STRUCTURE PLAN, LOT D, KWINANA EDUCATION PRECINCT, TOWN OF KWINANA, OCTOBER 2008

LANDCORP

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STRUCTURE PLAN
LOT D, KWINANA EDUCATION PRECINCT
TOWN OF KWINANA

OCTOBER 2008

PREPARED BY: ROBERTS DAY TOWN PLANNING + DESIGN
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ABN GROUP
GENERATION PROJECTS

PRINTED ON 100% RECYCLED PAPER

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ENDORSEMENT PAGE

This structure plan is prepared under the provisions of the City of Kwinana Town Planning Scheme No.2

IT IS CERTIFIED THAT THIS STRUCTURE PLAN WAS APPROVED BY RESOLUTION OF THE WESTERN AUSTRALIAN PLANNING COMMISSION ON:

13 March 2009

In accordance with Schedule 2, Part 4, Clause 28 (2) and refer to Part 1, 2. (b) of the *Planning and Development (Local Planning Schemes) Regulations 2015*.

Date of Expiry: 19 OCTOBER 2030

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ø *Remnants of the original Armadale - Rockingham Road*

60kms

50kms

40kms

30kms

20kms

JOONDALUP

STIRLING

PERTH

FREMANTLE

SUBJECT SITE

ROCKINGHAM

MANDURAH

1.0 INTRODUCTION + BACKGROUND

1.1 INTRODUCTION

A number of studies and master plans have previously been prepared for the Kwinana town centre and adjoining land in order to facilitate appropriate development and revitalise the locality. An important site within the town centre is the former Kwinana High School site and Orelia Oval which is now collectively known as the Kwinana Education Precinct (KEP). The KEP consists of four separate lots including the Gilmore College site, the Challenger Tafe Automtove Training Centre site and two vacant lots (Lots B and D), which have been identified for mixed use and residential development respectively. Lot D (the 'site') is subject to this Structure Plan.

The Structure Plan aims to create a vibrant and sustainable addition to the Kwinana town centre, comprising of a mix of densities and house types on the site that integrate well with the existing surrounding development. The Structure Plan proposes a highly interconnected street, path and public open space network with linkages to the adjoining residential areas, education facilities, recreation sites and the Kwinana town centre.

1.2 SITE DESCRIPTION

1.2.1 Location

The Structure Plan site comprises of an area of land on the eastern side of the Kwinana Education Precinct, formerly the Kwinana High School site. The site, which is 6.2312ha in area, is located between Sulphur Road, Orelia Avenue and Dargin Place.

The site is located approximately 31 kilometres from the Perth CBD, and forms part of the northern end of the Kwinana town centre. Access to the site from the Perth city centre is available via the Kwinana Freeway, Thomas Road then Gilmore Avenue.

- *Figure 1 - Regional Context Plan*
- *Figure 2 - Local Context Plan*

1.2.2 Land Ownership

The site is owned by the Department for Education and Training.

1.2.3 Existing Land Use & Development

The site is parkland cleared and is vacant. There are a number of walking trails which traverse the site.


DARGIN PLACE
ORELIA AVENUE
SULPHUR ROAD

1.3 PROJECT BACKGROUND

1.3.1 Project Team

In 2007 Landcorp chose Alcock Brown-Neaves Group (ABN) as a partner to develop the site after it was identified as surplus to the Department of Educations and Training's requirements. The following is the multi-disciplinary project team appointed by Landcorp to progress the Structure Plan for the site:

- Estill & Associates
- Generation Projects
- Hassell
- McMullen Nolan & Partners
- Curtin University Sustainability Policy Division
- Roberts Day Town Planning + Design
- Sharni Howe Architects
- Wood & Grieve Engineers

The objective that Landcorp holds for the Structure Plan area is to develop a contemporary inner-city residential development with increased densities and a range of housing stock that provides strong connectivity and integration within the Kwinana Education Precinct and to the town centre enhanced by high levels of pedestrian and landscaped amenity.

ø *Figure 3 - Site Plan*

1.3.2 Community Consultation (Initial Phase)

Estill & Associates, Generation Projects and Roberts Day Town Planning + Design undertook an initial phase of community consultation with the residents located directly adjacent to the sites on; Dargin Place, Sulphur Road and Oerlia Avenue via a community workshop. In addition to the workshop an information pamphlet and feedback form was distributed to over 600 surrounding landowners. A total of 22 feedback forms were received within the two week feedback timeframe.

Key comment that arose during the process included:

- There was strong support for the project to progress and for residential development to be undertaken on the site;
- The project should protect the existing and unique look and feel of Kwinana;
- Retention of trees on the site where possible was a strong theme, and where this would not be possible a planting program should be undertaken;
- There was strong support for the inclusion of a park in the site with trees, seating areas and play spaces for children;
- Safety was raised as a very important consideration, including good passive surveillance, adequate and well placed lighting, safe pedestrian links and park design;
- Street frontage treatments need to be carefully considered, particularly at Orelia Ave and Sulphur Ave;
- The interface of the development with the existing community at a similar scale was raised as an important element of the structure plan. Lower density should be located at the edges of the site adjacent to existing residential areas, with medium density in the southern and mid-sections and medium-higher density at the interface with the school. Higher density should not be in the form of high rise, but in a design that blends with the existing area;
- Development should try to follow the contours of the land;
- More information is required as to what a 'land mark' building might be; and
- Landscaping both internal and external to the site (in the form of street trees, traffic calming measures etc) was strongly supported.

The above key comments were taken into consideration when preparing the Structure Plan.

1.3.3 Stakeholder Workshop

A stakeholder workshop was held to identify issues and opportunities associated with the sites which would guide the design of the Structure Plan. The workshop included participants from the Town of Kwinana, Department for Education and Training, Kwinana Industries Council, Department for Planning and Infrastructure, Gilmore College, Landcorp and the project team.

The key outcomes and suggestions were summarised as follows:

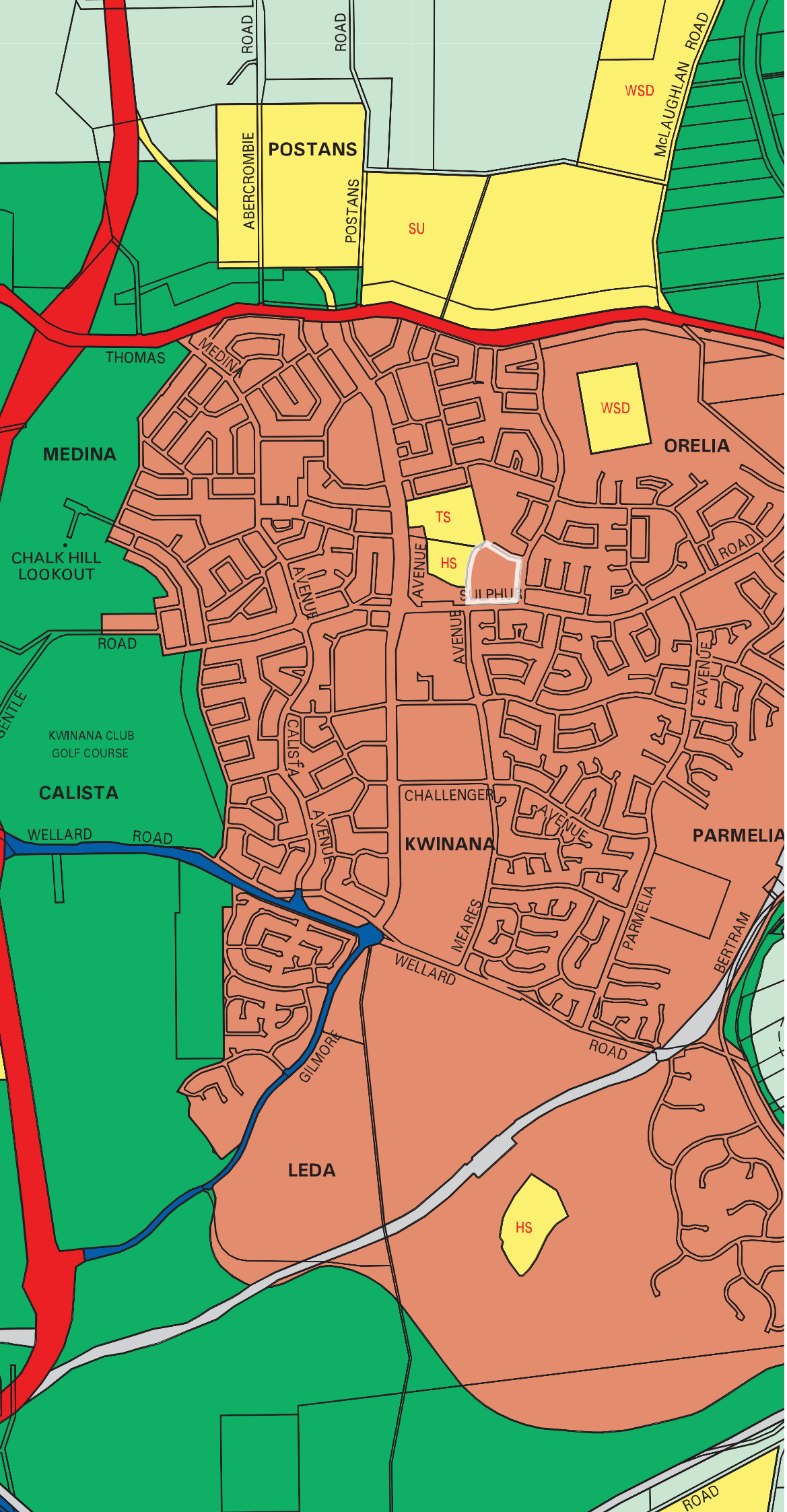
- Consider the co-location of a pedestrianised area and cars to ensure passive surveillance;
- Lower density in a "7" shape is supported at the edge of the site to provide an interface that is consistent with the existing residential area;
- Medium density is supported in the southern and mid section;
- Medium – higher density was supported at the interface with the school;
- The medium density could possibly move further east and north, but not touching Dargin and the Orelia/Dargin corner;
- Potentially reduce the width of the linear parkland and keep the integrity of the heritage trail. Extend

the open space provision over to help integrate it into the existing community;
- Retain significant trees where possible and where it is not possible undertake a planting program to ensure there is a net gain;
- The current mixed use corner of Lot D is to be a residential use, but be a landmark site with higher density and appropriate built form; and
- Further consideration to be given to affordable housing provision, with a thought to look at innovative alternatives to the norm.

1.3.4 Objectives

The principle objective of this document is to provide a sound planning basis for the future subdivision and development of land within the Structure Plan area. More specifically, the aims and objectives of the Structure Plan are as follows:

- To create a development that caters to those seeking an inner-city lifestyle that has a high standard of residential development and integrates well with the existing area;
- To implement innovative design and environmental initiatives to create a best-practice development;
- To provide strong connectivity with the adjacent education facilities through permeability with priority given to pedestrian movement;
- To ensure linkage to, and integration with the Town Centre, via landscaped pedestrian linkages and sensitive transition between the existing and new development with complimentary scales of built form;
- To create a new urbane-style through modern and contemporary built form, quality landscaping and an increase in residential densities; and
- To optimise the retention of trees and vegetation.



LEGEND

SCHEME BOUNDARY

RESERVED LANDS

- PARKS AND RECREATION
- RESTRICTED PUBLIC ACCESS
- RAILWAYS
- PORT INSTALLATIONS
- STATE FORESTS
- WATER CATCHMENTS
- CIVIC AND CULTURAL
- WATERWAYS

ROADS

- PRIMARY REGIONAL ROADS
- OTHER REGIONAL ROADS

PUBLIC PURPOSES - DENOTED AS FOLLOWS:

H	HOSPITAL
HS	HIGH SCHOOL
TS	TECHNICAL SCHOOL
CP	CAR PARK
U	UNIVERSITY
CG	COMMONWEALTH GOVERNMENT
SEC	STATE ENERGY COMMISSION
SU	SPECIAL USES
WSD	WATER AUTHORITY OF WA
P	PRISON

ZONES

- URBAN
- URBAN DEFERRED
- CENTRAL CITY AREA
- INDUSTRIAL
- SPECIAL INDUSTRIAL
- RURAL
- PRIVATE RECREATION
- RURAL - WATER PROTECTION

METROPOLITAN REGION SCHEME

This map has been derived from an electronic version of the scheme held and maintained by the Department for Planning and Infrastructure, on behalf of the Western Australian Planning Commission.

This map is one of a set of 38 which depicts the zones and reservations of the Metropolitan Region Scheme as adopted on 30 October 1963. The information shown is correct up to the date shown below as far as the Department and the Commission are aware.

The scheme does not purport to indicate the land use allocation under any local government provision.

Amended to: 01 May 2007

N

METROPOLITAN REGION SCHEME MAP
1:25000 MAP SERIES

2.0 CONTEXTUAL ANALYSIS + EXISTING STATUTORY FRAMEWORK

2.1 METROPOLITAN REGION SCHEME

The site subject to the Structure Plan is zoned 'Urban' under the Metropolitan Region Scheme (MRS). The adjacent Gilmore College land is zoning 'Public Purpose' and the remaining surrounding land is zoned 'Urban'.

2.2 TOWN OF KWINANA TOWN PLANNING SCHEME NO. 2

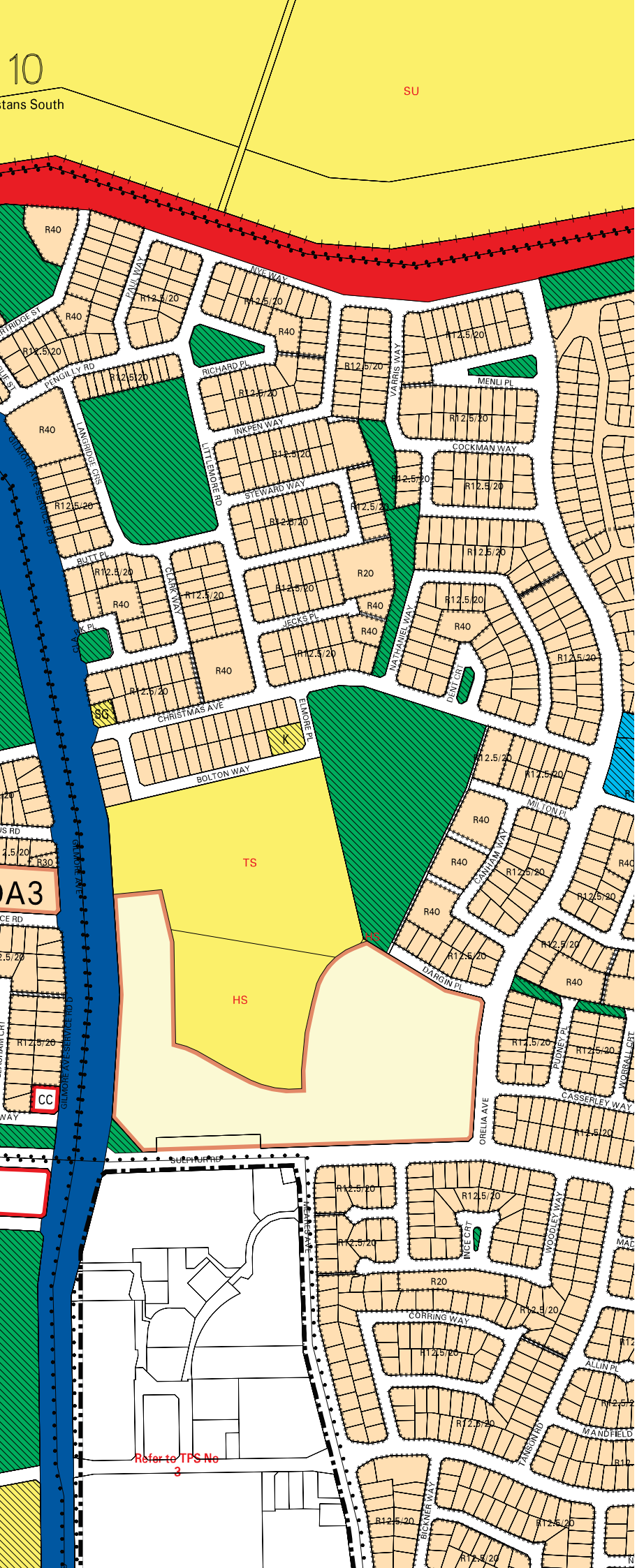
The site is zoned 'Development' under The Town of Kwinana Town Planning Scheme No. 2 (TPS2).

The purpose of the 'Development' zone is 'to provide for the orderly planning and development of larger areas of land in an integrated manner within a regional context whilst retaining flexibility to review planning and changing circumstances.'

The objectives of the 'Development' zone are to:

a. designate land for future development;
b. provide a planning mechanism for the identification and protection of areas of conservation value whilst facilitating the growth of the Town;
c. provide for the orderly planning of large areas of land for residential, commercial, industrial and associated purposes through a comprehensive structure planning process;
d. enable planning to be flexible and responsive to changing circumstances throughout the development stages of the area; and
e. provide sufficient certainty for demand forecasting by service providers.

ø *Figure 4 - MRS Zoning Map*



LEGEND

METROPOLITAN REGION SCHEME RESERVES

- PARKS AND RECREATION
  - R — RESTRICTED PUBLIC ACCESS
- RAILWAYS
- PORT INSTALLATIONS
- STATE FORESTS
- WATER CATCHMENTS
- CIVIC AND CULTURAL
- WATERWAYS
- PRIMARY REGIONAL ROADS
- OTHER REGIONAL ROADS
- PUBLIC PURPOSES - DENOTED AS FOLLOWS:
  - H — HOSPITAL
  - HS — HIGH SCHOOL
  - TS — TECHNICAL SCHOOL
  - CP — CAR PARK
  - U — UNIVERSITY
  - CG — COMMONWEALTH GOVERNMENT
  - SEC — STATE ENERGY COMMISSION
  - SU — SPECIAL USES
  - WSD — WATER AUTHORITY OF WA
  - P — PRISON

LOCAL SCHEME RESERVES

- PARK RECREATION & DRAINAGE
- PARK RECREATION & DRAINAGE — DENOTED AS FOLLOWS:
  - CR — CONSERVATION RESERVE
- PUBLIC PURPOSES
- PUBLIC PURPOSES — DENOTED AS FOLLOWS:
  - CF — COMMUNITY FACILITY
  - CG — COMMONWEALTH GOVERNMENT
  - H — HALL
  - K — KINDERGARTEN
  - LG — LOCAL GOVERNMENT
  - PS — PRIMARY SCHOOL
  - SG — STATE GOVERNMENT
- PUBLIC PURPOSES — DENOTED AS FOLLOWS:
  - T — TELECOM
  - WSD — WATER SUPPLY SEWERAGE & DRAINAGE

ZONES

- DEVELOPMENT
- RESIDENTIAL
- SPECIAL RESIDENTIAL
- COMMERCIAL
- KWINANA TOWN CENTRE
- MIXED BUSINESS 1
- SERVICE COMMERCIAL
- SPECIAL USE
- SPECIAL USE — DENOTED AS FOLLOWS:
  - APH — AGED PERSONS HOME
  - CC — CULTURAL CENTRE
  - F — FUNERAL PARLOUR
  - H — HOTEL
  - P — PRE-PRIMARY
  - S — SCHOOL
- SPECIAL USE — DENOTED AS FOLLOWS:
  - SS — SERVICE STATION
  - T — TAVERN
  - TD — TRANSPORT DEPOT
  - V — VARIOUS
  - W — WELFARE
- GENERAL INDUSTRY
- LIGHT INDUSTRY
- CLUSTER/COMMUNAL RURAL SETTLEMENT
- RURAL A
- RURAL B
- RURAL WATER RESOURCE
- SPECIAL RURAL

OTHER

- R CODES (e.g. R20)
- A1 — ADDITIONAL USES
- SCHEME BOUNDARY
- LOCAL GOVERNMENT BOUNDARY
- AREA OF LANDSCAPE PROTECTION
- POLICY AREAS (SEE SCHEME TEXT) (e.g. 1)
- DRAINAGE CATCHMENT MANAGEMENT
- SR2 — SPECIAL RURAL AREA (SEE SCHEME TEXT)
- SRes 1 — SPECIAL RESIDENTIAL AREA (SEE SCHEME TEXT)
- DA1 — DEVELOPMENT AREA (SEE SCHEME TEXT)
- DCA1 — DEVELOPMENT CONTRIBUTION AREA (SEE SCHEME TEXT)
- PRESERVATION OF BUILDINGS, OBJECTS AND PLACE (SEE SCHEME TEXT)
- NO ZONE

N

SCALE 1:10000

0 — 250 m

ø *Figure 5 - TPS 2 Zoning Map*

2.3 STATE STRATEGIES & POLICIES

2.3.1 State Sustainability Strategy

The State Sustainability Strategy provides an overarching framework for the State Government to respond to the sustainability agenda. The Strategy identifies the following six broad goals and 42 strategy areas intended to fulfil these goals and to guide Government action towards achieving its vision for a sustainable Western Australia:

- Sustainability and governance
- Contributing to global sustainability
- Sustainable natural resource management
- Sustainability and settlements
- Sustainability and community
- Sustainability and business

The policy objectives of the State Sustainability Strategy are incorporated into the planning system through State and Local Government policy and formally applied through planning decisions. The role of sustainability – economic, environmental and social - is fundamental to the planning of the Kwinana Education Precinct and is implicitly embodied in the content of the Structure Plan.

A sustainability schedule has been prepared for the site which outlines the projects commitment to environmental leadership, design excellence and community well-being (Refer to Appendix A).

These performance measures will be incorporated into the development of the site where appropriate. Each aspect of the sustainability schedule is considered to be a project objective and although not all performance measures may ultimately be achievable they form the benchmark for project's sustainability aims.

2.3.2 State Planning Strategy

The State Planning Strategy (1997) was prepared by the WAPC as a whole of Government approach to guide sustainable land use planning throughout the State up until 2029. The Strategy is aimed at developing a land use planning system to help the State achieve a number of key goals. These include generating wealth, conserving and enhancing the environment and building vibrant and safe communities for the enjoyment of this and subsequent generations of Western Australians. The Strategy was last audited in 2000-2001. The Structure Plan for the site is consistent with the goals and objectives of the State Planning Strategy.

2.3.3 Network City

Network City was adopted by the Western Australian Planning Commission (WAPC) in July 2004 and endorsed by the State Government in August 2004 "as the strategy framework and the basis for local dialogue in planning for the metropolitan and Peel regions."

A draft Statement of Planning Policy: Network City, made under section 5AA of the Town Planning and Development Act 1928, was released by the WAPC for public comment in March 2006.

Network City's vision is for "a world-class sustainable city, vibrant, more compact and accessible, with a unique sense of place." Network City identifies three principles to guide decision making:

- Enhance efficiency of urban land use and infrastructure.
- Protect and rehabilitate the environment and improve resource efficiency and energy use.
- Enhance community vitality and cohesiveness.

Network City has ten key objectives:

- Deliver urban growth management.
- Accommodate urban growth primarily within a Network City pattern, incorporating communities.
- Align transport systems and land use to optimise accessibility and amenity.
- Deliver a safe, reliable and energy-efficient transport system that provides travel choice.
- Protect and enhance the natural environment, open spaces and heritage.
- Deliver for all a better quality of life, building on our existing strengths.
- Plan with the communities.
- Ensure employment is created in centres.
- Deliver a city with 'urban' energy, creativity and cultural vitality.
- Provide a city plan that will be implemented, provide certainty and deliver results.

The key principles, objectives and strategies of Network City are captured in the following eight headline statements:

- Manage growth by sharing responsibility between industry, communities and government.
- Plan with communities.
- Nurture the environment.
- Make fuller use of urban land.
- Encourage public over private transport.
- Strengthen local sense of place.
- Develop strategies which deliver local jobs.
- Provide affordable housing.

Kwinana town centre is identified as an 'Activity Centre', where a range of activities are encouraged, including employment, retail, living, entertainment, higher education, and high level or specialised medical services.

The Structure Plan proposed for the site embraces the Network City vision in that it provides for the key principles

and objectives as listed above through an 'urban' form of development. Of particular importance is the provision of affordable housing for key workers and the provision of suitable densities in relation to the sites strategic location adjacent to the Kwinana town centre.

2.3.4 Liveable Neighbourhoods

Liveable Neighbourhoods Edition 3 (LN3) was prepared by the WAPC to implement the objectives of the State Planning Strategy and deliver the strategies and actions of Network City. Unlike Edition 2 of LN, which is a voluntary code under which applications may be lodged and assessed, LN3 has recently become a compulsory design code. As an operational policy of the WAPC LN3 guides the design and assessment of structure plans (regional, district and local), subdivision and development for new urban areas. Its aims include promoting the design of walkable neighbourhoods; places that offer community and a sense of place; mixed uses and active streets; accessible and sustainable parks; energy efficient design; and a variety of lot sizes and housing types.

The key initiatives of LN3 are covered under eight Design Elements. The implementation of each of these elements and the fulfilment of the overall principles of LN will be fundamental to ensuring that development of the structure plan area and the wider metropolitan region occurs in a thoughtful and sustainable manner. Application of the LN3 principles is therefore relevant to all levels of planning for the Kwinana town centre, from the proposed Structure Plan through to detailed lot and building design.

2.3.5 Statements of Planning Policy

Development of land must generally be consistent with any relevant Statements of Planning Policy (SPP) which are prepared and adopted by the WAPC under statutory procedures set out in Part 3 of the Planning and Development Act 2005. The WAPC and local governments must have due regard to the provisions of SPP's when preparing or amending regional and district planning schemes and when making decisions on planning matters. Details of the SPP's relevant to the Structure Plan are provided below.

i. SPP No 1 State Planning Framework

The State Planning Framework unites existing State and regional policies, strategies and statements with a central framework to provide a context for decision making on land use planning and development matters in Western Australia. The Structure Plan is consistent with the primary aim of this overarching policy, which can be surmised as "…to provide for the sustainable use and development of land."

The WAPC and local government will refer to the relevant planning instruments referred to under SPP No. 1 for all planning decisions, including those concerning the Structure Plan and subsequent planning proposals presented for the site.

ii. SPP No. 2 Environment and Natural Resources Policy

The Environment and Natural Resources SPP sets out a planning response to environment and natural resource management issues within the framework of the State Planning Strategy.

Specific policy areas of relevance to the site include those relating to air quality, soil and land quality, biodiversity, landscapes, greenhouse gas emissions and energy efficiency.

iii. SPP No 3Urban Growth and Settlement

SPP No. 3, which was gazetted in February 2006, applies to the whole of the State in promoting sustainable and well planned settlement patterns that have regard to community needs and are responsive to environmental conditions. The objectives and principles of Network City and Liveable Neighbourhoods are enshrined in this Policy.

SPP No. 3 recognises that much new development in metropolitan Perth has been in the form of low density suburban growth. This form of development intensifies pressure on valuable land and water resources, imposes costs in the provision of infrastructure and services, increases the dependence on private cars and creates potential inequalities for those living in the outer suburbs where job opportunities and services are limited.

To promote growth that is sustainable, equitable and liveable, SPP 3 encourages a more consolidated urban form.

In general terms the proposal for the Kwinana Education Precinct is consistent with the high level principles of SPP3.

The Structure Plan will facilitate:

- excellent access to public transport;
- provision of quality and accessible local recreation facilities, both active and passive;
- the creation of cohesive and walkable communities through the application of traditional neighbourhood design principles; and
- a diversity of land uses, housing types and lot sizes.

iv. SPP No. 3.5 Historic Heritage Conservation

The Historic Heritage Conservation SPP sets out the principles of sound and responsible planning for the conservation and protection of Western Australia's historic heritage. The identification of places and areas of local heritage significance is provided for in the Heritage of Western Australia Act 1990, which requires all local governments to identify heritage places in local government inventories (formerly

'municipal inventories').
The original Armadale-Rockingham Road, which traverses the site from east to west, is listed in the Town of Kwinana's Municipal Inventory. The retention and enhancement of this road is an integral part of the Structure Plan.

v. *Draft SPP Network City*
The objective of this Policy is to give statutory planning powers to the Network City Strategy and to set out the ways the strategy is to be applied by the WAPC In its decision-making. The Policy confirms that Network City is not simply a 'masterplan' that is to be carried out, but instead a foundation for active policy and plan making.
Consistent with the Draft SPP, the Structure Plan has been developed within the context of Network City and therefore reflects its broad principles for sustainable urban development.

2.4 TOWN OF KWINANA STRATEGIES & POLICIES

2.4.1 Local Planning Strategy (2003)

The purpose of the Local Planning Strategy is to define the strategic frameworks within which these growth pressures can be planned, controlled and guided in order to achieve Council's wider strategic directions in the context of State and Metropolitan objectives.

The strategy identifies the following for land located within the Structure Plan:

1. 'Low to Medium Density Residential Development' on its Short and Long Term Land Use Plans; and
2. Establishment of Local Open Space that further increases the provision within the Western portion of Parmelia.

2.4.2 Housing Strategy

The Local Housing Strategy recommends modest changes to the current residential densities and housing form. For all suburbs within the Townsite, a base code of R20 is recommended with medium density development surrounding Commercial Centres, Transport Nodes and Open Space.

The increase in housing density, within all suburbs, is proposed to promote redevelopment of housing stock, promote the sustainability of commercial centres and to create a focus on transport nodes and thus encouraging the use of more sustainable public transport systems.

All medium density development should be undertaken in accordance with appropriate development control conditions and the residential density plans. To manage medium density redevelopment additional development control provisions are required to regulate development on a lot-by-lot basis to ensure existing standards of amenity and streetscape are enhanced. This will also assist in maintaining suburb character and form.

The recommendation for increased density reflects changes in household occupancy rates and the need to provide for a variety of housing types and for more efficient resource use.

Excess Public Open Space within Calista, Medina, Orelia and Parmelia could be utilised for residential development. Before this occurs detailed design studies into the servicing and subdivision design is required through the preparation of local structure plans. Making these areas available for residential purposes could present a significant maintenance cost saving to the Town.

2.4.3 Kwinana Town Centre – Master Plan & Design Guidelines (2007)

In October 2005 the Town of Kwinana began a process to review the Town Centre Strategy Plan, associated Strategy Plan text and Kwinana Town Centre Design Guidelines, which were originally developed in 1996 and reviewed in 1998. These documents form the basis of land use and development within the Town Centre, through informing zoning and development control imposed under Town of Kwinana Town Planning Scheme No. 3.

The need for this review arose due to the imminent development of the Kwinana Education Precinct (comprising new High School and Technical College north of Sulphur Road), and the likely development of Lot E26 south of Challenger Avenue. With the Kwinana Hub Shopping Centre also being planned for redevelopment, there was a need to ensure the Strategy Plan, associated text and Design Guidelines were up to date and promoted the best possible development outcome for the town centre.

The Master Plan and Design Guidelines (the 'Plan') were adopted by Council in January 2008.

The Plan identifies the Structure Plan as part of the Education Precinct. The objectives for the Education Precinct as identified in the plan are:

- to attract related institutional or corporate uses that will expand education and employment opportunities in Kwinana;
- to reinforce an open and welcoming
- to create quality public spaces that invite community use; an character in the precinct; d
- to establish strong connections to surrounding development and the other sub-areas of the Town Centre.

The plan also splits the Education Precinct into three sites, one of which is subject to this Structure Plan. The following are general development guidelines provided by the Plan for the site: Orelia Neighbourhood Expansion:

Orelia Neighbourhood Expansion

The area east of Meares Avenue is intended for residential development, filling the gap in the existing housing along Orelia Avenue and north of Sulphur Road. The key objective of this area is that it is closely knitted into the fabric of the existing neighbourhood, rather than developed as a separate housing enclave or gated community. To meet this objective, while also maximising the advantage of proximity to the new high school and associated open space amenities, the following development guidelines are recommended:

2.4(a) A minimum of 10% of the site is to be reserved in a significant public open space or community park. This space is to be located on the Orelia and Sulphur Avenue corner so that it serves existing residents as well as the new homes, and helps to tie the new development into the larger context of the existing neighbourhood.

2.4(b) The route of the historic trail through the site should be preserved – as a pedestrian access way, a traditional footpath along a residential street, or in a grander celebration of its historical significance.

2.4(c) The western boundary of the development will be the extension of Meares Avenue to the north, connecting with Dargin Place, and hence, to Orelia Avenue. This new street, which is currently under construction, forms the interface between the housing development and the high school and it will be the primary entry route for school staff and students being dropped-off by car. It will therefore carry significant traffic at the beginning and end of the school day, including bus services. To minimise traffic conflicts, the number of intersections with internal roads of the residential area should be limited, but at the same time, the development should be sufficiently permeable to encourage pedestrian access to the high school complex.

2.4(d) Internal streets will be contained in 16 metre road reserves, with one lane of on-street parking, footpaths on both sides and landscaped verges.

2.4(e) To avoid garages lining the streets, lots should be provided with rear access laneways wherever possible. These lanes are typically 6 metres wide and should be narrowed to 3 metres at their intersection with neighbourhood streets to reduce the impact of mid-block breaks in the streetscape. Laneways are to be surfaced with pigmented asphalt that differs in colour from the surface of public streets to emphasise their semi-private, service function. They are centrally drained, with property lines on both sides marked by flush concrete banding.

2.4(f) To maintain an appropriate relationship with existing housing around the site, the density of development fronting existing streets – Sulphur and Orelia Avenues and Dargin Place – is R20. On the interior of the development, densities of R30 to R50 are recommended to increase the range of housing choice in the area and maximise the number of units within easy walking distance of the high school, TAFE and other facilities of the Town Centre.

2.4(g) Building setbacks, lot coverage and all other matters relating to the development of individual lots are to follow the provisions of the Residential Code.

2.4(h) Existing mature trees should be preserved wherever possible, and special attention should be paid to the landscaping of public open space, streets and pedestrian paths to reinforce

ø *Figure 6 - Excerpt from Kwinana Town Centre Master Plan & Design Guidelines relating to the subject site*

Kwinana's image as a town with extensive open space assets, a unique appreciation of its natural bush land, and a tradition of quality landscape design.

Details on how the above guidance has been incorporated into the Structure Plan are addressed within section 4.10 of this document.

2.4.4 Smart Growth Strategy

The City's Smart Growth Strategy (SGS) recognises that its population will continue to grow as a result of natural population growth, immigration, regional population shifts and people's desires to live within the City. This growth needs to be managed by balancing economic, environmental and social principles. Smart Growth sets out to achieve this through the following principles.

1. Create a range of housing options
2. Create walkable neighbourhoods
3. Encourage community collaboration
4. Foster distinctive, attractive places
5. Make development decisions predictable and fair
6. Mix land uses
7. Preserve open space, natural beauty, critical environmental areas
8. Provide a variety of transport choices
9. Strengthen community
10. Take advantage of compact building design

These principles are applied to seven (7) growth management issues:

1. *Community quality of life* - Create opportunities to enhance and develop the identity of the Town and its people
2. *Design* - Support the effective use and development of land and buildings for the benefit of the local area
3. *Economics* - Support opportunities that enhance industrial and commercial growth and promote job creation within the local area
4. *Environment* - Promote development that minimises environmental impact and support initiatives to conserve and enhance natural areas
5. *Health* - Create a safe community a nd healthy place to live
6. *Housing* - Encourage the provision of a variety of housing types and the enhancement of lifestyle options
7. *Transport* - Provide infrastructure which supports a variety of transport choices such as walking, cycling and utilising public transport

These principles have guided the preparation of the Structure Plan.

2.4.5 Design Guidelines for Medium Density Development Policy

The objectives for this Policy are:

1. *To ensure that medium density development in Kwinana occurs in harmony with surrounds and at highest possible standards.*
2. *To assist Council Officers in assessing and developers in preparing medium density development applications.*

The Policy provides guidance in respect to lot size, lot orientation and building site and design. The Structure Plan has been prepared in accordance with the matters detailed in this Policy.

2.4.6 Conservation of Remnant Vegetation Policy

The objectives for this Policy are:

To preserve the bushland character of the Municipality and strengthen the system enacting reservation and conservation of remnant vegetation.

1. *To insist that the retention of existing trees must be given a high priority by developers of residential estates.*
2. *To limit the removal of trees through Town Planning Scheme provisions and public education.*
3. *To retain significant visual landscape and vegetation features, preserving both internal and external views.*
4. *To retain viable representative samples of all different vegetation complexes and communities within the Town of Kwinana.*
5. *To maintain reserves of sufficient size and containing sufficient ecological linkages to be self sustaining and support native flora and fauna.*
6. *To protect bushland, natural areas and ecological linkages from threats such as environmental weeds and disease.*

The site has a number of mature native trees which are worthy of retention. The road network and public open space within the Structure Plan area has been strategically located to ensure that a number of the significant trees on the site can be retained. Of particular importance is the local park which has been located to ensure the protection of the most significant stand of trees on the site.

2.4.7 Municipal Heritage Inventory

The Town's Municipal Heritage Inventory (MHI) was prepared and adopted in accordance with Section 45 of the Heritage of Western Australia Act 1990. The MHI is a list of important heritage places and has been forwarded to the Heritage Council of Western Australia for public information, but has no statutory implications under the Heritage of Western Australia Act 1990.

The original Armadale-Rockingham Road, which traverses the site from east to west, is listed in the MHI. It is considered that the retention and enhancement of this road be an integral part of the Structure Plan.

3.0 SITE ANALYSIS ASSESSMENT - OPPORTUNITIES + CONSTRAINTS

The following information identifies the existing conditions of the Structure Plan area, and the key opportunities and constraints for the development.

3.1 SURROUNDING LAND USE & DEVELOPMENT

The land to the north-east, east and south of the site is zoned 'Residential' with an R-Coding of R12.5/20 in accordance with the Town of Kwinana Town Planning Scheme No. 2. The land to north-west is reserved for 'Parks & Recreation & Drainage' and is utilised as a public open space area. The land to the west is reserved 'Public Purpose' and is utilised for Gilmore College.

The site is located on the northern periphery of the Kwinana town centre.

3.2 CLIMATE

The study area experiences a warm Mediterranean climate. According to climate statistics recorded from the Kwinana BP refinery weather station, the sites experience hot summers with an average temperature of 28.3C, while winters are mild with a daily average temperature of 18.1C.

Most rain falls during the winter months May to October with monthly totals often exceeding 100mm. Monthly rainfall of up to 50mm may occur in the remaining months. The average annual rainfall for the area is 759.4mm.

Much of the site is exposed to the dominant off-shore winds. During summer, winds blow from the east in the morning and from the southwest in the afternoon, bringing cooling sea breezes created from the temperature differential between land and sea. The most severe winds come from the west and occur during the winter months, although tropical cyclones may occasionally migrate south in the summer to autumn period bringing gale force winds and heavy rains.

Key climatic considerations for the Structure Plan and subsequent detailed design include optimising solar orientation and utilising breezes for cooling effects, whilst ensuring that adequate sheltered and wind protected spaces are available where appropriate.

3.3 LANDFORM/ TOPOGRAPHY

Levels on the site range from RL 34m on the south eastern corner to RL 21m on the north western corner. The greatest level changes are located on the south eastern and western boundaries.

The topography of the site presents no significant constraints to development however due to level changes on the south eastern and western boundaries the erection of retaining walls and subsequent fill will be required.

The elevated areas adjacent to the education facility (Gilmore College) and the public open space provide the opportunity for passive surveillance.

3.4 HYRDOLOGY

There are no wetlands or natural surface water or drainage features within the site.

The watertable under the site ranges from approximately 30mAHD in the east and 24mAHD in the west and flows in a south westerly direction. It is approximately 20mAHD to the base of the superficial formation.

The hydrology of the site does not present a constraint to development.

3.5 LANDSCAPE/ VEGETATION

The sites are located within the Swan Coastal Plain. The Swan Coastal Plain is a low lying coastal plain, typically covered in woodlands. The sites are associated with the Drummond Botanical Subdistrict of the Swan Coastal Plain.

A spring flora and vegetation survey was undertaken in October 2007 (refer to Appendix B) and the following conclusions were made:

- The sites are associated with the Karrakatta – Central and South vegetation complex. Approximately 18% of the original extent of this vegetation complex remained in 2000. The survey area represents a degraded example of vegetation associated with this complex and as such is not considered to be locally significant;
- Two vegetation types were recorded within the survey area. Vegetation is broadly described as Eucalyptus marginata (Jarrah), Banksia attenuate and Eucalyptus gomphocephala (Tuart) Woodland over weed dominated Shrubland;
- No Threatened Ecological Communities were recorded within the sites. The sites range from Degraded to Completely Degraded condition depending on the proportion of native tree species remaining over the weed dominated understorey;
- A total of 39 flora species from 22 families were recorded. 23 species (59%) of the species recorded are weeds. The dominant family was Asteraceae; and
- No flora of conservation significance were recorded within the sites during the spring flora survey.

The location of the roads and public open space within the Structure Plan has allowed for the retention of a number of significant native trees within the site.

3.6 SOILS

Soils are described Cottesloe sands of the Spearwood Dune System. The Spearwood Dune System is a low hilly landscape with shallow sands over limestone, yellow sands on hills and brown sands on karst depressions and on some lower slopes.

The site is identified as having no known risk for acid sulfate soils.

The soils on the sites present no constraint to development.

3.7 CONSERVATION & HERITAGE VALUES

3.7.1 Aboriginal Heritage

An archival search of the 'Aboriginal Sites Register' of the Department of Indigenous Affairs confirmed there are no recorded sites of cultural significance to Aboriginal people on the land comprising the Structure Plan.

3.7.2 European Heritage

The Structure Plan area includes one place identified in the Town of Kwinana's Municipal Heritage Inventory (MHI). The original Armadale-Rockingham Road, which traverses the site from east to west, is listed in the MHI. It is considered that the retention and enhancement of this road be an integral part of the Structure Plan. It is proposed to upgrade the construction standard of the road in order to meet universal access standards and set it within a linear park with complimentary street furniture, lighting, landscaping and signage. The road is considered to be an important focus within the site and will be treated as such.

3.8 ROAD LAYOUT

The site is bound by Sulphur Road and Orelia Avenue on its southern and eastern boundaries respectively. Both of these roads have 30 metre reserves and are neighbourhood distributors. The northern and western boundaries are bound by Dargin Place, which is a local street but will attract high numbers of vehicles in the mornings and afternoons as a result of its proximity to Gilmore College.

3.9 PEDESTRIANS & CYCLISTS

As a result of the sites proximity to the Kwinana town centre and education facilities it is considered imperative that the subdivision design allows for legible permeability through the site. The site is currently utilised by a high number of pedestrians walking between the town centre and the residential areas to the east and north. In light of this it is proposed to provide a number of strategically placed links through the site.

The east-west link will be provided as a linear open space with the heritage listed Armadale-Rockingham Road being the focal point. The heritage road will be upgraded to a sealed standard in order to meet universal access standards and set it within a linear park with complimentary street

furniture, lighting and signage. This will create a pleasant and inviting corridor which will be utilised by pedestrians and cyclists accessing Gilmore College and the town centre. Dwellings will be directly fronting this space allowing for passive surveillance.

Each of the internal streets will be provided with pedestrian footpaths.

3.10 PUBLIC TRANSPORT

The site is serviced by two bus routes which have stops on Sulphur Avenue and Orelia Avenue directly adjacent to the site. Route 540 runs from Kwinana Rail Station to Kwinana Hub Bus Station via Orelia and Medina and Route 541 runs from Kwinana Rail Station to Wellard Rail Station via Kwinana Hub Bus Station and Calista. Both of these bus routes provide a service to two stations (Kwinana and Wellard) on the recently completed Mandurah rail line.

The existing public transport network is considered adequate to service the site.

3.11 COMMUNITY CONSULTATION

As noted in section 1.3.2 of this report, the initial phase of community consultation identified a number of opportunities and constraints for the site which have been addressed and incorporated into the Structure Plan design.

4.0 STRUCTURE PLAN

4.1 INTRODUCTION

The Kwinana Education Precinct Structure Plan area comprises of approximately 6.2ha in area and is located between Sulphur Road, Orelia Avenue and Dargin Place on the northern periphery of the Kwinana town centre.

The site is currently owned by the Department of Education and Training, which allows total control over the sites future development to ensure a coordinated and high quality planning outcome.

The proposed development will create a permeable and vibrant transition between existing residential areas, the redeveloped Gilmore College and the Kwinana town centre. The location of the site, existing features, changing lifestyle demands, sustainability considerations, affordability and an overriding objective to satisfy the needs of the community has driven the urban structure and design. The mix of densities and housing types will assist in the rejuvenation of the Kwinana town centre and will provide alternative housing options for existing Kwinana residents and attract new residents to the area. A new aesthetic for the Kwinana town centre will be showcased incorporating existing and new trees, quality urban spaces and contemporary architectural design.

4.2 GUIDING PRINCIPLES/DESIGN PHILOSOPHY

Four guiding principles have been common drivers throughout the design process, as documented below:

- Protection and enhancement of existing features;
- Integration with surrounding land;
- Permeability through the site; and
- Diverse density and housing type.

4.2.1 Protection and enhancement of existing features

The heritage listed Armadale-Rockingham Road, the existing significant trees, the undulating nature of the site and the surrounding land uses are strong features and demand an appropriate design response. The Structure Plan has been designed to focus on and celebrate the heritage road by formalising its construction and placing it within a linear parkland setting. The road will be an important east-west pedestrian link through the site for residents accessing the town centre and students accessing Gilmore College.

The location of the roads and public open space within the Structure Plan has allowed for the retention of a number of significant native trees. The Kwinana locality is known for its abundance of mature native trees and the retention of the trees within the site will ensure that the development is in keeping with the locality.

The western and north-western areas of the site are elevated above the adjacent land, which is utilised for the recently redeveloped Gilmore College and associated recreation grounds. This elevation provides the opportunity for built form to take advantage of the vistas over the recreation area and to provide passive surveillance of Gilmore College. The south-western corner of the site, adjacent to the Sulphur Road and Dargin Place round-about, is also elevated and provides the opportunity for a landmark building to present westwards down Sulphur Road to the Kwinana town centre.

4.2.2 Integration with surrounding development

The development of the site provides an opportunity to connect the surrounding residential development to the north, east and south to Gilmore College and the Kwinana town centre to the west. The site is strategically located in respect to community services, commercial uses and public transport but at present the site is underutilised. Taking the above into consideration it is important that the Structure Plan is designed to respect and integrate with the surrounding development. The Structure Plan design proposes to maintain an appropriate relationship with the existing residential development surrounding the site, in particular on Dargin Place and Orelia Avenue. This has been achieved via front loaded lots with wide frontages, which allows for traditional residential built form.

On the western portion of the site the Structure Plan design proposes increased densities which will allow for the development of terrace houses, townhouses and apartments. The scale and design of these buildings is proposed to compliment the newly constructed buildings on the Gilmore College campus allowing for an appropriate transition between the two sites.

The location of the public open space on the eastern boundary of the site provides an inviting entrance into the site from the existing residential areas to the east. The location of this public open space will ensure that it serves both existing and future residents within the locality.

4.2.3 Permeability through the site

The retention of the site as an important pedestrian thoroughfare to the adjoining Gilmore College, public open space and the Kwinana town centre is considered imperative. Permeability through the site has been achieved via strong north-south and east-west connections. The east-west connection is located along the route of the heritage listed Armadale-Rockingham Road, which will be a formalised dual use path, set in a linear and local park. The north-south connection will be provided via the 7 metre laneway accessed from Sulphur Avenue through to the local park. Both of these connections will be enhanced by lighting, street furniture and landscaping. Development will be fronting these connections to ensure adequate passive surveillance.

4.2.4 Diverse density and housing type

The site is located adjacent to the Kwinana town centre and in close proximity to community services, commercial uses and public transport. In light of this it is considered important to take advantage of the site's strategic location by providing for medium density residential development in appropriate areas of the site such as the central, western and southern areas. The provision of medium density sites will allow for the development of alternative housing stock that is not currently available within the Kwinana area.

Lower density areas are located opposite existing residential areas to ensure the transition between the site and the surrounding development is appropriate.

4.3 LOT YIELD & MIX

There is a changing demographic of the population within in terms of; married status, age, family size and composition. The role and function of suitability located and serviced areas, such as the subject site, are now more varied than in the past as a result of the above. Accordingly, this Structure Plan has been designed to offer a range of lot sizes and dwelling types to satisfy a range of lifestyles that are currently accommodated in the surrounding, predominately suburban areas.

Ø *Table 1 - Indicative Lot & Dwelling Yield & Mix*

R CODE	LOTS	DWELLINGS
R25	40	40
R30	11	11
R40	16	16
R50	2	100
TOTAL	69	167

o *Figure 7 - Housing Type Plan*

Traditional

Cottage

Terrace

Apartment / Townhouse

4.4 EARTHWORKS

Earthworks will consist of general cut to fill across the site and importation of clean structural fill, as required. The site falls approximately 12 metres from the northwest corner over a distance of 300 metres. Hence, retaining structures will be required to create generally flat lots across this sloping site. Please refer to Earthworks and Tree Retention Concept Plan in Appendix C.

The principle parameters upon which the earthworks design would be based include:

- Maintaining nature surface levels in areas where existing native vegetation are to be protected.
- Maintaining the route and grade of the Heritage Trail traversing the site east to west.
- Matching to existing levels along the perimeter of the development.
- Major storm event drainage management and flood routing.
- Limiting the overall change in natural grade of the predevelopment site contours.

A Geotechnical investigation may also provide confirmation of potential earthworks issues associated with acid sulphate soils, uncontrolled fill, buried debris or excessive topsoil thickness. Detailed digital feature survey, and subsurface strata characteristics from a Geotechnical investigation will ultimately be utilised for the final earthworks design, which will remain subject to Town of Kwinana approval.

4.5 SERVICING INFRASTRUCTURE

4.5.1 Sewer

Due to the infill nature of this development, it is likely the site will be serviced via connection to existing sewer infrastructure within roads surrounding the site. Links to existing sewer will ultimately direct sewerage northwards. It is envisaged the proposed lots will be serviced internally by 150mm diameter sewers.

A sewer diversion along Orelia Avenue will be required. An existing DN300 sewer traverses the eastern side of the site, where proposed lots will face Orelia Avenue. The existing sewer is located within the proposed lot area and will be required to be relocated into the Orelia Avenue road reserve.

Design of internal sewer, connection locations and relocations shall remain subject to Water Corporation approval.

4.5.2 Water Reticulation

Due to the infill nature of this development, it is likely the site will be serviced via connection to existing water mains within roads surrounding the site. It is envisaged the proposed lots will be serviced internally by 100mm and 150mm diameter water mains.

Design of internal water infrastructure and connection points shall remain subject to Water Corporation approval.

4.5.3 Power

Due to the infill nature of this development, it is likely the site will be serviced via connection to existing underground power infrastructure within roads surrounding the site. A transformer/switchgear site will likely be located within the proposed public open space. Streetlights have been proposed for all internal roads.

The existing overhead distribution lines along Orelia Avenue will be relocated underground as required by Western Power. In regard to existing overhead distribution lines in Dargin Place, Department for Education and Training have previously committed to residents on Dargin Place that their aerial lines would also be undergrounded. This requirement has been reiterated by the Kwinana Town Council.

Underground power and street lighting design remain subject to Western Power approval.

4.5.4 Drainage

The stormwater drainage system will be designed in accordance with Australian Rainfall and Runoff and to Town of Kwinana requirements. All stormwater runoff shall be directed and contained within the proposed public open space area(s). A small section of internal road may discharge to existing drainage infrastructure within Dargin Place, subsequent to intersection grades and earthworks levels. Refer to Appendix C for the Drainage Concept Plan.

The drainage design will promote the principles of Water Sensitive Urban Design. This includes the potential implementation of bottomless side entry pits/manholes to promote 'at source' infiltration of smaller rainfall events. Larger rainfall events shall be piped to unlined detention areas/basin(s) or swale to maximise groundwater recharge. Flush kerbing to roads adjacent the public open space will minimise drainage infrastructure and promote at source infiltration. Alternative 'at source' infiltration strategies can be explored (e.g. Atlantis Cells), if the Town of Kwinana require. Capacity of these detention areas are shown on the Drainage Concept Plan.

Drainage outlets to infiltration areas may be fitted with appropriately sized gross pollutant traps to promote the capture of general litter, sediments and hydrocarbons. Gross pollutant traps are highly effective during the immediate period of housing construction and are most efficient when coupled with regular cleaning and maintenance by the Town of Kwinana.

Stormwater drainage design remains subject to detailed design earthworks levels and Town of Kwinana approval.

4.6 ROAD NETWORK & PARKING

4.6.1 Internal Transport Network

The internal road network provides a combination of permeability and traffic control. The road network uses a minimum reserve width of 15.4m that will allow for vehicular, cyclist and pedestrian traffic as well as providing a social community link between residents. Landscaping within the road reserve can be accommodated within this width.

Traffic generated for internal movements is encouraged to be non-vehicular by the short travel distances of typically 100m to 150m.

Features of the internal network that enhance the safety for all users are short road lengths, multiple choice of travel paths within the area, the use T-intersections, the deliberate omission of four-way intersections, the use of 90° bends and road alignments that encourage vehicular drivers to concentrate on the short to medium distance in advance, hence reducing comfortable travel speeds.

The proposed road layout avoids long straight sections of road on which vehicle speeds can inadvertently become excessive. The longer straights are less than 100m with the use of a mid-block curved deflection in the alignment to visually and physically alter the perception of a 150m long straight. The potential is low for the use of the internal network by through traffic not associated with the local residences. The extension of Dargin Place to link Sulphur Road and Orelia Avenue forms a perimeter road to the internal road network.

A feature of the development that encourages a mixture of building styles is the provision of 6m wide laneways for property access. The intersections of these laneways with wider roads are at 90° to provide the best orientation for sight distance.

The intersections are proposed to be treated as 'Bellmouth' intersections with the deliberate reduction in width to 3m from the 6m. This treatment encourages a reduction in speed when exiting the laneway and also when approaching the laneway along the road due to reduced manoeuvring area. The treatments allow the enhancement of the streetscape with improved landscaping and a reduction in open bitumen appearance of wide intersections. The entry to a laneway becomes similar in appearance to a typical single residential driveway.

The State Planning Policy 3.1 Residential Design Codes released in April 2008 prescribes the parking required with group dwellings and indicates that some parking may be off-site, i.e. on-street, and comply with the R-Codes. On-street parking is proposed in two discrete areas close to the higher density housing. One area is a typical small car park nestled between properties and also serving as a link to a public open space area. The second area is standard on-road parallel parking at a location with sight distances that comply with Australian Standard 2890.5.

4.6.2 External Transport Network

The proposed development may include 168 dwelling units from which the traffic generated is estimated to be 1,500 vehicles per day. This level of additional traffic can be accommodated on the existing roads of Orelia Avenue, Sulphur Road and Gilmore Avenue at the present level of infrastructure in accordance with the Liveable Neighbourhoods guidelines.

The appropriate intersection controls on the major traffic roads already exist with roundabouts at the Sulphur Road/Meares Avenue/Dargin Place extension intersection and at the Sulphur Road/Orelia Avenue intersection. The Dargin Place/Orelia Avenue intersection is a standard T-intersection.

The orientation of properties is proposed to ensure most residential access is onto the new development roads and from those to major road intersections. There are direct residential accesses onto Dargin Place that will be typical of any residential road and will enhance the ability to create a sense of community along that road.

Along Orelia Avenue there will be a few direct residential accesses that in combination with the POS will provide an aesthetic aspect to the east side of this road. There are two laneway accesses onto Orelia Avenue that will act as minor intersections. The incorporation of the Bellmouth entry treatment encourages the use of the alternate normal road intersections for general vehicular access into the development area. The laneways do provide additional pedestrian access links between the new and existing residential areas.

On Sulphur Road the access to residential properties is proposed to be by a combined access place (CAP) system similar to that existing along the south side of that road. The CAP access will link to a laneway at the east end and directly to Sulphur Road at the west end. The benefit of a CAP system along a medium to heavily trafficked road is a reduction in the number of locations at which vehicles will be slowed down to manoeuvre. The combination with a laneway access is a further benefit.

Refer to Appendix E for the traffic engineer's review of the Structure Plan.

4.7 CYCLE & PEDESTRIAN NETWORK

As stated previously in this report permeability through the site has been achieved via strong north-south and east-west connections. The north-south connections are provided via the local road network. The east-west connection is along the route of the heritage listed Armadale-Rockingham Road, which will be a formalised dual use path, set in a linear and local park. The remaining local roads will be serviced by foot paths.

Figure 8 - Cycle/Footpath Network

4.8 PUBLIC OPEN SPACE

The WAPC generally requires that 10% of the net subdivisible residential area is proposed as Public Open Space (POS).

The Structure Plan provides 10% POS as detailed below.

o *Table 2 - Public Open Space Schedule*

SITE AREA	6.2312ha
GROSS SUBDIVISIBLE AREA	6.2312ha
PUBLIC OPEN SPACE @ 10%.	0.6231ha
PUBLIC OPEN SPACE CONTRIBUTION	
Local Park	0.7096ha
Minus 50% drainage swales	-0.0021ha
PUBLIC OPEN SPACE PROVISION	0.7075ha (11.3% of site)

It is proposed to provide additional POS above the prescribed 10%. This is a result of tree retention and the preservation of the heritage trail. This additional POS is not considered to compromise the lot yield for the site.

O *Figure 9 - Public Open Space*

4.9 LANDSCAPING

4.9.1 Design

The landscape design shall complement and enhance the built form of the development to achieve a sustainability driven contemporary, affordable urban village.

The landscape design shall define the character of the development through the retention, enhancement and integration of the heritage trail and many of the existing mature landmark and habitat trees (Tuarts, Banksia, Peppermint, Sheoak, Zamia and grass trees) primarily through the development of the lineal park and creation of sight lines and vistas along pedestrian, cycle and vehicle routes.

Pedestrian and bicycle connections with the surrounding education precinct, sporting, residential, communal buildings and civic spaces shall be clear and legible and developed to help encourage movement and reinforce social linkages with the surrounding community.

Plant selection shall be predominantly locally native plants particularly those species that are pest and disease resistant, non invasive, long lived and tolerant to local site conditions.

Plant selection shall be primarily by function and aesthetic criteria, such as height and form. Some plant materials may help deter mosquitoes.

Materials shall be selected based on an appropriate palette which aesthetically reflect and enhance the character of the development.

A sense of pride, identity, focus and ownership for the residents shall be fostered in the development through interpretive elements integrated into the public domain through provision of dog exercise grassed areas, play areas, meeting spaces, observation spaces, BBQ facilities, stage facilities, a natural amphitheatre, contemporary shade shelters, furniture and lighting, signage and artwork and a celebration of the heritage trail. Please refer to Appendix F for the draft landscaping master plan for the public open space.

Public art shall be designed to interpret and reflect the natural and cultural 'Sense of Place'.

Residents shall be encouraged to socially interact through the design and scale of the park space and amenities provided – both active and passive.

Day and night use of the park space shall be provided through the provision of aesthetic, functional and safety lighting.

Park and street spaces shall be designed to enable passive surveillance from surrounding streets, buildings and homes.

Universal access shall be provided to all public facilities.

Pockets of existing bushland shall be set aside within the park for future prosperity.

Retained trees where possible shall be woven into the residential fabric through retention of existing levels and designing around tree protection zones in both streets and lots in order to create a variety of experiences and diversity within the development.

4.9.2 Sustainability

The heritage trail shall be conserved and enhanced, and shall form the spine for the lineal park within the development.

An arboriculturalist shall be engaged to report on the condition of trees earmarked to be preserved and to recommend quality and measures to be taken to ensure their survival and safety.

The landscape shall achieve a net gain in native vegetation.

Materials and construction methods shall be selected that are environmentally sustainable, including water conservation, energy conservation, waste management, recyclability, protection of biodiversity and protection of significant natural and cultural environments.

The irrigation and landscape design shall adopt a water wise approach.

Biodiversity shall be enhanced through the protection of part of the existing vegetation and the creation of 'green corridors' along streets and through front and back yard planting to surrounding 'green spaces'.

Habitat trees where practicable shall be retained within the park to accommodate nesting places for possums, birds and reptiles.

Surface & sub surface archaeological material shall be retained. Where the level of the heritage trail requires to be raised, a boardwalk structure shall sit over the existing limestone road base.

The park shelters shall be roofed using photo voltaic cells to help supplement the park power and lighting requirements.

Construction of the landscape elements shall ensure minimal emissions of offsite sediment, dust, litter and excessive noise.

4.9.3 Maintenance

Turf areas shall be designed to facilitate ease of mowing, optimal function and visual amenity and avoid heavy wear, steep slopes, prolonged shade and drainage problems.

Irrigation shall be fully automated and designed to meet Town of Kwinana requirements (an exploratory bore shall be drilled to test groundwater availability and condition in liaison with the Town of Kwinana).

Existing trees to be retained shall be protected against damage during construction through the creation of tree protection zones.

Existing trees shall undergo ongoing management including selective pruning to ensure trees longevity and health, and ensure safety to people and property.

New trees shall be selected for ease of long term maintenance and appropriateness to site.

4.10 KWINANA TOWN CENTRE MASTER PLAN & DESIGN GUIDELINES

As previously referred to in Section 2.4.3 of this report, in October 2005 the Town of Kwinana began a process to review the Town Centre Strategy Plan, associated Strategy Plan text and Kwinana Town Centre Design Guidelines, which were originally developed in 1996 and reviewed in 1998. These form the basis to land use within the Town Centre, through informing zoning and development control imposed under Town of Kwinana Town Planning Scheme No. 3.

The following are the recommended development guidelines for the site (Orelia Neighbourhood Expansion) and comments on how they have been addressed in the Structure Plan:

2.4(a) *A minimum of 10% of the site is to be reserved in a significant public open space or community park. This space is to be located on the Orelia and Sulphur Avenue corner so that it serves existing residents as well as the new homes, and helps to tie the new development into the larger context of the existing neighbourhood.*

The Structure Plan includes the provision of over 10% of its site area for the purpose of public open space. The public open space is proposed to be located within a local park and heritage trail linear park with a total area of 7034m^2. The local park is located just north of the recommended Orelia and Sulphur Avenue corner and is well connected to the existing residential development to the east. The corner of Orelia and Sulphur Avenues was not considered suitable for a park as it is low lying, lacks passive surveillance, lacks the potential to retain any significant native trees and the amenity of the location is considered to adversely impacted upon by the proximity of the intersection of two neighbourhood distributor roads and the associated vehicular traffic issues (noise, fumes).

2.4(b) *The route of the historic trail through the site should be preserved – as a pedestrian access way, a traditional footpath along a residential street, or in a grander celebration of its historical significance.*

The route of the heritage trail is to be retained via the construction of a dual use path within the local park and a section of linear park. The trail will be constructed as a three metre wide poured limestone dual use path. This reflects is original width and construction material. Adjacent to the trail will be appropriate landscaping, lighting and street furniture. The trail will be the major east-west connection through the site.

2.4(c) *The western boundary of the development will be the extension of Meares Avenue to the north, connecting with Dargin Place, and hence, to Orelia Avenue. This new street, which is currently under construction, forms the interface between the housing development and the high school and it will be the primary entry route for school staff and students being dropped-off by car. It will therefore carry significant traffic at the beginning and end of the school day, including bus services. To minimise traffic conflicts, the number of intersections with internal roads of the residential area should be limited, but at the same time, the development should be sufficiently permeable to encourage pedestrian access to the high school complex.*

This road is nearing completion. The Structure Plan includes three local streets intersecting with this road for both vehicular and pedestrian use. These intersections have been located is suitable positions to reduce the potential for traffic conflict.

2.4(d) *Internal streets will be contained in 16 metre road reserves, with one lane of on-street parking, footpaths on both sides and landscaped verges.*

The Structure Plan proposes 15.4 metre road reserves in accordance with the provision of Liveable Neighbourhoods. This width is adequate to provide for on-street parking, footpaths and landscaping.

2.4(e) *To avoid garages lining the streets, lots should be provided with rear access laneways wherever possible. These lanes are typically 6 metres wide and should be narrowed to 3 metres at their intersection with neighbourhood streets to reduce the impact of mid-block breaks in the streetscape. Laneways are to be surfaced with pigmented asphalt that differs in colour from the surface of public streets to emphasise their semi-private, service function. They are centrally drained, with property lines on both sides marked by flush concrete banding.*

The higher density lots (R30-R50) proposed within the Structure Plan area are serviced by rear access laneways. The laneways will be constructed to the specifications as detailed above. The low density lots (R25) will be accessed from the front of the property. As the external facing lots to Dargin Place, Orelia Avenue

and Sulphur Road have wide frontages (up to 19 metres) the potential for garages to dominate the streetscape is lessened. The potential for garages to dominate on the streetscape on the remaining low density lots with 13-14 metre frontages can be reduced via Detailed Area Plans (DAPs) controlling the built form on each lot including the location and setback of the garages.

2.4(f) To maintain an appropriate relationship with existing housing around the site, the density of development fronting existing streets – Sulphur and Orelia Avenues and Dargin Place – is R20. On the interior of the development, densities of R30 to R50 are recommended to increase the range of housing choice in the area and maximise the number of units within easy walking distance of the high school, TAFE and other facilities of the Town Centre.

It is proposed to provide five levels of density within the site; R25, R30, R35, R40 and R50. The R25 lots will face the existing residential lots on Dargin Place, Orelia Avenue and a portion of Sulphur Road. The width of the frontage of these lots is similar to the existing residential lots on the opposite sides of the road and will therefore present a similar streetscape. It should be noted that a number of the R25 lots are above the minimum area for R20 lots, which is 440m2. The densities within the site then increase from east to west from R30 to R50. This mix of densities will provide for a range in housing type within the site including traditional lots, cottage lots, terrace lots and townhouse/apartment lots.

2.4(g) Building setbacks, lot coverage and all other matters relating to the development of individual lots are to follow the provisions of the Residential Code.

It is proposed to prepare DAP's over each cell within the Structure Plan. The DAP's will address built form issues such as building setbacks, the orientation of dwellings, garage locations and permeable fencing abutting public open space.

2.4(h) Existing mature trees should be preserved wherever possible, and special attention should be paid to the landscaping of public open space, streets and pedestrian paths to reinforce Kwinana's image as a town with extensive open space assets, a unique appreciation of its natural bush land, and a tradition of quality landscape design.

Where possible existing mature trees have been retained within the public open space areas and road reserves.

An arborist's assessment of the existing trees will be undertaken to determine if the trees are suitable for retention.

4.11 AFFORDABLE HOUSING

In order to ensure that the development of the site provides for a diverse housing outcome and ultimately a more vibrant community 10% of the dwelling stock will be allocated to affordable housing. The provision of affordable housing reinforces the projects commitment to sustainability by providing housing opportunities for those who need to be in close proximity to public transport, medical facilities and community and commercial facilities.

It should be noted that affordable housing constitutes more than just social housing as it also includes the provision of housing for key workers, product designed and produced to be released for first home buyers or dwellings sold to the public sector or not for profit organisation for the sole purpose of providing affordable housing.

- *Figure 10 - Structure Plan*

Updated structure plan map.

Incorporates minor changes approved by the Council on 26 November 2014, pursuant to (then) Kwinana Town Planning Scheme No. 2, clause 6.17.5.1

DISCLAIMER: ISSUED FOR DESIGN INTENT ONLY. ALL AREAS AND DIMENSIONS ARE SUBJECT TO DETAIL DESIGN AND SURVEY.

robertsday

perth | sydney | melbourne

LANDCORP

CADASTRAL INFORMATION
SOURCE: MAPS
TYM/MDD: 070701
DWG REF: 9°433-051
PROJECTION: MGA50

STRUCTURE PLAN
LOT D - Kwinana Education Precinct
City of Kwinana

SIZE A3
1:1500
0 metres 15 30 45 60

REF NO. DLL KWI | DRAW NO. RD1 303 | REV. D

15.3 CONSIDERATION TO ADOPT A MINOR CHANGE TO LOT D KWINANA EDUCATION PRECINCT STRUCTURE PLAN – LOT 505 DARGIN PLACE, ORELIA

The modification to the Lot D Kwinana Education Precinct Structure Plan will ensure the timely progression of subdivision in this area and should minimise further complications. Should Council not resolve to approve the proposed modification as a minor change, it risks delays to the timely facilitation of new growth occurring.

COUNCIL DECISION

322

MOVED CR B THOMPSON **SECONDED CR S WOOD**

That Council take the following action with respect to the proposed Minor Change to the Lot D Kwinana Education Precinct Local Structure Plan:-

1. **In pursuance of Clause 6.17.5.1 of Town of Kwinana Town Planning Scheme No. 2, determines that the proposed modifications to the Lot D Kwinana Education Precinct Structure Plan for Lot 505 Dargin Place in Orelia are a Minor Change and adopt the changes in accordance with the modified plan (Attachment C) and revised design results for dwelling density and lot yield (Attachment E), subject to the following:-**

   i. **A statutory planning fee of $831.90 being paid to the City for its assessment of the proposed modification.**
   ii. **Local Development Plans (LDPs) required for all areas with a density coding of R30 or greater, with the design of all built form adjoining the PAW to incorporate principles of passive surveillance across the PAW;**
   iii. **Measures to be taken by the proponent to ensure that trees within road reserves shall be retained, where possible, to the satisfaction of the City of Kwinana and in accordance with AS4970-2009 (*Protection of Trees on Development Sites*).**
   iv. **The proponent to liaise with the City's Coordinator Cultural Development with regard to appropriate interpretation and treatment of the Heritage Trail prior to any works commencing onsite.**

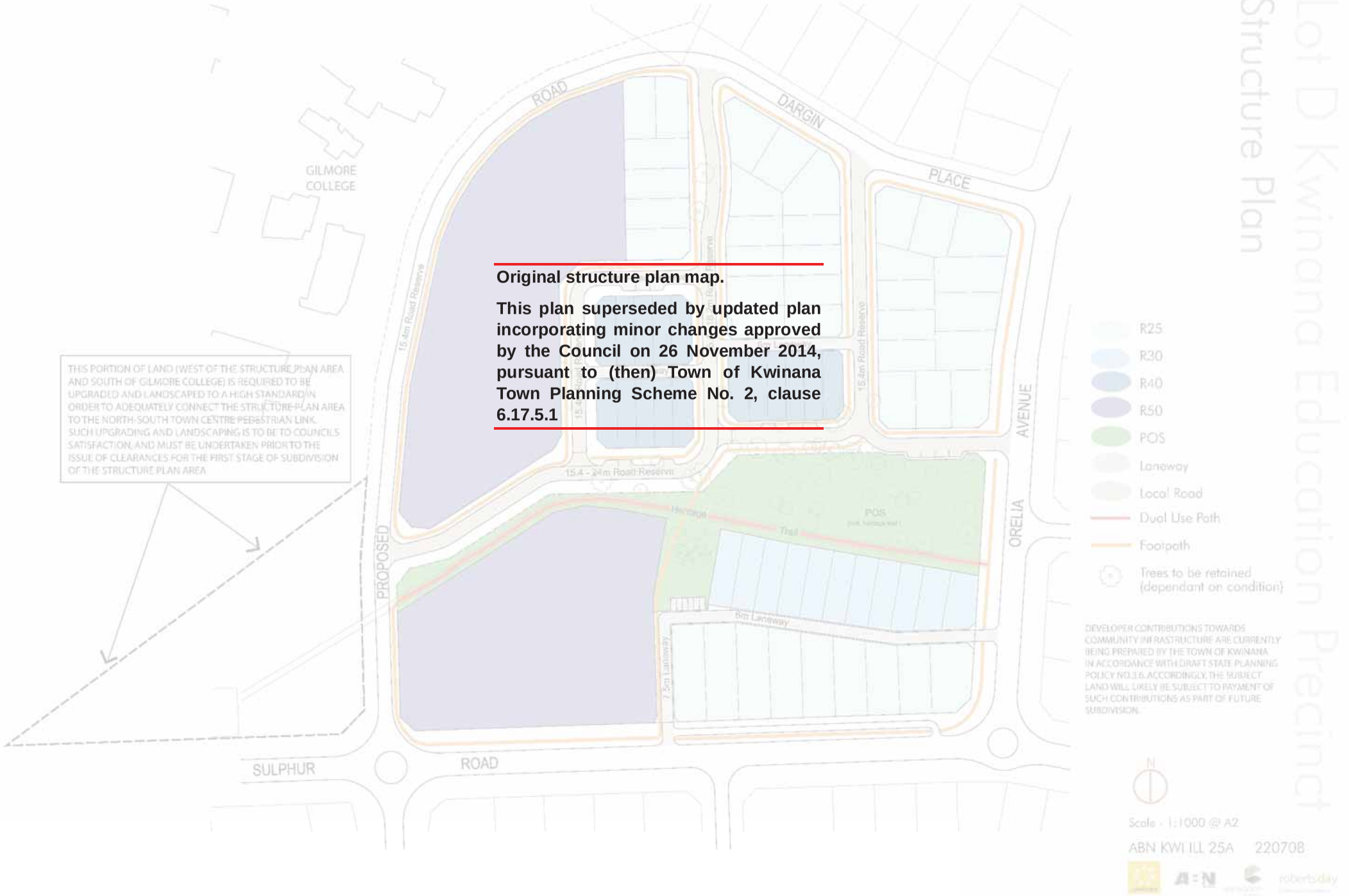
2. **In pursuance of Clause 6.17.5.2(a) of the Scheme, forwards a copy of the proposed Minor Change to the Lot D Kwinana Education Precinct Structure Plan, including any relevant information to make a determination, to the Western Australian Planning Commission within ten days of the date of this resolution.**

3. **In pursuance of Clause 6.17.5.2(b) (ii) of the Scheme, forward to the proponents and any other affected landowner or public authority as necessary a copy of the modified and adopted Lot D Kwinana Education Precinct Structure Plan.**

COUNCIL NOTE - Council would strongly encourage the landowner and developer to have an integrated development or joint venture for this development and Elected Members have requested that officers have discussions with the land owners to that effect.

CARRIED
7/0

COUNCIL NOTE – the Note was added at the meeting as part of the resolution and in addition to the Officer's Recommendation.


Lot D Kwinana Education Precinct
Structure Plan
Original structure plan map.
This plan superseded by updated plan incorporating minor changes approved by the Council on 26 November 2014, pursuant to (then) Town of Kwinana Town Planning Scheme No. 2, clause 6.17.5.1
THIS PORTION OF LAND (WEST OF THE STRUCTURE PLAN AREA AND SOUTH OF GILMORE COLLEGE) IS REQUIRED TO BE UPGRADED AND LANDSCAPED TO A HIGH STANDARD IN ORDER TO ADEQUATELY CONNECT THE STRUCTURE PLAN AREA TO THE NORTH-SOUTH TOWN CENTRE PEDESTRIAN LINK. SUCH UPGRADING AND LANDSCAPING IS TO BE TO COUNCIL'S SATISFACTION, AND MUST BE UNDERTAKEN PRIOR TO THE ISSUE OF CLEARANCES FOR THE FIRST STAGE OF SUBDIVISION OF THE STRUCTURE PLAN AREA
GILMORE COLLEGE
ROAD
DARGIN
PLACE
15.4m Road Reserve
15.4 - 24m Road Reserve
PROPOSED
ORELIA
AVENUE
POS
Heritage
Trail
8m Laneway
7.5m Laneway
SULPHUR
ROAD
R25
R30
R40
R50
POS
Laneway
Local Road
Dual Use Path
Footpath
Trees to be retained (dependant on condition)
DEVELOPER CONTRIBUTIONS TOWARDS COMMUNITY INFRASTRUCTURE ARE CURRENTLY BEING PREPARED BY THE TOWN OF KWINANA IN ACCORDANCE WITH DRAFT STATE PLANNING POLICY NO.3.6. ACCORDINGLY, THE SUBJECT LAND WILL LIKELY BE SUBJECT TO PAYMENT OF SUCH CONTRIBUTIONS AS PART OF FUTURE SUBDIVISION.
N
Scale - 1:1000 @ A2
ABN KWI ILL 25A 220708

5.0 DESIGN GUIDELINES

Intent

To provide for a built form that reflects a contemporary urban typology appropriate to the Kwinana town centre. The intent is to create an urban and vibrant place where the built form and visual interest enhance the sense of place and identity of the Structure Plan site.

The following guidelines have been prepared to provide general guidance in respect to development on the site. Prescriptive Detailed Area Plans (DAPs) will be prepared at the subdivision stage to provide more stringent guidance. These DAPs will require approval by the Town of Kwinana.

Setbacks

Development setbacks for dwellings will be controlled via Detailed Area Plans, having due regard to the Residential Design Codes.

Outbuildings, including stores/ workshops and the like, are permitted within the rear setback only when constructed in a design and material that matches the main dwelling. Where possible, storage areas should be fully integrated into the dwelling or garage.

Built Form

Built form should add to the diversity and variation of the streetscape both in style, materials, colour and form. As in any city, there will be no one style. A contemporary approach to design and engagement with the street and public open space is encouraged.

Repetition of facades of multiple units must be avoided and there shall be a change in colour, material and/or form between units. Attention to detail will create a variety of urban places.

Materials and Colours

Ensure the building façades have some variation of materials and are well detailed. Where possible, articulate wall planes to avoid large expanses of blank facades, particularly along secondary streets and laneways.

Balconies and Verandas

Incorporate balconies and verandas on the Park Front Lots and Apartment Lots where possible.

The design and material choice should be integrated in appearance with the main building. Lightweight material may be used to achieve transparency where appropriate. Any balcony design should consider appropriate shading and shelter from direct summer sun for the users. Where balconies face the west semi-permeable screening and awnings are encouraged.

Building Entry

Building entries shall be a clearly identifiable element within the façade.

For Park Front Lots the main building entry should align with the access stairs provided to the park or primary road reserve. Secondary entries may be accessed from the secondary street or laneway. Letter boxes to be located facing the park frontage.

For Apartment lots, the main building and public entry as well as letter boxes must address the adjacent external street.

Private Open Space

Private open space should be located on the northern side of the dwelling, where practical, to allow for winter sun access.

Ideally the open space will directly relate to living, kitchen or dining areas, providing winter sun penetration into these areas and indoor/outdoor lifestyle opportunities. For Park Front Lots a minimum dimension of 4 metres for open space areas is recommended with a minimum of 20m^2 open space required overall.

Building Heights

Two-storey buildings on the Park Front Lots are acceptable.

Any buildings constructed on the Sulphur Road frontage shall have due regard to the existing dwellings on the southern side of Sulphur Road in respect to height and mass.

Roofs

The use of pitched roofs, parapets and skillion roof forms is acceptable. Alternative roof designs and combinations of roof forms will be considered in the context of the overall streetscape.

Integrate service elements into the roof design or hidden behind parapets so they are not visible from the street front.

Laneways

Vehicular access is to be from the laneway as indicated on Detailed Area Plans.

Fencing and Walls

Any fencing adjacent to laneways shall be no more than 1.8 metres high.

Solid masonry fencing with infill panels of timber or zincalume/galvanised/ painted/powder coated steel in a horizontal design is preferable. Landscape infill's are also acceptable.

Consider creating interest and amenity by incorporating seating, planter boxes, water features and the like within the fencing design.

Energy Efficiency

In higher density urban areas the prefect building orientation is not always possible, however an energy efficient building can still be achieved with careful attention to design by means of good internal planning, location, sizing and protection of windows and openings and appropriate material selection. Passive design principles should be used wherever possible to increase comfort and minimise the need for heating and cooling.

Where practical orientate living spaces to achieve northern sun via windows, skylights or internals courts and gardens where possible. Provide sun shading elements where appropriate.

Acoustic

Good design detail and construction practice is critical to the performance of the building. The Building Code of Australia (BCA) specifies the minimum STC wall and floor requirements between adjoining dwellings. Exceeding the minimum specifications is recommended. When selecting materials, consider the impact of potential break out noise from surrounding uses on the dwelling.

Choose materials for walls, floors, ceilings and insulation of services such as plumbing and power outlets to ensure appropriate sound insulation and minimal sound transmission. Provide sold core doors externally; use door closers or foam/plastic strips on door frames to stop doors banging.

Minimise the need for noisy mechanical cooling by means of passive design elements. When used, locate plant equipment such as air conditioners on walls away from adjoining development, install sound baffles where necessary.

APPENDIX A - SUSTAINABILITY SCHEDULE

ENVIRONMENTAL LEADERSHIP PERFORMANCE MEASURES

PRIORITY	ASPECT	PERFORMANCE MEASURE
Energy	Solar passive design	Strive to achieve a target of 100 percent of lots being created to deliver appropriate levels of solar access and access to prevailing breezes (as per LandCorp Climate Responsive Design policy)
	Low energy building envelope	BASIX household energy target equivalent
	Heating and cooling appliances (All 'installed' appliances)	Heating and cooling appliances to be within 1 star of the best available, using the Energy Rating Label scheme
	Lighting	Lighting efficiency for residential, commercial buildings and public space lighting to be equivalent or better than compact fluorescent lamps
	Renewable energy supply	Photovoltaic package to be offered to consumers
	Carbon offsetting	Carbon offset package for construction of homes to be offered to consumers
Water	Potable water conservation	BASIX household water target equivalent and BCA 5 Star plus (stage 2)
	Storm water management	The delivery of best practice in Water Sensitive Urban Design techniques resulting in 100% onsite water infiltration and best practice in water quality standards
	Rainwater	Rainwater tank package to be offered to consumers
Transport	Sustainable transport	Locate increased housing densities within 400m of public transport and provide safe and secure cycling facilities in public and private spaces
Materials	Materials selection	Independently verified environmentally preferred materials are utilised in the construction of residential buildings, non residential buildings and infrastructure where possible
Waste	Construction waste management	90% of infrastructure and building construction and demolition waste to be recycled and or reused
	Onsite management	Site management plan demonstrates and ensures minimal emissions of offsite sediment, dust, litter and excessive noise
	Household waste	Support community household waste management for future residents
Biodiversity	Ecology	>50% of plantings to be native
	Native vegetation	Achieve a Net Gain in native vegetation of the site
Atmosphere	Refrigerants	Refrigerants have an Ozone depleting potential of 0

COMMUNITY WELL-BEING PERFORMANCE MEASURES

PRIORITY	ASPECT	PERFORMANCE MEASURE
Respond to community needs	Community consultation	The delivery of a community consultation strategy to ensure the views of community members are incorporated into the development
	Employment training	The delivery of a building and construction training program for Gilmore high school students
Connected Community	Build community capacity	High speed internet access delivered
Affordable and Diverse Housing	Deliver accessible and adaptable design	Inclusion of adaptability initiatives into built form outcomes
	Deliver affordable rental housing	Exploration of JV opportunities with affordable housing providers and rental housing with Foundation housing.
Affordable Home Purchase	Partner to deliver affordable house and land packages	Exploration of the delivering a set number of affordable (including purchase and operating costs) dwellings at an a greed price point for Key Worker Housing.

DESIGN EXCELLENCE PERFORMANCE MEASURES

Interpreting Place and Context	Study the site and its context to assess opportunities and constraints, including the evaluation of a rigorous market assessment.	Natural, landscape, cultural and built environment heritage of the site and surrounding areas are considered in the urban design, in particular the heritage trail.
		Existing social and physical infrastructure of both the site and surrounding areas have been considered in the urban design
Subdivision Design and the Quality of the Public Realm	Ensure the subdivision design includes well located, landscaped, safe and attractive public open spaces and generous footpaths.	Available, developable POS complements and enhances the existing surrounding POS (both passive and active recreation spaces) and enhances the public realm (including the development and enhancement of the heritage trail)
		An interconnected network of pedestrian paths and on and off street bicycle paths are provided on both sides of the street with narrow lot frontages, and single on wide lot frontages
		Sheltered areas suitable for providing shade, wind and rain shelter are provided to all parks, urban plazas and public gardens
		The urban design incorporates the use of high quality materials and finishes to all pedestrian areas, including street edges, footpaths, retaining walls, bridges, street trees, planting and plazas with an emphasis on high pedestrian use areas.
		High quality integrated art integrated into the Heritage trail that enhances the public realm and contributes to community identity and pride of place
Subdivision Design and the Quality of Residential Areas	Built-form quality	Architecturally designed, high quality sustainable built form that is affordable
Visual Character and Identity	Ensure the design imparts a sense of place or special character to the community	The urban design clearly employs views, landscape treatment, art and other features to create a distinctive visual character
		The design of buildings and landscapes (and associated design controls) place a greater emphasis on pedestrians than motor vehicles, and promote good street address that are human in scale and street activation
Legibility and orientation	Ensure the Concept Plan is easily understood by pedestrians, cyclists and drivers.	The urban design incorporates a street and path layout that is easily understood by pedestrians, drivers and cyclists, and assists with their orientation, including sight-lines and views, and building massing to provide good visual connectivity throughout the site
Permeability	Ensure the design enables all forms of traffic, pedestrian and vehicular to move easily through the site	Multiple connections are provided for pedestrians, cyclists and other vehicles to move through the site, including Heritage trail connection to the town centre
Safe and Secure	Ensure that footpaths, car parking areas, street lighting and guidelines for buildings which edge footpaths, are designed to maximise safe movement and to minimise unsafe pockets of space.	Active and passive surveillance over the public realm is achieved through the subdivision design, site planning, building designs, fence heights and landscape design, and good lighting is provided to all off street public parking areas

APPENDIX B - FLORA AND VEGETATION SURVEY

SPRING FLORA AND VEGETATION SURVEY
KWINANA EDUCATION PRECINCT
GILMORE AVENUE AND SULPHUR ROAD, KWINANA

Prepared for:

LandCorp
3rd Floor Wesfarmers House
40 The Esplanande
Perth WA 6231

Report Date: 10 January 2007
Project Ref: 2007/307, V1

Written/Submitted by:

Janelle Atkinson
Environmental Scientist - Botanist

Reviewed/Approved by:

Shaun Grein
Manager - Field Ecology

10 January 2007

LandCorp
3rd Floor Wesfarmers House
40 The Esplanande
Perth WA 6231

Attention: Derwent Southern

Dear Derwent

RE: Spring Flora and Vegetation Survey, Kwinana Education Precinct, Kwinana

Please find attached the report outlining findings from the spring flora and vegetation survey conducted at the Kwinana Education Precinct on 10 October, 2007, Should you have any further queries or comments regarding the information presented, please do not hesitate to contact either Shaun Grein or myself.

For and on behalf of Coffey Environments Pty Ltd

Janelle Atkinson
Environmental Scientist - Botanist

RECORD OF DISTRIBUTION

No. of copies	Report File Name	Report Status	Date	Prepared for:	Initials
4	LAN-2007-045_VEAS_001_ja_V1	V1	10 January 2008	Landcorp	JA
1	LAN-2007-045_VEAS_001_ja_V1	V1	10 January 2008	Coffey Environments	JA

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ABBREVIATIONS

AHD	Australian Height Datum
DEC	Department of Environment and Conservation
DRF	Declared Rare Flora
EPA	Environment Protection Authority
FCT	Floristic Community Type
SCP	Swan Coastal Plain
TEC	Threatened Ecological Community

EXECUTIVE SUMMARY

Coffey Environments Pty Ltd was commissioned by LandCorp to conduct a spring flora and vegetation survey of the Kwinana Education Precinct in Kwinana. The site consists of two discrete parcels of land, one fronting Gilmore Avenue, the other on the corner of Sulphur Road and Orelia Avenue. The two parcels of land were surveyed to determine the presence/absence of conservation significant flora and vegetation and to determine any potential impacts on the conservation values of local vegetation resulting from the proposed development.

A total of four quadrats were surveyed within representative vegetation types in the survey area. Vegetation in the survey area is considered to be in Degraded condition due to native understorey vegetation having been previously cleared and the subsequent colonisation of aggressive introduced species. Although the vegetation of the survey area is associated with the Karrakatta – Central and South vegetation complex, of which less than one fifth remains, the degraded condition precludes it from being locally or regionally significant.

The vegetation is broadly described as *Eucalyptus marginata* (Jarrah), *Banksia attenuata* and *Eucalyptus gomphocephala* (Tuart) Woodland over weed dominated Shrubland. No Threatened Ecological Communities were recorded during the spring survey.

A total of 39 flora species from 22 families were recorded from the survey. The majority of species recorded (59%) are weeds, many of which are aggressive in out-competing native species. No flora of conservation significance was recorded during the flora survey.

Native birds were observed to be nesting in a number of trees within the survey area. Where possible mature trees providing suitable habitat for native fauna should be retained within the proposed development.

1 INTRODUCTION

1.1 Background

Coffey Environments Pty Ltd was commissioned to conduct a spring flora and vegetation survey at the site of the proposed Kwinana Education Precinct. The site consists of two discrete parcels of land (Parcels B and D). Parcel B fronts Gilmore Avenue while Parcel D is located on the corner of Sulphur Road and Orelia Avenue in Kwinana.

The survey area is located at the site of the former Kwinana High School. The proposed Education Precinct will incorporate Gilmore College (formerly Kwinana High School), the TAFE Centre of Automotive Excellence and two residential developments.

A spring flora and vegetation survey was conducted by Ms Janelle Atkinson, an experienced botanist from Coffey Environments to determine the presence/absence of conservation significant flora in the survey area. An assessment of the conservation values of the site and potential impacts on vegetation was also incorporated in the survey.

1.2 Location

The Kwinana Education Precinct is proposed for the former Kwinana High School Site. The survey area consists of two parcels of land: Parcel B fronts Gilmore Avenue; while Parcel D occurs at the corner Sulphur Road and Orelia Avenue in Kwinana (Figure 1).

The survey area is approximately 7.9ha and is located 37km south of Perth Central Business District. The Town of Kwinana is the local administrative centre.

2 EXISTING ENVIRONMENT

2.1 Physical Environment

2.1.1 Climate

The Swan Coastal Plain experiences a warm Mediterranean climate. According to climate statistics recorded from the Kwinana BP refinery weather station, the survey area experiences hot summers with an average temperature of 28.3C, while winters are mild with a daily average temperature of 18.1C. Average annual rainfall for the area is 759.4mm (Bureau of Meteorology, 2007).

2.1.2 Geology and Soils

The Swan Coastal plain is generally flat, low-lying and supports numerous swamps and sandplains (Beard, 1990). The project area occurs over a relatively flat landscape.

Soils in the survey area are Cottesloe sands of the Spearwood Dune System. The Cottesloe System is a low hilly landscape with shallow sands over limestone, yellow sands on hills and brown sands on karst depressions and on some lower slopes (McArthur 1991).

2.1.3 Groundwater Hydrology

The watertable under the project area ranges from approximately 30mAHD in the east to 24mAHD n the west and flows in a south westerly direction. It is approximately 20mAHD to the base of the superficial formation (Government of Western Australia, 2004).

2.2 Biological Context of Project Area

2.2.1 Bioregional Context

The survey area occurs on the Swan Coastal Plain. The Swan Coastal Plain is a low lying coastal plain, typically covered with woodlands. It is dominated by *Banksia* or *Eucalyptus gomphocephala* (Tuart) on sandy soils, *Allocasuarina obesa* on outwash plains and paperbark in swampy areas. In the east, the plain rises to duricrusted Mesozoic sediments dominated by *Eucalyptus marginata* (Jarrah) woodland. Three phases of marine sand dune development provide relief. The outwash plains, once dominated by *Allocasuarina obesa-Corymbia calophylla* (Marri) woodlands and *Melaleuca* shrublands, are extensive only in the south (Environment Australia, 1995).

The survey area is associated with the Drummond Botanical Subdistrict of the Swan Coastal Plain. The area is typified by *Banksia* low woodland on leached sands and *Melaleuca* swamps in areas of poor drainage. Woodlands of *Eucalyptus gomphocephala* (Tuart), *Eucalyptus marginata* (Jarrah) and *Corymbia calophylla* (Marri) occur on less leached soils (Beard 1990).

2.2.2 Vegetation Complex

The study area is associated with the Karrakatta Complex: Central – South. This vegetation complex predominately supports Open Forests of *Eucalyptus gomphocephala* (Tuart), *Eucalyptus marginata* (Jarrah) and *Corymbia calophylla* (Marri). In deeper sand of eastern areas *E. marginata* dominates and *Banksia attenuata, Banksia menziesii* and *Allocasuarina fraseriana* are common. Understorey species

in the deeper sands include *Hibbertia hypericoides, Conospermum stoechadis, Hovea trisperma* and *Bossiaea eriocarpa* (Heddle *et al.,* 1980).

2.2.3 Bush Forever

The Bush Forever Strategy is a ten year strategic plan which formally commenced in 2000 to protect approximately 51,200ha of regionally significant bushland within approximately 290 Bush Forever Sites, representing where achievable, a target of at least 10% of each of the original 26 vegetation complexes of the Swan Coastal Plain portion of the Perth Metropolitan Region (Government of Western Australia, 2000b).

No Bush Forever Sites occur within or in the immediate vicinity of the study area, although three Bush Forever sites occur within approximately 2km of the survey area (Government of Western Australia, 2000a):

Leda and Adjacent Bushland, Leda (Bush Forever Site 349). 959.8ha bushland. Four floristic communities: '*Melaleuca rhaphiophylla – Gahnia trifida* seasonal wetlands' (FCT 17); 'Central *Banksia attenuata – Eucalyptus marginata* woodlands' (FCT 21a); 'Southern *Euclayptus gomphocephala – Agonis flexuosa* woodlands' (FCT 25); 'Spearwood *Banksia attenuata* or *B. attenuata –Eucalyptus* woodlands' (FCT 28) and one inferred floristic community: 'Woodlands over sedgelands in Holocene dune swales' (FCT 19b).

Sicklemore Road Bushland, Parmelia/Casuarina (Bush Forever Site 272): 84.6ha of bushland. Three floristic communities inferred: 'Mixed shrub damplands' (FTC 5); 'Wet forests and woodlands' (FCT 11) and 'Spearwood *Banksia attenuata* or *B. attenuata –Eucalyptus* woodlands' (FCT 28). *Diuris micrantha* (Rare), *Caladenia huegelii* (Rare) and *Aponogeton hexatepalus* (Priority 4) have been recorded.

The Spectacles, Anketell (Bush Forever Site 269): 349.7ha of bushland. Two florisitic communities have been inferred: 'Mixed shrub damplands' (FTC 5); 'Wet forests and woodlands' (FCT 11) and 'Spearwood *Banksia attenuata* or *B. attenuata –Eucalyptus* woodlands' (FCT 28). *Dodonaea hackettiana* (Prioirty 4) has been recorded.

3 FLORA AND VEGETATION SURVEY METHODOLOGY

The study area was visited by Janelle Atkinson, an experienced botanist from Coffey Environments on 10 October, 2007. The survey was conducted in accordance with Coffey Environments interpretation of Environment Protection Agency's (EPA's) Guidance Statement 51: *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia*. The flora and vegetation assessment consisted of two components:

1. Desktop study including a literature review and search of Department of Environment and Conservation (DEC) Declared Rare and Priority species databases and Threatened Ecological Community database; and
2. Field survey of the study area to search for conservation significant species, categorise vegetation units and compose a species list of vegetation types.

Species and site characteristics were recorded from four permanent 10m x 10m quadrats located in representative vegetation types. A handheld GPS was used to record quadrat locations and photographs were taken from the northwest corner of each quadrat. The entire survey area was also thoroughly traversed to search for conservation significant flora. Samples of species which could not be identified in the field were taken for verification at the West Australian Herbarium.

3.1 Data Collected

The following information was collected from each quadrat:

Location AMG coordinates recorded in WGS84 datum using a hand-held GPS. Recording taken from the northeast corner of each quadrat. Accuracy to approximately 5m.

Soil Description of soil texture and colour, presence of stony material and leaf litter.

Vegetation Description Description of vegetation composition based on all species recorded within each quadrat and their relative dominance.

Condition Condition was assessed according to the Vegetation Condition Rating Scale used in Bush Forever (Government of WA, 2000). Factors such as weed invasion, fire and grazing were considered.

Percentage Foliar Cover The percentage of cover was estimated for each species. Dominant species were estimated to the nearest percentage, herbs and infrequent species were estimated in a range, e.g. 2%-5% or >2%.

Full quadrat descriptions are presented in Appendix 1.

3.2 Vegetation

3.2.1 Vegetation Types

Vegetation types in the survey area were described according to the Vegetation Structural Classes described in Table 1:

Table 1

Vegetation Structural Classes

(Adapted from Muir, 1977 and Aplin, 1979)

Stratum	Canopy Cover				
	70%-100%	**30%-70%**	**10%-30%**	**2%-10%**	**<2%**
Trees over 30m	Tall Closed Forest	Tall Open Forest	Tall Woodland	Tall Open Woodland	Scattered Tall Trees
Trees 10m-30m	Closed Forest	Open Forest	Woodland	Open Woodland	Scattered Trees
Trees under 10m	Low Closed Forest	Open Forest	Woodland	Open Woodland	Scattered Low Trees
Shrubs over 2m	Tall Closed Scrub	Tall Open Scrub	Tall Shrubland	Tall Open Shrubland	Scattered Tall Trees
Shrubs 1m-2m	Closed Heath	Open Heath	Shrubland	Low Open Shrubland	Scattered Low Shrubs
Shrubs under 1m	Low Closed Heath	Low Open Heath	Low Shrubland	Low Open Shrubland	Scattered Low Shrubs
Grasses	Closed Grassland	Grassland	Open Grassland	Very Open Grassland	Scattered Grasses
Herbs and Sedges	Closed Sedgeland/ Herbland	Sedgeland/ Herbland	Open Sedgeland/ Herbland	Very Open Sedgeland/ Herbland	Scattered Sedges/ Herbs

3.2.2 Threatened Ecological Communities

Searches of DEC Threatened Ecological Community (TEC) databases found no records of threatened ecological communities within or surrounding the survey area.

3.2.3 Floristic Community Types

The presence/absence species composition of each quadrat surveyed was compared against the results of Gibson *et al.,* (1994) to determine floristic community types in the study area.

3.3 Flora

3.3.1 Conservation Significant Flora

Results of the DEC Declare Rare Flora (DRF) and Priority Species database search indicated that six conservation significant species, including two Declared Rare Flora (DRF), have been previously recorded in the vicinity of the study area (Table 2).

Table 2

Declared Rare and Priority Flora found within the Vicinity of the Study Area

Species	Conservation Status	Description
Aponogeton hexapetalus	4	Mud. Freshwater: ponds, rivers, claypans. Flowers July–October.
Aotus cordifolia	3	Peaty soils. Swamps. Flowers August–January.
Caladenia huegelii	R	Grey or brown sand, clay loam. Flowers September – October.
Diuris micrantha	R	Brown loamy clay. Winter-wet swamps, in shallow water. Flowers September–October.
Dodonaea hackettiana	4	Sand. Outcropping limestone. July–October.
Drakaea elastica	R	White or grey sand. Low-lying situations adjoining winter-wet swamps. Flowers October–November.

Information on each of the conservation significant flora, including habit and preferred habitat, was obtained from the Western Australian Herbarium (2007) and other appropriate literature. The entire study area was thoroughly traversed on foot to search for these conservation significant flora.

Under the *Wildlife Conservation Act 1950-1970,* flora species are given the status of rare flora if they are considered to be in danger of extinction, rare or otherwise in need of special protection. There are also four categories of Priority flora which cover poorly known species. The distinctions between the categories are defined as:

R: Declared Rare Flora – Extant: Taxa which have been adequately searched for and are deemed to be in the wild rare, in danger of extinction, or otherwise need in special protection. Flora is gazetted as rare following approval by the Minister for the Environment.

P1: Priority 1 – Poorly Known: Taxa which are known from one or a few (generally <5) populations which are under threat. Such taxa are under consideration for declaration as 'rare flora' but are in urgent need of further survey.

P2: Priority 2 – Poorly Known: Taxa which are known from 1 or a few (generally <5) populations, at least some of which are not believed to be under immediate threat. Such taxa are under consideration for declaration as 'rare flora' but are in urgent need of further survey.

P3: Priority 2 – Poorly Known: Taxa which are known from several populations, at least some of which are not known to be under immediate threat. Such taxa are under consideration for declaration as 'rare flora' but are in need of further survey.

P4: Priority 4 – Rare: Taxa which are considered to have been adequately surveyed and which, whilst being rare are not currently threatened by identifiable factors. These taxas require monitoring every 5-10 years.

Samples of species which could not be identified in the field were collected for verification at the West Australian Herbarium.

3.4 Survey Limitations

The spring flora survey was conducted in what was considered to be an optimal time of the year for identification of flowering plants on the Swan Coastal Plain. Perth Airport had received average rainfall in the year up to the date of the survey, including approximately 600mm in the six months preceding the survey date (Bureau of Meteorology, 2007). As a result of the favourable weather the majority of annual and ephemeral species which could be expected in the survey area were recorded. Other potentially limiting factors taken into consideration are presented in Table 3.

Table 3

Statement of Botanical Limitations

Potential Limitations	Constraints (Yes/No); Significant/ moderate/ negligible	Comment
Competency/experience of the consultant conducting the survey	No constraints	Botanist with extensive survey experience and taxonomic skills for the region.
Proportion of the flora identified	No constraints	Four hours spent on site, no limitations.
Sources of information (historic/recent or new data)	No constraints	The Perth Metropolitan Region and Swan Coastal Plain is well documented.
Proportion of the task achieved and further work that may need to be undertaken	No constraints	The spring survey was completed. No additional survey work required.
Timing/weather/season/cycle	No constraints	Spring survey conducted in October following good rainfall/
Intensity of survey (e.g. In retrospect was the intensity adequate)	No constraints	The proposed disturbance area was mapped and searched

Potential Limitations	Constraints (Yes/No); Significant/ moderate/ negligible	Comment
Completeness (e.g. was relevant area fully surveyed)	No constraints	comprehensively, with the entire site traversed by foot.
Resources (e.g. degree of expertise available for plant identification)	No constraints	Experienced botanist undertook plant identifications in field and at the Western Australian Herbarium.
Remoteness and/or access problems	No constraints	The site was relatively small and accessible by foot.
Availability of contextual (e.g. bioregional) information for the survey area.	No constraints	Vegetation, floristic communities and species of the Swan Coastal Plain have been well documented.

4 FLORA AND VEGETATION SURVEY RESULTS

4.1 Vegetation

Two vegetation types were recorded in the survey area. Vegetation types were described using the Vegetation Structural Classes described in Table 1. Two definitive vegetation types were recorded and mapped for the survey area (Figure 2). The vegetation types are described as:

EmBaAfOf *Eucalyptus marginata* (Jarrah), *Banksia attenuata* (Slender Banksia) and *Allocasuarina fraseriana* (Sheoak) Open Forest to 10m over Shrubland of *Xanthorrhoea preissii* (Grasstree) to 1.4m over Low Closed Heath of *Lupinus angustifolius* (Narrowleaf Lupin), *Lupinus cosentinii, Oxalis pes-caprae* (Soursob), *Ehrharta calycina* (Veldt Grass) and *Euphorbia terracina* (Geraldton Carnation Weed) to 0.6m. Condition is Degraded.

BaEmEgW *Banksia attenuata* (Slender Banksia), *Eucalyptus marginata* (Jarrah) and *Eucalyptus gomphocephala* (Tuart) Woodland to 10m over Shrubland of *Xanothorrhoea preissii* (Grasstree) and *Macrozamia riedlei* (Zamia) to 1.3m over Mixed Grassland and Shrubland of *Ehrharta calycina* (Veldt Grass), *Lupins angustifolius* (NArrowleaf Lupin), *Lupinus cosentinii, Gladiolus caryophyllaceus* (Wild Gladiolus), *Ursinia anthemoides* and *Ptilotus polystachyus* (Prince of Wales Feather) to 1m. Condition is Very Degraded.

Upper storey species have been retained within the survey area, but the majority of native understorey species have been cleared. The understorey is dominated by aggressive weed species which have colonised and out-competed regeneration of native species.

4.1.1 Vegetation Condition

Vegetation condition was assessed according to the condition rating scale of Bush Forever (Government of Western Australia, 2000b). The Bush Forever condition scale rates vegetation from Completely Degraded to Pristine, as shown in Table 4.

Table 4

Vegetation Condition Rating Scale

Vegetation Condition Rating Scale (Government of WA, 2000b)	
P	Pristine Pristine or nearly so, no obvious signs of disturbance
Ex	Excellent Vegetation structure intact, disturbance affecting individual species and weeds are non aggressive species
VG	Very Good Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
G	Good Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
Deg	Degraded Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
CD	Completely Degraded The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora composing weed or crop species with isolated native trees or shrubs.

The entire survey area has been affected by multiple disturbances and as a result is in poor condition. The majority of the site is considered to be in Degraded condition due to the presence of an open forest of native tree species over the weed dominated under storey. At least one third of the survey area is considered to be in Completely Degraded condition as much of the native overstorey has been cleared and weed species dominate.

Aggressive weed species have colonised the entire site and out-competed local species, forming a dense lower storey. Occasional native shrubs, sedges and herbs occur, but intensive management aimed at controlling introduced species would be required to return the site to a better condition.

4.1.2 Conservation Significance of Vegetation

The survey area is associated with the Karrakatta- Central and South vegetation complex of the Spearwood dunes system. The extent of this vegetation complex is limited on the Swan Coastal Plain due to extensive clearing. Bush Forever indicates that in 2000 only 6,275ha of an original 34,532ha (18%) remained of the Karrkatta – Central and South complex (Government of Western Australia, 2000a). As the survey area is a degraded example of vegetation associated with this vegetation complex and retains minimal native species, it is not considered to be regionally significant.

4.1.2.1 Floristic Community Types

Due to the presence of a high number of weed species and the minimal number of native species recorded, it is difficult to assign floristic community types to the survey area. A presence/absence comparison of species recorded from the survey area with the results of Gibson *et al*, (1994) indicates that the site is most closely aligned with Swan Coastal Plain Floristic Community Type (FCT) 28. FCT 28 has also been recorded or inferred in the nearby Bush Forever site 272 (Sicklemore Road Bushland, Parmelia/Casuarina); Bush Forever site 349 (Leda and Adjacent Bushland, Leda) and Bush Forever site 269 (The Spectacles, Anketell).

FCT 28 was recorded from 38 of the 509 quadrats surveyed during the Floristic Survey of the Swan Coastal Plain (Gibson *et al*., 1994). It occurs on the Spearwood dune system, typically in the Karrkatta and Cottesloe units. The community is usually made up of *Banksia attenuata* woodlands, *Eucalyptus calophylla – B. attenuata* woodlands or *Eucalyptus marginata – B. attenuata* woodlands. Species richness of Community 28 is 55.2 species per quadrat and weed frequency is high at 8 species per quadrat.

The survey area represents a poor example of FCT 28 due to the minimal number of native species present and the high density of introduced species. For these reasons the survey area has little conservation value in its current state. FCT 28 is well reserved and is not considered to be a Threatened Ecological Community (TEC).

4.1.2.2 Threatened Ecological Communities

According to DEC database searches, no Threatened Ecological Communities (TEC's) are recognised as occurring within or in the vicinity of the survey area. Site assessment confirmed that no vegetation communities of conservation significance occur within or immediately surrounding the proposed area of impact.

According to the data presented in Gibson *et al* (1994), the survey area represents an occurrence of FCT 28 considerably further south than those recorded in the floristic survey of the Swan Coastal Plain, although a number of other bushland sites nearby are recognised as supporting FCT 28. As the survey area is degraded and therefore not a significant representation of Community 28, it is not considered to be locally significant.

4.2 Flora

A total of 39 species from 22 plant families were recorded during the spring flora survey. The dominant family was Asteraceae (Daisies) with six species, all of which are introduced species. The Papilionaceae (Peas) family were also common with five species, four of which are introduced species. Twenty three weed species were recorded. The majority of introduced species are aggressive species, resulting in a high density of a relatively low number of species.

Average species richness for the quadrats sampled was 18 species, considerably less than the 55.2 species typical of FCT 28 and indicates the degradation and high number of weeds in the survey area. A list of all flora species recorded from within the survey area is presented in Appendix 2.

4.2.1 Conservation Significance of Flora

No flora of conservation significance were recorded within the survey area. DEC database records indicate that six conservation significant flora species have been recorded within the vicinity of the survey area. It is unlikely that any of these species would occur in the survey area due to the high density of weed species outcompeting native species.

Aotus cordifolia (P3)*, Aponogeton hexapetala* (P4), *Diuris micrantha* (DRF) and *Drakaea elastica* (DRF) are associated with winter-wet areas which do not occur in the survey area. *Dodonaeae hackettiana* occurs in sand associated with limestone which does not occur in the survey area and according to Western Australian Herbarium collection records, *Caladenia huegelii* (DRF) prefers grey sand, not the loamy soils recorded in the area surveyed. It is therefore unlikely that the survey area represents suitable habitat for any of the conservation significant species targeted during the spring survey.

5 IMPLICATIONS OF PROPOSED DEVELOPMENT

The survey area represents a degraded example of FCT 28. Due to the dominance of weed species in the under storey it is not considered to have high conservation values and as such is considered to be a suitable site for the proposed development based on the negligible impact it will have on native vegetation. No TEC's or conservation significant flora species were recorded during the spring survey.

A number of mature trees were observed in the survey area, at least three of which were being utilised by nesting birds. Where possible, mature trees should be retained within the proposed development, particularly those providing suitable fauna habitat.

6 SUMMARY AND CONCLUSIONS

Based on the results of the spring flora and vegetation survey conducted at Parcels B and D of the proposed Kwinana Education Precinct in Kwinana in October 2007, the following conclusions have been made:

- A spring flora and vegetation survey was conducted by an experience botanist from Coffey Environments on 10 October 2007. A total of four quadrats were surveyed from representative vegetation types;
- The survey area is associated with the Karrakatta – Central and South vegetation complex. Approximately 18% of the original extent of this vegetation complex remained in 2000. The survey area represents a degraded example of vegetation associated with this complex and as such is not considered to be locally significant;
- Two vegetation types were recorded within the survey area. Vegetation is broadly described as *Eucalypotus marginata* (Jarrah), *Banksia attenuata* and *Eucalyptus gomphocephala* (Tuart) Woodland over weed dominated Shrubland;
- No TEC's were recorded within the survey area. The survey area ranges from Degraded to Completed Degraded condition depending on the proportion of native tree species remaining over the weed dominated understorey;
- A total of 39 flora species from 22 families were recorded from quadrats. 23 species (59%) of the species recorded are weeds. The dominant family was Asteraceae;
- No flora of conservation significance were recorded within the survey area during the spring flora survey;
- A number of mature trees with nesting birds were observed. Where possible these trees should be retained within the proposed development.

7 REFERENCES

Aplin, T.E.H. (1979). *The Flora.* In: O'Brien B.J. (Ed.). Environment and Science. University of Western Australia Press: Western Australia.

Beard, J.S (1990). *Plant Life of Western Australia*. Kangaroo Press: Australia.

Bureau of Meteorology (2007). Climate Statistics. http://www.bom.gov.au/weather/wa/

Environment Australia (1995). *An Interim Biogeographic Regionalisation for Australia: A Framework for Setting Priorities in the National Reserves System Cooperative Program*. Department of Environment and Water: Australia.

Environmental Protection Authority (2002). *Terrestrial Biological Surveys as an Element of Biodiversity Protection: Position Statement No. 3.* Environment Protection Authority, Perth, Western Australia.

Environmental Protection Authority (2004). *Guidance Statement No. 51: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia.* Environment Protection Authority, Perth, Western Australia.

Gibson, N., Keighery, B., Keighery, G., Burbidge. and Lyons, M. (1994). *A Floristic Survey of the Southern Swan Coastal Plain.* Department of Conservation and Land Management and Conservation Council: Unpublished.

Government of Western Australia (2000a). *Bush Forever – Keeping the Bush in the City. Volume 2: Policies, Principles and Processes.* Perth, WA.

Government of Western Australia (2000b). *Bush Forever – Keeping the Bush in the City. Volume 2: Policies, Principles and Processes.* Perth, WA.

Government of Western Australia (2004). *Perth Groundwater Atlas.* Department of Environment: Western Australia.

Heddle, E.M., Loneragan, O.W. and Havel, J.J. (1980). *Vegetation Complexes of the Darling System Western Australia.* Atlas of Natural Resources Darling System Western Australia: Perth

McArthur, W.M (1991). *Reference soils of south-western Australia*. Department of Agriculture: Western Australia.

Muir, B.G. (1977). *Biological Survey of the Western Australian Wheatbelt. Part II: Vegetation and habitat of Bendering Reserve.* Records of the Western Australian Museum, Supplement No. 3.

Western Australian Herbarium (2007). Florabase: http://florabase.calm.wa.gov.au/

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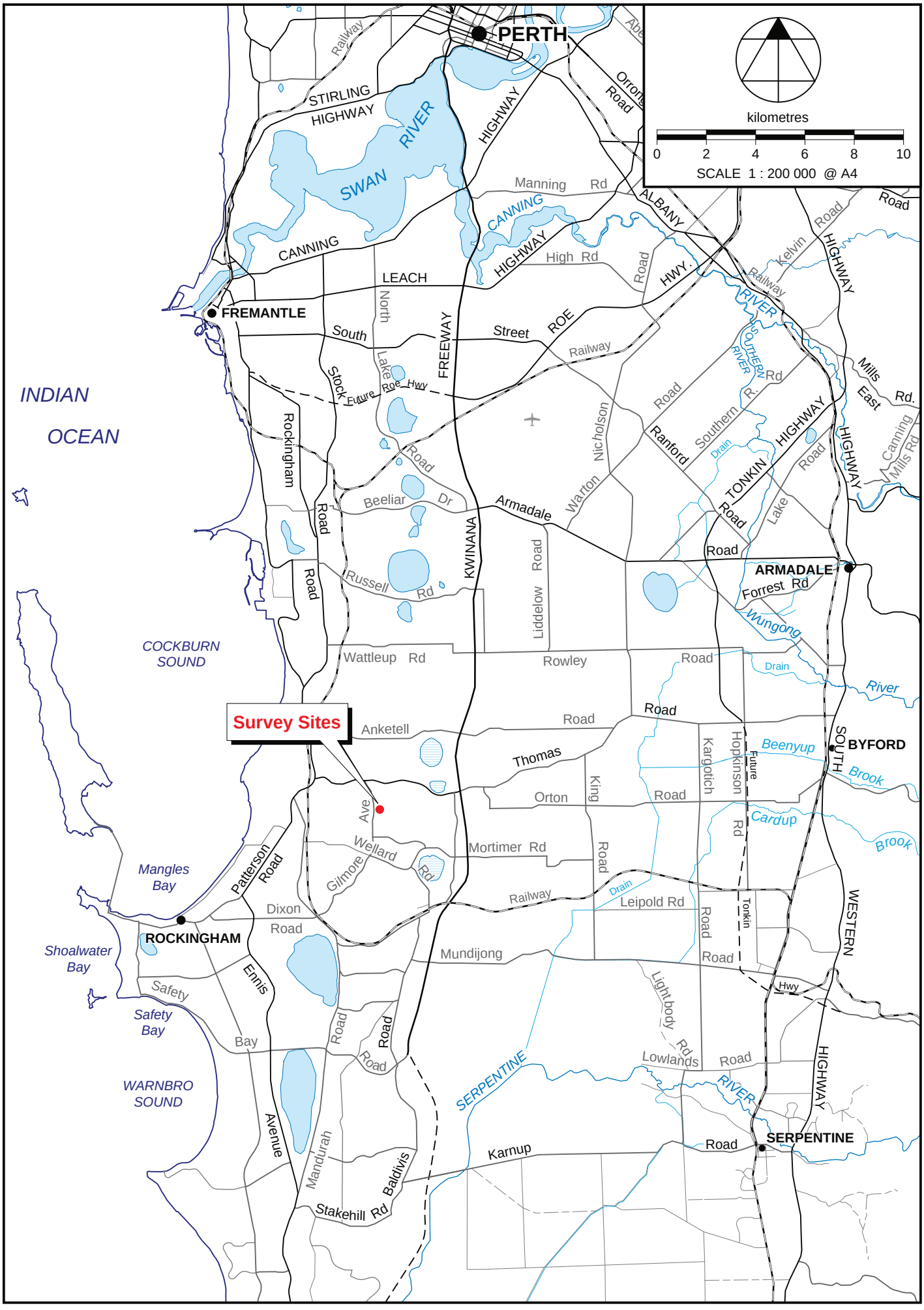
Figures

Spring Flora and Vegetation Survey
Kwinana Education Precinct, Kwinana



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SPECIALISTS IN LIVING AND WORKING PLACES

REGIONAL LOCATION

FIGURE 1

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metres

0 30 60 90 120 150

SCALE 1 : 3 000 @ A3

LEGEND

- Study Area Boundary
- Vegetation Type Boundary
- Vegetation Condition Boundary

VEGETATION TYPE DESCRIPTIONS

BaEmEgW *Eucalyptus marginata, Banksia attenuata* and *Allocasuarina fraseriana* Open Forest over Shrubland of *Xanthorrhoea preissii* over Low Closed Heath of *Lupinus angustifolius, Lupinus cosentinii, Oxalis pes-caprae, Ehrharta calycina* and *Euphorbia terracina*

EmBaAfOF *Banksia attenuata, Eucalyptus marginata* and *Eucalyptus gomphocephala* Woodland over Shrubland of *Xanothorrhoea preissii* and *Macrozamia riedlei* over *Ehrharta calycina, Lupins angustifolius, Lupinus cosentinii, Gladiolus caryophyllaceus, Ursinia anthemoides* and *Ptilotus polystachyus*

VEGETATION CONDITION

(Legend Source: BUSH FOREVER Govt. of W.A.)

P	Pristine. (Not Applicable)
Ex	Excellent. (NA)
VG	Very Good. (NA)
G	Good. (NA)
Deg	Degraded.
CD	Completely Degraded.

NOTE: For full description see text.

SOURCE: IMAGERY - Google Earth, 2007

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SPECIALISTS IN LIVING AND WORKING PLACES

VEGETATION TYPES AND CONDITION

FIGURE 2

Appendix A
Quadrat Data

Spring Flora and Vegetation Survey
Kwinana Education Precinct, Kwinana

LandCorp – Kwinana Education Precinct
Site: Quadrat 1

Described: JA **Date:** 10/10/2007 **Type:** Quadrat (10m x 10m) **Season:** Excellent

Location: Corner Sulphur Road and Orelia Avenue

MGA Zone: 50 388685mE; 6432490mN

Soil: Brown sandy loam.

Vegetation: *Eucalyptus marginata, Banksia attenuata* and *Allocasuarina fraseriana* Open Forest over Shrubland of *Xanthorrhoea preissii* over Low Closed Heath of *Lupinus angustifolius, Lupinus cosentinii, Oxalis pes-caprae, Ehrharta calycina* and *Euphorbia terracina.*

Veg Condition: Degraded

Species List:

Name	Cover (%)	Height (m)
Burchardia congesta	2	0.4
Ehrharta calycina	30	1
Eucalyptus marginata	25	6
Euphorbia terracina	5	0.3
Hardenbergia comptoniana	5	climber
Lupinus angustifolius	20	0.5
Lupinus cosentinii	20	0.5
Oxalis pes-caprae	15	0.3
Taraxacum officinale	2	0.1
Trifolium campestre	15	0.15
Xanthorrhoea preissii	15	1.1

LandCorp– Kwinana Education Precinct
Site: Quadrat 2

Described: JA **Date:** 10/10/2007 **Type:** Quadrat (10m x 10m) **Season:** Excellent

Location: Corner Sulphur Road and Orelia Avenue

MGA Zone: 50 388589mE; 6432520mN

Soil: Brown sandy loam.

Vegetation: *Banksia attenuata, Eucalyptus marginata* and *Eucalyptus gomphocephala* Woodland over Shrubland of *Xanothorrhoea preissii* and *Macrozamia riedlei* over *Ehrharta calycina, Lupins angustifolius, Lupinus cosentinii, Gladiolus caryophyllaceus, Ursinia anthemoides* and *Ptilotus polystachyus.*

Veg Condition: Degraded

Species List:

Name	Cover (%)	Height (m)
Arctotheca calendula	5	0.25
Avena fatua	5	0.8
Banksia attenuata	5	5
Carpobrotus edulis	2	0.15
Ehrharta calycina	40	1
Eucalyptus gomphocephala	10	12
Eucalyptus marginata	10	10
Gladiolus caryophyllaceus	5	1
Lupinus angustifolius	10	0.5
Lupinus cosentinii	15	0.5
Macrozamia riedlei	5	0.6
Oxalis pes-caprae	10	0.2
Petrorhagia velutina	2	0.25
Ptilotus polystachyus	2	0.3
Sparaxis bulbifera	2-5	0.4
Ursinia anthemoides	2-5	0.2
Xanthorrhoea preissii	15	1.3

LandCorp- Kwinana Education Precinct
Site: Quadrat 3

Described: JA **Date:** 10/10/2007 **Type:** Quadrat (10m x 10m) **Season:** Excellent

Location: Corner Sulphur Road and Orelia Avenue

MGA Zone: 50 388561mE; 6432422mN

Soil: Brown sandy loam.

Vegetation: *Banksia attenuata, Eucalyptus marginata* and *Eucalyptus gomphocephala* Woodland over Shrubland of *Xanothorrhoea preissii* and *Macrozamia riedlei* over *Ehrharta calycina, Lupins angustifolius, Lupinus cosentinii, Gladiolus caryophyllaceus, Ursinia anthemoides* and *Ptilotus polystachyus.*

Veg Condition: Degraded

Species List:

Name	Cover (%)	Height (m)
Acacia pulchella	10	1.5
Banksia attenuata	10	5
Briza maxima	10	0.35
Briza minor	5	0.2
Dianella revoluta	5	0.5
Ehrharta calycina	40	0.9
Eryngium pinnatifidum	2	0.6
Eucalyptus marginata	10	10
Gladiolus caryophyllaceus	5	1
Hakea prostrata	5	2
Hypochaeris glabra	2	0.1
Lagurus ovatus	5-10	0.2
Lomandra hermaphrodita	2-5	0.25
Lomandra micrantha	2-5	0.2
Lupinus angustifolius	15	0.5
Lupinus cosentinii	15	0.5

Macrozamia riedlei	5	0.6
Microtis media	2	0.15
Oxalis pes-caprae	10	0.2
Petrorhagia velutina	2	0.3
Ptilotus polystachyus	5	0.35
Senecio angulatus	2	0.4
Sonchus oleraceus	2	0.5
Taraxacum officinale	2	0.1
Trifolium campestre	10	0.15
Ursinia anthemoides	5	0.2
Xanthorrhoea preissii	10	1.1

LandCorp- Kwinana Education Precinct
Site: Quadrat 4

Described: JA **Date:** 10/10/2007 **Type:** Quadrat (10m x 10m) **Season:** Excellent

Location: Gilmore Avenue

MGA Zone: 50 388208mE; 6432767mN

Soil: Brown loam. Moderate leaf litter.

Vegetation: *Eucalyptus marginata, Banksia attenuata* and *Allocasuarina fraseriana* Open Forest over Shrubland of *Xanthorrhoea preissii* over Low Closed Heath of *Lupinus angustifolius, Lupinus cosentinii, Oxalis pes-caprae, Ehrharta calycina* and *Euphorbia terracina.*

Veg Condition: Degraded

Species List:

Name	Cover (%)	Height (m)
Allocasuarina fraseriana	10	5
Arctotheca calendula	5	0.25
Asphodelus fistulosus	2	0.5
Banksia attenuata	5	8
Ehrharta calycina	25	1
Erodium moschatum	5	0.1
Euphorbia terracina	5	0.3
Lagurus ovatus	10	0.3
Lupinus angustifolius	5-10	0.6
Lupinus cosentinii	5-10	0.5
Petrorhagia velutina	2	0.3
Sonchus oleraceus	2	0.5
Taraxacum officinale	2	0.1
Trifolium arvense	5	0.15
Trifolium campestre	5	0.1
Xanthorrhoea preissii	5	1.4

Appendix B
Species List

Spring Flora and Vegetation Survey
Kwinana Education Precinct, Kwinana

Flora Species Recorded from Kwinana Education Precinct Spring Flora and Vegetation Survey

	Number of quadrats recorded from
016A ZAMIACEAE	
Macrozamia riedlei	2
031 POACEAE	
* *Avena fatua*	1
* *Briza maxima*	1
* *Briza minor*	1
* *Ehrharta calycina*	4
* *Lagurus ovatus*	2
054C DASYPOGONACEAE	
Lomandra hermaphrodita	1
Lomandra micrantha	1
054D XANTHORRHOEACEAE	
Xanthorrhoea preissii	4
054E PHORMIACEAE	
Dianella revoluta	1
054G ASPHODELACEAE	
* *Asphodelus fistulosus*	1
054J COLCHICACEAE	
Burchardia congesta	1
060 IRIDACEAE	
* *Gladiolus caryophyllaceus*	2
* *Sparaxis bulbifera*	1
066 ORCHIDACEAE	
Microtis media	1
070 CASUARINACEAE	
Allocasuarina fraseriana	1
090 PROTEACEAE	
Banksia attenuata	3
Hakea prostrata	1
106 AMARANTHACEAE	
Ptilotus polystachyus	2
110 AIZOACEAE	
* *Carpobrotus edulis*	1
113 CARYOPHYLLACEAE	
* *Petrorhagia velutina*	3
163 MIMOSACEAE	
Acacia pulchella	1

165	**PAPILIONACEAE**	
	Hardenbergia comptoniana	1
*	*Lupinus angustifolius*	4
*	*Lupinus cosentinii*	4
*	*Trifolium arvense*	1
*	*Trifolium campestre*	3
167	**GERANIACEAE**	
*	*Erodium moschatum*	1
168	**OXALIDACEAE**	
*	*Oxalis pes-caprae*	3
185	**EUPHORBIACEAE**	
*	*Euphorbia terracina*	2
273	**MYRTACEAE**	
	Eucalyptus gomphocephala	1
	Eucalyptus marginata	3
281	**APIACEAE**	
	Eryngium pinnatifidum	1
345	**ASTERACEAE**	
*	*Arctotheca calendula*	2
*	*Hypochaeris glabra*	1
*	*Senecio angulatus*	1
*	*Sonchus oleraceus*	2
*	*Taraxacum officinale*	3
*	*Ursinia anthemoides*	2
	Total species	**39**
	Total native species	**16**
	Total non-native species	**23**

* = weed species

APPENDIX C - EARTHWORKS & TREE RETENTION CONCEPT PLAN

REV.	DESCRIPTION	DRN	VER'D	APPROVED
A	ORIGINAL ISSUE		-	- -
B	SWALE/ BASIN 1 RELOCATED	AIN	-	- -
C	ORELRA AVENUE LANEWAY REPLACED WITH ROAD LOTS AMENDED	AIN		

PLAN
SCALE 1:1000

LEGEND

DRAINAGE CATCHMENT AREA

CONCEPT DRAINAGE SWALE/BASIN LOCATION

PIPED DRAINAGE FLOW ARROWS

DRAINAGE DATA

TOTAL ROAD RESERVE CATCHMENT AREA = 9700m²

CATCHMENT 1 = 4800m²

CATCHMENT 2 = 2500m²

CATCHMENT 3 = 900m²

CATCHMENT 4 = 1500m²

RUNOFF CO-EFFICIENT = 0.9

ASSUMED INFILTRATION RATE = 10m/day = 0.0001m/sec

LOCATION AND CONFIGURATION OF DRAINAGE SWALE / BASINS WITHIN POS ARE YET TO BE CONFIRMED SUBJECT TO AUTHORITY APPROVAL AND LANDSCAPING DESIGN

SWALE / BASIN 1

CONTRIBUTING CATCHMENT No 3 = 900m²

20 YEAR RAINFALL INTENSITY = 130.9mm/hr

AREA REQUIRED = 6x6 = 40m²

DEPTH = 200mm

SWALE / BASIN 1

CONTRIBUTING CATCHMENT No 1 & 4 = 6300m²

20 YEAR RAINFALL INTENSITY = 130.9mm/hr

AREA REQUIRED = 15x15 = 220m²

DEPTH = 600mm

SWALE / BASIN 2

CONTRIBUTING CATCHMENT No 2 = 2500m²

20 YEAR RAINFALL INTENSITY = 130.9mm/hr

AREA REQUIRED = 12.5x12.5 = 160m²

DEPTH = 200mm

SCALE BAR 1:1000 @ ORIGINAL SHEET SIZE A1

WOOD & GRIEVE ENGINEERS
Wood & Grieve Pty Ltd
A.B.N. 75 900 169 652
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PERTH
MELBOURNE
SYDNEY
BRISBANE
HOBART
BUNBELTON

CLIENT: LANDCORP

PROJECT: KWINANA EDUCATION PRECINCT - LOT D

TITLE: DRAINAGE CONCEPT PLAN

DESIGNED: M.DEL BORRELLO	VERIFIED	/ /	WAPC No. N/A	DATUM: A. H. D.	
DRAWN: A.NGUYEN	APPROVED FOR TENDER	/ /	DRAWING No. 20179-PER-C/SK1	REV. C	
APPROVED FOR CONSTRUCTION		/ /			

APPENDIX D - DRAINAGE CONCEPT PLAN

REV.	DESCRIPTION	DRN	VER'D	APPROVED
A	ORIGINAL ISSUE		-	- -
B	SWALE/ BASIN 1 RELOCATED	AIN	-	- -
C	ORELRA AVENUE LANEWAY REPLACED WITH ROAD LOTS AMENDED	AIN		

PLAN
SCALE 1:1000

LEGEND

DRAINAGE CATCHMENT AREA

CONCEPT DRAINAGE SWALE/BASIN LOCATION

PIPED DRAINAGE FLOW ARROWS

DRAINAGE DATA

TOTAL ROAD RESERVE CATCHMENT AREA = 9700m²

CATCHMENT 1 = 4800m²

CATCHMENT 2 = 2500m²

CATCHMENT 3 = 900m²

CATCHMENT 4 = 1500m²

RUNOFF CO-EFFICIENT = 0.9

ASSUMED INFILTRATION RATE = 10m/day = 0.0001m/sec

LOCATION AND CONFIGURATION OF DRAINAGE SWALE / BASINS WITHIN POS ARE YET TO BE CONFIRMED SUBJECT TO AUTHORITY APPROVAL AND LANDSCAPING DESIGN

SWALE / BASIN 1

CONTRIBUTING CATCHMENT No 3 = 900m²

20 YEAR RAINFALL INTENSITY = 130.9mm/hr

AREA REQUIRED = 6x6 = 40m²

DEPTH = 200mm

SWALE / BASIN 1

CONTRIBUTING CATCHMENT No 1 & 4 = 6300m²

20 YEAR RAINFALL INTENSITY = 130.9mm/hr

AREA REQUIRED = 15x15 = 220m²

DEPTH = 600mm

SWALE / BASIN 2

CONTRIBUTING CATCHMENT No 2 = 2500m²

20 YEAR RAINFALL INTENSITY = 130.9mm/hr

AREA REQUIRED = 12.5x12.5 = 160m²

DEPTH = 200mm

SCALE BAR 1:1000 @ ORIGINAL SHEET SIZE A1

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CLIENT: LANDCORP

PROJECT: KWINANA EDUCATION PRECINCT - LOT D

TITLE: DRAINAGE CONCEPT PLAN

DESIGNED: M.DEL BORRELLO	VERIFIED	/ /	WAPC No. N/A	DATUM: A. H. D.	
DRAWN: A.NGUYEN	APPROVED FOR TENDER	/ /	DRAWING No. 20179-PER-C/SK1	REV. C	
APPROVED FOR CONSTRUCTION		/ /			

APPENDIX E - TRAFFIC REVIEW

ACN 074 110 375
ABN 51 828 614 001

Consulting Traffic & Civil Engineers,
Risk Managers.

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Mr M Del Borrello
Wood & Grieve Engineers
Level 3 Hyatt Centre
3 Plain Street
East Perth WA 6004

5 May 2008

Dear Sir

Re: Kwinana Education Precinct Concept

In response to your request of 24 April 2008, a review has been undertaken of the draft concept plans for the residential subdivision of land to the north of Sulphur Road, Kwinana between Orelia Avenue and Meares Avenue extending to Dargin Place. Copies of the drawings provided are attached for certainty of information.

The Western Australian Planning Commission has guidelines for development regarding the transport assessment requirements for structure plans. The format of those guidelines has been used to assess the draft concept plan though it is understood from the brief to Shawmac that a full assessment with in-depth analysis is not required at this time.

Internal Transport Network

The internal road network provides a combination of permeability and traffic control.

The road network uses a minimum reserve width of 15.4m that will allow for vehicular, cyclist and pedestrian traffic as well as providing a social community link between residents. Landscaping within the road reserve can be accommodated within this width.

Traffic generated for internal movements is encouraged to be non-vehicular by the short travel distances of typically 100m to 150m.

Features of the internal network that enhance the safety for all users are short road lengths, multiple choice of travel paths within the area, the use T-intersections, the deliberate omission of four-way intersections, the use of 90° bends and road alignments that encourage vehicular drivers to concentrate on the short to medium distance in advance, hence reducing comfortable travel speeds.

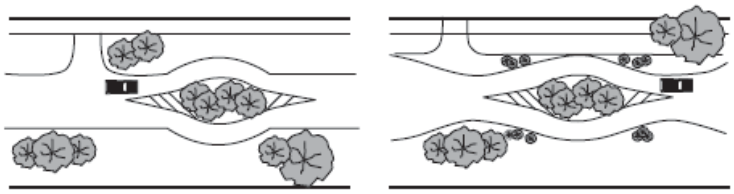
The proposed road layout avoids long straight sections of road on which vehicle speeds can inadvertently become excessive. The longer straights are less than 100m with the use of a mid-block curved deflection in the alignment to visually and physically alter the perception of a 150m long straight.

The potential is low for the use of the internal network by through traffic not associated with the local residences.

The extension of Dargin Place to link Sulphur Road and Orelia Avenue forms a perimeter road to the internal road network. This extension of Dargin Place may be a desirable through traffic route and at detailed planning level, some traffic management treatments may be advantageous to have included.

Desirable traffic management treatments for this development are mid-block slow points (blister islands) with a minor widening of the road reserve to accommodate pedestrian movements.

Figure 5.5: Examples of the two main types of centre blister arrangement



Extract from Austroads Guide to Traffic Engineering Practice
Local Area Traffic Management AP-G11.10-04

A feature of the development that encourages a mixture of building styles is the provision of 6m wide laneways for property access. The intersections of these laneways with wider roads are at 90° to provide the best orientation for sight distance. The intersections are proposed to be treated as 'Bellmouth' intersections with the deliberate reduction in width to 3m from the 6m. This treatment encourages a reduction in speed when exiting the laneway and also when approaching the laneway along the road due to reduced manoeuvring area. The treatments allow the enhancement of the streetscape with improved landscaping and a reduction in open bitumen appearance of wide intersections. The entry to a laneway becomes similar in appearance to a typical single residential driveway.

The State Planning Policy 3.1 Residential Design Codes released in April2008 prescribes the parking required with group dwellings and indicates that some parking may be off-site, i.e. on-street, and comply with the R-Codes. On-street parking is proposed in two discrete areas close to the higher density housing. One area is a typical small car park nestled between properties and also serving as a link to a public open space (POS) area. The second area is standard on-road parallel parking at a location with sight distances that comply with Australian Standard 2890.5. All parking will be constructed to the dimensions specified in AS 2890.5. On-street parallel parking is advantageous where it can be combined with POS.

External Transport Network

The proposed development may include 168 dwelling units from which the traffic generated is estimated to be 1,500 vehicles per day. This level of additional traffic can be accommodated on the existing roads of Orelia Avenue, Sulphur Road and Gilmore Avenue at the present level of infrastructure in accordance with the Liveable Neighbourhoods guidelines.

Traffic Flow Routes

The major traffic flow associated with this development will be to employment and shopping.

The major commercial precinct is close to the development and accessed via Meares Avenue.

Routes to employment will utilise Gilmore Avenue and Orelia Avenue to access areas away from Kwinana, including access to the Kwinana Freeway. Sulphur Road is a major link to the Kwinana Railway Station.

Intersection Controls

The appropriate intersection controls on the major traffic roads already exist with roundabouts at the Sulphur Road/Meares Avenue/Dargin Place extension intersection and at the Sulphur Road/Orelia Avenue intersection. The Dargin Place/Orelia Avenue intersection is a standard T-intersection.

Cycle Routes

The development includes a strong cycle link through public open space and a specially widened road reserve to provide a safe cycling environment. This cycleway links with a Heritage cycle route.

Residential Property Access

The orientation of properties is proposed to ensure most residential access is onto the new development roads and from those to major road intersections.

There are direct residential accesses onto Dargin Place that will be typical of any residential road and will enhance the ability to create a sense of community along that road.

Along Orelia Avenue there will be a few direct residential accesses that in combination with the POS will provide an aesthetic aspect to the east side of this road. There are two laneway accesses onto Orelia Avenue that will act as minor intersections. The incorporation of the Bellmouth entry treatment encourages the use of the alternate normal road intersections for general vehicular access into the development area. The laneways do provide additional pedestrian access links between the new and existing residential areas.

On Sulphur Road the access to residential properties is proposed to be by a combined access place (CAP) system similar to that existing along the south side of that road. The CAP access will link to a laneway at the east end and directly to Sulphur Road at the west end. The benefit of a CAP system along a medium to heavily trafficked road is a reduction in the number of locations at which vehicles will be slowed down to manoeuvre. The combination with a laneway access is a further benefit.

In the absence of being able to view the overall draft structure plan text, I trust that this review provides suitable information that is compatible with that document.

Yours faithfully,

Geoff Miles

Senior Engineering Manager

APPENDIX F - DRAFT POS LANDSCAPE MASTERPLAN

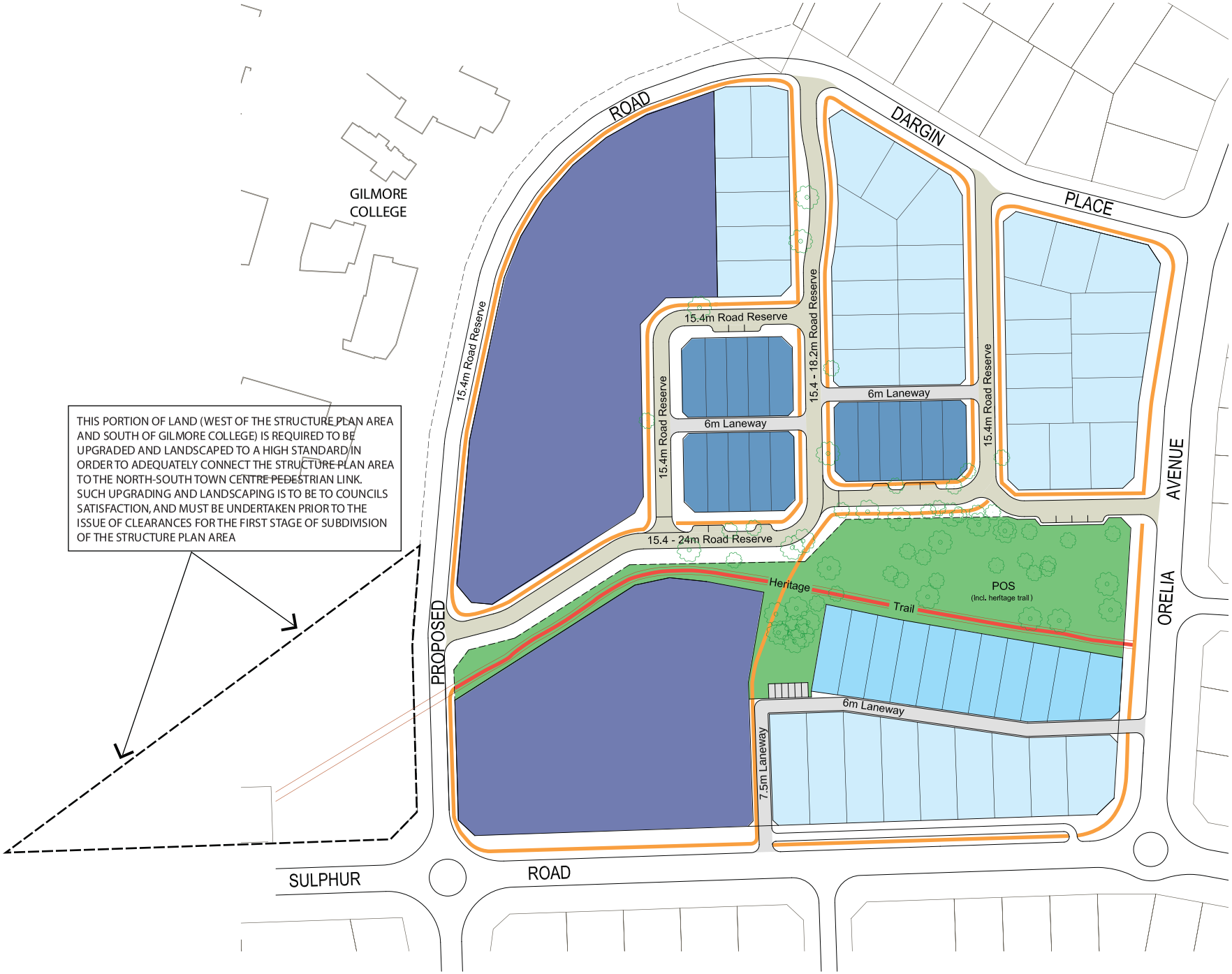
HASSELL

Client	Project	Drawing	Drawing No	Project No	Date	Scale	Drawn By
LANDCORP	KWINANA EDUCATION PRECINCT JOINT VENTURE	LANDSCAPE MASTER PLAN - POS AREA	SK02	PPL0100	03.06.08	1:400 @ A2	COOEJ

APPENDIX G - STRUCTURE PLAN

Lot D Kwinana Education Precinct

Structure Plan



- R25
- R30
- R40
- R50
- POS
- Laneway
- Local Road
- Dual Use Path
- Footpath
- Trees to be retained (dependant on condition)

DEVELOPER CONTRIBUTIONS TOWARDS COMMUNITY INFRASTRUCTURE ARE CURRENTLY BEING PREPARED BY THE TOWN OF KWINANA IN ACCORDANCE WITH DRAFT STATE PLANNING POLICY NO.3.6. ACCORDINGLY, THE SUBJECT LAND WILL LIKELY BE SUBJECT TO PAYMENT OF SUCH CONTRIBUTIONS AS PART OF FUTURE SUBDIVISION.

N

Scale - 1:1000 @ A2

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