table 7.1 shows that the atmosphere in the Baldivis region is stable for 15.87% over the 1995 – 1997 yearly dataset and neutral for a further 27.08% over this three-year dataset.

Table 7.1: Distribution of PG stability classes vs. wind speed (Hope Valley data).							
Pasquill Gifford Stability Class	Wind speed (m/s)						
	≤ 2	≤ 4	≤ 8	≤ 12	> 12	Total	%
A	450	533	-	-	-	983	3.74%
B	253	1785	490	-	-	2528	9.61%
C	149	1542	4417	179	-	6287	23.90%
D	168	1312	5419	224	-	7123	27.08%
E	224	4053	932	-	-	5209	19.80%
F	1401	2771	2	-	-	4174	15.87%

Table 7.2 below represents dispersion stability classes and time of day. Stable conditions (stability F) exist between 6pm to 8am for the three-year '95-'97 meteorological dataset, with the greatest stability occurring between the hours of 9pm through until 5am.

**Table 7.2: Distribution of PG stability classes vs. time of day (Hope Valley data).**

Pasquill Gifford Stability Class	Time of day (hrs)								Total
	2400 - 0259	0300 - 0559	0600 - 0859	0900 - 1159	1200 - 1459	1500 - 1759	1800 - 2059	2100 - 2359	
A	-	-	17	393	408	150	15	-	983
B	-	1	96	785	999	573	74	-	2528
C	6	8	417	1501	1581	2083	689	2	6287
D	852	862	1469	602	300	482	1692	864	7123
E	1228	1284	803	5	-	-	539	1350	5209
F	1202	1133	486	2	-	-	279	1072	4174

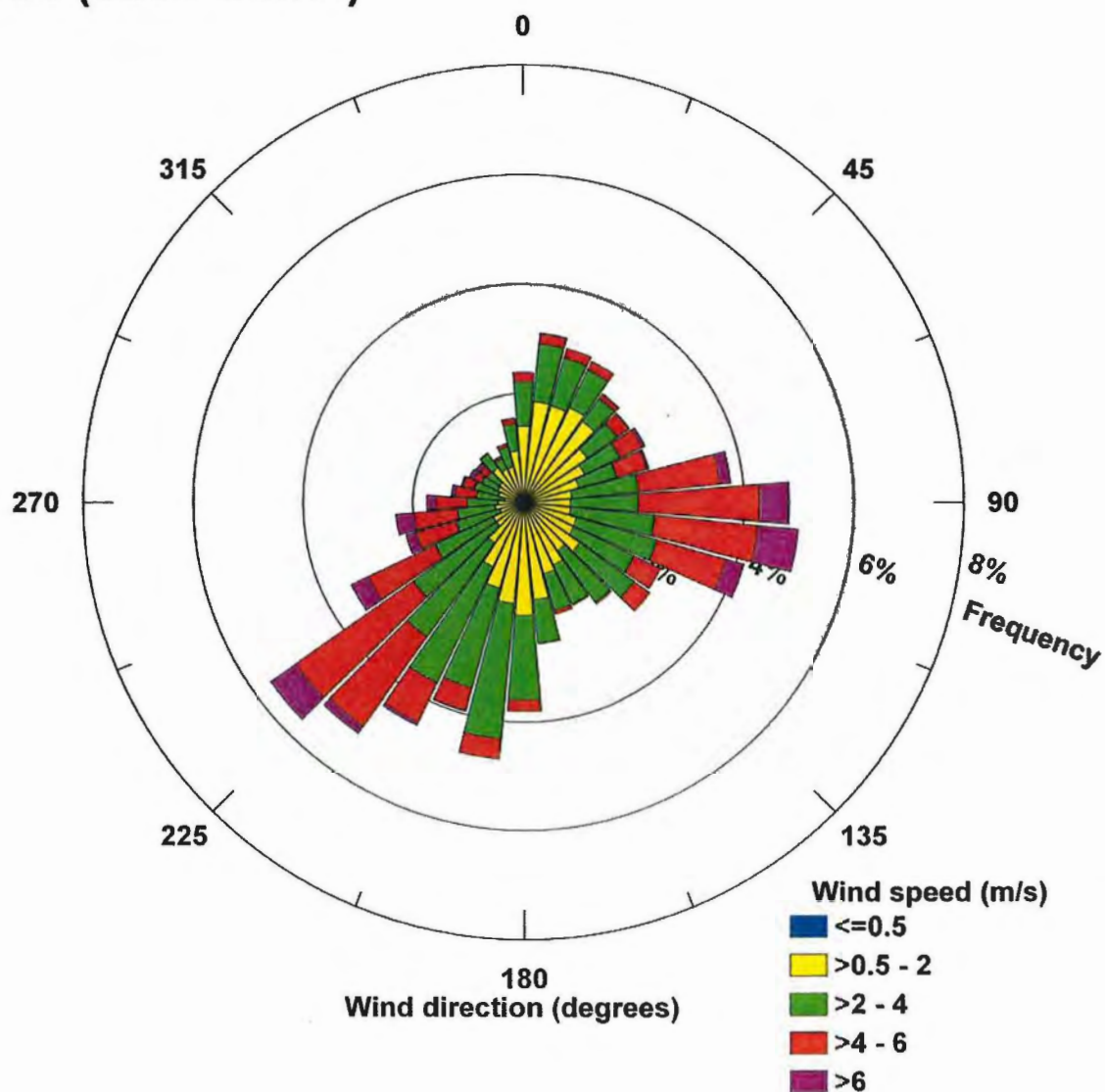
The observations in **Table 7.2** represent local meteorological observations from the Hope Valley station in the Baldivis region approximately ten years ago. Local weather has changed over the last decade and has seen a shift in patterns where easterlies tend to remain for longer periods in the summer months. Typically, the period of December – March represents longer easterly conditions in the early morning with winds moving southerly and south-westerly in the early afternoon. Generally speaking, these easterly conditions can be considered the most problematic in the Perth region with respect to air dispersion. Moreover, under very calm conditions, odour plumes tend to elevate due to buoyancy, and increase in concentration, and are ‘pushed, or moved’ away from the source under low intermittent wind conditions. This often creates intermittent impacts off-site from a given odour source which under more constant wind conditions may have little odour impact due to the continual ‘stripping’ of the odour plume.

The windrow figure below illustrates the Caversham metrological dataset used in the dispersion modelling assessments.





## Caversham Site Specific 1994 (ca94-b.met)





## **7.2 LOCAL LAND USE AND TOPOGRAPHY**

The Baldivis LSP locale can be considered a 'flat to rolling rural' landscape southwest of the Perth Metropolitan CBD, where many properties are large hectare lots. The current trend of 'urban-sprawl' within the Perth Metropolitan area has seen a significant increase in residential developments encroaching into rural landscapes. The Baldivis LSP Farm is situated within a currently developing residential area and is largely surrounded by natural vegetation and large well-established forestry.

The topography in the immediate vicinity of the LSP Farm is both flat and rolling rural. The land elevation at the LSP Farm is approximately 15m Australian Height Datum (AHD).

The surface roughness category ( $Z_0$ ) chosen for this dispersion model was 0.3, to reflect the surface friction created by the rolling rural landscape and the established flora on the adjoining and surrounding properties.

## **7.3 GRIDDED RECEPTOR FILE**

The Receptor file used in the model was a Cartesian grid with receptors spaced at 50m by 50m intervals. The grid extended approximately 1,000m to the west of the LSP Farm, approximately 900m to the east, and both 700m and 500m to the north and south of the LSP Farm respectively. As Ausplume does not incorporate terrain elevation into the calculation for volume sources, terrain effects were ignored.





#### 7.4 DISPERSION MODEL SOURCE AND EMISSION RATE CONFIGURATIONS

The dispersion model configuration for odour sources was developed from data estimated by TOU during the field based ambient surveys, and from aerial imagery data. Three odour sources were identified by TOU as follows:

Shed 1 – Layershed

Shed 2 – Layershed

Shed 3 – Layershed /or/ Litter Storage Shed

As discussed in **Section 2**, preferred odour emissions data was advised by the WA DEC and applied to the LSP Farm. In addition, TOU reviewed the “Australian Model Code of Practice for the Welfare of Animals - Domestic Poultry” (4th Edition), to ascertain the recommended stocking densities of poultry prescribed in the code. The estimated areas of each of the odour sources are presented in **Table 7.3**. The derived odour emission rates (OER's) are presented in **Tables 7.4; 7.5 & 7.6** with each table representing differing odour emissions data that reflects the individual emission scenarios discussed in Section 2.

**Table 7.3:** LSP Farm Estimated Individual Odour Source Dimensions.

Odour Source	Length (m)	Width (m)	Height (m)	Surface Area (m <sup>2</sup> )
Shed 1 - Layershed	88	15	5	<b>1,320</b>
Shed 2 - Layershed	58	15	5	<b>870</b>
Shed 3 – Layershed/Litter Storage	50	18	5	<b>900</b>


**Table 7.4:** LSP Farm derived OER's based on "Poultry Code of Practice" **PRE2001**.

Odour Source	# Birds <sup>A</sup>	<b>PRE2001</b> Stocking Density <sup>B</sup> (Birds / m <sup>2</sup> )	Odour Emission Rate <sup>C</sup> (ou.m <sup>3</sup> sec <sup>-1</sup> )
Shed 1 - Layershed	<b>29,304</b>	22.2	<b>6,007</b>
Shed 2 - Layershed	<b>19,314</b>	22.2	<b>3,959</b>
Shed 3 – Layershed/Litter Storage	<b>19,980</b>	22.2	<b>4,096</b>

<sup>A</sup>Bird Numbers derived from source surface areas x Stocking Densities. <sup>B</sup>The "Code of Practice for the Welfare of Animals - Domestic Poultry" (4th Ed.) prescribes a minimal stocking Density, **PRE2001**, of 450cm<sup>2</sup> per bird (22.2 birds /m<sup>2</sup>). <sup>C</sup>Odour Emission Rate (OER) derived from multiplying the bird numbers x 0.205ou.m<sup>3</sup> sec<sup>-1</sup>.

**Table 7.5:** LSP Farm derived OER's based on "Poultry Code of Practice" **POST2001**.

Odour Source	# Birds <sup>A</sup>	<b>POST2001</b> Stocking Density <sup>B</sup> (Birds / m <sup>2</sup> )	Odour Emission Rate <sup>C</sup> (ou.m <sup>3</sup> sec <sup>-1</sup> )
Shed 1 - Layershed	<b>24,024</b>	18.2	<b>4,925</b>
Shed 2 - Layershed	<b>15,834</b>	18.2	<b>3,246</b>
Shed 3 – Layershed/Litter Storage	<b>16,380</b>	18.2	<b>3,358</b>

<sup>A</sup>Bird Numbers derived from source surface areas x Stocking Densities. <sup>B</sup>The "Code of Practice for the Welfare of Animals - Domestic Poultry" (4th Ed.) prescribes a minimal stocking Density, **POST2001**, of 550cm<sup>2</sup> per bird (18.2 birds /m<sup>2</sup>). <sup>C</sup>Odour Emission Rate (OER) derived from multiplying the bird numbers x 0.205ou.m<sup>3</sup> sec<sup>-1</sup>.



**Table 7.6:** LSP Farm derived OER's based on WA DEC advice of  $0.205 \text{ ou.m}^3 \text{ sec}^{-1}$ .

Odour Source	# Birds <sup>A</sup>	WA DEC Stocking Density <sup>B</sup> (Birds / m <sup>2</sup> )	Odour Emission Rate <sup>C</sup> (ou.m <sup>3</sup> sec <sup>-1</sup> )
Shed 1 - Layershed	22,968	17.4	4,708
Shed 2 - Layershed	15,138	17.4	3,103
Shed 3 – Layershed/Litter Storage	15,660	17.4	3,210

<sup>A</sup>Bird Numbers derived from source surface areas x Stocking Densities. <sup>B</sup>The WA DEC advised TOU on using the Jiang & Sands (1998) study for Broiler Farm emissions, which prescribes a stocking density of 17.4 birds per m<sup>2</sup>. <sup>C</sup>Odour Emission Rate (OER) derived from multiplying the bird numbers x  $0.205 \text{ ou's sec}^{-1}$ .

## 7.5 ODOUR DISPERSION MODELLING SCENARIOS

Three scenarios were modelled for this impact assessment study, with each scenario having differing emissions data according to either the WA DEC recommended, or the Code of Practice for Domestic Poultry (refer Tables 7.4; 7.5 & 7.6 above).

All three scenarios were modelled according to the QEPA OPC "Ecoaccess" criteria of  $2.5 \text{ ou}$ , 1-hour averaging times at the 99.5<sup>th</sup> percentile.

In addition, each modelled scenario was further assessed at criteria of  $8 \text{ ou}$ , 1-hour averaging times at the 99.9<sup>th</sup> percentile, which illustrates a predicted odour impact concentration 'near field' to the LSP Farm property boundary.

Importantly, all odour emission rates have been modelled as constant. It is highly unlikely that odours are constant from the LSP Farm given that the sheds are closed in the evening, and the life cycles of the birds would vary, and therefore odour emissions would vary. A constant emission rate represents the most conservative approach for dispersion modelling.



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## 8 ODOUR DISPERSION MODELLING STUDY RESULTS

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Figures 8.1; 8.2 and 8.3 present the results of the odour dispersion modelling study, presenting the odour contours relating to each emission rate scenario outlined in Tables 7.4; 7.5 and 7.6 of section 7.

All dispersion modelling was predicted with constant emission rates, and with emission rates exempt from temperature dependency.

Figure 8.1 illustrates modelled emissions based on the WA DEC recommended stocking density of 17.4 birds per m<sup>2</sup> of floor space. The emission rate applied to this stocking density was 0.205ou.m<sup>3</sup> sec<sup>-1</sup> bird<sup>-1</sup> and was recommended by the WA DEC, and taken from Jiang & Sands (1998).

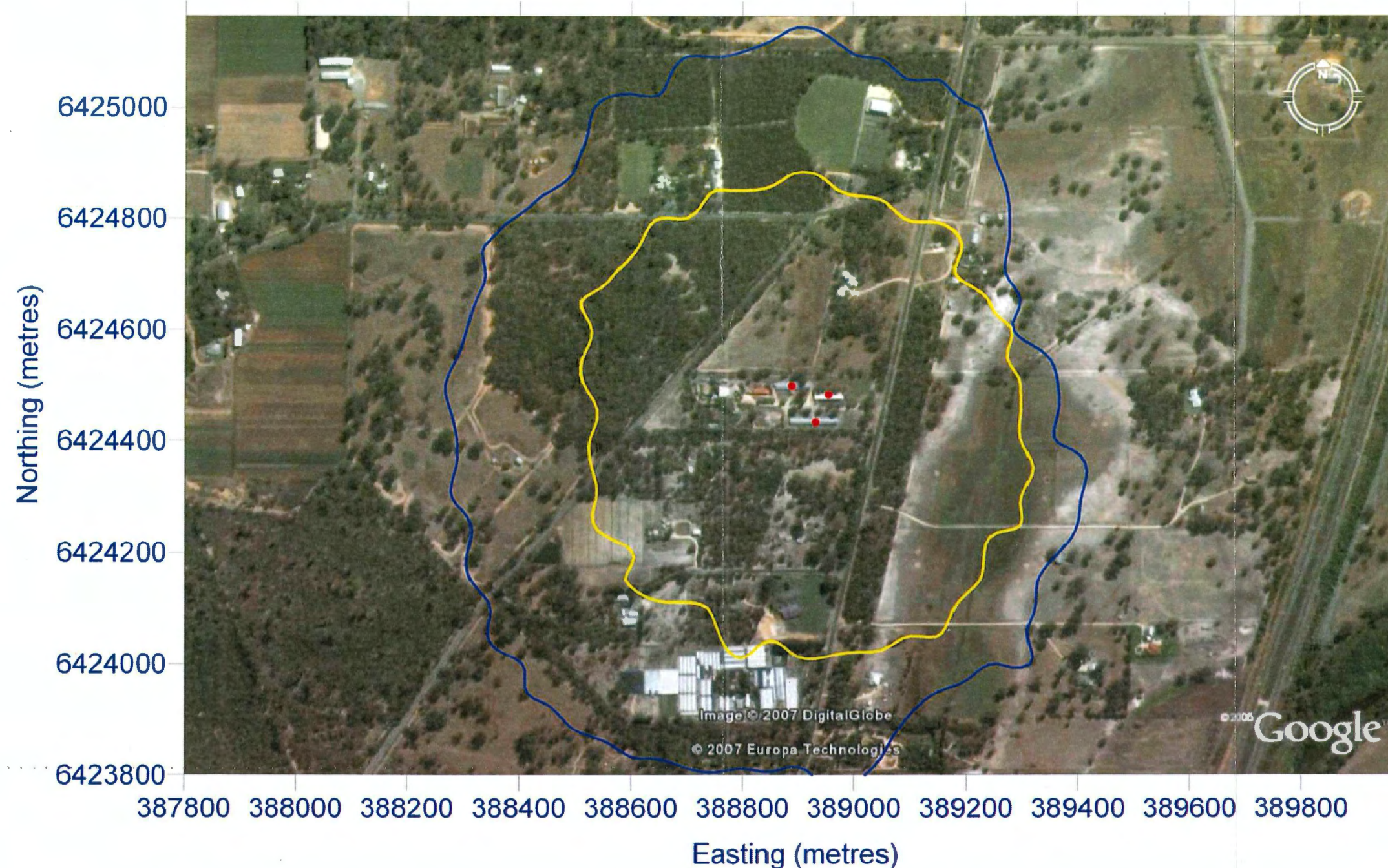
Figure 8.2 illustrates modelled emissions based on the Australian Model COP (POST2001) recommended stocking density of 18.2 birds per m<sup>2</sup> of floor space. The emission rate applied to this stocking density was 0.205ou.m<sup>3</sup> sec<sup>-1</sup> bird<sup>-1</sup> and was recommended by the WA DEC, and taken from Jiang & Sands (1998).

Figure 8.3 illustrates modelled emissions based on the Australian Model COP (PRE2001) recommended stocking density of 22.2 birds per m<sup>2</sup> of floor space. The emission rate applied to this stocking density was 0.205ou.m<sup>3</sup> sec<sup>-1</sup> bird<sup>-1</sup> and was recommended by the WA DEC, and taken from Jiang & Sands (1998).





## Baldivis Egg Layer & Hatchery - WA DEC Stocking Density of 17.4birds/m<sup>2</sup>



Yellow contour = 8ou; 99.9th percentile; 1-hour averaging (OER = 0.205ou.m<sup>3</sup> sec-1/bird)

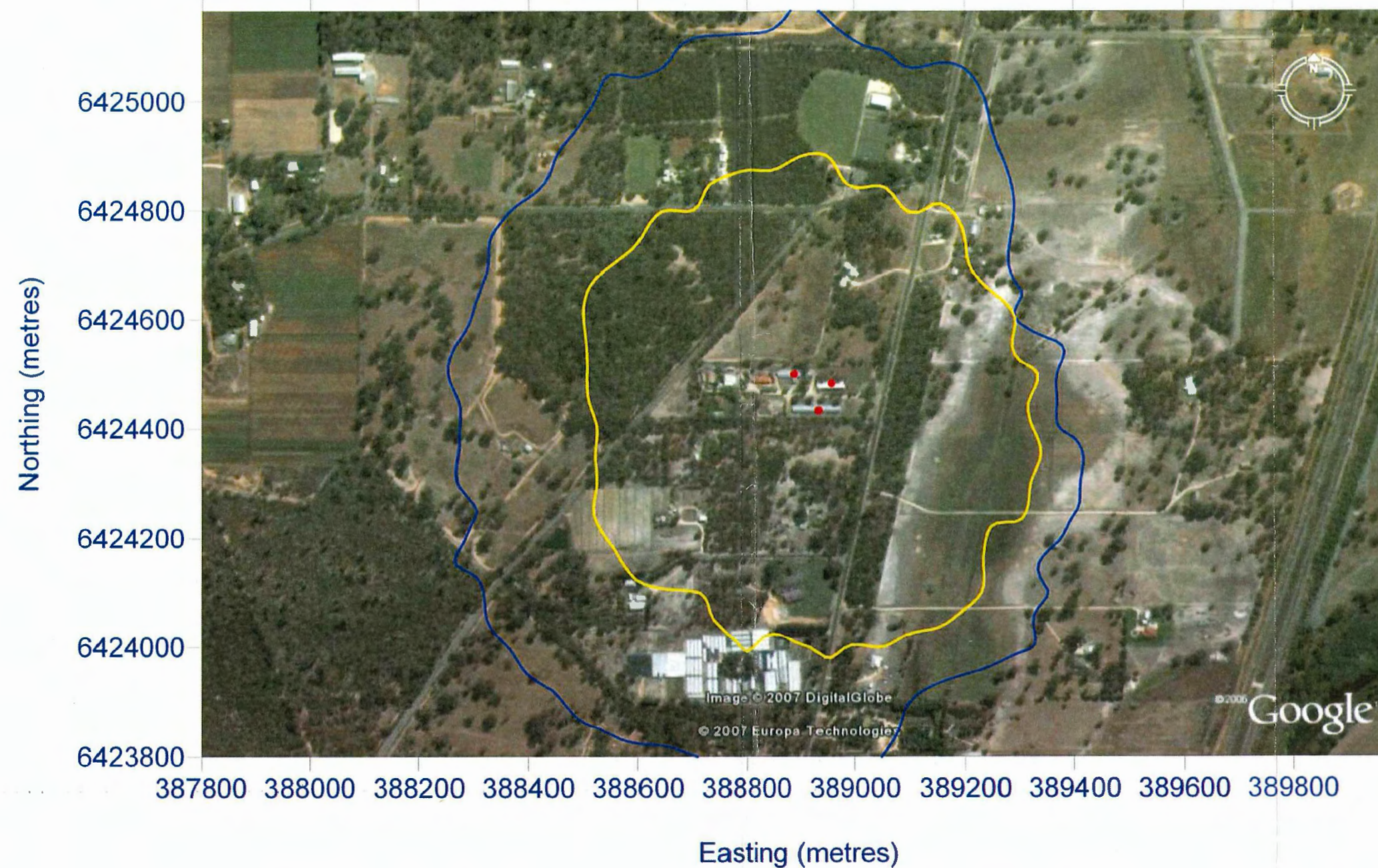
Blue contour = 2.5ou; 99.5th percentile; 1-hour averaging (OER = 0.205ou.m<sup>3</sup> sec-1/bird)

**Figure 8.1:** Modelling result contours for the WA DEC recommended Emission Rates (refer Section 2.1).





## Baldivis Egg Layer & Hatchery - Model COP (POST2001) Stocking Density of 18.2birds/m<sup>2</sup>



Yellow contour = 8ou; 99.9th percentile; 1-hour averaging (OER = 0.205ou.m<sup>3</sup> sec<sup>-1</sup>/bird)

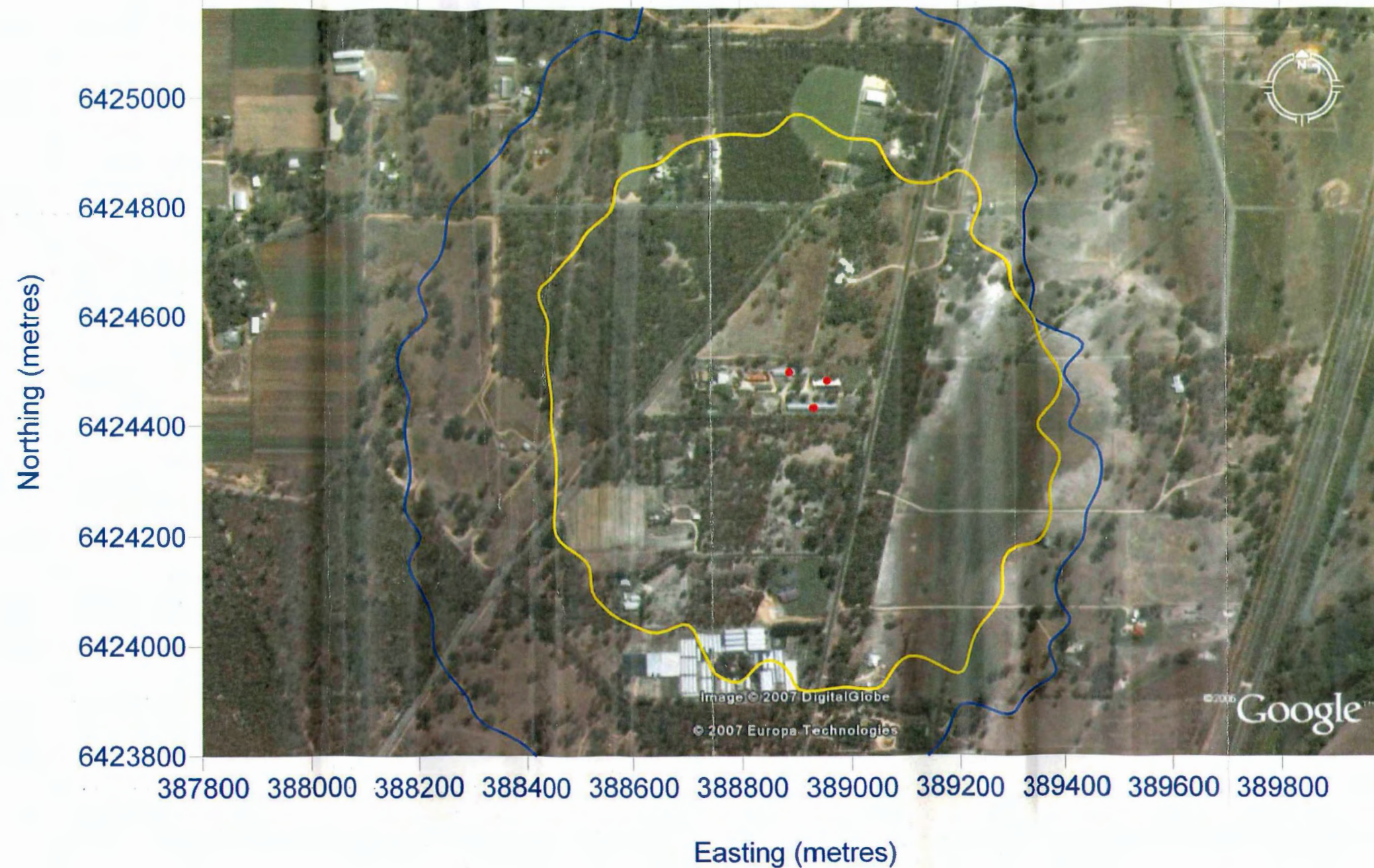
Blue contour = 2.5ou; 99.5th percentile; 1-hour averaging (OER = 0.205ou.m<sup>3</sup> sec<sup>-1</sup>/bird)

**Figure 8.2:** Modelling result contours for Emission Rates based on the "Australian Model Code of Practice for the Welfare of Animals – Domestic Poultry (4<sup>th</sup> Ed.) POST2001 Guidance. (Refer Section 2.2.1).





### Baldivis Egg Layer & Hatchery - Model COP (PRE2001) Stocking Density of 22.2birds/m<sup>2</sup>



Yellow contour = 8ou; 99.9th percentile; 1-hour averaging (OER = 0.205ou.m<sup>3</sup> sec-1/bird)

Blue contour = 2.5ou; 99.5th percentile; 1-hour averaging (OER = 0.205ou.m<sup>3</sup> sec-1/bird)

**Figure 8.3:** Modelling result contours for Emission Rates based on the "Australian Model Code of Practice for the Welfare of Animals – Domestic Poultry (4<sup>th</sup> Ed.) PRE2001 Guidance. (Refer Section 2.2.1).





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## 9 DISCUSSION OF RESULTS

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The Odour Unit Pty Ltd (TOU) conducted an Odour Dispersion Modelling & Field Based Ambient Odour Survey Study of the Layertech Services Poultry (LSP) Facility in Baldivis Western Australia throughout the period of January 2010. The structure for this Odour Impact Study was to assess the potential problematic impacts from the LSP Farm on the adjacent land holding at Lot 311 Fifty Road that has been proposed for redevelopment. Whilst undertaking a 'desktop' Odour Dispersion Modelling Study, TOU also conducted five 'Field Based Ambient Odour Assessments' (FAOA's) to evaluate ground level odorous impacts emanating from the LSP Farm.

The results of the FAOA surveys have concluded that TOU field assessors did not observe problematic odours beyond the boundary of the LSP Farm.

The German VDI 3882 intensity scale is used in FAOA surveys to 'rank' observations of odours. TOU's observations did not exceed an intensity rank of 3, which can be considered problematic. Moreover, TOU field technicians had to 'actively' seek out odour and attempt to define its character during the survey periods. Observations such as this indicate strongly that odours are not problematic, in particular beyond the boundary of the LSP Farm. This result was expected when accounting for the Free Range configuration of the LSP Farm.

TOU is of the belief that the odours observed during the FAOA surveys are non-problematic with respect to Lot 311 Fifty Road. In addition, odour observations were transient and the plume was considered to be narrow. TOU also observed many rural odours that often 'masked' those small intensity odours experienced from/at the LSP Farm boundary. These odours were customary of a typical rural landscape such as grass, fruit and flowering trees.

The Odour Dispersion Modelling 'desktop' study results (refer section 8) indicates odour impacts well beyond those observations made during the FAOA's. Again, this result was expected, particularly since the odour emission rate used represents a





poultry broiler (meat) farm. Jiang and Sands suggest that odour emission from free range farms may be at least 2.5 times less than broiler odours. This finding is highly supported by TOU, however, TOU believes that odours from poultry free range farms, in particular egg layer and hatchery configurations such as the LSP Farm, may have odour emission rates much less than indicated by Jiang and Sands.

For comparison, TOU has modelled the Jiang and Sands reported odour emission rate of  $0.079 \text{ ou} \cdot \text{m}^3 \text{ sec}^{-1} \text{ bird}^{-1}$  for free range configurations and investigated a near-field ground level odour concentration of 5 odour units. TOU modelled the 0.079 OER against an odour criterion of 5ou, 99.5<sup>th</sup> percentile and 1 hour averaging times. The result of this sensitivity model is illustrated in **Figure 9.1** below.





## LPS Farm - Jiang & Sands Free Range OER (0.079ou.m3 sec-1/bird)



Green contour = 5ou; 99.5th percentile; 1-hour averaging (OER = 0.079ou.m3 sec-1/bird)

**Figure 9.1:** Sensitivity Modelling result for an OER of 0.079 at 5ou, 99.5<sup>th</sup> percentile and 1 hour averaging.





TOU investigated three dispersion modelling scenarios for the LSP Farm based on an Australian Poultry industry literature review, and recommendations from the WA DEC.

TOU has undertaken an odour sensitivity modelling (**Figure 9.1**) exercise to derive what emission rate and odour criteria may be relevant to the LSP Farm. The model projection compares well with the FAOA findings. The model projection shows a distance of off-site odour impacts up to approximately 100 metres in any direction from the shed locations at the LSP Farm. This distance is supported by TOU's field observations.

The sensitivity model projection represents a ground level odour impact of 5 odour units at the 99.5<sup>th</sup> percentile. The stocking density determines the overall odour emission rate and therefore it is likely that the stocking densities at the LSP Farm are less than the 17.4 birds per m<sup>2</sup> investigated. TOU's field observations may represent ground level odours of 1 or 2 odour units at or near the LSP Farm boundary and therefore may support a reduction in the stocking density. These odours were not considered problematic.

The modelling outcomes from the Australian Model Code of Practice and those from the Jiang and Sands data represent highly conservative and overstated emissions for the LSP Farm. The emissions data used represented poultry broiler operations. The LSP Farm is not a broiler producer and has been found to be non-problematic beyond the boundary with respect to odour observations. The model projections in this study also represent constant odour emissions of which the LSP Farm would not produce.

It is the strong viewpoint of TOU that odours from the LSP Egg Layer and Hatchery Farm would not be problematic beyond the LSP Farm boundaries.

However, since Lot 311 Fifty Road, Baldivis adjoins the LSP Farm via Eighty Road, it is likely based on the field observations and the sensitivity modelling assessment that odour (albeit low intensity and frequency) may impact the proposed north-west residential land development at Lot 311 Fifty Road, Baldivis. With this in mind TOU



strongly recommends that the proposed residential land development at Lot 311 Fifty Road retain some public land and/or recreational areas that would border Eighty Road. This recommendation is based on the close proximity of the LSP Farm to the Eighty Road boundary and therefore it cannot be assumed that transient odour impacts would not occur under the worst conditions for dispersion.





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## 10 REFERENCES

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1. Animal Welfare Committee (AWF). 'Australian Model Code of Practice for the Welfare of Animals – Domestic Poultry, 4<sup>th</sup> Ed. Endorsed by Primary Industries Ministerial Council (PIMC) May 2002.
2. Jiang, J & Sands, J. 'Odour Emissions from Poultry Farms in Western Australia'. Centre for Waste Water Technology NSW, 1998.
3. Queensland Environment Protection Agency. 'Ecoaccess – Guideline: Odour Impact Assessment from Developments', 2004.
4. Western Australian Department of Environmental Protection: 'Guidance for the Assessment of Environmental Factors – Assessment of Odour Impacts from New Proposals' Document No. 47, 2002.
5. Western Australian Department of Environmental Protection. 'Odour Methodology Guideline', March 2002.



## **Appendix A**

### **Example of the AUSPLUME Model Output File**



Layertech\_Baldivis\_0.2050ER\_2.5ou's\_99.5&amp;ile\_1hr\_ca94-b

Concentration or deposition	Concentration
Emission rate units	OUV/second
Concentration units	Odour_Units
Units conversion factor	1.00E+00
Constant background concentration	0.00E+00
Terrain effects	None
Smooth stability class changes?	No
Other stability class adjustments ("urban modes")	None
Ignore building wake effects?	No
Decay coefficient (unless overridden by met. file)	0.000
Anemometer height	10 m
Roughness height at the wind vane site	0.300 m
Use the convective PDF algorithm?	No

## DISPERSION CURVES

Horizontal dispersion curves for sources <100m high	Pasquill-Gifford
Vertical dispersion curves for sources <100m high	Pasquill-Gifford
Horizontal dispersion curves for sources >100m high	Briggs Rural
Vertical dispersion curves for sources >100m high	Briggs Rural
Enhance horizontal plume spreads for buoyancy?	Yes
Enhance vertical plume spreads for buoyancy?	Yes
Adjust horizontal P-G formulae for roughness height?	Yes
Adjust vertical P-G formulae for roughness height?	Yes
Roughness height	0.300m
Adjustment for wind directional shear	None

## PLUME RISE OPTIONS

Gradual plume rise?	Yes
Stack-tip downwash included?	Yes
Building downwash algorithm:	Huber-Snyder method.
Entrainment coeff. for neutral & stable lapse rates	0.60,0.60
Partial penetration of elevated inversions?	No
Disregard temp. gradients in the hourly met. file?	No

and in the absence of boundary-layer potential temperature gradients given by the hourly met. file, a value from the following table (in K/m) is used:

Wind Speed Category	Stability Class					
	A	B	C	D	E	F
1	0.000	0.000	0.000	0.000	0.020	0.035
2	0.000	0.000	0.000	0.000	0.020	0.035
3	0.000	0.000	0.000	0.000	0.020	0.035
4	0.000	0.000	0.000	0.000	0.020	0.035
5	0.000	0.000	0.000	0.000	0.020	0.035
6	0.000	0.000	0.000	0.000	0.020	0.035

## WIND SPEED CATEGORIES

Boundaries between categories (in m/s) are: 1.54, 3.09, 5.14, 8.23, 10.80

WIND PROFILE EXPONENTS: "Irwin Rural" values (unless overridden by met. file)

## AVERAGING TIMES

1 hour

2.5ou\_99.5th\_1hr\_Jiang&Sands  
SOURCE CHARACTERISTICS

VOLUME SOURCE: SHED1

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
388933	6424434	0m	3m	4m	1m

(Constant) emission rate = 4.71E+03 OUV/second  
No gravitational settling or scavenging.

VOLUME SOURCE: SHED2

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
388889	6424499	0m	3m	4m	1m

(Constant) emission rate = 3.10E+03 OUV/second  
No gravitational settling or scavenging.

VOLUME SOURCE: SHED3

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
388957	6424483	0m	3m	5m	1m

(Constant) emission rate = 3.21E+03 OUV/second  
No gravitational settling or scavenging.

1

Layertech\_Baldivis\_0.2050ER\_2.5ou's\_99.5&ile\_1hr\_ca94-b

RECEPTOR LOCATIONS

The Cartesian receptor grid has the following x-values (or eastings):

387800.m	387850.m	387900.m	387950.m	388000.m	388050.m	388100.m
388150.m	388200.m	388250.m	388300.m	388350.m	388400.m	388450.m
388500.m	388550.m	388600.m	388650.m	388700.m	388750.m	388800.m
388850.m	388900.m	388950.m	389000.m	389050.m	389100.m	389150.m
389200.m	389250.m	389300.m	389350.m	389400.m	389450.m	389500.m
389550.m	389600.m	389650.m	389700.m	389750.m	389800.m	389850.m
389900.m	389950.m					

and these y-values (or northings):

6423800.m	6423850.m	6423900.m	6423950.m	6424000.m	6424050.m	6424100.m
6424150.m	6424200.m	6424250.m	6424300.m	6424350.m	6424400.m	6424450.m
6424500.m	6424550.m	6424600.m	6424650.m	6424700.m	6424750.m	6424800.m
6424850.m	6424900.m	6424950.m	6425000.m	6425050.m	6425100.m	6425150.m
6425200.m	6425250.m	6425300.m	6425350.m	6425400.m	6425450.m	6425500.m
6425550.m	6425600.m	6425650.m	6425700.m	6425750.m		

METEOROLOGICAL DATA : Caversham 1994 Blockley 271200. Read ca94aus.rea for



Layertech\_Baldivis\_0.2050ER\_8ou's\_99.9&amp;ile\_1hr\_ca94-b

Concentration or deposition	Concentration
Emission rate units	OUV/second
Concentration units	Odour_Units
Units conversion factor	1.00E+00
Constant background concentration	0.00E+00
Terrain effects	None
Smooth stability class changes?	No
Other stability class adjustments ("urban modes")	None
Ignore building wake effects?	No
Decay coefficient (unless overridden by met. file)	0.000
Anemometer height	10 m
Roughness height at the wind vane site	0.300 m
Use the convective PDF algorithm?	No

## DISPERSION CURVES

Horizontal dispersion curves for sources <100m high	Pasquill-Gifford
Vertical dispersion curves for sources <100m high	Pasquill-Gifford
Horizontal dispersion curves for sources >100m high	Briggs Rural
Vertical dispersion curves for sources >100m high	Briggs Rural
Enhance horizontal plume spreads for buoyancy?	Yes
Enhance vertical plume spreads for buoyancy?	Yes
Adjust horizontal P-G formulae for roughness height?	Yes
Adjust vertical P-G formulae for roughness height?	Yes
Roughness height	0.300m
Adjustment for wind directional shear	None

## PLUME RISE OPTIONS

Gradual plume rise?	Yes
Stack-tip downwash included?	Yes
Building downwash algorithm:	Huber-Snyder method.
Entrainment coeff. for neutral & stable lapse rates	0.60,0.60
Partial penetration of elevated inversions?	No
Disregard temp. gradients in the hourly met. file?	No

and in the absence of boundary-layer potential temperature gradients given by the hourly met. file, a value from the following table (in K/m) is used:

Wind Speed Category	Stability Class					
	A	B	C	D	E	F
1	0.000	0.000	0.000	0.000	0.020	0.035
2	0.000	0.000	0.000	0.000	0.020	0.035
3	0.000	0.000	0.000	0.000	0.020	0.035
4	0.000	0.000	0.000	0.000	0.020	0.035
5	0.000	0.000	0.000	0.000	0.020	0.035
6	0.000	0.000	0.000	0.000	0.020	0.035

## WIND SPEED CATEGORIES

Boundaries between categories (in m/s) are: 1.54, 3.09, 5.14, 8.23, 10.80

WIND PROFILE EXPONENTS: "Irwin Rural" values (unless overridden by met. file)

## AVERAGING TIMES

1 hour

8ou\_99.9th\_1hr\_Jiang&Sands  
SOURCE CHARACTERISTICS

VOLUME SOURCE: SHED1

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
388933	6424434	0m	3m	4m	1m

(Constant) emission rate = 4.71E+03 OUV/second  
No gravitational settling or scavenging.

VOLUME SOURCE: SHED2

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
388889	6424499	0m	3m	4m	1m

(Constant) emission rate = 3.10E+03 OUV/second  
No gravitational settling or scavenging.

VOLUME SOURCE: SHED3

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
388957	6424483	0m	3m	5m	1m

(Constant) emission rate = 3.21E+03 OUV/second  
No gravitational settling or scavenging.

1

Layertech\_Baldivis\_0.2050ER\_8ou's\_99.9&ile\_1hr\_ca94-b

RECEPTOR LOCATIONS

The Cartesian receptor grid has the following x-values (or eastings):

387800.m	387850.m	387900.m	387950.m	388000.m	388050.m	388100.m
388150.m	388200.m	388250.m	388300.m	388350.m	388400.m	388450.m
388500.m	388550.m	388600.m	388650.m	388700.m	388750.m	388800.m
388850.m	388900.m	388950.m	389000.m	389050.m	389100.m	389150.m
389200.m	389250.m	389300.m	389350.m	389400.m	389450.m	389500.m
389550.m	389600.m	389650.m	389700.m	389750.m	389800.m	389850.m
389900.m	389950.m					

and these y-values (or northings):

6423800.m	6423850.m	6423900.m	6423950.m	6424000.m	6424050.m	6424100.m
6424150.m	6424200.m	6424250.m	6424300.m	6424350.m	6424400.m	6424450.m
6424500.m	6424550.m	6424600.m	6424650.m	6424700.m	6424750.m	6424800.m
6424850.m	6424900.m	6424950.m	6425000.m	6425050.m	6425100.m	6425150.m
6425200.m	6425250.m	6425300.m	6425350.m	6425400.m	6425450.m	6425500.m
6425550.m	6425600.m	6425650.m	6425700.m	6425750.m		

METEOROLOGICAL DATA : Caversham 1994 Blockley 271200. Read ca94aus.rea for



Layertech\_Baldivis\_0.079OER\_Sou's\_99.5&amp;ile\_1hr\_ca94-b

Concentration or deposition	Concentration
Emission rate units	OUV/second
Concentration units	Odour_Units
Units conversion factor	1.00E+00
Constant background concentration	0.00E+00
Terrain effects	None
Smooth stability class changes?	No
Other stability class adjustments ("urban modes")	None
Ignore building wake effects?	No
Decay coefficient (unless overridden by met. file)	0.000
Anemometer height	10 m
Roughness height at the wind vane site	0.300 m
Use the convective PDF algorithm?	No

## DISPERSION CURVES

Horizontal dispersion curves for sources <100m high	Pasquill-Gifford
Vertical dispersion curves for sources <100m high	Pasquill-Gifford
Horizontal dispersion curves for sources >100m high	Briggs Rural
Vertical dispersion curves for sources >100m high	Briggs Rural
Enhance horizontal plume spreads for buoyancy?	Yes
Enhance vertical plume spreads for buoyancy?	Yes
Adjust horizontal P-G formulae for roughness height?	Yes
Adjust vertical P-G formulae for roughness height?	Yes
Roughness height	0.300m
Adjustment for wind directional shear	None

## PLUME RISE OPTIONS

Gradual plume rise?	Yes
Stack-tip downwash included?	Yes
Building downwash algorithm:	Huber-Snyder method.
Entrainment coeff. for neutral & stable lapse rates	0.60, 0.60
Partial penetration of elevated inversions?	No
Disregard temp. gradients in the hourly met. file?	No

and in the absence of boundary-layer potential temperature gradients given by the hourly met. file, a value from the following table (in K/m) is used:

Wind Speed Category	Stability Class					
	A	B	C	D	E	F
1	0.000	0.000	0.000	0.000	0.020	0.035
2	0.000	0.000	0.000	0.000	0.020	0.035
3	0.000	0.000	0.000	0.000	0.020	0.035
4	0.000	0.000	0.000	0.000	0.020	0.035
5	0.000	0.000	0.000	0.000	0.020	0.035
6	0.000	0.000	0.000	0.000	0.020	0.035

## WIND SPEED CATEGORIES

Boundaries between categories (in m/s) are: 1.54, 3.09, 5.14, 8.23, 10.80

WIND PROFILE EXPONENTS: "Irwin Rural" values (unless overridden by met. file)

## AVERAGING TIMES

1 hour

Sou\_99.5th\_1hr\_Jiang&Sands\_0.079  
SOURCE CHARACTERISTICS

VOLUME SOURCE: SHED1

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
388933	6424434	0m	3m	4m	1m

(Constant) emission rate = 1.82E+03 OUV/second  
No gravitational settling or scavenging.

VOLUME SOURCE: SHED2

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
388889	6424499	0m	3m	4m	1m

(Constant) emission rate = 1.20E+03 OUV/second  
No gravitational settling or scavenging.

VOLUME SOURCE: SHED3

X(m)	Y(m)	Ground Elevation	Height	Hor. spread	Vert. spread
388957	6424483	0m	3m	5m	1m

(Constant) emission rate = 1.24E+03 OUV/second  
No gravitational settling or scavenging.

1

Layertech\_Baldivis\_0.079OER\_5ou's\_99.5&ile\_1hr\_ca94-b

RECEPTOR LOCATIONS

The Cartesian receptor grid has the following x-values (or eastings):

387800.m	387850.m	387900.m	387950.m	388000.m	388050.m	388100.m
388150.m	388200.m	388250.m	388300.m	388350.m	388400.m	388450.m
388500.m	388550.m	388600.m	388650.m	388700.m	388750.m	388800.m
388850.m	388900.m	388950.m	389000.m	389050.m	389100.m	389150.m
389200.m	389250.m	389300.m	389350.m	389400.m	389450.m	389500.m
389550.m	389600.m	389650.m	389700.m	389750.m	389800.m	389850.m
389900.m	389950.m					

and these y-values (or northings):

6423800.m	6423850.m	6423900.m	6423950.m	6424000.m	6424050.m	6424100.m
6424150.m	6424200.m	6424250.m	6424300.m	6424350.m	6424400.m	6424450.m
6424500.m	6424550.m	6424600.m	6424650.m	6424700.m	6424750.m	6424800.m
6424850.m	6424900.m	6424950.m	6425000.m	6425050.m	6425100.m	6425150.m
6425200.m	6425250.m	6425300.m	6425350.m	6425400.m	6425450.m	6425500.m
6425550.m	6425600.m	6425650.m	6425700.m	6425750.m		

METEOROLOGICAL DATA : Caversham 1994 Blockley 271200. Read ca94aus.rea for



## **ANNEXURE H**

# **TRAFFIC ASSESSMENT REPORT**



**Lot 311 Fifty Road, Baldivis**  
**Transport Assessment**  
Allerding & Associates

7 June 2013



This report has been prepared from the office of Tarsc  
13 Sopwith Elbow Maylands WA 6051 T +61 8 9471 9991 F +61 8 9471 9996

#### Acknowledgements and Recognition

Issue Date	Revision No	Author	Checked	Approved
08/07/2012	0	Rodney Ding	Alan Rimmer	R Ding
22/08/2012	1	Rodney Ding	Alan Rimmer	R Ding
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**Appendix A Site Plan**

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**1 Introduction**

**1.1 Purpose of This Report**

This report was commissioned by Allerding & Associates to document a transport assessment for the proposed residential subdivision on Lot 311 Fifty Road in Baldvis.

**1.2 Background**

The proposed development in Baldvis is proposed to lie in the south west corner of Fifty Road and Eighty Road in Baldvis. This land is presently vacant except for trees across the majority of the site. This development is proposed to 191 residential lots of varying sizes. Refer to the proposed development site plan at **Appendix A**.

The area surrounding the proposed development is a mix of semi-rural, new residential development with a school just to the north of the site.

Refer to the locality plan in **Appendix B**.

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## 2 Development Proposal

The proposed development provides for residential lots of mixed densities across the entire site.

The main access to the eastern portion of the site is proposed to be via Eighty Road from Fifty Road and via a North-South road, west of Nairn Drive for the western portion of the development. Nairn Drive splits the site into two parts with access via a left-in/left-out treatment for both sides of the development.

No direct access is proposed onto Nairn Drive with access onto lots provided by internal roads.

The essential traffic elements include:

- Total land area of 15.115Ha;
- 192 residential lots;
- Direct lot access onto Eighty Road via a CAP road; and,
- Connectivity to Nairn Drive via a left-in/left-out (LILO) intersection which bisects the lot into two sub lots at a roundabout.



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### **3 Existing Situation, Integration & Changes to Surrounding Road Network**

#### **3.1 Current Road Network**

The highest order road in the vicinity of the development is Fifty Road along the northern edge of the development site. This road is neither a red or blue road under the MRS but is classified as a Local Distributor under the Functional Road Hierarchy. This road is a two-way two-lane road with a 8.5 wide carriageway (comprising a single 3.2 wide lane in each direction and a 2m wide median) within a current 20m wide reserve. No recent traffic data was available from the City of Rockingham or Main Roads but current traffic volumes are estimated at approximately 2,000 to 3,000 vehicles per day (vpd) on this section of Fifty Road and is subject to a posted speed limit of 60km/h. It is understood that this reserve is to be widened to 24.5m to cater for a road of similar cross section to a Neighbourhood Connector A type road, being similar to that currently constructed, but to also allow embayed parking being in accordance with Liveable Neighbourhoods. This road cross section can carry volumes up to 7,000 vehicles per day in a residential context and up to 15,000 in a town centre context.

Along the eastern boundary of the proposed development is Eighty Road. Eighty Road is classified as a Local Access Road. Eighty Road is approximately 7.0m wide between kerbs and provides one lane in each direction within a 20m wide reserve. It is estimated that approximately 1,000 to 2,000 vpd currently use Eighty Road (1,900 vpd were recorded north of Sixty Eight Road in 2007/08). This road intersects with Fifty Road at a T-junction under Give Way control and it is subject to a posted speed limit of 70km/h.

#### **3.2 Proposed Pedestrian and Cycle Network**

The subdivision is proposed to incorporate a shared path and footpath network as shown in **Appendix A**. Most roads are expected to have traffic volumes of approximately 300 vpd and as such footpaths and shared paths are proposed on one side of roads that are wide enough to support the width of a footpath or shared path. Thus nearly all roads will have access to footpath of shared paths.

#### **3.3 Changes to External Road Network**

This area of Baldvis will undergo significant changes to the road network as it is modified to support the approved structure plan for the area. The major change impacting on this proposed development is the construction of Nairn Drive, a main north-south district distributor type road (and a MRS Blue Road) that will bisect the proposed subdivision. As a result of this, Eighty Road will be modified so that it runs down between Nairn Drive and Baldvis Road. This modified Eighty Road route will also support suggested bus route for the area, which would also use Fifty Road and Eighty Road. Refer to **Appendix C**.

The intersection of Nairn Road and Fifty Road is expected to be controlled by either a roundabout or traffic signals in the longer term. In the interim, until traffic volumes dictate, the intersection should operate as a Stop sign controlled

intersection, but designed for future signalisation or have a roundabout installed soon.

Fifty Rd presently has a 20m wide road reserve, but this has been recommended to increase to 25m as part of the Baldivis Roads Needs Study, Worley Parson, 2005 and this will accommodate a Neighbourhood Connector A type road (Boulevard) with embayed parking on both sides of the road. Eighty Road has been proposed to have a 20m wide road reserve as per the Baldivis Roads Needs Study with a Neighbourhood Connector B type road.

The intersection of Eighty Road and Fifty Road has been assumed to be a simple intersection of a Neighbourhood Connector A (Fifty Road) with a median treatment and a Neighbourhood Connector B (Eighty Road) with a traffic island at the intersection. No special channelization has been assumed and this forms the basis of the subsequent assessment.

### 3.4

#### Crash Assessment

The safety of the intersections where most of the development traffic will flow through was checked utilising the Main Roads crash database. The only intersection with current crash data was the intersection of Fifty Road and Eighty Road, summarised below in **Table 3.1**.

**Table 3.1 - Intersection of Abernethy Road/Soldiers Road**

Freq. Rank	Cost Rank	Total	RE	SS	RA	RTT
5482	2552	2	0	0	0	0
Wet	Night	Ped	Cycle	Truck	MC	Casualty
1	2	0	0	0	0	0

The intersection Fifty Road and Eighty Road exhibits a very good safety record with a low number of crashes over the 5 year period to 31<sup>st</sup> December 2011.



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## 4 Analysis of Transport Networks

### 4.1 Trip Generation Rate

The proposed development is to be a residential subdivision as advised by the client. The traffic generation for the site was based on the publication Land Use Traffic Generation Guidelines (Director General of Transport, SA, 1987).

The rate assumed was based on the daily rate for a detached dwelling occupied by families and children, which is 10 trips per day per dwelling.

### 4.2 Trip Generation of Site

Using the above generation rate for 192 dwellings (this being conservative as some of the R40 development would have generation rate somewhat less than 10 trips per day) there should be in the order of 1,920 trips per day generated by the proposed development with 960 entering and 960 exiting over an entire day. For the AM and PM peak there should be about 192 trips per hour with 144 exiting and 48 entering in the AM peak and 64 exiting and 128 entering in the PM peak.

This traffic generation of the site assumes that there is no traffic generated from the current land-uses on the site.

### 4.3 Trip Distribution

With the site bordered by three roads and the location of the centre the proposed distribution of trips are as shown by the sketch in **Appendix D** and summarised below.

- Fifty Road to the east – 50%;
- Nairn Drive to the north – 20%;
- Fifty Road to the west – 20%; and,
- Nairn Drive to the south – 10%.

**Table 4.1** summarises the expected traffic flows on roads within the vicinity due to the development and the current flows on those roads and the above assumed directional flows to and from the proposed development.

The traffic volumes were assumed for both Fifty Road (10% of assumed 10,000 vpd, 5,000vpd less than maximum flow for a road of this nature, being an Integrator B town centre main street where volumes up to 15,000 can be accommodated) and Nairn Drive (10% of assumed 25,000 vpd maximum flow for a road of this nature, being the maximum volume for a road that could fit within the 40m reserve width, an Integrator A type road - centres). This is considered to represent the expected traffic flows 10 years after completion of the development.

**Table 4.1 - Trip Distribution from Development (2031 Flows)**

Road	Expected Traffic Volume (vpd, two-way)	Expected Development Traffic (vpd, two-way)
Fifty Road to west	10,000	380
Fifty Road to east	10,000	950
Nairn Drive to north	24,000	380
Nairn Drive to south	24,000	190
Eighty Road	1,200	1,200

#### 4.4

##### **Traffic Impact of Development**

In general terms the roads surrounding the development will have traffic volumes that should not exceed their maximum traffic flows for similar roads of their type. The comparisons to maximum flows that these roads should carry are shown below in **Tables 4.2 and 4.3**. The maximum hourly flows are expected to be approximately 50% of the midblock carrying capacity of the roads, except for Nairn Drive, whilst the daily flows are expected to be within acceptable limits.

**Table 4.2 – Expected Daily Flows (two way) - 2031**

Road	Indicative Maximum Daily Flow (vpd, two-way)	Expected Daily Flow (vpd, two-way)
Fifty Road to west	3,000 <sup>1</sup> – 15,000 <sup>2</sup>	10,380
Fifty Road to east	3,000 – 15,000	10,950
Nairn Drive to north	25,000 <sup>3</sup>	24,380
Nairn Drive to south	25,000	24,190
Eighty Road	3,000 <sup>4</sup>	2,400

<sup>1</sup> Based on Neighbourhood Connector A – 50km/h, Liveable Neighbourhoods, 2009

<sup>2</sup> Based on Integrator B – town centre main street – 40-50km/h, Liveable Neighbourhoods, 2009

<sup>3</sup> Based on Integrator A – Centres – 60km/h, Liveable Neighbourhoods, 2009

<sup>4</sup> Based on Neighbourhood Connector B – 50km/h, Liveable Neighbourhoods, 2009



**Table 4.3 – Expected Hourly Flows (one way) - 2031**

Road	Capacity (vph, one-way) <sup>5</sup>	Expected Flow (vph, one-way)
Fifty Road to west	900	380 (WB)
Fifty Road to east	900	420 (EB)
Nairn Drive to north	1,900	1,705 (NB)
Nairn Drive to south	1,900	1,730 (NB)
Eighty Road	900	150 (NB)

It can be seen that the traffic flows are not expected to exceed the indicative maximum acceptable daily flow rates on any of the roads bordering the proposed development. The critical factor in this instance is the peak hour flows and the intersection performance at the intersections of Nairn Drive with the internal east-west road and the intersection of Fifty Road and Eighty Road.

With regards to intersections, Austroads Guide to Traffic Engineering Practice Part 5 – Intersections at Grade provides advice as to intersection performance in peak flow conditions with regards to possible further analysis. This is summarised in Table 4.4.

**Table 4.4 – Austroads Guidelines**

Major Road Type	Major Road Flow (vph, two-way)	Minor Road Flow (vph, two-way)
Two-lane	400	250
	500	200
	650	100
	1000	100
Four-lane	1500	50
	2000	25

<sup>5</sup> Based on Table 7.1, Roadway Capacity, Guide to Traffic Engineering Practice, Austroads

Examining the expected traffic flows at each of the intersections around the proposed development **Table 4.5** is derived.

**Table 4.5 – Comparison to Austroads Guidelines**

Intersection	Major Road Flow (vph, two-way)	Minor Road Flow (vph, two-way)
Nairn Drive/EW LILO Road	2,400	72
Fifty Road/Eighty Road	700	200
Fifty Road/NS Road	740	30
Eighty Road/EW Road (typ)	80	20

From the above it can be seen that the subject intersections highlighted red should be above the above values given in **Table 4.5**. Thus, these intersections should be examined in further detail.

#### 4.5

##### **Sidra Assessments**

To further assess the performance of these intersections during peak periods a computer program called Sidra Intersection (Version 5) was utilised to assess all of the above intersections.

The AM peak was chosen as the most appropriate period as this period has the most traffic exiting the development area entering onto roadways. This will produce the better assessment as there would be less traffic exiting the development in the PM peak.

##### 4.5.1

##### **Intersection of Nairn Drive/EW Road**

This LILO intersection was assessed using the AM peak flows of the development and the AM peak flows expected on the road network. The results are shown below in **Table 4.6**. Overall, the intersection should perform satisfactorily levels of being consistently A/B. The queues on the western approach are expected to be 13m/2 vehicles at worst, this being acceptable.



**Table 4.6 — Expected AM Performance**

Lane Use and Performance																
	Demand Flows				HV Cap.		Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Length	SL Type	Cap. Adj.	Prob. Block.
	L	T	R	Total	%	veh/h					Vehicles	Distance				
	veh/h	veh/h	veh/h	veh/h			v/c	%	sec		veh	m	m		%	%
<b>South: Nairn Road</b>																
Lane 1	50	868	0	918	5.0	1883	0.488	100	0.5	LOS A	0.0	0.0	500	—	0.0	0.0
Lane 2	0	921	0	921	5.0	1889	0.488	100	0.0	LOS A	0.0	0.0	500	—	0.0	0.0
Approach	50	1789	0	1839	5.0		0.488		0.2	NA	0.0	0.0				
<b>East: EW Road</b>																
Lane 1	9	0	0	9	5.0	567	0.017	100	12.6	LOS B	0.1	0.4	500	—	0.0	0.0
Approach	9	0	0	9	5.0		0.017		12.6	LOS B	0.1	0.4				
<b>North: Nairn Road</b>																
Lane 1	14	361	0	375	5.0	1885	0.199	100	0.3	LOS A	0.0	0.0	500	—	0.0	0.0
Lane 2	0	376	0	376	5.0	1889	0.199	100	0.0	LOS A	0.0	0.0	500	—	0.0	0.0
Approach	14	737	0	751	5.0		0.199		0.2	NA	0.0	0.0				
<b>West: EW Road</b>																
Lane 1	53	0	0	53	5.0	101	0.519	100	59.9	LOS F	1.8	12.9	500	—	0.0	0.0
Approach	53	0	0	53	5.0		0.519		59.9	LOS F	1.8	12.9				
Intersection				2652	5.0		0.519		1.4	NA	1.8	12.9				

#### 4.5.2 Intersection of Fifty Road/Eighty Road

This intersection was also assessed using the AM peak flows of the development and the AM peak flows expected on the road network, with results shown below in Table 4.7.

**Table 4.7 — Expected AM Performance**

Lane Use and Performance																
	Demand Flows				HV Cap.		Deg. Satn	Lane Util.	Average Delay	Level of Service	95% Back of Queue		Lane Length	SL Type	Cap. Adj.	Prob. Block.
	L	T	R	Total	%	veh/h					Vehicles	Distance				
	veh/h	veh/h	veh/h	veh/h			v/c	%	sec		veh	m	m		%	%
<b>South: Eighty Road</b>																
Lane 1	100	0	0	100	0.0	334	0.299	100	12.2	LOS B	0.6	4.4	7 Turn Bay		0.0	0.0
Lane 2	0	0	124	124	0.0	205	0.605	100	37.7	LOS E	3.1	21.7	500	—	0.0	0.0
Approach	100	0	124	224	0.0		0.605		26.3	LOS D	3.1	21.7				
<b>East: Fifty Road</b>																
Lane 1	63	500	0	563	0.0	1939	0.290	100	0.9	LOS A	0.0	0.0	500	—	0.0	0.0
Approach	63	500	0	563	0.0		0.290		0.9	NA	0.0	0.0				
<b>West: Fifty Road</b>																
Lane 1	0	500	0	500	0.0	1950	0.256	100	0.0	LOS A	0.0	0.0	500	—	0.0	0.0
Lane 2	0	0	12	12	0.0	375	0.032	100	10.9	LOS B	0.1	0.4	7 Turn Bay		0.0	0.0
Approach	0	500	12	512	0.0		0.256		0.3	NA	0.1	0.4				
Intersection				1299	0.0		0.605		5.0	NA	3.1	21.7				

The intersection is expected to operate at a level of service B/E on the Eighty Road approach with vehicles able to undertake right turns through the intersection in a single stage through an assumed 2m wide median incurring a 28s delay and queue lengths of about 3 vehicles.

#### 4.5.3 Performance Assessment Concept Parameters

The level of service concept describes the quality of traffic service in terms of six levels, designated A to F, with level of service A (LOS A) representing the best

operating condition (i.e. at or close to free flow), and level of service F (LOS F) the worst (i.e. forced flow). More specifically:

- *LOS A:* Individual drivers are virtually unaffected by others in the traffic stream. Their freedom to select their own desired speed and to manoeuvre in the traffic stream is extremely high, and the general level of comfort and convenience is excellent;
- *LOS B:* Individual drivers still have reasonable freedom to select their desired speed and to manoeuvre in the traffic stream, although the general level of comfort and convenience is less than at LOS A;
- *LOS C:* Most drivers are restricted to some extent in their freedom to select their desired speed and to manoeuvre in the traffic stream;
- *LOS D:* All drivers are severely restricted in their freedom to select their desired speed and to manoeuvre in the traffic stream. Traffic is close to the upper limit of stable flow, the general level of comfort and convenience is poor, and small increases in traffic flow will usually cause operational problems;
- *LOS E:* Traffic volumes are at, or close to capacity, and drivers have virtually no freedom to select their desired speed or to manoeuvre. Traffic flow is unstable and minor disturbances will result in stop-start conditions; and,
- *LOS F:* Flow is forced and the amount of traffic approaching the point under consideration exceeds that which it can handle. Stop-start conditions apply and queuing and delays result.

In addition to the above:

- Average Delay: is the average of all travel time delays for vehicles through the intersection; and,
- Queue: is the queue length below which 95% of all observed queue lengths fall.

#### 4.6

##### **Impact of Development on Local Area**

Based on the above assessment it is concluded that the development will have an acceptable impact on the surrounding roads and intersections.



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## 5 Internal Traffic Flows and Road Reserves

Traffic flows on internal roads within the development site are shown in **Appendix D**. Most traffic flows on roads are in the order of 100 to 400 vehicles per day, with the only exception near the commercial centre development site where volumes are expected higher due to the commercial development.

Under these conditions, most roads are 14.2m wide reserves representing Access Street D (allowing 6.0m wide roadway and 4.1m wide verges each side). These 13.2m wide reserves narrow by 1m along the Nairn Road frontage, with the verge adjacent to Nairn Road narrowed to 3.1m. Adjacent to POS and development sites the reserve widens to 15.2m to allow a wider 5.1m verge adjacent to these POS/development sites incorporating 2.1m wide embayed parking within the 5.1m wide verge.

This plan also shows the location of footpaths within the development located on both sides of Fifty Road and Nairn Drive, but otherwise generally on one side of the road (again except near the commercial centre).

Road priority is generally reinforced by the use of coloured pavement at T-junction intersections and further enforced by the use of Stop/Give Way signage at two intersections on the western portion of the site.

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**6 Summary**

As a result of the analysis undertaken for the proposed new shopping centre at Lot 311 Fifty Road in Baldivis, the following findings were made:

- The proposed development will generate approximately 1,920 vehicular trips per day;
- There are good pedestrian footpaths currently and proposed on all sides of the proposed development with access to public transport; and,
- The impact of the traffic volumes associated with the development are considered acceptable in the longer term with increases in traffic flows to 2031.



## Appendix A Site Plan





# PROPOSED STRUCTURE PLAN

LOT 311 FIFTY ROAD  
BALDIVIS

CITY OF ROCKINGHAM

0 25 50 75 100 125m

SCALE: 1:2500  
ORIGINAL PLAN SIZE: A3

JOB CODE:  
LIL BAL GE

DATE:  
31.05.2013



## LEGEND:

SUBJECT LAND -  
RESIDENTIAL R20 -  
RESIDENTIAL R25 -  
RESIDENTIAL R30 -  
DEVELOPMENT SITE (R40) -  
COMMERCIAL (MIXED USE) -  
PUBLIC OPEN SPACE -



DUAL USE PATH -  
LOCAL FOOTPATH -



**Allering Associates**  
Town Planners, Advocates  
and Subdivision Designers

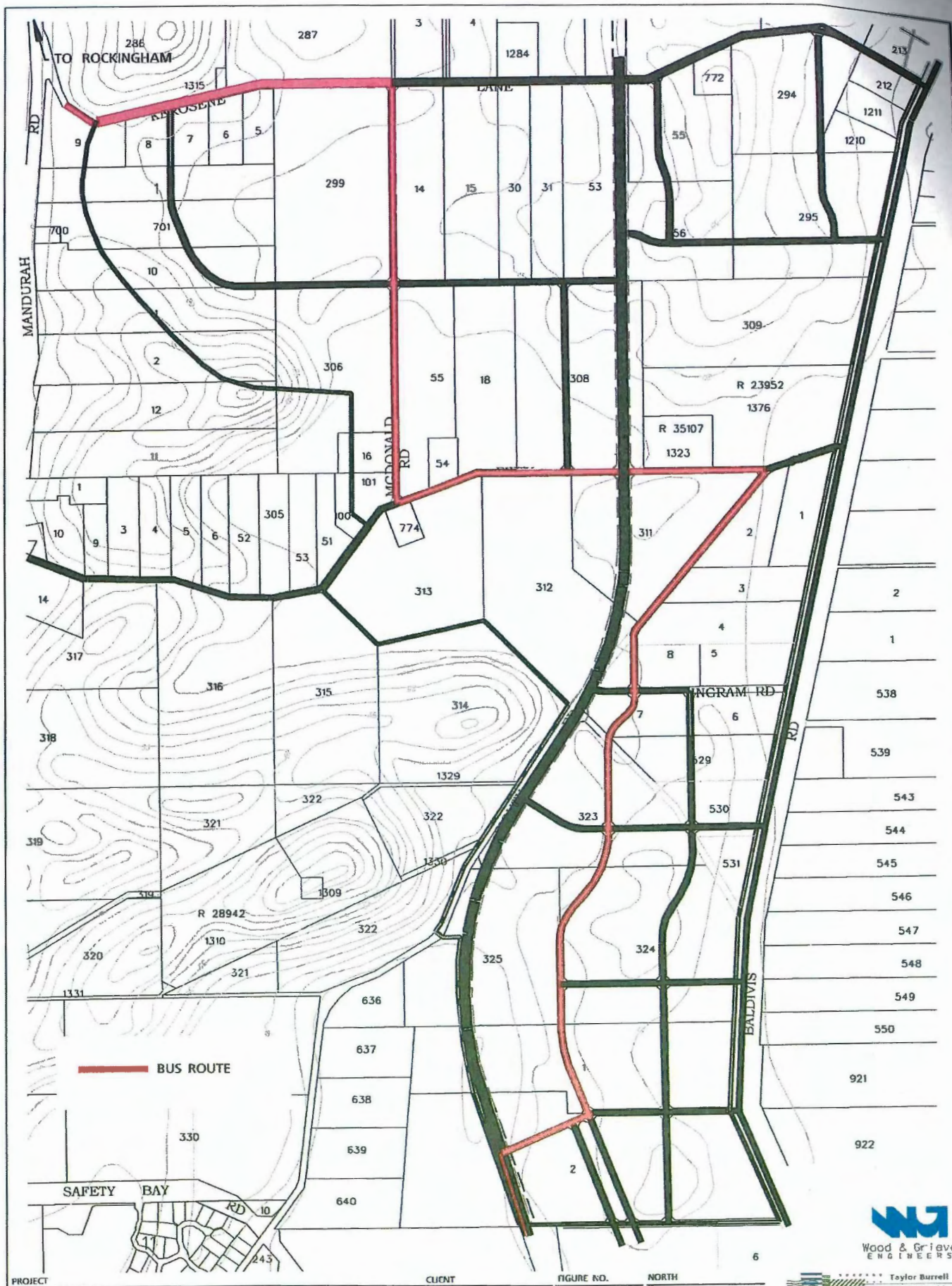


## Appendix B Locality Plan





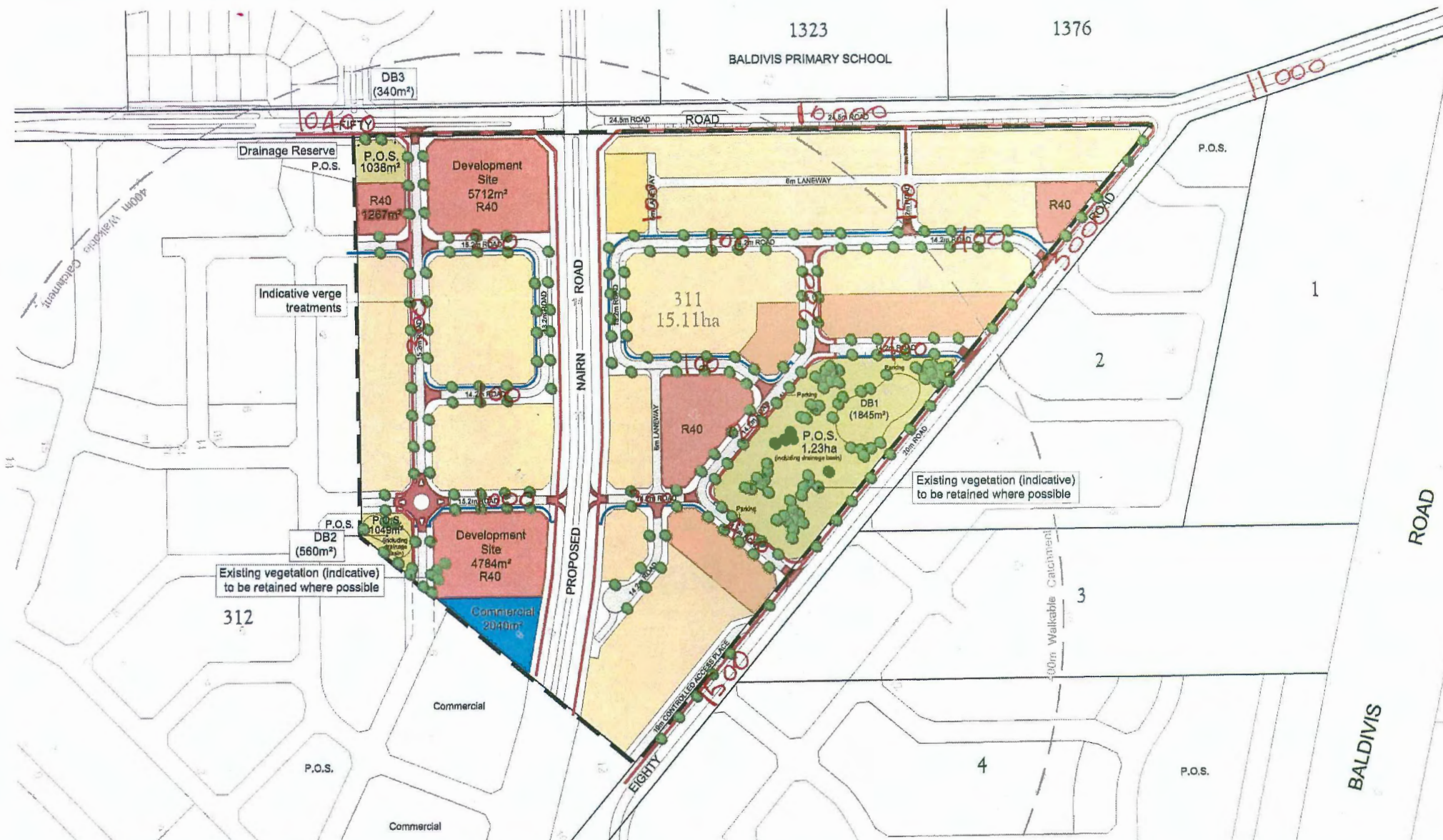
## Appendix C DSP Road Structure



STUDY AREA - SUGGESTED LOCAL BUS ROUTE  
BALDIVIS (NORTH) DISTRICT STRUCTURE PLAN



## Appendix D Trip Distribution



# PROPOSED STRUCTURE PLAN

TRIP DISTRIBUTION  
+ TRAFFIC VOLUMES

LOT 311 FIFTY ROAD  
BALDIVIS

CITY OF ROCKINGHAM

0 25 50 75 100 125m

SCALE: 1:2500  
ORIGINAL PLAN SIZE: A3

JOB CODE:  
LIL BAL GE

DATE:  
31.05.2013



## LEGEND:

SUBJECT LAND -  
RESIDENTIAL R20 -  
RESIDENTIAL R25 -  
RESIDENTIAL R30 -  
DEVELOPMENT SITE (R40) -  
COMMERCIAL (MIXED USE) -  
PUBLIC OPEN SPACE -



DUAL USE PATH -  
LOCAL FOOTPATH -



Allerding  
Associates

Town Planners, Advocates  
and Subdivision Designers

125 Hamersley Road, Subiaco WA 6008  
T: (08) 9382 3000 F: (08) 9382 3005 W: allerdingassoc.com