TAMALA PARK LOCAL STRUCTURE PLAN NO. 79

Part Two - Explanatory Report

(Prepared pursuant to WAPC correspondence dated 13 April 2011)

March 2012

TAMALA PARK LOCAL STRUCTURE PLAN NO. 79 -
STATEMENT OF MODIFICATIONS TO TPG PARTS 2 & 3 – EXPLANATORY SECTION & TECHNICAL REPORTS DATED SEPTEMBER 2009
PREPARED PURSUANT TO WAPC CORRESPONDENCE DATED 13 APRIL 2011 AND CITY OF WANNEROO CORRESPONDENCE DATED 19 JULY 2011

The following statement of modifications applies to Parts 2 & 3 of the Tamala Park Structure Plan dated September 2009 and prepared by TPG. The modifications are consistent with the WAPC correspondence dated 13 April 2011 and the City of Wanneroo correspondence dated 19 July 2011. The Department of Planning and the City of Wanneroo has agreed to this form of modification to Parts 2 and 3 of the Tamala Park Structure Plan.

1. In the case of any inconsistency between Parts 1, 2 and 3, the Part 1 March 2012 version is to prevail and override any inconsistencies.

2. Any reference to the Mitchell Freeway – Neerabup Road northbound off ramp made in Parts 2 and 3 of this Local Structure Plan is withdrawn. The off ramp does not form part of the Part 1 Local Structure Plan Map and in the case of any inconsistency between Parts 1, 2 and 3 in this regard, the Part 1 is to prevail.

3. An updated Figure 1, 5, 6 and 7 of Appendix 14 is included in Part 3. Consistent with this an updated Figure 23, 24 and Indicative Development Plan is appended to this statement. All plans have been amended to remove direct access to service roads from Regional Roads and service roads are removed from Regional Road Reserves.

   Modifications 2 and 3 reflect the Council resolution (Item 2.1) of the 4 May 2010 schedule of submissions and comments from Main Roads. The advertised structure plan identified future off ramp from the Mitchell Freeway to Neerabup Road as well as direct access to service roads from Regional Roads. During the advertising of the Tamala Park Structure Plan, Main Roads advised that the structure plan was supported with the exception of the Mitchell Freeway – Neerabup Road northbound off ramp. The City of Wanneroo also requested direct access to service roads from Regional Roads was also removed. The traffic model was not contingent on the freeway off ramp or the inclusion of service roads and the removal of these items did not affect the plan or require further modelling to be undertaken.

4. An updated Figure 3 of Appendix 14 is included in Part 3. Consistent with this an updated Figure 21 to the Part 2 is appended to this statement. The shared path has been moved to the southern side of Neerabup Road.

   Modification 4 reflects the Council resolution (Items 7.1 and 7.2) of the 4 May 2010 requiring additional information to be included on Figure 3 - Recommended Pedestrian & Cyclist Facilities of Appendix 14 - Transport Report to clearly delineate proposed facilities for pedestrian cyclists as well as the relocation of the shared path on Neerabup Road (east of Connelly) to the southern side.

5. The following summarises the total amount of land under each zoning on the structure plan:

Zone	**Gross Area** *(approximate only, subject to confirmation at subdivision stage)*
Residential R30 – R60	116ha
Residential R80 – 100	10ha
Mixed Use	9.5ha
Commercial	2.8ha
Primary School	5ha
Strategic Open Space	15.6ha
Local Open Space	9.24ha

Modification 5 reflects the Council resolution (Item 27.1) of the 4 May 2010 requesting inclusion of a table summarising the amount of Business, Commercial and Mixed Use zoned land shown on the Structure Plan Map to ensure that the information is easily accessible.

6. Appendix 1 of Part 3 has been updated to include the approved Environmental Management Plan, appendix 3b is the level 2 Flora survey, with recommendations in Section 9.0.

Modification 6 reflects the Council resolution of the 4 May 2010 requiring a Level 2 Flora Survey to be included in Part 3 and the Environmental Management Plan be updated to include the recommendations of the FVS and finalised prior to adoption of the Structure Plan.

7. All references to the "Green Link" contained in the TPG September 2009 Part 2 are to be replaced with "Significant Social / Pedestrian / Cycle Linkage".

Modification 7 reflects Item 23 the WAPC resolution of the 13 April 2011. This modification acknowledges that this key east-west linkage through Tamala Park achieves a variety of objectives (ie. social as well as environmental).

8. Updated Section 14.6 follows, this overrides Section 14.6 as contained in the TPG September 2009 Part 2:

14.6 PUBLIC OPEN SPACE PROVISION

As a demonstration development, POS within the Tamala Park Development will include well utilised areas that are purposeful, easily accessible and connected to a network of pedestrians and cycle paths. Existing areas of excellent quality native bushland, significant trees and priority flora, which require

conservation, drive the locations of POS. Considered integration of these indentified areas of conservation will be expected throughout the development to minimise environmental impact.

Table 17- POS schedule is included below and indicates that the Structure Plan would comply with the minimum 10% POS provision required by the WAPC's DC Policy 2.3 – Public Open Space in Residential Areas. The Structure Plan provides 14.5% public open space.

Table 17 – Public Open Space Schedule (Plan 2228-31D)

TAMALA PARK LOCAL STRUCTURE PLAN TABLE 17 - PUBLIC OPEN SPACE SCHEDULE			
Site Area		**179**	
Deductions			
Primary School	5		
West Tamala Park Local Centre	0.17		
Central Tamala Park Local Centre	1.3		
Tamala Park Neighbourhood Centre	1.4		
1:1 year drainage area	1.1		
Total Non-residential Land Use Deductions		**8.9**	
Gross Subdivisible Area		**170.6**	
Public Open Space at 10%		**17.0**	
Minimum 80% unrestricted use open space		13.6	
Maximum 20% restricted use open space		3.4	
Unrestricted Use Open Space Provided			
Strategic and Local Open Space not affected by 1:1 to 1:5 year drainage area		23.91	
Restricted Use Open Space Provided			
Strategic and Local Open Space affected by 1:1 to 1:5 year drainage area		0.93	
Total Open Space provided		**23.9**	**14.6%**

The drainage allocation for each precinct is to be determined at the detailed area planning stage through the preparation of Urban Water Management Plans (UWMP's). The drainage component within the POS should not exceed 20%.

As described previously in section 13.2.7, the infiltration basins should always be referred to, and designed, as a series of treatment swales and wetlands. These swales and wetlands should be located and designed into the landscape to maximise the useability and functionality of the public open space while maintaining acceptable depths of detention and inundation. The treatment wetland should be designed so that the area inundated more frequently is limited and separated preferably to the edge of the public open space. This area will be vegetated with native vegetation.

Based on the approved LWMS the preliminary estimate of storage area required to store the 1 in 5 year ARI and 1 in 100 year ARI events are approximately 2.9 and 5.2ha respectively. These figures do not take into account measures to reduce run-off volumes and enhance infiltration at source. As a consequence, the storage volumes and basin areas are likely to significantly overestimate the actual requirements. Further detailed modelling is required to produce realistic volumes in the post development landscape, based on a finalised storage management system design. This will occur prior to subdivision as a component of UWMP's. The stormwater management system will need to be well interfaced with the POS, in order to ensure compliance with minimum area thresholds defined in Element 4 of Liveable Neighbourhoods (WAPC 2007).

Where the POS is used for stormwater management the following should apply in addition to the requirements of Liveable Neighbourhoods:

- The TWL area for the 100 year ARI should be limited to 75% of the area of any individual basin.
- The TWL area for the 5 year ARI should be limited to 25% of the area of any individual basin.
- The EIA contributing to any one basin should not exceed 8ha.

Modification 8 reflects Item 24 of the WAPC resolution of the 13 April 2011 requiring a revised public open space schedule consistent with the requirements of Liveable Neighbourhoods. Modifications to the POS table include, deletion of the Bush Forever area of 27.9208 ha (not included as part of gross area), increased area of the primary school site to 5 hectares, inclusion of updated calculations for local and neighbourhood centres, deletion of green link in calculation and identification of restricted open space as comprising the difference between the 1:5 yr and the 1:1 yr drainage requirements. Consistent with Council resolution (Item 35.4) of the 4 May 2010, the revised Section 14.6 clearly identifies criteria for stormwater management.

9. Updated Section 13.7.2 follows, this overrides Section 13.7.2 as contained in the TPG September 2009 Part 2:

13.7.2 FLOOD MANAGEMENT IN PUBLIC OPEN SPACES

Public Open Space areas are commonly used in the stormwater management systems to assist with the storage and infiltration of peak flow events. A preliminary assessment of potential storage volumes and areas required to store storm water runoff within the proposed development has been made, based on the IDP contained in the LSP and CoW basic criteria for preliminary stormwater drainage detention design.

The preliminary estate of storage area required to store the 1 in 5 year ARI and 1 in 100 year ARI events are proximately 2.9 and 5.2ha respectively. These figures do not take into account measures to reduce run-off volumes and enhance infiltration at source. As a consequence, the storage volumes and basin areas are likely to significantly overestimate the actual requirements.

Further detailed modelling is required to produce realistic volumes in the post development landscape, based on a finalised stormwater management system design. This will occur prior to subdivision as a component of UWMPs. The stormwater management system will need to be well interfaced with the public open space area, in order to ensure compliance with minimum area thresholds defined in element 4 of Liveable Neighbourhoods (WAPC 2007).

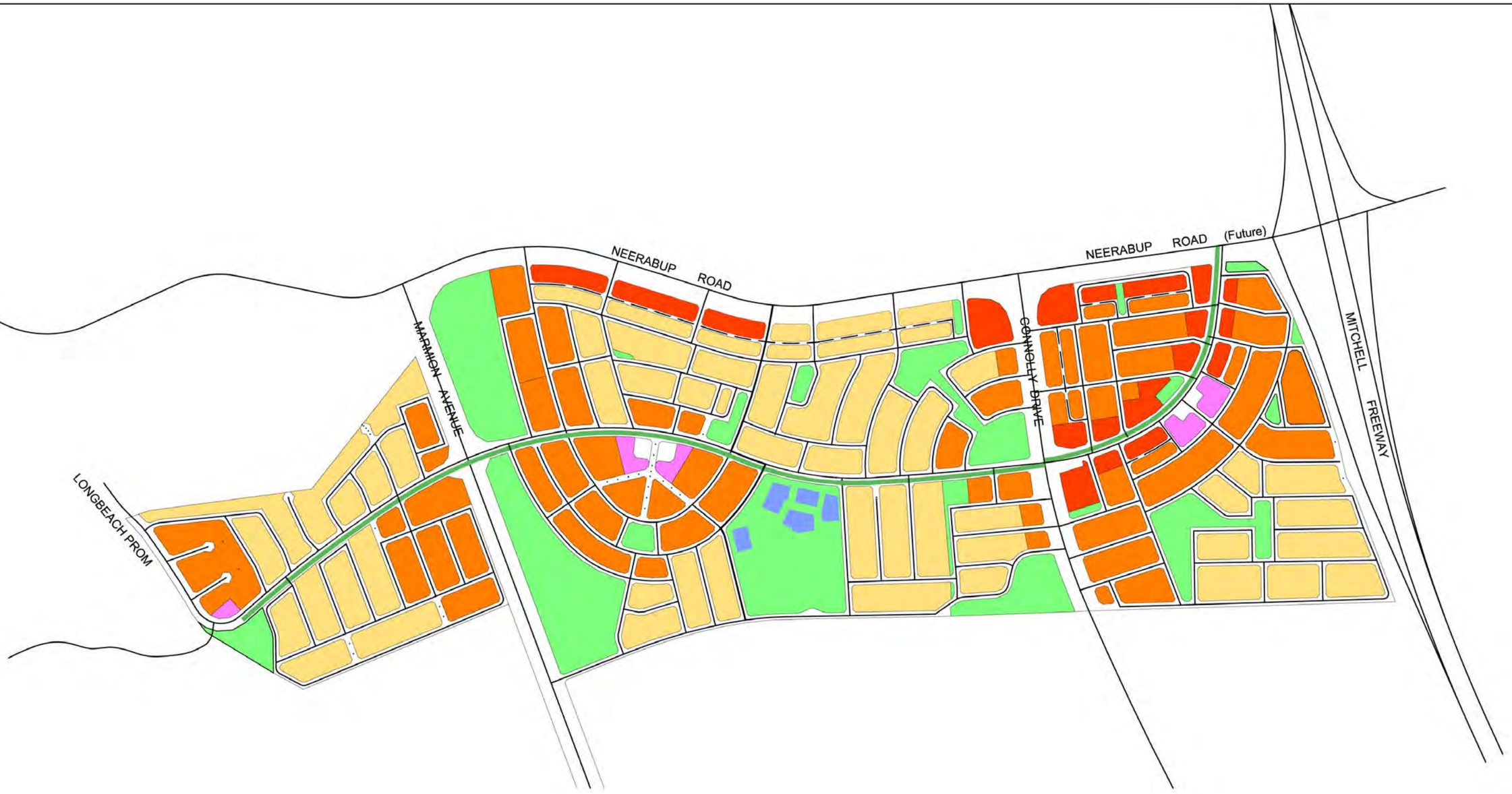
An area of approximately 14 ha situated East of Marmion Avenue had been proposed as a conservation area. This remnant vegetation in this area is in relatively good condition compared with the majority of the study area. As a component of the protection of this vegetation, stormwater flows from adjacent developed areas will be prevented from entering this area.

Infiltration basins in POS areas should be designed and located to maximise the usability of the POS while maintaining acceptable depths of inundation. The basins will be designed so that the area that is inundated more frequently is limited and separated, preferably to the edge of the open public space. Infiltration areas will be vegetated with native vegetation and aesthetically blended into the surrounding landscape.

Soak wells or other similar structures may be placed under the more frequently inundated public open space areas to reduce the required infiltration area. These structures are recommended in public open space areas that are highly utilised for recreation to reduce 'nuisance' flooding.

Flows from the 1 year critical duration event shall not reach public open space, and shall be infiltrated within the road network. Any area of public open space affected by runoff from up to the 1 in 5 year ARI event shall be contained in restricted public open space, capped at a maximum of one-fifth of the ten percent POS liability. Where a public open space would be significantly inundated by the 1 in 5 year ARI event, underground storage/infiltration will be required.

Modification 9 reflects the Council resolution (Item 35.3) of the 4 May 2010 requiring Section 13.7.2 to include discussion of the 1 in 5 year events, in line with Liveable Neighbourhoods, and the relevant design criteria to determine restricted / unrestricted public open space.



Source: TPG

- Low Density (Single Dwelling / Semi Detatched)
- Medium Density (Single Dwelling / Semi Detatched / Apartments)
- Mixed Use (Single Dwelling / Semi Detatched / Apartments / Commercial)
- Business (Showroom / Office)
- Centre (Apartments / Office / Commercial / Retail)
- Reserve
- Community / Educational

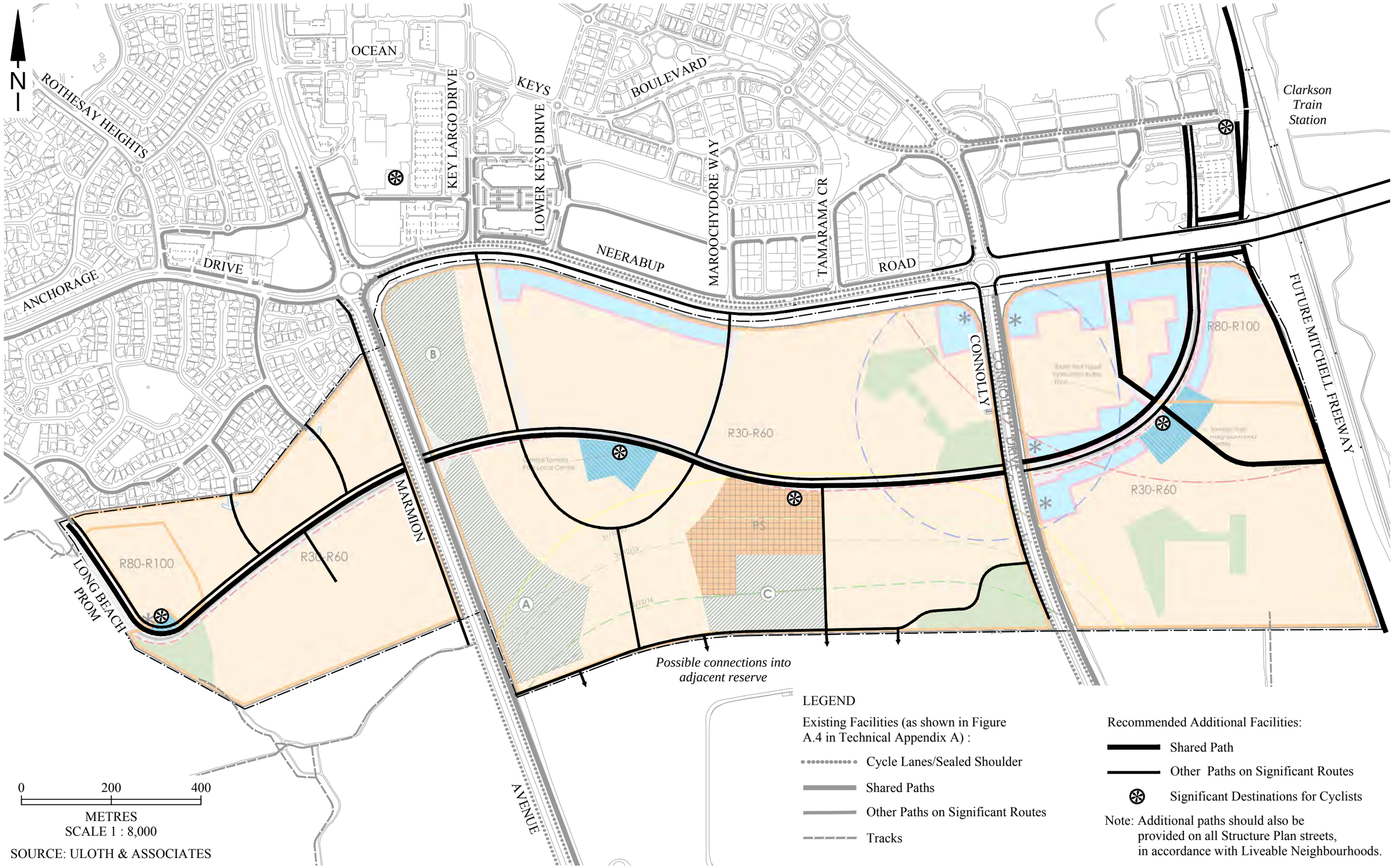
0 250 / 125 500 / 250m

Note : All boundaries indicative only and subject to survey and verification

Tamala Park Indicative Development Plan
TPRC

Date: June, 2009 Designer: BWG
Scale: 1: 10000/ 5000 @ A3/A1 Drawn: MK
Drawing No. 709-045 CP1B 10.06.09.dwg

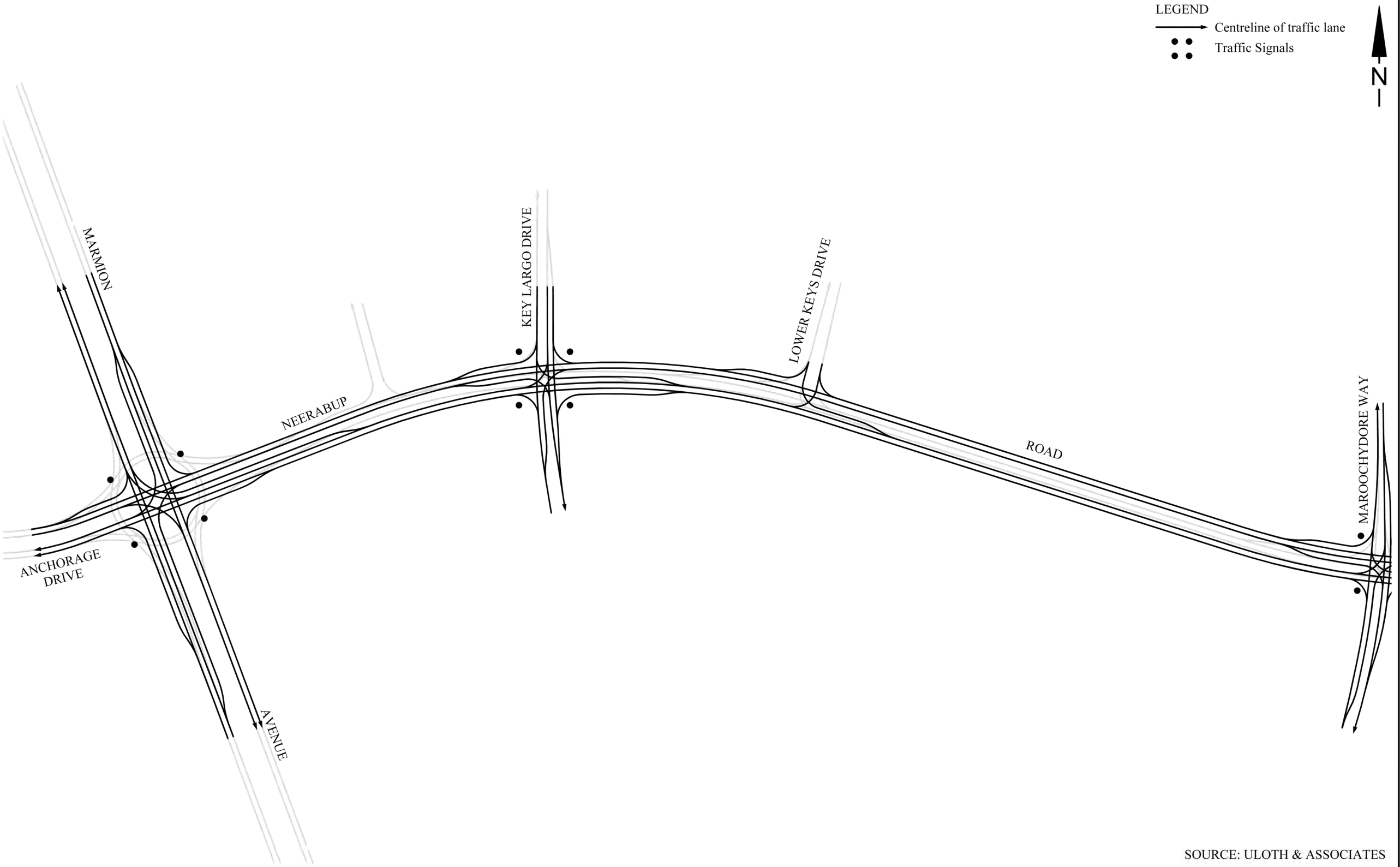
TOWN PLANNING AND URBAN DESIGN



Recommended Pedestrian/Cyclist Facilities

PROPOSED TAMALA PARK STRUCTURE PLAN

Figure 21

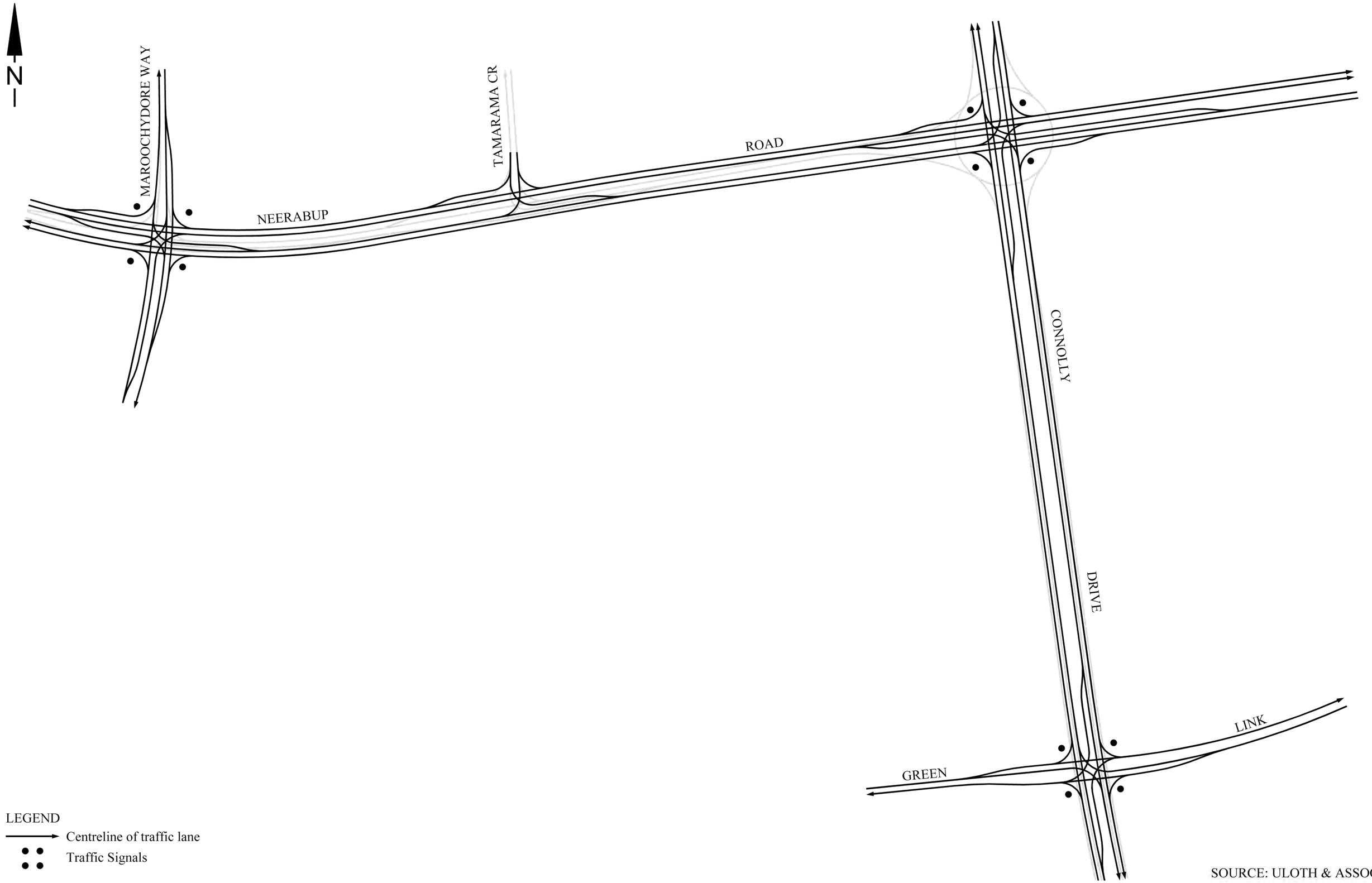


SOURCE: ULOTH & ASSOCIATES

Recommended Intersection Configurations

NEERABUP ROAD (WESTERN END)

Figure 23



LEGEND

Centreline of traffic lane

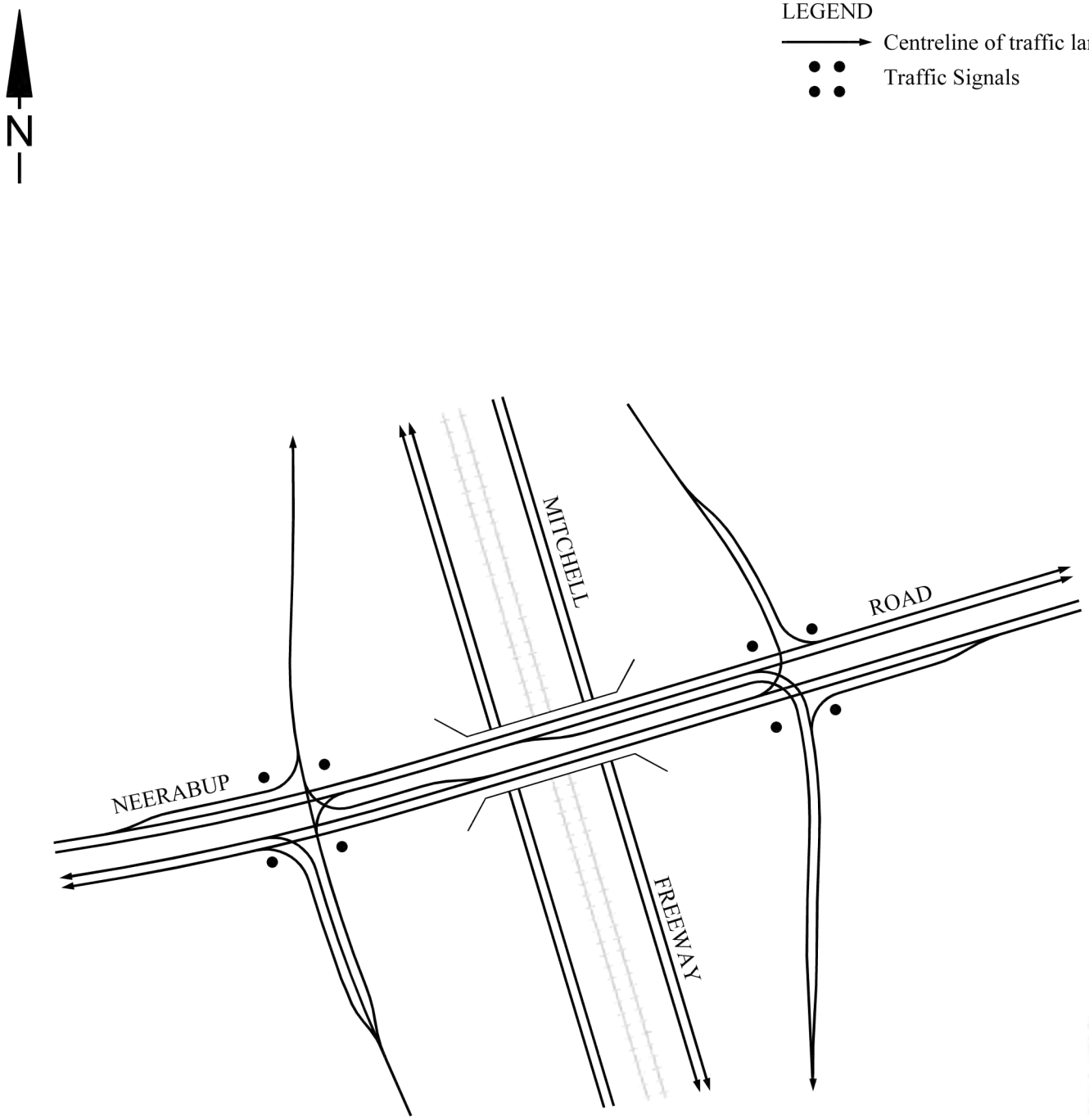
Traffic Signals

SOURCE: ULOTH & ASSOCIATES

Recommended Intersection Configurations

NEERABUP ROAD (EASTERN END) AND CONNOLLY DRIVE

Figure 24



SOURCE: ULOTH & ASSOCIATES

Recommended Intersection Configurations

NEERABUP ROAD - MITCHELL FREEWAY RAMPS

Figure 25

TOWN PLANNING
AND URBAN DESIGN

TAMALA PARK LOCAL STRUCTURE PLAN

PART TWO - EXPLANATORY SECTION

Our Ref: 709-045
September 2009

perth
sydney

DOCUMENT CONTROL

Document ID: PLANNING/PG 2009/709-045/ Final Documents/ Final Report/ Explanatory Report2 07.09.09.indd						
Issue	Date	Status	Prepared by		Approved by	
			Name	Initials	Name	Initials
1	07.09.09	Final	Jeff L.M. Malcolm		Murray Casselton	

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1.0 INTRODUCTION

1.1 PREAMBLE

TPG Town Planning and Urban Design (TPG) have been commissioned by the Tamala Park Regional Council (TPRC) to prepare the Tamala Park Local Structure Plan (LSP). The LSP will guide the future development of Tamala Park in an appropriate manner, drawing on a variety of contemporary mechanisms with respect to sustainable and sensitive community development, urban design and urban water management.

This section of the report provides information as required within Schedule 9 of the City of Wanneroo (CoW) District Town Planning Scheme No. 2 (DPS2) addressing relevant urban design, economic development and environmental issues. The subsequent sections will inform future planning studies and initiatives relating to sustainable development during the preparation of Detailed Area Plans (DAP's) guiding subdivision and development within Tamala Park.

Key aspects of the structure plan include:

- Providing for the orderly distribution of residential density and a range of housing typologies that address changing demographics and the needs of future populations within the Perth Metropolitan Region, including affordable housing opportunities.
- Providing for sustainable environmental outcomes with respect to such matters as water use, energy efficiency, conservation and transport, while taking advantage of natural features and views.
- Providing active commercial centres and community hubs that meet the daily and weekly needs of residents and provide employment opportunities that are co-located with local recreation and community facilities.
- Providing an appropriate urban design response in recognition of adjoining public transport infrastructure.
- A high level of linkage both within and beyond the boundaries of the subject site to commercial centres, coastal reserves and transport nodes via cycle and pedestrian access, public transport and private vehicle.
- Addressing the forecast demand for a variety of community services and social infrastructure.

Project objectives have been arrived at by the TPRC, through review and refinement of the objectives of the CoW Smart Growth Strategy, in order to specifically address outcomes considered desirable for the Tamala Park development.

The LSP is to be endorsed by the CoW and subsequently the Western Australian Planning Commission (WAPC).

1.2 PROJECT TEAM

The LSP has been prepared by a team of highly experienced specialist consultants, providing input in relation to a range of matters including the following:

TPG Town Planning and Urban Design	Urban Design, Planning, Architecture and Built Form
Syrinx Environmental	Environment and Sustainability Initiatives and Investigations
Douglas Partners	Geotechnical
TABEC	Servicing and Civil Engineering
Uloth and Associates	Transport
Creating Communities	Community Facilities and Community Development
Pracsys	Economy, Employment and Activity Centres
MWH	Local Water Management Strategy
CSIRO	Integrated Water Management and Groundwater Research

2.0 SUBJECT LAND

2.1 LOCATION

Tamala Park (referred to hereinafter as the subject land) is located in the northwest corridor of the Perth Metropolitan Region in the CoW, approximately 35 kilometres north of the Perth Central Business District. The boundary of the LSP area is depicted in Figure 1 – Tamala Park Local Structure Plan

Refer to Figure 1 - Tamala Park Local Structure Plan Area

Figure 1 - Tamala Park Local Structure Plan Area

2.2 LAND OWNERSHIP

The lands included in the structure plan comprise an area of approximately 180 hectares and are described as follows:

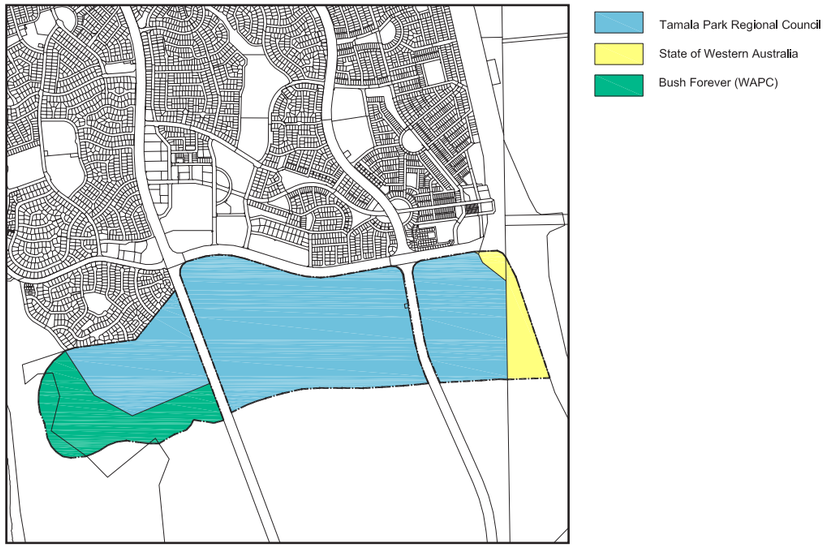
Table 1 - Land Ownership

Lot / Reserve	Location	Deposited Plan / Diagram	Ownership	Area (Ha)
9504	Marmion Avenue and Connolly Drive, Tamala Park	DP 52070	Tamala Park Regional Council	167.484ha
807	Neerabup Road		State of WA	1.816ha
Reserve 27575/3321999	Mitchell Freeway, Tamala Park	Diagram 96200	State of WA	8.9317ha

Land ownership is depicted in Figure 2 – Land Ownership.

Refer to Figure 2 - Land Ownership.

Figure 2 – Land Ownership



3.0 LOCAL AND REGIONAL CONTEXT

3.1 LOCAL CONTEXT AND LAND USE

The lands subject of the LSP are bound by the suburbs of Mindarie and Clarkson, by Neerabup Road to the north, the Mitchell Freeway reservation and Neerabup Regional Park to the east, the Mindarie Landfill Facility to the south and an existing coastal foreshore reserve adjacent to the Indian Ocean to the west. The future Mitchell Freeway Reserve is designed as a 'Primary Regional Road' under the Metropolitan Region Scheme (MRS). Marmion Avenue and Connolly Drive are 'Other Regional Roads' under the MRS and run in a north-south direction through the subject land.

The Mindarie Keys Marina is located in the order of 1 kilometre to the north of Tamala Park, providing berthing, restaurants, bars and short-stay accommodation. The Clarkson Train Station is located less than 1km away, immediately to the northeast. Under the provisions of the Clarkson Agreed Structure Plan No. 33, the Clarkson Train Station Precinct has been allocated 3,000m^2 of retail floor space, of which a maximum of 2,800m^2 will be located within the Main Street Mixed Use area.

A mixture of civic and commercial activities are included in the Ocean Keys District Centre located to the north of Neerabup Road at the corner of Marmion Avenue. DPS2 currently places a cap of 28,000m^2 of retail floor space over the Ocean Keys District Centre as a whole.

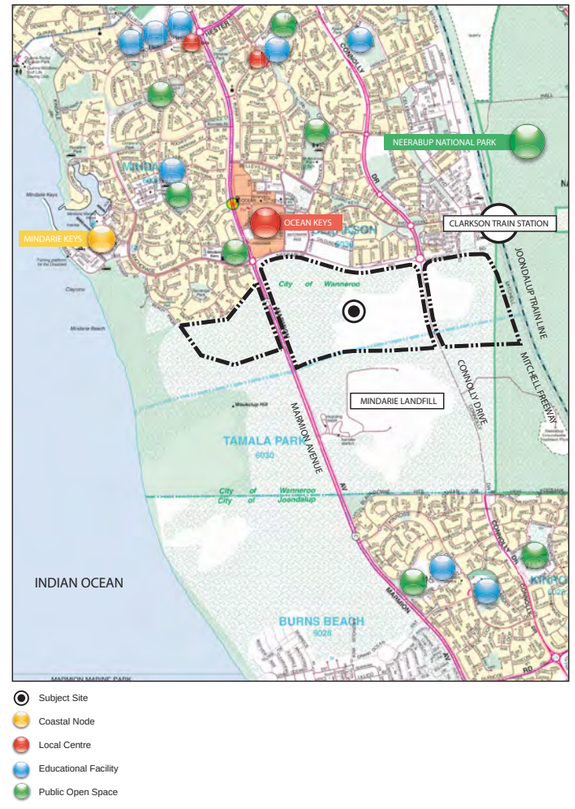
The landfill area located immediately south affects the southwestern portion of the subject land. The Mindarie Regional Council is modifying the landfill operation in order to ensure that by 2011 the landfill does not affect amenity within the future development or encroach within the mandatory 500-metre buffer area. The processing of a substantial volume of household waste will occur in an alternative location, at a secondary waste plant on industrial land located on Flynn Drive.

Neerabup National Park is located to the east of the subject land. The 1069 hectare park follows an old stock route, which in turn follows part of an ancient Aboriginal migration route between Lake Joondalup, in the Yellagonga Regional Park, and Loch McNess in Yanchep National Park. The route also forms the basis for the 28 kilometre Yaberoo Budjara Heritage Trail, developed in 1988 as one of a network of heritage trails marking the Australian Bicentenary. Neerabup National Park provides a narrow corridor to allow the movement of animals along the coastal plain and associated wetlands.

Use of the Neerabup National Park for recreation purposes is already increasing, as urban growth continues along its western edge. The park has a vital role to play in the preservation of the natural environment in Perth's north western corridor. Land located to the east and south west of the structure plan area includes coastal foreshore reserve, with a portion of the land being reserved as Bush Forever.

Refer to Figure 3 – Local Context Plan

Figure 3 – Local Context Plan



3.2 REGIONAL CONTEXT

The subject land is situated in the north west corridor of the Perth Metropolitan Region, as previously described.

The Neerabup Industrial Area (Meridian Park) is located within 5km to the east of the subject land and has been quoted by Landcorp as having the potential to deliver 20,000 jobs for the north-west corridor. Landcorp has the intention of attracting higher value, employment intensive industries to this location.

The Mitchell Freeway will in future be extended through to Neerabup Road, which will impact upon the vocational decisions of strategic business seeking a site for expansion or development. However, it is recognised that the Joondalup Regional Centre and in the future, Alkimos Regional Centre, will accommodate the majority of growth in strategic employment.

The Joondalup Regional Centre, located 10 km to the south east of the subject land is the closest regional centre to Tamala Park providing higher levels of retail, civic, community service and commercial recreation facilities. Joondalup will in future be superseded by the Alkimos Regional Centre as a destination for residents in Tamala Park seeking to access such amenities by virtue of its proximity. In addition to Alkimos, the future St. Andrews City centre located approximately 20km to the north will provide a similar level of amenity. The Joondalup, Alkimos and St. Andrews centres will provide population driven and greater strategic employment opportunities for future residents in Tamala Park and the greater north western corridor in the future.

Wangara and Landsdale industrial areas currently service the population-driven needs of the northwest corridor. These areas are undergoing significant expansion and are under increasing pressure to allow for the expansion of bulky goods retailing in the area.

Refer to Figure 4 – Regional Context Plan

Figure 4 – Regional Context Plan

4.0 STATUTORY PLANNING FRAMEWORK

4.1 METROPOLITAN REGION SCHEME ZONING

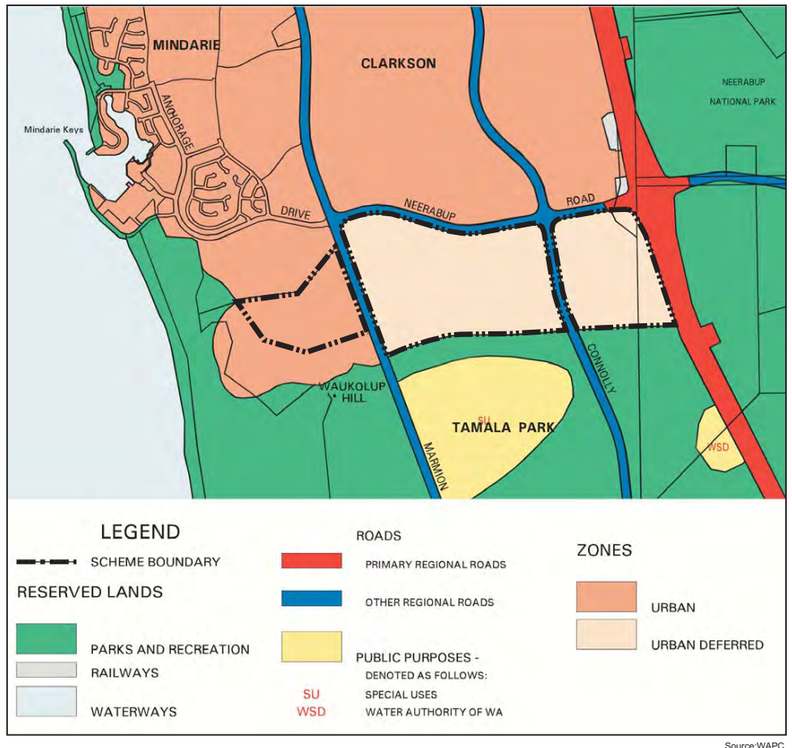
That portion of the subject land located to the west of Marmion Avenue is zoned 'Urban', and the lands located to the east of Marmion Avenue are zoned 'Urban Deferred' under the Perth Metropolitan Region Scheme (MRS).

A Primary Regional Road reserve is in place providing for the future extension of the Mitchell Freeway.

The current 'Urban Deferred' zoning east of Marmion Avenue was established following the endorsement of MRS Amendment No. 992/33 - Clarkson-Butler. It will be necessary to lodge an application to lift the 'Urban Deferred' zoning of those portions of the subject land east of Marmion Avenue and in order to accommodate the Bush Forever Reserve.

Refer to Figure 5 – MRS Zoning.

Figure 5 - MRS Zoning Map



4.2 CITY OF WANNEROO DISTRICT PLANNING SCHEME NO.2 (DPS2)

The subject land is zoned 'Urban Development' under the City of Wanneroo District Planning Scheme No.2 (DPS2). DPS2 provides that land zoned 'Urban Development' requires the preparation and endorsement of an Agreed Structure Plan by the Council and the Western Australian Planning Commission (WAPC) in order that subsequent applications for subdivision or development of the subject land may be considered.

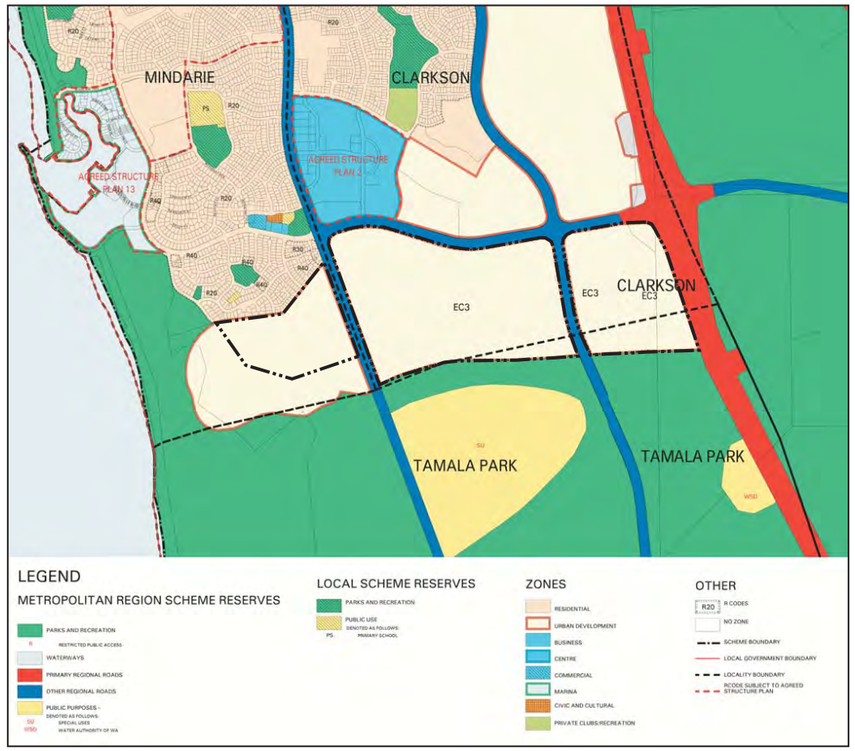
The LSP will guide future land use and development on the subject land and will provide for the rezoning of relevant portions from 'Urban Deferred' to 'Urban' under the MRS, facilitating subdivision and development.

Mechanisms for implementing biodiversity protection through rezoning of natural areas have been identified by the CoW. These matters have been taken into consideration during the structure planning process. The City proposes to adapt the current local scheme reserves in the next local planning scheme to reflect the changed vesting purpose and management. This could be achieved in a number of ways:

- By expanding the local reserve classifications to include 'Conservation and Recreation'. This may restrict the locality to passive recreation, which would allow for further protection and provide clear direction as to the use of City reserves; or
- By including City reserves managed for conservation in a specific 'Conservation' zone, which details the purpose and specific uses within these areas.
- Providing for the protection and management of these local reserves under the provisions of DPS2. For example in Schedule 5 (sub-clause 5.3.1) It has been assumed that better protection of natural areas in public open space will be implemented across most planning precincts in order to achieve a number of different biodiversity targets.

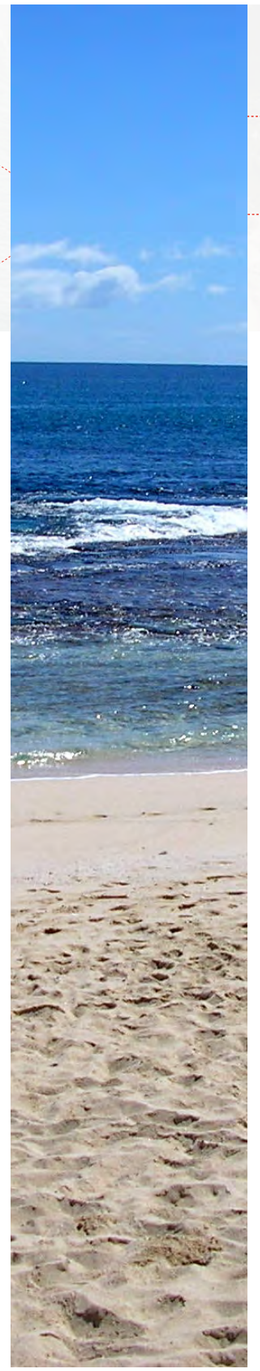
Refer to Figure 6 – DPS2 Zoning

Figure 6 – DPS2 Zoning



Source:WAPC

Subject Site



4.3 ENVIRONMENTAL PLANNING FRAMEWORK

4.3.1 Commonwealth Legislation

The *Environmental Protection and Biodiversity Conservation Act 1999* (the EPBC Act) is the Commonwealth Government legislation that applies to the development of the subject land. The EPBC Act provides a framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places defined in the Act as matters of National Environmental Significance (NES). Approval from the Environment Minister is required where a proposed action may impact on matters of NES. This referral process determines whether a proposed action requires formal assessment and approval under the EPBC Act. Species registered as being of NES have been identified on the subject land, including the Carnaby's Black Cockatoo. Implications for the LSP design and the responses undertaken guiding future development are documented in later sections of this report.

4.3.2 State Legislation and Environmental Conditions

State legislation applying to the LSP area includes the *Environmental Protection Act 1986*, being the primary source of environmental protection in Western Australia. The Act provides guidance on a range of environmental issues including the conservation, preservation, protection, enhancement and management of the environment.

An environmental assessment was undertaken in association with the Clarkson Butler Scheme Amendment No. 992/33 Clarkson-Butler, Wanneroo (Bulletin No.971), which established the 'Urban Deferred' zoning. A series of Ministerial conditions were applied to Lot 17 (central and eastern portions of the LSP area). These conditions have been addressed through the preparation of an Environmental Management Plan (EMP), which serves to mitigate and manage the impact of subdivision and development. The information required to satisfy the Ministerial conditions has been addressed through the following:

- The identification and retention of good quality remnant vegetation giving consideration to its reservation status, while achieving a strengthened east-west linkage between the coast and the Neerabup National Park.
- A survey of Declared Rare and Priority Flora within the area subject of the amendment.
- Identification of the feeding and roosting habitats of threatened Carnaby's Black Cockatoo.
- Proposals for revegetation to help strengthen east-west linkages.

The treatment of the western portion of the subject land (Lot 9504) west of Marmion Avenue was also addressed as part of the Clarkson-Butler Scheme Amendment. Biodiversity issues have since been addressed via the Negotiated Planning Solution (NPS) (WAPC 2006), through the ceding of lands for reservation as Bush Forever land. That portion of the subject land west of Marmion Avenue is therefore exempt from the assessment. However the NPS does not 'fetter the EPA' (WAPC 2006) and does not exclude the area from EPBC referral process requirements. On this basis, a full environmental assessment has been undertaken in respect of the development area.

State legislative requirements affecting the western portion of the subject land have been addressed through a combination of desktop studies and observations made during the targeted Declared Rare Flora (DRF) and priority flora surveys conducted during March 2009 within the lands located west of Marmion Avenue, focussing on:

- Potential Carnaby's Black Cockatoo habitat and roosting sites.
- The potential location of priority flora habitat.
- The location of vegetation types considered to be of regional value for retention in public open spaces.

4.3.3 Better Urban Water Management (WAPC, 2008) and Interim: Developing a local water management strategy (Department of Water, 2008).

The LSP includes a Local Water Management Strategy (LWMS) in Section 13. The LMWS addresses water use and water management considerations associated with the proposed development, with emphasis placed on total water cycle management and water sensitive urban design. It has been prepared based on the guidelines contained in Better Urban Water Management (WAPC, 2008) and the interim policy - Developing a Local Water Management Strategy (Department of Water, 2008). The LWMS provides guidance and instruction for the preparation of Urban Water Management Plans (UWMP's) associated with the detailed area planning and subdivision stage of urban developments. UWMP's address specific water management and system design aspects at the subdivision level.

4.3.4 Local Policy Requirements

The subject land is located in the CoW local government area. CoW requirements are based on the principles outlined in the Smart Growth Strategy document (CoW, 2005). Those strategies relating to the 'Long Term Health of the Environment' under the Smart Growth Strategy are of particular relevance and deal with the conservation and enhancement of biodiversity, water conservation and efficient energy use.

A draft Local Biodiversity Strategy for the CoW was released for comment in December 2008. The draft identifies the Tamala Park Structure Plan area as an 'opportunity to protect new areas for biodiversity conservation as these areas undergo structure planning and development' (CoW 2000). The mechanisms to be utilised were described previously in Section 4.2. The CoW policy requirements have been satisfied through:

- Performing a Level 1 fauna survey identifying priority fauna species.
- Recording and mapping significant trees present on site according to the City's tree preservation policy.

4.3.5 Environmental Management Plans

Environmental Management Plans (EMP's) must be prepared in respect of the lands zoned 'Urban Deferred' under DPS2. Management actions within the EMP prepared by Syrinx Environmental (as attached in Appendix 1), responds to Ministerial Statement 629 and the following specific matters are addressed:

- The management of remnant vegetation including:
    - Public access and recreation.
    - Weed management and feral animal management.
    - Fire management.
    - Drainage management.
    - Fencing and Signage.
    - Refuse.
- The management of the interface between urban development and bushland.
- Revegetation proposals.
- Community awareness and education.

Refer to Appendix 1 - Syrinx Environmental Management Plan

5.0 STRATEGIC PLANNING FRAMEWORK

5.1 STATE STRATEGIC PLANNING FRAMEWORK

5.1.1 State Sustainability Strategy

The Western Australian State Sustainability Strategy (2003) (SSS) includes principles and objectives of relevance to the LSP.

In keeping with the intent of the SSS, the LSP has been prepared with a view to achieving the objectives for sustainable development, through extensive research and investigation by the consultant team to address sustainable environmental, social and economic development outcomes. These initiatives are discussed further in Sections 9, 11 and 16. Future development will provide for a high level of liveability and affordability through:

- Facilitating sustainable transportation throughout the LSP area for pedestrians, cyclists and those making use of public transport.
- Providing an opportunity to realise greater levels of employment self-sufficiency.
- Addressing the housing needs of future populations.
- The preservation of significant environmental features in a manner providing for successful long-term integration into the urban development.

5.1.2 Network City: Community Planning Strategy (WAPC 2004)

Network City is a strategy prepared to guide the future form and function of the Perth Metropolitan and Peel Regions. It embodies a metropolitan land use and transport strategy through a whole-of-Government approach to the provision of services and a commitment to partnership with local government in planning with communities.

The key elements of Network City relevant to the LSP include:

- Consolidating residential development in existing areas and directing urban expansion into designated growth areas, which are, or will be, well serviced by employment and public transport.
- Giving priority to infill development in established urban areas, particularly through urban regeneration and intensification of development on under-utilised urban land, whilst respecting neighbourhood character.
- Locating higher residential densities in locations accessible to transport and services, such as in and around the CBD, regional and district centres and activity corridors.
- Concentrating commercial, health, education, entertainment and cultural development in and around activity centres and corridors, with public transport easily accessed by the catchment population.
- Developing an integrated land use and transport network which reduces car dependence and broadens travel options, makes it easier for people to use public transport or walk / cycle to their destinations.
- Protecting water resources and reducing the use of non-renewable resources and waste generation.

The efficient use of urban land involves reducing urban sprawl and enabling residential development on a greater variety of lot sizes than has been traditionally provided. The Perth Metropolitan Region is experiencing a change in demography, household occupancy rate and increased diversity in lifestyle and household types. A greater choice of housing style is therefore required, including small lot housing such as villas and townhouses. Density in Tamala Park may be skewed spatially to higher densities within proximity to centres and high frequency public transport nodes. Densities will vary according to the function and sense of place sought, but in all cases a diversity of housing is to be provided.

Under the Network City Strategy, urban land is to be developed in a sequence that optimises infrastructure provision in terms of services such as transport, utility, sewerage, water supply, primary and high schools, community centres and child-care facilities.

The development of Tamala Park is in keeping with these principles for urban development, being located contiguous to existing gas, telecommunications, water, sewer and electricity services. A range of community facilities, shopping and consumer services are also present in proximity to the subject land, which will be further enhanced with nodes serving as community hubs and employment centres.

In order to complement the philosophies relating to the spatial framework of centres and corridors, the LSP has been designed to create an activity corridor along Neerabup Road to complement the adjoining Clarkson District Centre and support future public transport networks throughout the locality.

5.1.3 North West Corridor Structure Plan (1992)

The North West Corridor Structure Plan (NWCSP) and interim NWCSP provide a basis for the coordination of development and the current MRS zonings affecting the subject land. The NWCSP includes the following objectives relevant to the future development of the Tamala Park locality.

- Timely provision of residential land to meet future housing needs.
- The creation of distinctive communities.
- The provision of local employment opportunities.
- Development of an effective public transport system.
- The protection of important environmental and cultural sites.
- The provision of private and public infrastructure in a cost effective manner.
- Achievement of good quality urban and natural environments.

The LSP has been developed to reflect the intent of the above objectives of the NWCSP and interim policy. The WAPC is currently creating an interim NWCPS as a complimentary framework to guide future planning pending completion of the review of the NWCSP. The interim NWCPS is based on contemporary Network City and Liveable Neighbourhood objectives and measures, which are realised in the LSP. However the interim NWCPS is yet to be finalised.

5.1.4 Liveable Neighbourhoods (2007)

Liveable Neighbourhoods principles apply to the preparation and review of regional, district and local structure plans for new urban areas, local structure plans for new subdivisions and in planning for the revitalisation or redevelopment of existing areas.

These principles include:

- A sense of community, strong local identity and sense of place in neighbourhoods and towns.
- Active street frontages with buildings facing streets to improve personal safety through increased surveillance and activity.
- New development which supports the efficiency of public transport systems where available and provides safe, direct access to the system for residents.
- Mixed use urban development which provides for a wide range of living, employment and leisure opportunities capable of adapting over time as the community changes, and reflects appropriate community standards of health, safety and amenity.
- A variety of lot sizes and housing types to cater for the diverse housing needs of the community at a density that can ultimately support the provision of local services.
- Subdivision and housing types which can adapt to changing needs and accommodate gradual intensification.
- The protection of key environmental areas and the incorporation of significant cultural and environmental features of a site into the design of an area with an integrated approach to the design of open space and urban water management.
- Cost-effective and resource-efficient development to promote affordable housing.

Consequently, the LSP includes provisions serving to implement the above objectives of Liveable Neighbourhoods 2007, as detailed in Sections 9, 11 and 16.

5.1.5 SPP 2 - Environment and Natural Resources Policy

SPP 2 furthers the objectives of the State Planning Strategy with respect to matters including water resource management, soil and land quality, landscapes, greenhouse gas emissions and energy efficiency. The LSP integrates the conservation of natural resources including flora and fauna, thus satisfying the objectives of SPP 2.

5.1.6 SPP 3 - Urban Growth and Settlement

State Planning Policy 3 - Urban Growth and Settlement (SPP3) provides high-level objectives relating to the desired pattern of urban development in the State. These reflect the higher order principles of the State Planning Strategy. SPP 3 provides the following objectives being of particular relevance to the LSP, including:

- To build on existing communities having established local and regional economies, concentrating investment in the improvement of services and infrastructure and enhancing the quality of life in those communities.
- To manage the growth and development of urban areas in response to the social and economic needs of the community and in recognition of relevant climatic, environmental, heritage and community values and constraints.
- To promote the development of a sustainable and liveable neighbourhood form which reduces energy, water and travel demand whilst ensuring safe and convenient access to employment and services by all modes, provides choice and affordability of housing, and creates an identifiable sense of place for each community.

Urban development in the Perth Metropolitan Region is characterised predominantly by low-density suburban development, resulting in car-dependent communities that experience a lag in the timing of infrastructure and establishment of employment opportunities in activity centres. The proposed redevelopment will aim to reverse these trends, providing a range of housing options in proximity to existing and future employment nodes, community facilities, public transport and civic, cultural and entertainment facilities. The LSP provides for the economic and social well being of residents, with due regard given to local community values, heritage and public amenity.

Consequently, the LSP implements the objectives of SPP 3.

5.1.7 SPP 4.2 - Metropolitan Centres Policy Statement for the Perth Metropolitan Region (2000)

The Metropolitan Centres Policy (MCP) aims to provide a broad regional planning framework to co-ordinate the location and development of retail and other commercial activities in the Perth Metropolitan Region. The objectives of this policy statement are to establish a hierarchy of well-located centres that will:

- Promote regional centres as important suburban centres offering a focus for the community, providing a mix of retail, office, entertainment, recreation and community facilities.
- Encourage centres to be developed as the focus of the community and employment activities comprising a range of appropriate commercial and community uses.
- Ensure that centres are highly accessible, of a high standard of urban design and are developed with due regard to the residential amenity of the locality.

Requirements relating to economic impact included within the policy are addressed in the LSP. It is noted that the WAPC is unlikely to support proposals, which are in their opinion likely to:

- Undermine the established or planned hierarchy of centres.
- Adversely affect the economic viability of existing, approved and planned centres where this could result in a deterioration in the level of service to the local community or undermine public investments in infrastructure and services.
- Adversely affect the amenity of the locality.

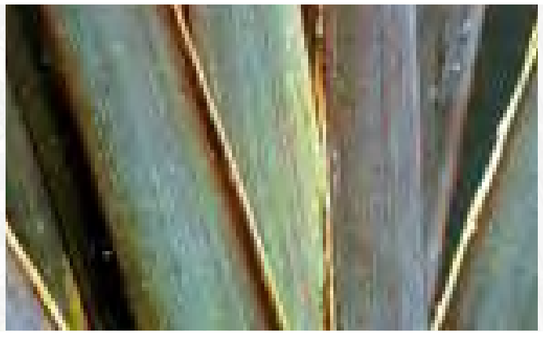
The LSP satisfies the above objectives of the MCP through the provision of goods and services within an orderly distribution of local activity centres that will not adversely impact on existing activity centres in the locality. A revised Activity Centres Policy has been prepared by the WAPC, and has been released for comment. The new Activity Centres Policy is likely to aid in realizing a greater level of diversity in future activity centres within Tamala Park.

5.1.8 Statement Of Planning Policy 2.6 - State Coastal Planning Policy

The policy identifies that development in coastal areas should not exceed five storeys or 21 metres, except where community support is evident, local character is respected and visual amenity is maintained.

The objectives of the policy are to:

- Protect, conserve and enhance coastal values, particularly in areas of landscape, nature conservation, indigenous and cultural significance.
- Provide for public foreshore areas and access to these on the coast.
- Ensure the identification of appropriate areas for the sustainable use of the coast for housing, tourism, recreation, ocean access, maritime industry, commercial and other activities.



5.1.9 Draft Perth Coastal Planning Strategy

The Draft Perth Coastal Planning Strategy (DPCPS) realises the objectives of the State Planning Strategy, SPP 2.6 and Network City and provides for the planning of coastal areas addressing coastal activity centre development, conservation, recreation heritage and tourism.

The DPCPS provides the following in relation to coastal lands in proximity to the Tamala Park precinct:

'This area is entirely conservation, dominated by Bush Forever and a large area of bushland registered as an Australian heritage site. There is very low access, although some passive recreation activities limited to well-defined pathways is permitted. Residential pressure from the south should be managed. Use of interpretive signage is recommended to improve awareness about conservation values. There is potential for some tourism and spiritual activities relating to the areas conservation values.'

The intent of the DPCPS is recognised, however the identification of a coastal node in the foreshore reserve is outside the scope of the LSP. The previous comment notwithstanding, a coastal node may in future be planned to further complement development in the locality.

5.1.10 Bush Forever

The State Bush Forever Policy addresses the need to preserve and protect areas featuring significant tracts of native vegetation on the Swan Coastal Plain. The subject land is bound by Bush Forever site 322 to the west within the foreshore reserve and the Neerabup National Park to the east, being Bush Forever site 383.

The site is connected to Bush Forever Site 323 which currently surrounds the MRC waste management facility.

A significant area west of Marmion Avenue was previously identified as significant remnant vegetation and habitat for endangered species and has been ceded for preservation as a Bush Forever site under a Negotiated Planning Solution (NPS) with the WAPC.

5.1.11 DC Policy 1.6 Planning To Support Transit Use & Transit Oriented Development

This policy seeks to maximise the benefits to the community of the public transit system by promoting planning and development that achieves an effective integration of land use and public transport infrastructure.

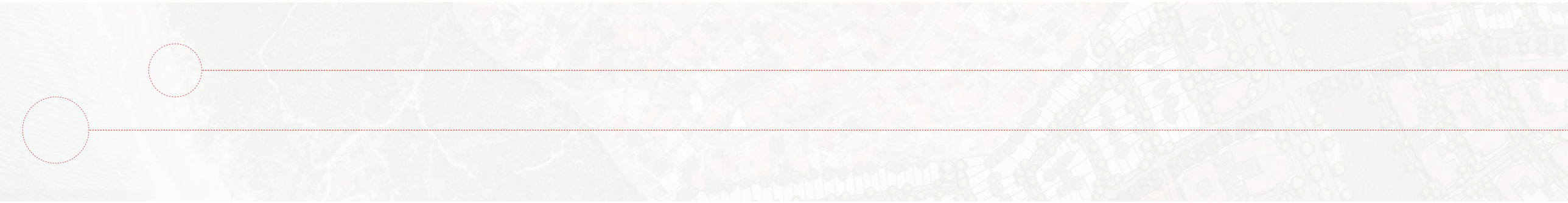
Key objectives and statements identified in the policy being of most relevance to the subject site include:

- Residential development and other forms of appropriate development such as short stay accommodation should be encouraged close to transit facilities, to help in creating a sense of place that makes a Transit Oriented Development (TOD) precinct more than just a place where transit is available, giving places an individual identity within the urban fabric.
- Higher density residential development places greater numbers of occupants and residents close to transit services, increasing the potential for those occupants and residents to look to transit as a travel option, with a corresponding increase in patronage.

The DC Policy 1.6 states that 'within existing developed areas, there are clear opportunities to intensify existing activities and to promote new uses that will make better use of transit facilities and services.'

The LSP directly supports the objectives and intent of Development Control Policy 1.6 as detailed below:

- The LSP provides for a greater density and diversity of dwelling types in locations supported by urban design and infrastructure providing efficient access to the Clarkson Train Station. Future development will generate demand, supporting use of the existing transit infrastructure and facilitate efficient public transport services through the development and within the locality.
- The proposed development will provide for improved amenity along Neerabup Road and development of a pedestrian route for people to access the train station.



5.2 CITY OF WANNEROO STRATEGIES AND POLICIES

5.2.1 Smart Growth Strategy (City of Wanneroo, 2005)

The CoW Smart Growth Strategy recognises that much of the City's growth has been undertaken using conventional land planning practices, with outcomes that are not sustainable. The smart growth approach involves working toward more sustainable practices through the integration of environmental, social and economic issues and concerns. The Smart Growth Strategy identifies a range of principles that are intended to form the basis of strategies and actions for effectively addressing the identified issues and challenges. The principles are:

- Lifestyle and housing choice - encourages the provision of a variety of housing types and enhancement of lifestyle options.
- Effective use of land and infrastructure - supports the effective use and development of land and development buildings for the benefit of the local area.
- Long term health of the environment - promotes development that has minimum environmental impact, together with practices that conserve and enhance natural areas.
- Identity, equity and inclusiveness - enhances the identity of the City's places and people.
- Long term economic health - supports industry growth and job creation.
- People and government - citizen and stakeholder participation in governance and development decisions.

The smart growth principles above have been used to guide the planning process for the LSP, particularly given that the TPRC has adopted revised smart growth principles as the objectives for the development of the land. The Smart Growth Strategy Principles are addressed in Section 11.

5.2.2 Housing Strategy (City of Wanneroo, 2005)

The CoW Local Housing Strategy (LHS) has been prepared in keeping with the principles of the Smart Growth Strategy and earlier Local Environmental Strategy.

The aim of the LHS is to guide the future form and type of housing within the CoW. The LHS has ten (10) principle objectives which are as follows:

- Ensure that a wide range and choice of housing is provided to meet the changing social and economic needs of the community, and to understand the community's attitude to housing choice.
- Ensure that an adequate supply of affordable housing is provided, particularly for first homebuyers.
- Promote innovative, cost-effective and well-designed forms of housing which incorporate environmentally beneficial features.
- Promote appropriate forms of housing close to existing and proposed community facilities and services (e.g. Employment centres, transport hubs) to enable more efficient and effective use of those facilities and services.
- Ensure an overall density, which will improve the viability and range of transport alternatives.
- Ensure that residential areas are designed for all people of all ages and abilities and that these areas are protected from inappropriate development.
- Provide a greater degree of certainty to developers and the community in the development of new housing areas and the redevelopment of existing housing areas.
- Provide the City with an improved basis for decision making in relation to development applications and rezoning proposals.
- Provide the Housing Strategy component for a future Local Planning Strategy in support of the review of the City's District Town Planning DPS2.
- Promote universal design principles to ensure that all housing has a core of accessible features to the main living areas of the house.

The housing strategy identifies targets for various forms of housing stock and density in particular geographic locations, such as within 800m of a transit node or within 400m of a neighbourhood centre. These targets will be acknowledged during the structure planning process. A mix of housing types, based on 76% separate houses, 15% semi-detached houses and 9% flats or apartment living for all new household growth up to 2021.

The future intent for residential development within the LSP area is in keeping with the objectives of the Local Housing Strategy. The structure plan will implement a range of choice in housing density in proximity to centres and provide an improved basis for decision making on rezoning and development applications.

5.2.3 City of Wanneroo Employment Policy

The CoW Employment Policy (2003) supports the overarching SMART Growth Strategy, articulating the need to improve employment self-sufficiency and employment self-containment in the region, as well as providing specific strategies considered appropriate for large – scale residential developments. Six priority strategies identified include:

- An economic development fund.
- Broadband Infrastructure.
- Employment supportive design.
- Employment supporting land uses.
- Flexible use developments within main street or retail centres.
- Adherence to the City's Smart Growth Strategy.

In addition, eighteen optional strategies are provided to support the priority initiatives above. These range in scale and scope from provision of day care, active business attraction and the development of tourism centres. The major implications for Tamala Park in connection with the CoW's Employment Policy is the expectation placed on the development by the City as to dedicating attention and resources to the employment challenges faced by the region. Residential developments that do not contribute to employment generation beyond typical population driven demand are required, as part of the structure planning process, to contribute to a pool of funds set aside by the CoW to resource employment generating initiatives. This contribution typically is $500 per lot.

5.2.4 Draft Biodiversity Strategy

The CoW Draft Local Biodiversity Strategy provides the following principles of relevance to biodiversity conservation:

- Retention of at least 30% of the pre-European extent of each ecological community is required to prevent an exponential loss of species and failure of ecosystem processes.
- Protect regionally significant and locally significant natural areas.
- Biodiversity is best conserved in-situ – protect what you have before revegetating.
- Regeneration is a higher priority than revegetation.
- Prioritise protection and management of the areas having highest biodiversity value.
- Community involvement in helping conserve biodiversity.
- Biodiversity values must be made transparent in decision-making processes.
- Site-specific field survey is essential to understand biodiversity value.
- Natural area conservation is a legitimate land use.

A target for the preservation of vegetation complexes is provided in the strategy. As a general principle of biodiversity conservation, at least 30% of each vegetation complex should be protected over its natural range to retain diversity This assumes that the 30% protected is in good or better condition, is in patches of high viability, and is distributed strategically to maximise variability across its natural extent. A local protection target of 29% for the Cottesloe Central and South vegetation complex incorporating Tamala Park is provided for in the strategy. This figure includes Public Open Space (POS) for conservation/passive recreation outside of parks and recreation reserves.

The strategy has implications for the planning of POS in the LSP for vegetation conservation and passive recreation purposes. The CoW has indicated that the LSP should aim to enhance biodiversity and habitat preservation through non-contiguous green linkages between natural areas. The LSP achieves the desired outcomes of the strategy and the intent outlined by the CoW. The landscaping strategy developed for the LSP area will enhance green linkages through the planting of native species in public places, particularly along the central Green Link.

An assessment relating to the provision of parks and recreation reserves and landscaping provision is provided in Section 16. The proposed LSP contributes to the retention of significant tracts of valuable vegetation communities to a high level in keeping with the desired CoW targets.

6.0 SITE CONTEXT AND ANALYSIS

6.1 TOPOGRAPHY AND LANDSCAPE

The subject land is characterized by an undulating landscape incorporating steep dunes and limestone ridges. The landscape varies between the western, central and eastern portions of the site in terms of the steepness of the dunes and soil composition. The portion of the subject land west of Marmion Avenue generally comprises sand dunes, which are steep in places, with surface levels ranging between approximately 10 metres AHD and 36 metres AHD. To the east of Marmion Avenue, the level of the site rises from approximately 35 metres AHD to the high point of the site at approximately 50 metres AHD. Further eastwards the site slopes to a level of approximately 6 metres AHD.

The subject land incorporates adjoining Quindalup and Spearwood dune systems. This interface is considered to be of regional importance, as good representations of this type of geomorphology have not been reserved adequately in the Perth Metropolitan Region. Adjoining Bush Forever sites and other parks in the Metropolitan Area provide good representation of each of these complexes but they are highly fragmented. The abovementioned complexes are significant because they are supportive of diverse flora and fauna.

6.2 EXISTING LAND USE

The subject land is currently void of any improvements and comprises uncleared bushland including trees, scrub and grass.

6.3 SOILS

6.3.1 Soil Typology

The following published information was utilised in the assessment of the subject land:

- Yanchep 1:50 000 Environmental Geology Map Sheet.
- Perth Groundwater Atlas (2004).
- Perth Groundwater Atlas (1997).
- Aerial Photograph, Perth Metropolitan Area, Source: Landgate Website.

Review of the abovementioned documents and a site visit indicate that the subject land is underlain by Safety Bay Sand, sand derived from Tamala Limestone.

Additional information regarding these soil types is as follows.

Safety Bay Sand

Safety Bay Sand generally comprises white, fine to medium grained, calcareous sand, and occurs across a small area of the western portion of the development. The sand forms either mobile dunes where no vegetation cover exists, or fixed dunes, covered with vegetation. The fixed dunes can easily re-mobilise if vegetation is removed.

Tamala Limestone

Tamala Limestone generally comprises light yellowish brown; fine to coarse grained lithified quartz sand, possibly with some shell debris. This geological unit underlies approximately 90% of the site, and is likely to be overlain by a thin layer of sand. Tamala Limestone generally has a highly variable strength, and can occur from high strength cap-rock through to weakly cemented sand and loose sand.

Sand Derived From Tamala Limestone

Sand derived from Tamala Limestone generally comprises yellow brown, fine to medium grained quartz sand and is a residual product of the Tamala Limestone after leaching of the limestone carbonate cement. This profile can occur up to several metres in thickness. This sand occurs in the eastern extremity of the development area and is underlain by Tamala Limestone. Surficial soils across the site generally comprise silty sandy topsoil, although areas of limestone outcrops and limestone boulders are observed in parts of the site.

The Perth 1:50,000 geology sheets indicate that the shallow sub-surface conditions of the site comprise sand derived from Tamala Limestone.

Fieldwork results revealed the following ground conditions on and beneath the site:

Topsoil

Minor surface topsoil to depths of approximately 0.10 metres to 0.15 metres comprising silty sand and some rootlets.

Sand

Generally loose to medium dense sand and medium dense sand generally increasing in density with depth, fine to medium grained sand with a trace of silt underlying the topsoil to the maximum investigation depth of 2.5m or to limestone.

Limestone

Low to medium strength, white limestone was encountered at various depths and locations across the site. High strength limestone (cap rock) was identified at shallow depths. A geotechnical laboratory testing programme investigated the particle distribution size on nine samples and the organic content of 3 samples, with the results summarised on page 5 of the Geotechnical Investigation Report prepared by Douglas Partners attached at Appendix 2.

The presence of Tamala limestone, which underlies approximately 90% of the site, may pose problems in drainage if the remnant bushland is removed. A recent geotechnical survey by Douglas and Partners (2009) indicates that a significant area of the remnant vegetation located to the west of the central portion of the site is growing in shallow soils. Disturbance to this vegetation, especially in areas of excellent condition, would require a considerable amount of effort if any revegetation were to occur. Furthermore, cutting through limestone to accommodate for straight paths would cause the limestone to be exposed. These areas are not suitable for revegetation and would be at risk of erosion problems over time.

6.3.2 Site Classification

The ground conditions beneath the site generally comprise loose to medium dense sand increasing in density with depth and proximity to limestone. It is considered that the site can be classified as 'Class A' in accordance with Australian Standard 2870, provided that appropriate site preparation is carried out.

6.3.3 Acid Sulphate Soils

Acid Sulphate Soil (ASS) risk mapping (WAPC 2003) indicates that the site has low to no risk of ASS at a depth greater than 3 metres. Therefore, no ASS investigation is considered necessary for the LSP area.

6.3.4 Contaminated Lands

The Contaminated Sites Database holds information on sites that are classified by the Department of Environmental and Conservation (DEC) as:

- Contaminated - remediation required.
- Contaminated - restricted use.
- Remediate for restricted use.

A search of the DEC Contaminated Sites Database indicated that the study area contains no contaminated land.

The Mindarie Landfill Facility to the south of the study area was classified by the DEC in 2007 as 'possibly contaminated investigation required'. As the site has not been suitably investigated or subject to appropriate risk assessment, a comment cannot be made on the suitability of the site as a whole for existing or future land use. In accordance with Department of Health advice if groundwater is being, or is proposed to be abstracted, the DEC recommends that analytical testing should be carried out to determine if the groundwater is suitable for its intended use.

The facility is currently subject to a 500 metre land use exclusion buffer in the absence of appropriate studies addressing the management of potential odour, dust and landfill gas issues. It is intended that the buffer distance will be realigned to match the northern boundary of the landfill facility prior to development. In accordance with Ministerial Statement 629, it will be possible to amend the buffer distance if demonstrated to be environmentally acceptable for future residents. Depending on the status of the buffer realignment, a staged approach to development will be adopted if required to accommodate the buffer.

6.3.5 Karst

Field tests and observations of the subject land indicate that there are no major surficial cavities present beneath the site. However, the geologic map indicates that possible solution cavities and fissures occur within the limestone formation beneath the site. Extensive cave systems and other karstic features are not known of on the subject land.

The risk of major cavities is low, however small voids being no greater than a few cubic metres in size cannot be excluded. Further testing may be warranted once finished levels and building locations are identified, particularly in areas having shallow limestone in order to accurately identify possible cavities and voids beneath the site.

6.4 HYDROLOGY

MWH Consultants and the CSIRO have undertaken an analysis of hydrological conditions over the subject land.

6.4.1 Groundwater

The Tamala Park development area lies on the coastal margin of the Gnangara mound where the saturated thickness of the superficial formations is around 30 metres and the depth to groundwater below ground surface varies from around 15 to 45 metres. Superficial groundwater within the Tamala Limestone drains in a westerly direction towards the coast. Sub crop formations include aquitards of the Osborne Formation and upper members of the underlying Leederville aquifer. Safety Bay Sand overlies Tamala Limestone along the coastal margin.

The Perth Groundwater Atlas (DoW, 2004) indicates that the superficial aquifer water level ranged from approximately 3 metres AHD in the east to less than 1 metres AHD at the west of the site in May 2003. Monitoring by DoW during 2008 and 2009 indicated a very flat water table varying by only 0.2 metres across the site. This is consistent with the moderate to high permeability generally found in the Safety Bay Sand and Tamala Limestone as per Davidson (1995).

A Geotechnical Investigation by Douglas Partners (Douglas Partners, 2009) observed no free groundwater at any of the test pit or borehole locations to depths of up to 2.5 metres below surface level.

All available data from groundwater monitoring sites in and around the study area was obtained from the DoW. Recent groundwater level monitoring data was available for one bore located within the study area and three bores surrounding the study area

Refer to Figure 7 - Location of groundwater monitoring site.

The start of the historical record varies between bores, from 1974 to 2007. Recent groundwater measurements were taken between 15 January 2008 and 29 April 2009. The bore records are shown in Table 2 – Superficial groundwater levels at bores surrounding the study area.

Refer to Table 2 - Superficial groundwater levels at bores surrounding the study area.

Table 2 - Superficial groundwater levels at bores surrounding the study area

Bore	Historical min. water level elevation (mAHD)	Historical max. water level elevation (mAHD)	Mean 2008/2009 water level elevation (mAHD)	Mean 2008/2009 depth to groundwater (m)
QJ17-89	0.33	1.21	0.57	42.12
QL18-89	0.40	1.37	0.69	23.56
QG15-89	0.37	1.52	0.54	34.91
JP-3D	0.39	1.78	0.75	19.71

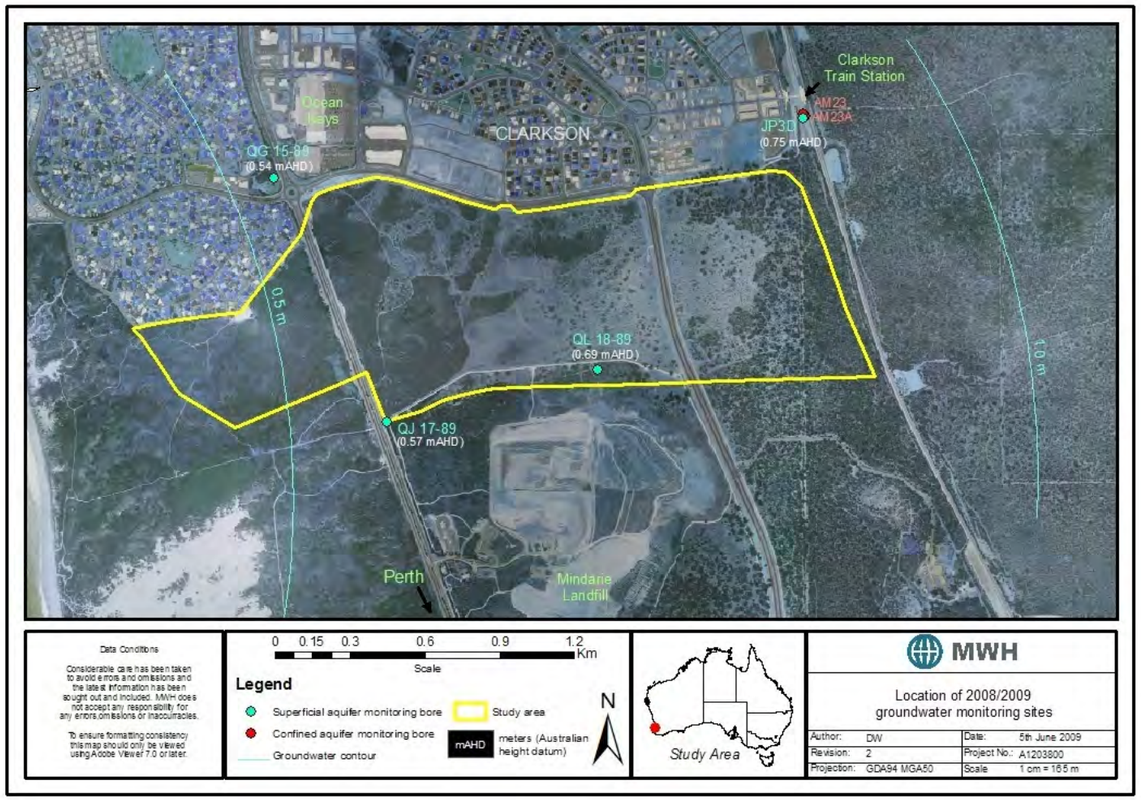
The data obtained from the DoW did not contain any recent ground water quality data for the bores in and around the study area. A progress report on groundwater associated with the Mindarie Regional Council landfill site indicated elevated ammonium concentrations in bore QL 18-89 near the border between the study area and the Mindarie Regional Council landfill site (CSIRO, 2009). The ammonium is not of concern but may represent the leading edge of a leachate plume emanating from the landfill.

The CSIRO study is ongoing and will establish whether groundwater and soils beneath the development are currently or likely to become contaminated.

The regional flow direction to the west/south-west will assist to mitigate the contamination potential. Local Water Corporation scheme pumping bores may influence flow in the confined aquifer but are unlikely to significantly change the superficial flow direction.

Refer to Figure 7 - Location of Groundwater Monitoring Sites

Figure 7 - Location of Groundwater Monitoring Sites



6.4.2 Surface Water

The hydrological characteristics of the study area are largely a function of the topography, soils and vegetation occurring at the site. The majority of the site is characterised by deep well drained sands, such that the dominant water redistribution process site is infiltration (CSIRO, 2009). Consequently, there are no significant surface flows to or from the site.

6.4.3 Priority Public Drinking Water Source Area

The subject land is located within a Priority 3 Public Drinking Water Source Area (PDWSA). Priority 3 (P3) classification areas are defined to manage the risk of pollution to the water source from catchment activities. Priority 3 areas are located over land where water supply sources can coexist with other land uses such as residential, commercial and light industrial development (DoE, 2004). Land uses that are not permitted in P3 areas are:

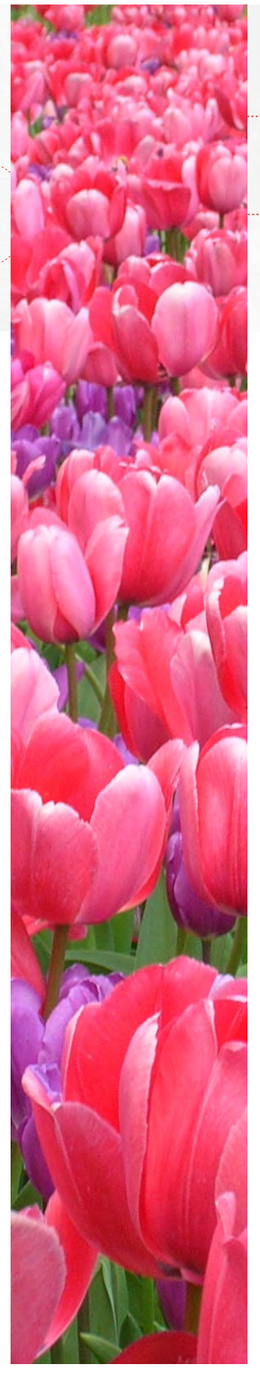
- Piggeries
- Abattoirs
- General industry including metal production and finishing and heavy industry (light industry is acceptable)
- Rural industry such a tanneries
- Landfills of Class II or higher, or tyre storages
- Injection of wastewater to the ground (DoE, 2004)

None of these land uses are proposed for this site.

6.4.4 Water Management

The shallow ground conditions beneath the site generally comprise loose to medium dense sand and limestone. Limestone should be considered to be impervious for drainage purposes on a small scale. At a regional scale, the limestone can be considered to be a pervious medium. Stormwater disposal using soakwells and basins is considered to be suitable for the proposed development where a suitable depth of sand overlies limestone. In areas of shallow limestone, it is suggested that ripping the area to one metre below the base of soakwells should provide adequate drainage. Ripped areas of rock however, will still need to drain out naturally after being ripped. Development, including roads, roofs and other impermeable areas will increase storm water runoff on the site.

A Local Water Management Strategy (LWMS) has been prepared by MWH consultants to provide objectives and solutions for the sustainable disposal and reuse of water, which is included in Section 13.



6.5 FLORA

6.5.1 Preamble

A number of flora and vegetation surveys have been undertaken in the Tamala Park Development Area and the nearby Neerabup National Park. Tingay and Associates (1999) have prepared a detailed environmental review of the area in 1999 and Mattiske (2000) assessed the vegetation condition and summarised previous surveys to assess the vegetation in a local and regional context.

Most recently, Syrinx Environmental reviewed the vegetation condition and undertook a declared rare and priority flora survey to satisfy one of the conditions stated in the Ministerial Statement 629. In addition, a significant tree survey was undertaken to address additional requirements of the CoW.

Refer to Appendix 1 - Syrinx Environmental Management Plan

Refer to Appendix 4 – Syrinx Declared Rare and Priority Flora Survey for the Western Cell of the Tamala Park Proposed Development

6.5.2 Floristic Community Types

The regional study of the floristic variation of the Swan Coastal Plain by Gibson et al. (1994) identified three floristic community types in the Tamala Park bushland. The vegetation communities identified within the proposed development area correspond most closely to the following community types:

- 26b Woodlands and mallees on limestone.
- 28 Spearwood *Banksia attenuata* or *Banksia attenuata* – Eucalyptus woodlands.
- 29b Acacia shrublands on taller dunes.

The shallow soils found on the limestone ridges adjacent to the Marmion Avenue are dominated by *Banksia sessilis* heath which most closely corresponds to floristic community type 26b. *B. sessilis* is the dominant species of the limestone heath on site, which is not typical of FCT 26b, Gibson et al. (1994). *Acacia rostellifera* Low shrublands are located in the same part of the site and on the ridge in proximity of Connolly Drive (central section of the area zoned 'Urban Deferred'). This community can be classified as type 29b. Towards the east, Banksia /Tuart/Jarrah woodlands provide the transition into the Neerabup National Park.

6.5.3 Vegetation Communities

Alan Tingay and Associates (1999) identified nine (9) vegetation communities on site. During the 2009 survey, Syrinx Environmental identified two vegetation types previously identified in the area were inconsistent with the vegetation type recently observed.

Inconsistencies include the community that is described as *Banksia attenuata*, *B. menziesii* and *Allocasuarina fraseriana*, Low Open Woodland with Scattered Emergent Jarrah *(Eucalyptus marginata)* and Tuart *(E. gomphocephala)* over *Hibbertia hypericoides* and *Mesomelaena psuedostygia*, is consistent with a community type described as Limestone Heath (*Banksia sessilis*) with occasional strands of Banksia.

Similarly, a community described as Banksia Woodland over *Hakea lissocarpha*, *Acacia rostellifera, Banksia sessilis* and *X. preissii*, is more consistent with Jarrah and Tuart Woodland with *B. attenuata, B. menziesii* and *Allocasuarina fraseriana* Low woodland over *X. preissii, Stirlingia latifolia, Hibbertia hypericoides* and *Conostylis aculeata*).

Refer to Appendix 3 - Best Practice Recommendations for Tamala Park Proposed Development Area report.

Refer to Figure 8 – Vegetation Communities

Figure 8 – Vegetation Communities

CLIENT :	TAMALA PARK REGIONAL COUNCIL	**DRAWING :**	**VEGETATION TYPES - ALL CELLS**	**DATE :**	30.04.2009
PROJECT :	TAMALA PARK STRUCTURE PLAN	**DRAWING NUMBER :**	-	**SCALE :**	1:5000 @ A1
PROJECT NUMBER :	0823	**DRAWING REFERENCE :**	D4	**DRAWN BY :**	JW | RT

SYRINX environmental pl

6.5.4 Threatened Ecological Communities (TEC)

A search of the DEC Threatened Ecological Communities (TEC) Database revealed that there are no known occurrences of threatened ecological communities recorded within the boundary of the site. During the DRF and priority flora survey of the area Syrinx Environmental confirmed that there are no TEC on site. A specific search was conducted for the following TEC's, which occur in the 5km radius of the site:

- *Banksia attenuata* woodland over species rich dense shrublands (SCP20a) (Endangered).
- *Melaleuca huegelii-Melaleuca systena shrublands* on limestone ridges (SCP26a)(Endangered).
- Coastal shrublands on shallow sands (SCP 29a) (Priority 3).

6.5.5 Conservation Status of Vegetation Communities

Although vegetation present in the Tamala Park Development Area is not considered as regionally significant in Bush Forever (Government of Western Australia, 2000), it has elements of regional and local significance. As the vegetation communities present are well represented throughout the site especially near Marmion Avenue close to Bush Forever site 322 and Neerabup Park to the eastern border of the site, they may be considered of local significance as they form a part of the Cottesloe Central and South Complex which is relatively poorly reserved in the area. The Local Biodiversity Strategy for the CoW identifies preservation of the Cottesloe Central and South Complex as one of its priorities.

Acacia rostellifera shrublands are considered poorly reserved (Gibson et. al, 1994) and are susceptible in terms of a conservation status as this community can be modified and vulnerable to threatening processes such as human activities. Therefore, this particular vegetation community can be considered to be of local significance.

6.5.6 Vegetation Condition

Vegetation condition for the majority of the subject land east of Marmion Avenue is degraded to completely degraded with the excellent to good patches located at the western extent of the site.

Refer to Figure 9 - Vegetation Condition and Priority Flora on site.

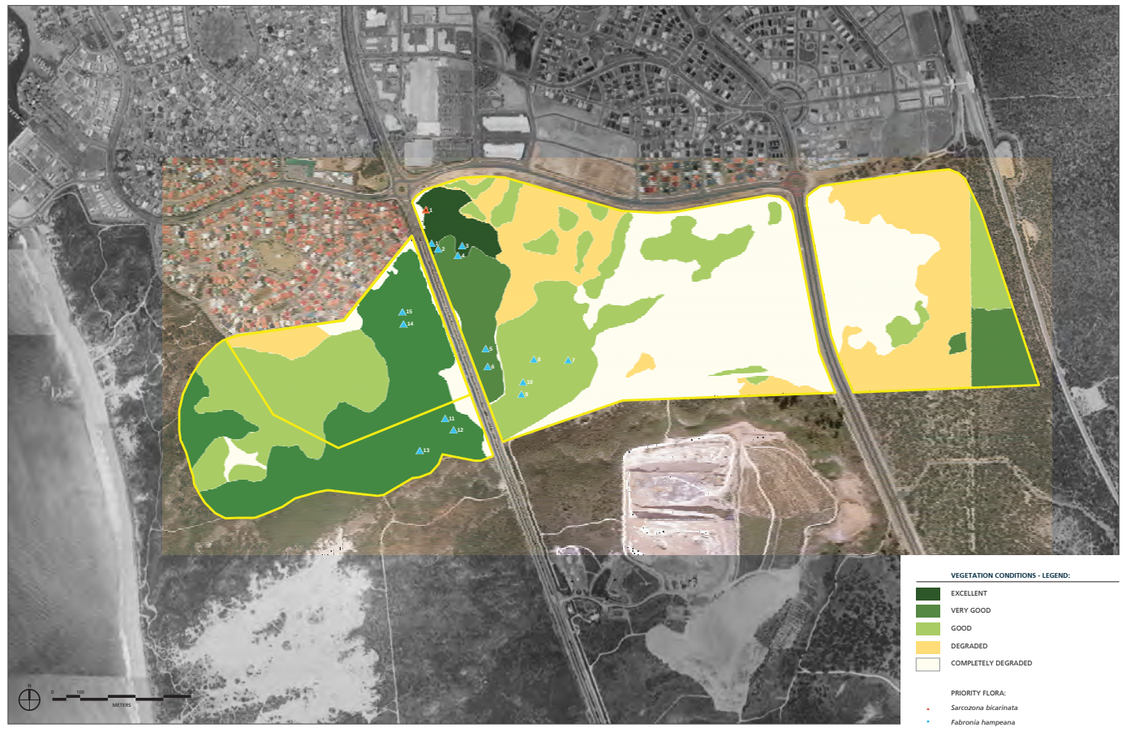
The degradation of bushland condition between the survey conducted in 2000 by Mattiske and 2009 by Syrinx was most evident in fragmented patches of the bushland at the northern boundary of the site. This degradation is attributed to weed spread from the degraded areas of the site and the urban areas across Neerabup Road as well as patch fires and rubbish disposal.

The Banksia woodland that was present in 2000 (Mattiske, 2000), at the southern boundary of the site was cleared for storage of the excavated soil generated by the refuse facility. Dumping of rubbish and proliferation of 4WD tracks was prominent in the eastern part of the site especially in the north-west corner (south of Clarkson railway station). The area adjacent to the railway line and to the south was in much better condition than the remainder of the site with the condition improving towards the southeast corner. The resilience to weeds and other damage for this particular part of the site can be attributed to vegetation density, distance from urban areas and the lack of tracks.

In the western precinct to the west of Marmion Avenue, the vegetation condition has degraded since the last vegetation condition assessment by Mattiske in 2000. Whilst the over-storey density remained the same, the under-storey density has been affected by weed invasion at the northern site boundary due to urban development. The eastern most extent of the bushland was in the best condition, most probably due to the density of the *Banksia sessilis* thickets and perhaps being adjacent to a noisy road has meant fauna do not tend to frequently feed on or trample the vegetation in this area.

Refer to Appendix 4 – Syrinx Declared Rare and Priority Flora Survey for the Western Cell of the Tamala Park Proposed Development

Figure 9 - Vegetation Condition and Priority Flora On Site



6.5.7 Declared Rare Flora (DRF) and Priority Flora

A recent survey was conducted over the subject land east of Marmion Avenue to determine the presence of declared rare and priority flora as per condition 5 of the Ministerial statement 629. The Condition 5 indicated that the search for DRF and Priority flora more specifically *Jacksonia sericea* and *Hibbertia spicata subsp. leptotheca* was to be conducted in spring. After the liaison with DEC and due to the fact that all species searched for are perennial, some of which were in flower in summer, the survey was conducted in January instead of spring due to timing constraints and flowering of *Jacksonia sericea*.

In addition to the species indicated in the statement, seven other species, which have the potential to occur in the area were searched for. The list of all species searched for, details of the survey methodology and results of the survey are included in the DRF and priority flora survey report attached to the Syrinx Environmental Management Plan (Appendix 1). Two priority flora were found on site: *Sarcozona bicarinata* (Ridged Noon-flower) P3, and *Fabronia hampeana* (moss) P2. Populations of both of these species were found at the western extent of the site in proximity of Marmion Avenue.

Refer to Appendix 1 – Syrinx Environmental Management Plan.

No DRF was found on the subject land to the west of Marmion Avenue. *Fabronia hampeana* (P2) (moss) was the only priority species found on site. Five populations of *Fabronia hampeana* were found to the west of Marmion Avenue, all associated with large *Macrozamia riedlei*. Each population had 1-3 Macrozamia plants on which the moss was growing. Two populations were located in the very open Banksia woodland in the area zoned urban and three populations in the Banksia woodland area ceded to Bush Forever as part of Negotiated Planning Solution (WAPC 2006).

Refer to Appendix 4 – Syrinx Declared Rare and Priority Flora Survey for the Western Cell of the Tamala Park Proposed Development

Refer to Figure 9 – Vegetation Conditions and Priority Flora on site.

6.5.8 Weeds

As most of the site was cleared for grazing the prevalence of weeds is high. A total of 58 weed species has been recorded at Tamala Park in previous surveys (Tingay 1999, Matiske 2000) with eight dominant species observed during the field survey undertaken by Syrinx in January 2009. This includes two declared weeds under the Agriculture and Related Resources Protection Act 1976; *Solanum linnaeanum* (Apple of Sodom) and *Gomphocarpus fruticosus* (Narrowleaf Cottonbush). The majority of weed species exist within the cleared areas and along the edges of the remnant bushland areas. *Gomphocarpus fruticosus* was observed within the cleared area adjacent to Neerabup Road. The list of species with the potential to encroach into area reserved for conservation or into POS areas are shown in Appendix 4 of the EMP.

Within the Biodiversity Conservation Area the weeds include: *Avena barbata* (Bearded oat), *Carpobrotus edulis* (Pigface) *Ehrharta calycina* (Perennial Veldt Grass), *Ehrharta longiflora* (Annual Veldt grass), *Euphorbia terracina* (Geraldton Carnation Weed), *Gladiolus caryophyllaceus* (Wild Gladiolus), *Lagurus ovatus* (Hare's Tail Grass), *Pelargonium capitatum* (Rose Pelargonium), *Asphodelus fistulosus* (Onion weed), *Cortaderia selloana* (Pampas Grass) and *Foeniculum vulgare* (Fennel).

6.5.9 Significant Trees Analysis

A tree survey was conducted and GPS locations of trees suitable for retention on the basis of habitat and amenity values recorded. Syrinx has prepared a report for the TPRC at the request of CoW. The report is attached to the Syrinx Environmental Management Plan attached at Appendix 1. Several significant trees exist on site including trees of cultural significance such as scar trees.

In addition, strands of *Eucalyptus decipiens* are found in the western portion of the development site, which are considered regionally significant as they occur as localized pockets on the Swan Coastal Plain and are insignificant in size particularly on limestone (Mitchell, McCotter and Ecoscape 1993, in Mattiske 2000).

Refer to Appendix 1 – Syrinx Environmental Management Plan (Significant Tree Analysis)

6.6 FAUNA

6.6.1 Preamble

A vertebrate fauna survey which involved intensive trapping and bird surveys was completed by Kinhill Stearns in 1982 as part of the proposal for the MRC waste management facility site. A total of 83 species including one amphibian, 23 reptiles, 54 birds, two native mammals and three introduced mammal species were recorded at this time. The most diverse fauna assemblages were supported in habitats of Banksia Woodland and Limestone (coastal) Heath (Tingay 1999).

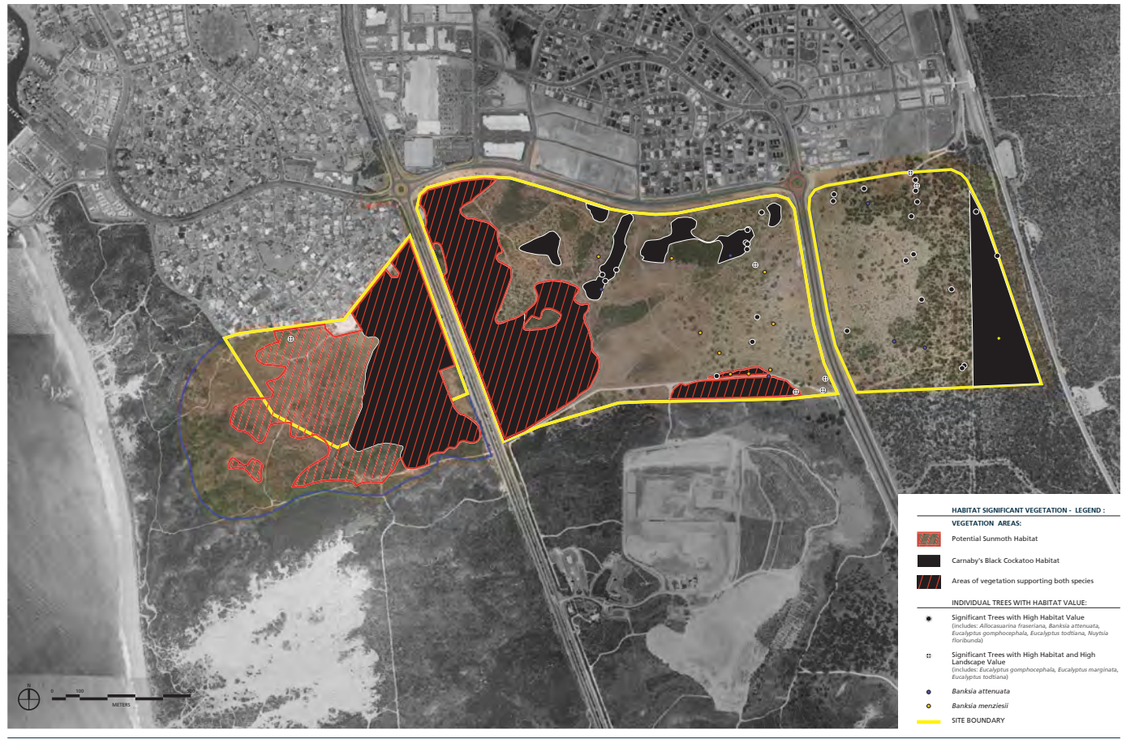
During the Level 1 fauna survey completed by Syrinx Environmental in 2009 (Appendix 1 of the Syrinx Environmental Management Plan), which did not involve trapping. 29 vertebrate species were identified including 23 birds, three reptiles, one native mammal and two introduced mammal species. Six of the bird species are listed as conservation significant species in Bush Forever (2000). No priority or threatened fauna were recorded during this survey although potential habitat for the endangered Carnaby's Black Cockatoos *(Calyptoryhnchus latirostris)* and Graceful Sun Moth *(Synemon gratiosa)* was identified.

6.6.2 Specially Protected Fauna

During an inspection of the land east of Marmion Avenue on 20 March 2009, approximately 12 Carnaby's Black Cockatoos were observed feeding on *Banksia sessilis* heath adjacent to Marmion Avenue at the southwestern corner of the site. Much larger flocks were observed feeding on *Banksia sessilis* within Tamala Park in May 2009. *Banksia sessilis* heath is scattered throughout the site with the patches of highest density located at the western extent of the site. The Graceful Sun Moth habitat is typically open Banksia woodlands, however a new population was recently discovered within coastal heath vegetation. This suggests that the Sun Moth seems to be adapting to a wider range of habitats although further research is required. These two habitat types exist at the western extent of the subject land. The habitats for both fauna are presented in Figure 12 - Feeding Habitat of the Carnaby's Cockatoo and potential Graceful Sun Moth Habitat East of Marmion Avenue. The feeding habitat identified for the Carnaby's Cockatoo to the west of Marmion Avenue is depicted in Figure 10 – Habitat Significant Vegetation.

Refer to Figure 10 – Habitat Significant Vegetation

Figure 10 - Habitat Significant Vegetation



6.6.3 Subterranean Fauna

Observations of the area by Douglas and Partners (2009) did not indicate any evidence of occurrence of major cavities and no evidence of cavities was observed during test pitting. Although it is considered that the occurrence of major cavities beneath the site is low, the occurrence of small voids, of a few cubic metres in size, cannot be excluded. Therefore, although there might be a possibility of subterranean fauna assemblages occurring on site it is likely that the size and extent of the populations are not significant, however further investigations by a specialist Subterranean Ecologist may be warranted.

Refer to Appendix 4 - Douglas Partners Geotechnical Investigation

6.6.4 Pest Fauna

Three introduced mammals were recorded on site; the Fox *(Vulpes vulpes)*, Rabbit *(Oryctolagus cuniculus)* and the House Mouse *(Mus musculus)* (Tingay and Associates 1999, Syrinx Environmental 2009). Currently there are ongoing feral animal control programs within the MRC landfill site and coastal areas to the west of Marmion Ave (Butcher 2009 pers com) however no feral animal control is applied in this area. Native mammals, in particular kangaroos, can become pests if their numbers increase beyond what is sustainable for the remnant vegetation in the area. This can cause degradation of remaining bushland areas as a result of overgrazing.

Ravens have increased in numbers to due to the refuse facility. Rainbow *lorikeets (Trichoglossus haematodus)* and Corella *(Cacatua sanguine)* populations are increasing throughout the northern suburbs. These non-endemic species compete with local species such as Carnaby's Black Cockatoo and Ringneck parrots for breeding hollows. Feral bees also take over hollows.

6.6.5 Other Fauna

There were a number of snakes observed during the survey completed by Syrinx Environmental in 2009. Mostly Dugites *(Pseudonaja affinis)* were sited although a Bardick *(Echiopsis curta)* were also observed at the western extent of the western portion of the site. Snakes are important in maintaining a natural balance in ecosystems by eating insects, rodents and feral animals. The majority of snakes hibernate in winter and are known to move to residential areas in hot dry conditions in search of food and water (Brimbank City Council 2009). Although bandicoots have not been observed in this area they have been recorded in adjacent bushland. These mammals are very adaptable and may re-colonise the site.

6.6.6 Assessment Of Biodiversity Values On Site

The process of assessing biodiversity values on site included collation and mapping of all available data for physical and biological elements of the Tamala Park proposed development area. After considering topography, drainage, soil types, and existing flora and fauna assemblages and their regional and local significance a set of layers was produced. By overlapping the layers, a final map was produced (Figure 11 – Environmental Best Practice Recommendations Map). Strengthening the east west linkage with Neerabup National Park as well as best management practice options for sustainability of biodiversity in the area were taken into consideration.

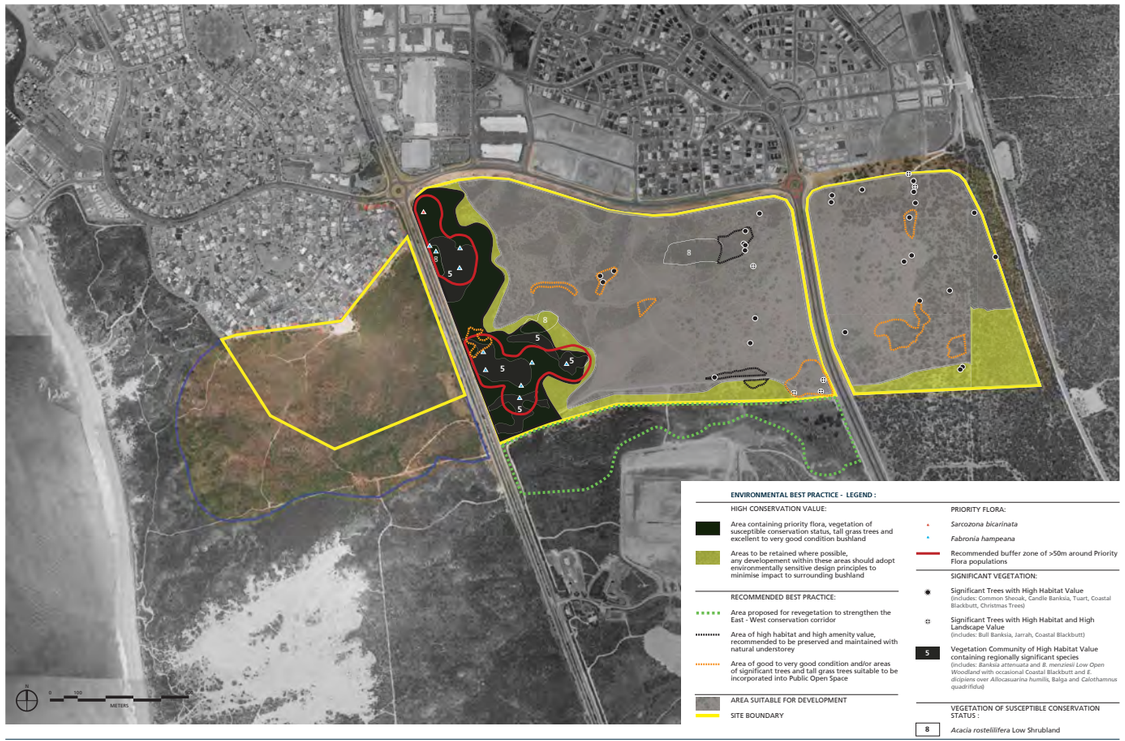
Refer to Figure 11 – Environmental Best Practice Recommendations Map

The areas reserved for conservation were selected based on the following:

- Good to excellent bushland condition (weed resistant).
- Several representations of each vegetation community.
- Location of priority flora.
- Presence of habitat for Carnaby's Cockatoo and possible Graceful Sun Moth habitat.
- Presence of locally *(Acacia rostellifera)* and regionally *(Eucalyptus decipiens)* mallee on limestone significant flora.
- Lower points in the landscape – vegetation retained in these areas as a good stormwater management practice.
- Opportunity for passive recreation, for example a network of walking tracks and cycling paths may be suitable offering good views and variety of landscapes including variable topography.
- Noise and visual barrier from Marmion Avenue.

Recommendations made during the structure planning process were based on the above considerations. Refer to Appendix 1 – Syrinx Environmental Management Plan for more information.

Figure 11 – Environmental Best Practice Recommendations Map



6.7 CLIMATE

Perth experiences a Mediterranean climate characterised by dry, hot summers and wet, mild winters. Winter months get substantial rain with overcast sky conditions. The sky is generally clear during summer. The wind is mainly easterly in the morning and south westerly in the afternoon. Being very close to the coast, the cooling winds of the south westerly 'Fremantle Doctor' in summer will be significant, and developments may even require some protection, depending on topography and exposure. The strong winds and high number of clear days make both solar and wind power generation on site feasible, although more work would be required to ascertain possible energy production potentials.

6.8 HERITAGE

The University of Western Australia undertook comprehensive archaeological and ethnographic surveys of the subject land in 1988. The ethnographic survey revealed a mythological Waugal site on the parabolic dune ridge towards the northern edge of the waste disposal facility. The archaeological investigation located a sparse occurrence of artifacts made of fossiliferous chert. This site has since been registered as Site No. S2471, under the *Aboriginal Heritage Act 1972*. Additional surveys of the subject land undertaken in 1992 determined that the area beyond the parabolic dune ridge does not contain any sites of Aboriginal heritage significance.

Australian Interaction Consultants have performed recent investigations and provided advice and recommendations with respect to Aboriginal Heritage concerns. The following conclusions were made as a result of the investigations:

- Although no archaeological sites or materials were located during the survey the Elders involved confirmed the significance of the coastal dunal system and identified several areas of heightened cultural sensitivity.
- The issues and concerns raised by the Elders and their respective representatives that fall outside the scope of this project are an indication of their strength and breadth of commitment to heritage, native title and land rights in their role as traditional custodians of their ancestors' and descendants' legacy.
- The degradation of the environment as a result of urban development/sprawl is of great concern to Aboriginal people. If development is required, it has to be carried out with ongoing Aboriginal involvement.
- In relation to conserving and acknowledging significant areas on the subject land, a nearby survey in Butler to the north of Tamala Park included a significant limestone ridge within a fully developed residential area. It has been fenced and signposted with a heritage trail traversing the centre.

6.9 MOVEMENT NETWORK

6.9.1 Existing Road Network

The Tamala Park LSP Area lies directly to the south of Neerabup Road. Both Marmion Avenue and Connolly Drive run north south through the structure plan area, splitting it into three distinct sections.

Marmion Avenue currently carries approximately 35,000 vehicles per day, while flows along Connolly Drive south of Neerabup Road are in the region of 7,000 vehicles per day. It is expected that traffic on Connolly Drive will decrease when the Mitchell Freeway is completed and extended further north beyond Burns Beach Road, while traffic on Marmion Avenue will decrease by a corresponding amount.

Notwithstanding that the future extension of the Freeway to Neerabup Road and beyond will see a significant decrease in traffic using Connolly Drive, following development in the structure plan area. Future traffic on Connolly Drive could still be in the vicinity of 10,000 to 12,000 vehicles per day.

Neerabup Road currently runs east west between Marmion Avenue and Connolly Drive carrying approximately 7,000 vehicles per day east of Marmion Avenue. It is planned that Neerabup Road will eventually be extended to the east through the Neerabup National Park linking up with Wanneroo Road, with a connection to Mitchell Freeway also planned.

6.9.2 Public Transport

The provision of a high standard public transport network within the Tamala Park LSP Area has been identified as a key part of the development, connecting with the existing Clarkson Train Station in the east, as well as the Ocean Keys District Centre and Mindarie Keys to the west.

7.0 COMMUNITY ANALYSIS

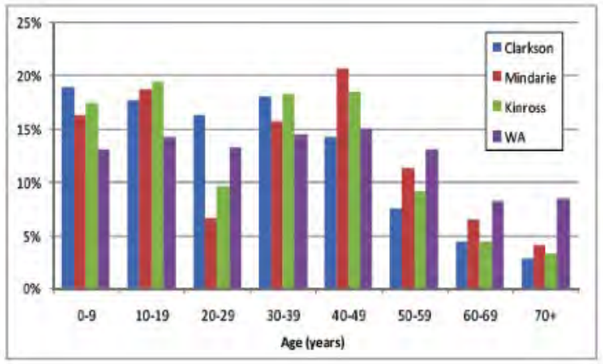
7.1 DEMOGRAPHIC ANALYSIS

7.1.1 Population and Housing

There is a total population of 21,044 residents currently living in the locality. There is a relatively even spread of residents in Kinross, Mindarie and Clarkson, with a minimal number of residents living in Burns Beach and none in Tamala Park at present. A high proportion of younger families and young adults live in the area. However, Mindarie attracts a proportionally older population compared to Kinross and Clarkson, with median ages being 36, 32 and 28 respectively.

Refer to Figure 12 - Age Structure.

Figure 12 – Age Structure (Clarkson, Mindarie, Kinross)



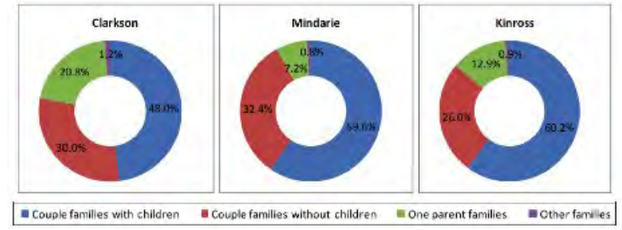
(Source ABS 2006, Creating Communities)

The vast majority of households surrounding Tamala Park are families, ranging from 83% in Clarkson to 89% in Kinross and 90% in Mindarie. Clarkson has a higher proportion of lone person households (15%) compared to Mindarie (9%) and Kinross (10%).

There are a high proportion of family households in the region, the majority of which have children. Specific differences include Clarkson, which has a greater proportion of single parent families and lone person households, while Mindarie has a higher proportion of couples without children.

Refer to Figure 13 – Household Composition.

Figure 13 – Household Composition (Source ABS 2006, Creating Communities)



The vast majority of households surrounding Tamala Park are families, ranging from 83% in Clarkson to 89% in Kinross and 90% in Mindarie. Clarkson has a higher proportion of lone person households (15%) compared to Mindarie (9%) and Kinross (10%).

The family characteristics of Clarkson, Mindarie and Kinross include the following:

- Kinross and Mindarie have a higher proportion of couples with children compared to Clarkson.
- Clarkson has a significantly higher proportion of single parent families.
- Mindarie has a higher proportion of couples without children compared to Clarkson and Mindarie.

The vast majority of all dwellings within Clarkson, Mindarie and Kinross are separate houses (low density). In Clarkson, 100% are separate houses, in Kinross 97% are separate houses and in Mindarie 91% are separate houses. Within Mindarie (5%) and Kinross (2%) there are some medium density dwellings and in Mindarie there is a small proportion of high density (2.5%) and other (1%) dwellings.

The high proportion of family households may indicate demand for traditional subdivision and development in Tamala Park, however the proportion of couples without children is also marginally higher in the CoW compared to the Perth Metropolitan average, which also indicates that there would be strong demand for smaller dwelling types and associated lifestyle amenities.

7.1.2 Education

Most residents within the locality have completed year 12, however a lower proportion of residents in Clarkson have completed year 12 (44%) compared to residents in Mindarie (52%) and Kinross (51%). A higher proportion of residents in Clarkson have completed school up until year 10 (30%) or 11 (17%) compared to Mindarie (year 10: 27%, year 11: 13%) and Kinross (year 10: 28%, year 11: 15%).

The profile of residents attending an educational institution in the suburbs of Clarkson, Mindarie and Kinross is very similar. The vast majority attends a pre-primary, primary or high school (between 81% and 83%). In Clarkson a slightly higher proportion are attending a technical or further education institution (9%) compared to Mindarie and Kinross (both 7%) and a lower proportion are attending university (7%) compared to Mindarie (9%) and Kinross (10%).

The residents of Mindarie and Kinross have a similar education profile with that of Clarkson. In Mindarie and Kinross a higher proportion of residents have obtained or are completing a higher qualification than those residents in Clarkson.

7.1.3 Income And Employment

The weekly household income differs between Clarkson, Mindarie and Kinross. In Clarkson, the weekly household income is proportionally lower than Mindarie and Kinross. Households in Kinross are earning an average weekly income while households in Mindarie are earning a higher income. In particular:

- The majority of households in Clarkson earn under $1,400 per week (72%) compared to Kinross (51%) and Mindarie (45%).
- A high proportion of residents in Kinross earn between $1,400 and $1,999 per week (28%) compared to Mindarie (22%) and Clarkson (17%).
- A high proportion of households in Mindarie earn $2,000 or more per week (33%) compared to Kinross (21%) and Clarkson (11%).

Households in Mindarie earn a higher weekly income compared to households in Kinross and Clarkson and households in Clarkson earn a low weekly household income compared to Kinross and Mindarie.

7.1.4 Forecast Tamala Park Community Profile

The portion of Tamala Park on the western side of Marmion Avenue, on the coast, is likely to become a high socio-economic area, similar to Mindarie, with the price of land and housing being slightly higher due to its close proximity to the coast. However, the LSP incorporates measures to facilitate housing diversity including the capacity for mixed densities and housing typologies. The portion on the eastern side of Marmion Avenue is likely to be an above average socio-economic area, similar to Kinross.

Specific demographic characteristics of residents in Tamala Park are likely to include the following:

- A high proportion of family households with children of all ages and some without children.
- They will be well educated and earn an above average household income per week.
- The vast majority of dwellings will be separate houses.
- Most households will have Internet access at home.
- There will be a high proportion of white collar workers and approximately one third will be blue collar workers.
- Key industries of employment are likely to be retail, construction, manufacturing and health care and social assistance.
- Approximately half of all residents will be born in Australia, with a low Indigenous population.
- The area will attract residents born in England, Scotland, South Africa and New Zealand.
- Most households will own two or more vehicles and these will be their main form of transport, however there is likely to be good access to public transport.

Likely future population characteristics of the Tamala Park region include:

- Population: Forecast to increase by 90% over the next 15 years to 40,000 people in 2012, with the bulk of the population growth occurring in Tamala Park, Mindarie, Clarkson and Burns Beach.
- Age structure: Expected to attract a high proportion of families with children of all ages and some without children as well as young adults to the region.
- Households: Expected to attract family households and some lone person households.
- Education: With the attraction of families with children the demand for primary and secondary school facilities will increase.
- Income: The median weekly income is likely to remain within the similar ranges currently existing in the region.
- Dwellings and Tenure: The majority of new dwellings are likely to be separate houses with a high proportion of owner-occupiers who are purchasing their house.

7.2 THE ECONOMY

7.2.1 Labour Force

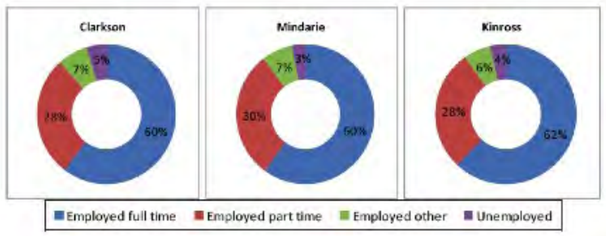
The labour force within the suburbs of Clarkson, Mindarie and Kinross consists of all residents aged 15 and over who are either employed in some capacity, or unemployed and looking for work. In Clarkson, 3,430 people or 71% of the population aged 15 and over are in the labour force, in Mindarie 3,292 people or 72.5% are in the labour force and in Kinross 3,760 people or 76% are in the labour force.

Of the residents within the labour force in Clarkson, Mindarie and Kinross, the majority are employed

full time (60-62%) and part time (28-30%) and some residents indicated their employment as 'other' (6-7%). Mindarie has the lowest unemployment rate at 3%, Kinross has an unemployment rate of 4% and Clarkson has an unemployment rate of 5%.

Refer to Figure 14 – Employment Profile.

Figure 14 – Employment Profile (Source ABS 2006, Creating Communities)



7.2.2 Occupation and Industry of Employment

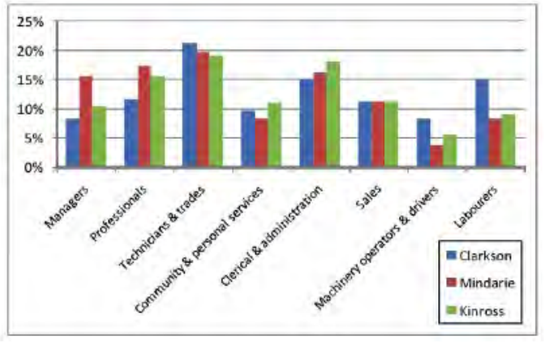
The occupation of residents within the suburbs of Clarkson, Mindarie and Kinross differs as follows

Refer to Figure 15 – Occupation of Residents.

- A higher proportion of professionals and managers reside in Mindarie (33%) compared to Kinross (26%) and Clarkson (20%).
- A higher proportion of blue collar workers (technicians and trades, machinery operators and drivers and labourers) in Clarkson (45%) compared to Kinross (34%) and Mindarie (32%).
- Kinross has a higher proportion of clerical and administration and community and personal service workers (29%) compared to Mindarie (24%) and Clarkson (24%).

Mindarie and Kinross have a higher proportion of white-collar workers in comparison to Clarkson, which has a higher proportion of blue-collar workers. However, the main industries of employment are similar for all three suburbs, namely retail, construction, health care and social assistance and manufacturing.

Figure 15 – Occupation of Residents (Source ABS 2006, Creating Communities)



7.2.3 Cost of Living

The proportion of household income spent on rental payments is the highest in Mindarie (19.0%) and slightly lower in Clarkson (18.6%) and Kinross (17.5%). Households in Clarkson spend the most on mortgage repayments per week as a proportion of income, (26.4%) while in Mindarie 24.9% is spent on mortgage repayments and in Kinross 21.8% is spent on mortgage repayments. In Clarkson, the weekly rent and mortgage repayments are less than Kinross and Mindarie, however the median weekly household income is also significantly less. Therefore after these repayments, persons in Clarkson have approximately $70 less than Kinross and $100 less than Mindarie remaining per week.

7.3 SOCIETY

7.3.1 Ethnicity

Approximately half of all residents in the suburbs surrounding Tamala Park are born in Australia; Clarkson has the highest proportion at 59%, Kinross has 52% and Mindarie has 46%. Approximately three quarters of all residents are Australian citizens, ranging from 75% in Mindarie to 78% in Kinross and 80% in Clarkson. Mindarie and Kinross have a low proportion of Indigenous residents (0.3%) and Clarkson has 2.8% Indigenous residents.

Excluding Australia the top countries of birth in Clarkson, Mindarie and Kinross is England, with 14%, 27% and 21% respectively born in England. The other three top countries of birth for all suburbs are Scotland, New Zealand and South Africa.

English is the most common language spoken at home with a range of between 83% and 88% of all households only speaking English. Afrikaans is the most common other language across Clarkson, Mindarie and Kinross.

7.3.2 Crime and Security

Between the 2003-04 and 2007-08 financial years, 3,499 crimes were reported in the suburbs surrounding Tamala Park, of which 59% were in Clarkson, 25% were in Mindarie and 16% were in Kinross.

The top three crimes in each suburb were graffiti, assault and burglary of dwellings. Key differences between the suburbs include:

- Mindarie had the highest proportion of reported graffiti offences (37%) compared to 28% in both Clarkson and Kinross.
- Kinross had the highest proportion of reported burglary (dwelling) offences (31%) compared to 24% in Clarkson and 23% in Mindarie.
- Clarkson had the highest proportion of reported assaults (26%) compared to Mindarie (20%) and Kinross (19.5%).

The WA Police, located at Clarkson, indicated that there was a problem with graffiti and vandalism in the area. Meetings with local schools corroborated this, with a lot of them now fenced off in order to alleviate the problem. There also appeared to be a high level of domestic violence and this was linked to the social demographic and the pressures on family life linked to the prevalence of fly in/out workers. Clarkson has a substantially higher number of reported crimes compared to Mindarie and Kinross and similarly, the ratio of reported crimes per person per year in Clarkson is also substantially higher than Mindarie and Kinross. However, the types of crimes being committed are similar amongst all three suburbs.

7.3.3 Vehicle Ownership and Transport Patterns

The profile of vehicles per dwelling within Mindarie and Kinross are very similar; however dwellings in Clarkson have, on average, fewer vehicles. Specifically:

- 4% of dwellings in Clarkson have no vehicle, while only 2% in Kinross and 1% in Mindarie have dwellings with no vehicles.
- 40% of dwellings in Clarkson have one vehicle, compared to only 26% in Mindarie and 28% in Kinross.
- Clarkson has a lower proportion of dwellings with two or more vehicles (56%) compared to Mindarie (73%) and Kinross (71%).

Refer to Figure 16 – Vehicle Ownership

The vast majority of residents in Clarkson, Mindarie and Kinross travel to work in a private vehicle (79%-81%). A lower proportion of residents in Mindarie use public transport to travel to work (10%), compared to Clarkson (15%) and Kinross (14%). However, a higher proportion of residents in Mindarie work from home (4%) compared to Clarkson and Kinross (both 2%).

Refer to Figure 17 – Travel Patterns.

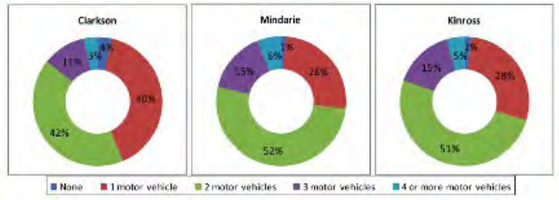


Figure 16 – Vehicle Ownership (Source ABS 2006, Creating Communities)

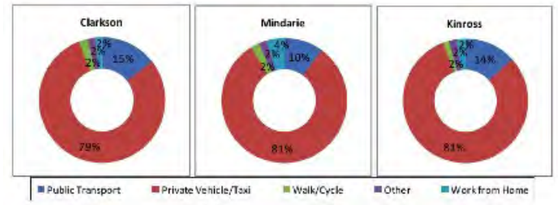


Figure 17 – Travel Patterns (Source ABS 2006, Creating Communities)

Most households are reliant on their private vehicles to travel to and from work, however in Mindarie, a higher proportion of residents work from home (4%) compared to Clarkson and Kinross (both 2%).

7.3.4 Public Transport Availability

Clarkson Train Station

The Clarkson Train Station offers efficient and reliable public transport into the Perth CBD and to other areas in the metropolitan area. This station largely services the population of Clarkson, Mindarie and other suburbs to the north.

Currambine Train Station

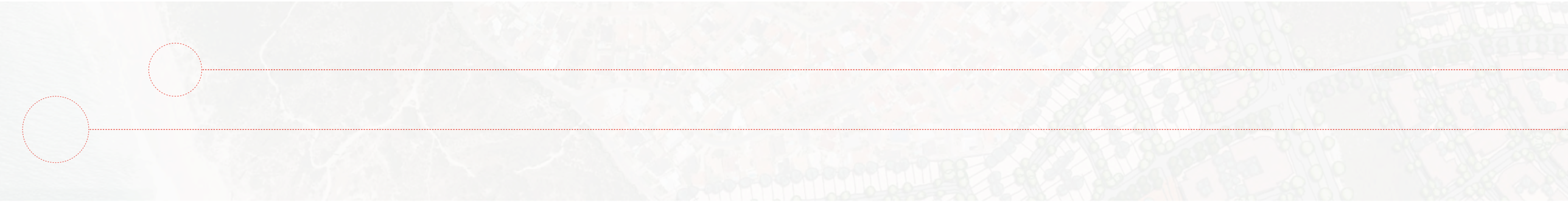
The Currambine Train Station is situated just south of Kinross. The majority of residents in Kinross would utilise the park and ride facility at the station, however some residents are within walking distance of the station.

Bus Services

A range of bus routes are available through the suburbs of Clarkson, Mindarie and Kinross. Clarkson has the greatest access to bus routes, as the Clarkson train station is a destination point for all services on the Northern 67 and 78 bus timetables. In total seven bus routes connect to the station:

- 481 to Quinns Rocks via Quinns Road.
- 482 to Quinns Rocks via Santa Barbara Parade.
- 483 to Butler via Merriwa.
- Butler via Ridgewood.
- 490 to Two Rocks Shopping Centre.
- 472 to Joondalup Train Station via Currambine.
- 474 to Joondalup Train Station via Kinross.

Public transport accessibility surrounding Tamala Park is very good, with access into the Perth CBD and other locations around the metropolitan area available using the northern train line. Bus routes connect residents in Mindarie and Clarkson to the Clarkson Train Station and residents in Kinross to the Joondalup Train Station. Kinross residents are also in close proximity to the Currambine Train Station for park and ride users.



7.4 SUMMARY OF DEMOGRAPHICS - SURROUNDING SUBURBS

7.4.1 Clarkson

Clarkson is considered a lower socio-economic area, with a high proportion of public housing and more affordable housing for young adults and young families entering the housing market. Specifically, the community profile of Clarkson is as follows:

- Clarkson has a high proportion of young families and young adults.
- The median age of residents in Clarkson is 28 years.
- The majority of households are families with children, however there is a high proportion of lone person households and single parent households in Clarkson.
- Resdents in Clarkson, on average, have a lower level of education compared to Mindarie and Kinross.
- The median weekly household income in Clarkson is between $300 and $500 lower than Kinross and Mindarie.
- The vast majority of dwellings in Clarkson are separate houses, with a low proportion currently fully owned by their occupant, over half are being purchased by the occupant and one third are rental properties of which 10% are public rentals.
- The majority of households have access to the internet at home, however compared to Mindarie and Kinross, a high proportion do not have internet connection at home (by choice).
- There are a higher proportion of blue-collar workers in Clarkson compared to Mindarie and Kinross.
- The indigenous population in Clarkson is relatively small but significantly greater then Mindarie and Kinross.
- 40% of residents were born overseas, mainly in England and South Africa.
- Clarkson is a high crime area compared to Mindarie and Kinross, with approximately one reported crime occurring per 17 residents per year over the past five years.
- Accessibility to public transport in Clarkson is excellent, with close access to the Clarkson Train Station and a range of bus routes travelling through the suburb.

7.4.2 Mindarie

Mindarie is considered a higher socio-economic area, with more expensive housing located close to the coast, attracting residents who are able to afford this lifestyle. The community profile is as follows:

- Mindarie has an older population, with a high proportion of people aged 40 plus living in the suburb.
- The median age of residents in Mindarie is 36 years.
- The majority of households in Mindarie are families with children, however a higher proportion of households have no children when compared to Clarkson and Kinross.
- In Mindarie, more residents are undertaking higher-level qualifications compared to Clarkson, but at a similar level to Kinross.
- Households in Mindarie earn a higher weekly household income compared to residents in Kinross and Clarkson.
- The majority of dwellings in Mindarie are separate houses, however there are a small proportion of medium and high-density dwellings close to the marina.
- Most households have access to either broadband or dial-up internet access at home in Mindarie.
- A high proportion of white-collar workers live in Mindarie, particularly professionals and managers.
- Just under half of all residents were born in Australia and just over one quarter were born in England.
- Compared to Clarkson there is a low rate of reported crimes per person, however there is a much higher rate compared to Kinross.
- There are a high proportion of vehicles per households and the majority of residents use a private vehicle to travel to and from work.

7.4.3 Kinross

Kinross is an above average socio-economic area, attracting a wide range of families to the area. The community profile of Kinross is as follows:

- Kinross has a younger population, similar to Clarkson, however there is a mixture of families with young children and teenagers.
- The median age of residents in Kinross is 32 years.
- Residents in Kinross are well educated, with a high proportion currently studying for a post-school qualification and 25% have completed a university degree.
- The median weekly household income is approximately $150 less than Mindarie, but $300 more than Clarkson.
- The vast majority of dwellings are separate houses, and are occupied by the owner, with only 20% of dwellings being rented.
- Household internet connectivity is high with only 17% not having access to the internet at home.
- Kinross has the highest level of labour force participation at 76%, compared to Mindarie (72.5%) and Clarkson (71%).
- Kinross has a higher proportion of lower level white collar workers in clerical, administration, community and personal services jobs.
- Just over half of all residents were born in Australia, however there is a very low proportion of indigenous residents living in Kinross.
- 22% of residents were born in England, with other key nationalities including Scottish, South African and New Zealander.
- Kinross has a low level of reported crimes compared to both Mindarie and Clarkson.
- Residents in Kinross, on average, own two or more vehicles per household and mostly use a private vehicle to travel to work.
- Residents also have good access to public bus and train services.

7.4.4 Burns Beach

Burns Beach is a high socio-economic area, attracting older families and couples who can afford large houses along the coast. Residents within the suburb are associated with either 'old' Burns or 'new' Burns. 'Old' Burns is an established residential area while 'new' Burns is a new residential development area. Key demographics of residents currently (2006) living in Burns Beach compared to Mindarie, Clarkson and Kinross are as follows:

- Burns Beach has a proportionally older population with the majority of residents aged 35 and over; further to this almost one quarter (23.9%) are aged 55 or over;
- There is a low proportion of children and youth in Burns Beach.
- The median age of residents is 39 years.
- Just over half (52.9%) of all residents were born in Australia and just over one quarter (25.8%) were born in England.
- The majority of households are families (68.9%), of which the majority are couples with no children; however there are also a high proportion of lone person households (20.0%).
- There is a low level of workforce participation with only 60% of residents aged 15 and over in the labour force.
- A high proportion of residents are white-collar workers (65.3%), the majority of whom are professionals and managers (35.5%).
- The median weekly household income is lower; this may be due to a high proportion of retired residents earning minimal or no income.
- A high proportion of households are fully owned (26.7%) by occupants, a low proportion are being purchased (32.2%) by occupants and a relatively high proportion are being rented (30.0%) privately. It is likely that some of these rentals are holiday let.

8.0 OPPORTUNITIES AND CONSTRAINTS ANALYSIS

A number of opportunities and constraints have been identified during preliminary investigations into the development of the locality. These have shaped the objectives, strategies and design of the LSP. The constraints and opportunities associates with the development are discussed below, being separated into urban (comprising social and economic development constraints and opportunities) and environmental constraints and opportunities.

8.1 URBAN DEVELOPMENT OPPORTUNITIES AND CONSTRAINTS

8.1.1 Transport and Road Network Considerations

Opportunities

- Opportunities exist to connect pedestrian and cycle networks throughout the subject land, linking the Ocean Keys District Centre, Clarkson Train Station and including connections with regional open spaces and the Neerabup National Park.
- A connection to the Mitchell Freeway is also planned in the LSP, which will aid in activating the commercial and employment nodes in Tamala Park.
- Improvement to the public interface of future commercial development on Neerabup Road, in the interests of visual amenity, activation and the safety of pedestrians.
- Opportunity exists for a district public transit route to provide regular and attractive connection between the beach and the Clarkson Train Station.
- An at-grade crossing beneath a bridged Neerabup Road may be established to facilitate greater linkage with the Clarkson Train Station.

Constraints

- Traffic on Connolly Drive south of Neerabup Road is in the region of 7,000 vehicles per day. Future traffic on Connolly Drive could be in the vicinity of 10,000 to 12,000 vehicles per day following development of the subject land.
- Marmion Avenue and Connolly Drive are an impediment to east-west connectivity. The final LSP design should respond in a manner maintaining traffic flow with treatments sufficient to accommodate orderly pedestrian and vehicle travel in an east west direction. The intensity of urban development may increase adjacent to various sections of these transport routes, in order to take advantage of improved accessibility.
- The existing commercial development adjacent to Neerabup Road currently presents a limited public interface with large format commercial buildings, featuring car-based, low intensity activity. Limited capacity for connection and integration with surrounding built form to the north of the subject land is a constraint to be overcome as part of the consideration of the LSP.
- The impact of poor linkages on vehicle, pedestrian and bicycle traffic from Tamala Park will need to be carefully considered, may result in increased vehicle trips and congestion. The Mitchell Freeway is yet to be developed up to Neerabup Road. The current isolation from primary industrial infrastructure in the locality is likely to impact upon the location decisions of business seeking a site for expansion or development.
- Public transport in the area is good, though for lower socio-economic groups who do not have access to a car, intra-suburb transport is difficult.

8.1.2 Land Use

Opportunities

- There is an opportunity to establish of an employment node within the northern eastern part of the Tamala Park area, with associated service roads.
- There is an opportunity to develop Neerabup Road as an activity corridor accommodating a greater intensity and diversity of uses to establish a viable continuous east-west link from the Clarkson Train Station to coast.
- The Tamala Park development can emphasise the minimisation of the exposure of residents to rising transport costs through the proximity of the development to employment opportunities and transport infrastructure.
- Lands may be set apart in proximity to the Clarkson Train Station or adjacent the Ocean Keys Town Centre to accommodate future employment development in home-based business, mixed-use office and service commercial development sectors.

- Existing and planned mixed business development in the Ocean Keys District Centre immediately north of Tamala Park combined with the Neerabup Industrial Park to the east and the Clarkson Train Station precinct, provide an opportunity to address major local employment deficiencies within the area.
- The proximity of Tamala Park to the Joondalup Passenger Rail Line via Clarkson Station provides the opportunity to integrate transit-oriented design principles into the development.
- The activation of precincts such as the proposed Tamala Park mixed use precincts in close proximity to the train station is likely to be easier and more successful as employers increasingly consider accessibility to their premises by employees and customers by public transport.
- Future residents within Tamala Park will have the benefit of an existing District Shopping Centre inclusive of a range of goods, services and employment opportunities. The centre provides a node, which may be expanded on to provide additional local employment opportunity.
- The development has the potential to provide affordable housing opportunities. People will move to the area for the lifestyle, including proximity to the beach, the cost of land and affordability.
- The Mindarie Regional Council (MRC) Landfill site may be developed as a regional reserve or utilised for future power generation purposes.

Constraints

- The planned retail offering of Clarkson is likely, in the short to medium term, to be sufficient to satisfy the retail needs of Tamala Park residents. Therefore, retail development within the Tamala Park area should be limited to convenience retail servicing the daily needs of residents.
- A 500-metre buffer is required from the landfill site, which affects the south- western portion of the subject land. The Mindarie Regional Council is modifying the landfill operation in order to ensure that by 2011, the buffer area does not extend into the Tamala Park land.

8.1.3 Landform

Opportunities

- View sheds can be maximised from elevated land near Marmion Avenue and the central portion of the subject land opposite Maroochydore Way.
- The preservation of topographical features into the design of the development will provide views toward the ocean from many different parts of the development area, while preserving associated ecological communities through ecological links to the adjacent bushland areas. In order to achieve this, topographical features of the subject land should retained in appropriate locations.

Constraints

- Residential buildings of a scale serving to maintain landform will be required, locating lower density dwellings on or adjacent dune ridges.
- There is a need to provide grades that will facilitate walkability within the proposed Green Link.

8.1.4 Servicing and Infrastructure

- Western Power have indicated that a substation will be required in the Tamala Park area within the next 15-20 years, to meet rising demands. There is a need to consider alternative methodologies / alignments to reduce the visual impacts of any high voltage lines, along with opportunities for the local generation of power and solar panels.
- The implementation of contemporary communication networks will be required.
- Street lighting and lighting to centres and community facilities to provide safer conditions.
- Water Sensitive Urban Design reducing dependence on mains water in addition to the reuse of wastewater and stormwater, such that flows off the site closely match the predevelopment flow rates.
- Excess stormwater quantities should be detained and infiltrated on site wherever possible.
- Potentially utilise local materials from the landfill site for earthwork and road works operations.
- Faster development rates or greater development densities than R40 are likely to trigger requirements for a greater provision of infrastructure

8.1.5 Economic Incentives and mechanisms

It may be possible for the CoW to discount rates or for the City of TPRC to provide rates subsidies based on the sustainability performance of a property based on objective measures against which households would be assessed, such as average annual electricity consumption (or contribution to the grid), average water consumption, rainwater tank storage or other. The percentage of discount could be proportional to the level of sustainability performance achieved (to encourage continual improvement).

8.1.6 Cultural Heritage

Cultural heritage may be accommodated through a greater focus on consultation and ongoing involvement of the Aboriginal community in the planning process in the management of the Coastal Foreshore, Bush Forever and 'Waughal' sites.

8.1.7 Community Facilities

Opportunities

- There exists a number of established community facilities in the Clarkson District Centre immediately north of the subject land.
- There is an opportunity to provide a community club and sporting facilities of a high standard. The district level facilities identified by Creating Communities may add value and vitality if they are located in the area.

Constraints

- Despite being a reasonably established area, there are relatively few community facilities available.
- An overall general assessment of people's current patterns would be that not only do they leave the area in large numbers for their employment, but that they are also forced to seek leisure activities outside of the area.
- A primary school will be required to be developed in the structure plan area.

8.2 ENVIRONMENTAL OPPORTUNITIES AND CONSTRAINTS

8.2.1 Vegetation

- Areas located in proximity of the Marmion Avenue are in a very good to excellent condition with relatively low weed infestation.
- The vegetation communities are well represented throughout the site especially near Marmion Avenue close to Bush Forever site 322 and Neerabup Park.
- There are five major vegetation types present on the subject land, including: Eucalypt/Banksia woodlands, Banksia woodlands, Acacia shrublands, limestone heaths dominated by Dryandra sessilis and cleared or grassland areas.
- The main constraints to development with regard to flora are bushland fragmentation leading to failed ecosystems and provision of an adequate buffer between the developments and surrounding bushland areas.

8.2.2 Water Management

- Pesticides and aromatic hydrocarbons were undetectable in bore samples tested as well as heavy metal concentrations with the exception of zinc (slight). Ammonium concentrations were below detection levels (Trefry and Davis, 2008). All of this indicates that at this point in time groundwater on the development site is not affected.
- There is potential to develop subterranean storm water collection facilities to minimise extraction.
- Allow for storm water drainage to recharge areas of remnant vegetation.

8.2.3 Bush Forever Site

- The Bush Forever reserve provides for coastal conservation reserve planning and there is potential to accommodate an open space and urban corridor connection through the development site providing for improved environmental linkages and the maintenance of diversity.

8.2.4 Topography

- The preservation of topographical features into the design of the development will provide views toward the ocean from many different parts of the development area, while preserving associated ecological communities through links to the adjacent bushland areas. In order to achieve this, topographical features of the site should be retained in appropriate locations.

8.2.5 Geotechnics

- There is an opportunity to reuse rock excavated during the land development process, such as for landscaping and filling purposes.

8.2.6 Geology And Soils

- Disturbance to the dunes of the Quindalup Complex may cause problems in the future, as the sands comprising these dunes are highly mobile when vegetation is removed. As the re-vegetation process is lengthy, it is advisable to avoid disturbances to the area as much as is practicable and implement strategies to prevent dune erosion.
- The topographical features should be preserved as much as possible along with the preservation of soil complexes within a vegetative strip across the subject land. Flattening the landscape may exacerbate the problems, which already exist to the west of the subject land (large sand blowout).

8.2.7 Fauna

- The clearing of quality vegetation generally results in habitat loss for local fauna. In this instance, preservation of bushland areas including Dryandra sessilis and Banksia species will be undertaken within the subject land where practical, as these support significant fauna such as Carnaby's Cockatoo.
- A Green Link with diverse bushland areas providing feeding and nesting habitat is required and is intended to be provided at the northern side of the MRC landfill site, with an appropriate management plan to care for these areas. When it comes to Avifauna a continuity of the habitat is sometimes more important than the actual size of the fragmented part of the bushland. Clusters of significant trees should be marked and kept on site for this purpose (e.g. large Banksia, Tuart and Jarrah).

9.0 SUSTAINABILITY STATEMENT

Creating sustainable urban developments requires an innovative planning framework that integrates different functional components (i.e. water, energy, waste and natural ecologies) in a holistic manner that fulfils multiple objectives and provides additional benefits.

Sustainable development is generally broken into three constituent parts: environmental, social and economic sustainability, with the urban (physical form infrastructure) of a development being evaluated by these elements. The Tamala Park LSP has been developed with a 'bottom-up' approach based on sustainability principles and is aligned with national and local planning tools, and aims to exceed current best practice.

9.1 FUTURE PROOFING

In order to ensure that the Tamala Park development remains an example of leading edge sustainable metropolitan development, a number of trends, which are being taken up by the development industry, have been incorporated into the LSP. Measures will be put in place to ensure their implementation throughout the planning and design phases through to development and occupancy. These include strategies such as land banking and the identification of strategic sites, allowing for long-term density requirements and the valuing of natural resources with future market values rather than current.

The environment as a natural resource is in particular becoming increasingly valuable, and urban infrastructure, which seeks to utilise these resources over an extended time frame, will need to take into account their future values as opposed to that which the current market holds. This is already becoming standard practice with readily measurable elements such as energy and water, and is increasingly being valued in economic terms for items such as bio-diversity, with projected values far exceeding those currently seen in the marketplace.

9.2 ENVIRONMENTAL SUSTAINABILITY

Environmental sustainability, while encompassing the preservation of natural habitats and ecologies, also addresses the health and biodiversity of our built environments. The overall objectives of environmental sustainability are to achieve a healthy environmental outcome for both the natural and built environments and all resident inhabitants and ecologies.

Current market acceptability of principles such as the preservation of the natural environment, efficient use of resources, including energy and water have been incorporated in the Local Structure Plan, along with market leading strategies such as the integration of natural ecologies into the urban fabric, which is often termed 'Bio-city' or 'Green Infrastructure'. This is an emerging field of global best practice, which has a number of benefits to the development, such as reducing the 'heat island effect', managing stormwater, increasing biodiversity, and providing aesthetic and health amenity to the community.

The existing biodiversity rich areas both within and surrounding Tamala Park are considered long-term assets for the environment generally, the health and amenity of the community as well as economic land value, and have been incorporated into the structure plan wherever possible.

9.3 SOCIAL SUSTAINABILITY

Social sustainability is integral to and reliant on economic and environmental sustainability as well as the urban infrastructure of the development. Best practice social sustainability strategies have been employed at Tamala Park and are integrated with other development principles.

Best practice strategies such as designing out crime, provision of community facilities, and assessment of employment and affordability have informed the LSP and will need to be incorporated through further planning stages, while a number of strategies such as the exploration of alternative forms of housing ownership and the establishment of community group involvement with urban bushland conservation will need further exploration and development by the authority. Matters relating to social sustainability have been addressed by Creating Communities Australia as included in Sections 11 and 12, with respect to community facilities and a community development plan.

9.4 ECONOMIC SUSTAINABILITY

While economics is the traditional bottom line of assessing a development's feasibility, when the concept of sustainability is applied, the concept of long term 'economic health' becomes dominant, and is integral to both social and environmental sustainability, as well as the urban infrastructure. Pracsys economic consultants have addressed economic sustainability as discussed in Section 19.0 - Economic and Employment Strategies.

9.5 URBAN INFRASTRUCTURE

Accepted best practice strategies such as TOD and the efficient use of infrastructure and buildings have been incorporated into the structure plan as well as market leading examples, such as land-banking, in addition to the development of appropriate residential densities.

10.0 THE LOCAL STRUCTURE PLAN

10.1 PREAMBLE

The LSP has been prepared and designed in a manner reflecting the objectives of State and Local government policy, including Liveable Neighbourhoods, the CoW Smart Growth Strategy and Network City. The LSP design has been prepared as an holistic response to the inputs prepared by the consultant team and the objectives adopted by the TPRC.

10.2 PREVIOUS STRUCTURE PLANNING

Whelans Town Planning Consultants, Sinclair Knight Merz and Stanton Hillier Parker audited the endorsed structure plan for Lot 17 Marmion Avenue in November 1999. This town planning audit noted that the structure plan shows four principle development cells, of which three had been formally accepted and endorsed by the joint Councils, with the exception of the CoW. TPG Town Planning and Urban Design in respect of Lot 17 Marmion Avenue prepared a structure plan in 2002

10.3 NEGOTIATED PLANNING SOLUTION

In December 2004, the joint owners of Lot 9504 (consisting of seven local authorities) commissioned a review in relation to the interface of the land to be transferred to the Bush Forever Office as part of a Negotiated Planning Solution (NPS) with the Western Australian Planning Commission (WAPC). A negotiated planning solution has since been adopted with respect to the transfer and acquisition of portion of Lot 9504 by the WAPC for public open space and Bush Forever Purposes.

10.4 ENQUIRY BY DESIGN WORKSHOP 2007

An Enquiry by Design (EBD) workshop was held on 18 and 19 January 2007. The workshop allowed key stakeholders, including participant councils, to consider the opportunities for the future of Tamala Park, develop a vision and ultimately a mapped indication of a draft option for the site. It also identified implementation issues and areas that required further research or consultation. A final refined concept plan and key themes emerged that have informed the current structure planning processes. Those in attendance at the workshop included representatives from the following organisations:

- Representatives of the seven local authorities that make up the Tamala Park Regional Council.
- The Department for Planning and Infrastructure
- Koltasz Smith Town Planners
- Estill and Associates
- The Department of Water
- Western Power

10.5 LSP DESIGN PHILOSOPHY

In addition to satisfying the objectives adopted by the TPRC, the following principles relating to the subject land were acknowledged during the design process.

Residential

- Provide a range of densities and residential typologies that will respond to future demands resulting from changes in demography and lifestyle choices.
- Higher residential densities to be developed in proximity to the Clarkson Rail Station.
- An arrangement that will facilitate lot orientation that benefits from solar access to a high level.

Environmental

- Significant rare and priority vegetation is intended to be conserved in reserve and POS areas wherever possible, including within the public environment, streetscapes and on private lots wherever practical.
- Designing in a manner facilitating retention of landform and topography as much as is practical.
- The incorporation of a Green Link within the public realm and through the strategic retention of existing tracts of vegetation that will serve as connections between the coast and Neerabup National Park.

Public Open Space and the Public Realm

- Public open spaces are to be designed and located in a manner that will maximise surveillance and minimise crime.
- Public open spaces are to accommodate a variety of functions and adding to the amenity of centres.

Low-density Residential Development (Single Dwellings)

Low-density Residential Development (Single Dwellings)

Medium-density Residential Development (Units)

Medium-density Residential Development (Apartments)

- Public open spaces are to accommodate a variety of functions and needs, including the sporting and active recreation requirements of the community, while also adding to the amenity of community hubs.
- Public open spaces are to be located to maximise non-vehicular connectivity, and to maximise a range of usage by a range of community groups.

Activity Centres and Employment

- Facilitate the development of an activity corridor adjacent Neerabup Road taking advantage of and complementing existing infrastructure, including the rail station and public transit services.
- Realising the benefits associated with establishing connections between the rail station, activity centres within Tamala Park and the Clarkson District Centre.
- Activity centres co-located with community facilities and public open spaces along a multi purpose centrally located Green Link.
- A distribution of retailing and commercial activity suited to the level of development envisaged, paying regard to surrounding employment centres.

Community Facilities

- The appropriate provision and location of community facilities including a primary school site.

Connectivity

- Providing a road system that appropriately accommodates the needs of pedestrians and cyclists, facilitating a high level of connectivity through the development to existing centres and public transport nodes.
- A road layout that links the three development cells efficiently in an east west direction, while providing for high levels of linkage to Neerabup Road and the Clarkson Rail Station.
- A design that will accommodate direct freeway access to the eastern precinct to capitalise on potential commercial benefits.

10.6 ACTIVITY AND DEVELOPMENT WITHIN THE LSP

The LSP proposes a range of land use and development including the following:

- Educational Establishment (primary school).
- Residential Development.
- Activity Centres.
- Business (Larger Format Commercial) Sites.
- Mixed Use Sites.
- Community Facilities.

These are discussed in further detail below.

The following images depict the desired form of residential, mixed use and commercial development in the locality.

10.6.1 Residential Development

Structure Plan Residential Yields

An overall dwelling target of approximately 2,600 dwellings is to be achieved, representing a gross density in the order of 14.5 dwellings/ha over the entire structure plan area. This will provide for a population in the order of 6,500 persons based on a projected occupancy rate of 2.5 persons per dwelling.

The desired form of urban development depicted on the LSP represents an orderly scenario and design outcome that realises the objectives of the TPRC. The LSP depicts future land use intent, identifying preferred dwelling typologies as a means of portraying the desired distribution of density and the form of urban development in future detailed area planning.

Conceptual R-Code densities were applied to various parts of the LSP to model expected dwelling yields and in order to inform transport and retail modelling exercises.

It has also been factored in that precinct density targets could be exceeded up to an acceptable variance of 10% during the preparation of detailed area plans, without additional transport modelling, retail modelling and alterations to the community facilities strategy. Any increase beyond the acceptable variance of 10%, whilst potentially being acceptable, would necessitate the undertaking of these various studies.

Medium-density Residential Development (Town Houses, Semi-Detached Dwellings)

The dwelling target yield for the subject land is presented below in Table 3 – Housing Distribution, based on the likely distribution of dwellings in the LSP area.

Refer to Table 3 - Housing Distribution - Entire LSP.

Indicative targets for various typologies of dwellings for each of the four identified Precincts are provided in Section 11.

Table 3 - Housing Distribution – Entire LSP

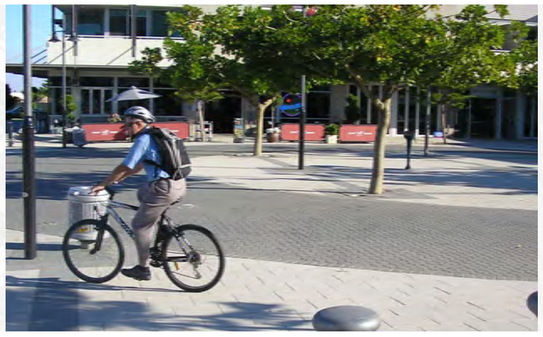
Total Development Area Yield	Planned Indicative Dwelling Yield	Percentage of Housing Type	City of Wanneroo Housing Strategy Requirement
Separate Housing	1755	67%	76.2 %
Semi Detached / Town Houses	557	21%	14.4%
Flats and Apartment Units	315	12%	9.4%
Total	2627	100%	100%

Basis of Housing Provision and Intent of the LSP

It is intended that the LSP will facilitate residential development meeting or exceeding the requirements of the City of Wanneroo Housing Strategy in terms of the distribution of dwelling typologies. Future detailed area planning will however require a greater level of site responsive design and an analysis of dwelling provision based on future market demands. The distribution of dwellings under the LSP comes as a response to the prevailing landform and meeting the objectives for development through facilitating higher residential density in strategic locations to activate future activity centres and to take advantage of existing centres and transport infrastructure in close proximity. Lower density sites are planned to primarily accommodate single dwellings. There is potential to provide residential densities in the order of Residential R15 to the west of Marmion Avenue, to encourage the retention of landform and natural features. However, in remaining residential precincts, a minimum of Residential R20 is intended to prevail as the minimum density in low-density residential localities in order to achieve indicative dwelling targets.

Mixed Use Development

Commercial Development



Public Places

10.6.2 Neerabup Road Activity Corridor

Pracsys economic consultants have provided an indicative yield for commercial floor space on the Neerabup Activity Corridor in Tamala Park, based upon projected traffic volumes and associated demands. A range of yields for future commercial floorspace is provided for Neerabup Road, equating to a minimum of 2,423m^2 and a maximum of 7,472m^2 commercial office floor space.

Based on the rate of urban development in established neighbouring localities and development on the urban fringe in Alkimos, planning for the provision of commercial floor space based on the lower yield estimate in the medium term provides the most acceptable scenario outcome for commercial office development in mixed use sites on Neerabup Road (See Pracsys Economics Neerabup Road Benchmark Report attached at Appendix 5).

The ability of Neerabup Road and the eastern commercial precinct to attract and sustain knowledge intensive producer service businesses will be contingent on the successful development of nearby employment nodes (such as Meridian Park and Alkimos) and the ability of Neerabup Road to establish itself as part of the supply chain for these employment nodes. Mixed-use sites are proposed to be developed on Neerabup Road in Precincts 3 and 4.

10.6.3 Activation of Focal Points

Pracsys economic consultants performed an investigation and made recommendations with respect to the activation of focal points in the Tamala Park development.

Activating the Tamala Park development will involve linking the residents and visitors to core activity precincts; concentrating retail tenancies to encourage life and vibrancy; maximising possible modes of transport for easy access and minimising access routes to channel traffic past shop fronts.

Six principles of place activation have been developed into a coherent framework to apply to urban development projects. These principles are outlined below:

Purpose of Place

This involves identifying the user population and enhancing the precinct through design considerations to maximise the frequency and concentration of transactions. There is potential for Tamala Park to mature to accommodate knowledge intensive producer and consumer services based on servicing surrounding centres and the Neerabup Industrial Estate.

Access – Arrival Points

- A design that funnels people and traffic into the core and which arrive at the 'front door' of the place, not around the back.

Origins – Car Parking and Transport Nodes

- The strategic distribution of car parks and transport nodes will maximise pedestrian movement.
- Street parking is important for commercial areas.
- Charge no fees and relax time limits.

Exposure – Pedestrian Movement

- Economic activation is driven by the frequency and concentration of transactions, therefore maximising pedestrian exposure is imperative.
- Concentrate transactions by pushing people past as many shop windows as possible;

Destinations – Major attractions

- Give major destinations special treatment through understanding the needs of the customer and building the centre around these major destinations.
- Amplify the impact of attractions by creating support amenity and infrastructure to maximise frequency, length of stay and expenditure

Control – Strategic Sites

- Tenure control is vital for overall development success.
- Identify active frontages and take control of key sites.
- Corner sites drive uses on either side.
- Not all areas in a place need to be active – be selective.

The LSP design has paid due regard to these principles and future detailed area planning and design guidelines controlling development within and adjacent activity centres and mixed use areas will also be informed by these principles. Further discussion on the treatment of various commercial nodes is provided in Section 11, being specific to each precinct.

10.7 COMMUNITY PURPOSE SITES AND STRATEGIES

10.7.1 Preamble

Creating Communities Australia undertook community consultation and community planning for the Tamala Park development. The community facilities strategy prepared by Creating Communities based on an analysis of the information obtained through initial community audits (See Appendix 6 – Creating Communities Community Audit Report). It provides a community facilities provision strategy for Tamala Park, guiding the planning, development and funding of community facilities. The research undertaken provided a clear indication of the future needs for both local and district level facilities. Of particular importance is access to recreation facilities, community meeting and activity spaces, and areas designed to engage young people.

10.7.2 Research Outcomes

The research identifies a lack of local community facilities in the surrounding suburbs, particularly community centres/halls, active reserves and sporting clubrooms, primary schools and childcare centres. If these needs are not addressed the demand on proposed local facilities within Tamala Park are likely to be exacerbated. The standards review process carried out identified that the study area is relatively well accommodated for in the following areas:

- Public open space.
- Public and Private High Schools.
- Churches; and
- Playgrounds.

However, with respect to public open space, it is identified that local active spaces in surrounding areas are too small to meet community needs and are experiencing capacity issues.

A need for the following facilities within the study area were identified:

- A recreation centre.
- A district level sporting complex (4 to 6 sporting areas).
- A district level aquatic facility.
- A hall or community centre.
- Change room facilities on all active sporting reserves (4).
- Tennis courts (13).
- Cricket wickets (2).
- Public primary schools (DET standards).
- Infant health clinic (1).
- Out of school centres.

10.7.3 Community Facilities Strategy

The community facilities strategy addresses community facility requirements at a district level, as well as local facility needs. The provision of local community facilities within the Tamala Park development is not expected to rectify any shortfall of facilities at a district level.

However, the development of Tamala Park will increase demand for district level facilities, some of which are already lacking. The current lack of public facilities is augmented by limited access to public transport. This is a particular dilemma for individuals without private transport who wish to access services or participate in leisure activities in neighbouring areas or regional centres such as Joondalup.

Whilst the train is an effective means of travelling in a north-south direction, limited feeder services to the train stations and poor intra – district bus services present genuine obstacles to accessing community facilities. There is also strong support for the co-location of community education, specialist health services and social support services in local community centres, which has implications for the orderly development of activity centres.

10.7.4 Local Facilities

A summary of the local level facilities considered imperative for inclusion within the Tamala Park development are as set out below, see the full Community Facilities Strategy report prepared by Creating Communities is attached at Appendix 7 for greater detail.

- Public primary school (1) A minimum 4ha site should be provided with the LSP. It is noted that the LSP actually identifies a 5ha site to accommodate expected future demand.
- Primary school oval (Shared use) (1) that:
    - Should be enhanced in size to enable it to accommodate a senior Australian Rules football ground.
    - Cricket wicket to be incorporated.
    - Car parking to be included and designed to enable access by both the school and community user groups.
- Shared use of the Primary School Hardcourts (2)
    - Should be multi-marked for tennis/ basketball/ netball.

The LSP accommodates these requirements, although detailed design relating to access is required in future.

- Local active open space, incorporating active sporting areas and passive spaces as follows:
    - One senior sized sporting oval.
    - Cricket wicket to be incorporated.
    - Include amenity for youth (i.e. skate/ cycle track).
    - Integrate passive spaces/ amenity into design (i.e. playground equipment, BBQ areas, a gazebo and benches).
    - If possible, this active open space may be constructed adjacent to the school oval to maximise flexibility and multi-use by having two playing surfaces within close proximity
- Multipurpose Community Facility- Co-located with active open space and primary school (incorporating sporting pavilion amenities). A combined community purpose building and club room facility that can accommodate functions for community groups and sporting clubs
    - Main function/ multipurpose activity area, adaptable as a clubroom facility;
    - Meeting/ activity spaces;
    - Internal and external storage (external equipment storage for ground users);
    - Toilet and change room facilities for both male and female users; and
    - Office accommodation.
- Childcare centre 1 - A site should be provided in close proximity to the primary school for future development by a commercial operator. Alternatively, provision could be made within the design of the multipurpose community facility to enable the provision of a service by a community-based organisation (i.e. YMCA).
- Youth space 1 - The provision of a space designed to attract young people. Should include multiple elements that are passive and active (i.e. skating rails and ramps, gazebo with durable street furniture).

- A network of internal walking and cycle paths is considered essential infrastructure, required to provide local residents with pedestrian and cycle access to key facilities within the Tamala Park development (i.e. local shops, school, local parks, etc).
- The provision of a cycle/ skate track is recommended to provide local youth with a physical activity option, as well as a local transport route. A track with obstacles and challenge elements located within the lineal park and integrated/ linked with walking and cycle paths, will provide an attractive, active option for local youth.

10.7.5 District Facilities

A district level indoor sporting venue is required to reduce the current reliance on the Gum Blossom Recreation Centre. Design components are to include:

- Two indoor sports courts;
- Health and fitness suite;
- Large multipurpose activity space/ function room; and
- Meeting rooms.
- District Active Open Space (4 to 6 playing areas)

A district level sporting reserve that can accommodate a number of different sporting codes at senior level is also required. This should include:

- A number of broad acre playing spaces;
- Specialist sporting facilities;
- Tennis or bowls club;
- Social and change room facilities.
- Integrate passive open space into the design; and
- Possible co-location with district recreation centre to create a significant sport/ recreation precinct.
- Infant Health Clinic - 1 District level facility accommodated within a community centre or co-located with a public primary school.
- Youth Services Centre - 1 District level facility that works in conjunction with the existing Clarkson Youth Centre.

11.0 PRECINCT AREAS

11.1 PRECINCT 1 – WESTERN PRECINCT

11.1.1 Preamble

Development in this precinct is to deliver an outcome demonstrating best practice in terms of sensitive subdivision design and future built form that is in sympathy and complementary to the dunes underpinning the natural character of the area. Ocean views are a key feature of the precinct, which will also be enhanced through preservation of the natural topography and a responsive subdivision layout.

The road network will embrace the eastern and southern boundaries of the precinct, punctuated by public open space and a potential local dining and retailing facility in a small coastal activity node located in the western most section of the precinct closest to the coast.

A hard edge to the Bush Forever site is to be implemented, that will facilitate pedestrian access, inhibit vehicular access and limit edge effects on remnant vegetation on adjacent vegetation complexes. Efficient and direct pedestrian and vehicular access across Marmion Avenue via the Green Link to the central precincts is also to be provided.

11.1.2 Land Use and Development

The land use composition depicted on the Indicative Development Plan (IDP) is detailed below in Table 4.

Table 4 – Western Precinct Land Distribution

Western Precinct	Percentage (%)	Area (Ha)
Residential	64.88%	21.0349
Non-Residential		
Centre	0.513%	0.1662
Public Open Spaces		
Active / Passive Public Open Space	3.15%	1.0212
Green Link	4.28%	1.386ha
Total Including Roads		32.4198

Residential Development

The Tamala Dunes Precinct must contribute to realising the objectives of the LSP, allowing for a variety of housing typologies and densities. To this end, the LSP envisages medium and higher density residential development typologies at the western extremity of the precinct adjacent active open spaces and at the eastern edge adjacent Marmion Avenue. Apartments up to six storeys may also be established. Medium density residential development will include cottage lots and grouped dwelling development sites.

Other portions of the precinct will accommodate lower-density single residential dwelling development, of a form that serves to maintain existing topography while taking advantage of prevailing views. There is capacity to favourably consider residential density in the future below a density of R20 where this would aid in maintaining the existing topography of the land.

The following table provides an indication as to potential dwelling yield in various typologies that will meet the dwelling target yield for this precinct, as identified in the statutory section of the LSP. This will be subject to future design and detailed area planning, which may produce an alternative form of development. Further justification and supporting information will be required in order to exceed the dwelling yield targets for the precinct beyond an allowable tolerance of 10%, as listed in the statutory section of the LSP.

Table 5 - Western Precinct - Indicative Dwelling Distribution

Zone	Housing Typology	% Split	Dwelling Yield	% Yield
Western Low Density	Single Houses	90%	247	51%
	Semi – Detached and Town Houses	10%	28	5.5%
Medium Density	Single Houses	70%	149	31%
	Semi-Detached / Townhouses	20%	42	8.5%
	Flats	10%	21	4%
Total			487	100%

Table 6 – Western Precinct - Indicative Housing Typology Totals

Single Houses	Semi - Detached	Flats, Units Apartments	Total
396	70	21	487
81%	15%	4%	100%

Activity Centre Development

A small activity centre located in the western most portion of the precinct is envisaged that will provide a limited offering servicing the daily and weekly needs of residents in the locality.

The centre is located so as to create space between the site and Marmion Avenue and take advantage of the coastal ambience, providing an attractive setting for additional activities including restaurants and cafes.

The centre will also provide a link and support to recreational activities that may be established in the adjacent coastal reserve in the future, as per the intent for the reserve under the Draft Perth Coastal Planning Strategy. Examples of the form of development envisaged for the local activity centre are provided in the images below:

11.2 PRECINCT 2 – CENTRAL WESTERN

11.2.1 Preamble

The intent for this precinct is to provide a high quality and sustainable residential environment having a range of alternative housing typologies. This precinct will balance the need for higher residential densities with natural and physical amenity, through outlooks to natural features and the close proximity of local services and education facilities.

Development within this precinct will provide pedestrian friendly streetscapes with high levels of passive surveillance to the public domain, particularly in proximity to the central Green Link. Local employment through business development is also encouraged at the northern edge adjacent Neerabup Road, immediately opposite the Ocean Keys District Centre.

A neighbourhood activity centre will abut the central Green Link surrounded by higher density residential development and green spaces, providing a community hub and focal point that complements the primary school and associated community and recreational facilities.

11.2.2 Land Use and Development

The land use composition depicted in the LSP is detailed below in Table 7.

Table 7 – Central Western Precinct Land Distribution

Central Western Precinct	Percentage (%)	Area (Ha)
Residential		
Residential	44.3%	22.33
Non-Residential		
Centre	1.41%	0.7089
Business	4.13%	2.0844
Public Open Space		
Active / Passive Public Open Space	1.812%	0.9173
Green Link	2.38%	1.2026
Conservation Reserves	23%	11.5784
Total Including Roads		50.4647

Residential Development

The Central Western Precinct will provide for the retention of significant tracts of high quality remnant vegetation while providing for a variety of housing typologies and densities to be developed, with higher densities in proximity to activity centres, public transport routes and adjacent public open space areas. Medium density residential development will include cottage lots and grouped dwelling development sites, while portions of the precinct will accommodate lower-density single residential dwelling development, of a form that serves to maintain existing topographies. Apartments being up to six storeys may be established in this precinct also.

The following table provides an indication as to dwelling yield in various typologies that will meet the dwelling target yield for this precinct, as identified in the statutory section of the LSP. This will be subject to future design and detailed area planning, which may produce an alternative form of development. Further justification and supporting information would be required in order to exceed the dwelling yield targets for the precinct beyond an allowable tolerance of 10%.

Table 8 – Central Western Precinct - Indicative Dwelling Distribution

Zone	Housing Typology	% Split	Dwelling Yield	% Yield
Low Density	Single Houses	90%	379	58%
	Semi – Detached and Town Houses	10%	42	6.5%
Medium Density	Single Houses	70%	136	20.5%
	Semi-Detached / Townhouses	20%	38	6%
	Flats, Units and Apartments	10%	20	3%
Centre	Flats	100%	38	6%
Total			653	100%

Table 9 – Central Western Precinct - Indicative Housing Typology Totals

Single Houses	Semi – Detached / Townhouses	Flats, Units Apartments	Total
515	80	58	653
78.9%	12.2%	8.8%	100%

Activity Centre Development

A local activity centre is envisaged that will provide a limited retail offering servicing the daily and weekly needs of residents in the locality. The centre is located so as to create a central focal point and a community hub that will accommodate activity and development complementing the neighbouring school site. The small retail offering would be enhanced through the proximity of the school and entrance of vehicles from Marmion Avenue.

Business Sites on Neerabup Road

Precinct 2 will provide land for the establishment of commercial premises accommodating themed larger format retailing and offices. The business area has been identified in order to facilitate the development of a continuous mixed-use corridor and recognises the desire to concentrate potential for higher intensity employment and activity in closer proximity to the Clarkson Train Station land in the eastern TOD and Mixed Use Precincts.

11.3 PRECINCT 3 – CENTRAL EASTERN

11.3.1 Preamble

This precinct will primarily accommodate low-density residential development, with an appropriate transition to mixed-use developments within Precinct 4 to the east. An education facility is to be developed to the southwest corridor of the precinct, which will accommodate shared-use of facilities and associated senior level recreation facilities. Active and passive public open spaces are to permeate the precinct, which should be well - addressed by residential development.

Mixed-use development is to be fostered adjacent to Neerabup Road as a priority, in addition to nodes adjacent the western edge abutting Connolly Drive and particularly at the corner of Connolly Drive and Neerabup Road.

11.3.2 Land Use and Development

The land use composition depicted in the LSP is detailed below in Table 10.

Table 10 – Central Eastern Land Use Distribution

Central Eastern	Percentage (%)	Area (Ha)
Residential	44.3%	21.0349
Non-Residential		
Mixed Use	5.26%	2.5
Public Open Space		
Active / Passive Public Open Space	2.15%	1.0212
Green Link	1.296%	0.616
Total Including Roads		47.5176

Residential Development

The Central Residential and Mixed Use Precinct will provide for the retention of significant tracts of vegetation and a variety of housing types and densities. A school site is to be developed within the precinct and as such residential development will be required to address and provide surveillance to the school and related open space areas. Medium density residential development will include cottage lots and grouped dwelling development sites, while portions of the precinct will accommodate lower-density single residential dwelling development, of a form that serves to maintain existing topographies.

Apartments being up to six storeys may be established in this precinct also. It is envisaged that higher residential densities would abut Neerabup Road and Connolly Drive in this Precinct in order to activate the corridor and provide support and locate residents more closely to transit and other services.

The following table provides an indication as to dwelling yield in various typologies that will meet the dwelling target yield for this precinct, as identified in the statutory section of the LSP. This will be subject to future design and detailed area planning, which may produce an alternative form of development. Further justification and supporting information would be required in order to exceed the dwelling yield targets for the precinct beyond an allowable tolerance of 10%.

Table 11 – Central Eastern Precinct - Indicative Dwelling Distribution

Zone	Housing Typology	% Split	Dwelling Yield	% Yield
Low Density	Single Houses	90%	313	59.6%
	Semi – Detached and Town Houses	10%	35	6.6%
Medium Density	Single Houses	70%	46	8.8%
	Semi-Detached / Townhouses	20%	13	2.5%
	Flats, Units and Apartments	10%	7	1.3%
Mixed Use	Single Houses	10%	11	2.2%
	Semi-Detached / Townhouses	55%	61	11.6%
	Flats, Units and Apartments	35%	39	7.4%
Total			525	100%

Table 12 – Central Eastern Precinct - Indicative Housing Typology Totals

Single Houses	Semi – Detached / Townhouses	Flats, Units Apartments	Total
370	109	46	525
78.9%	12.2%	8.8%	100%

Combined Public Open Space and School Site

Based on the future population level in Tamala Park, the provision of a primary school site is a necessity. While the Community Facilities Strategy prepared by Creating Communities identifies the need for a 4ha school site, the LSP provides 7.26 ha, which includes a 5ha school site to accommodate a large primary school along with other shared use facilities. The 5ha provision will provide for flexibility in design and meet future demand.

It is noted that sharing the playing fields as a district facility would allow the size of the primary school site to be reduced to 3.5 hectares as per Liveable Neighbourhoods 4. However the LSP does not propose this given the potentially higher student number.

Shared active recreational spaces are to be provided on the land, including a senior size AFL football oval in addition to a soccer field or potentially tennis courts in the POS area.

Also, it is unknown as to whether there will be future demand to establish a private school or a temporary primary school within Tamala Park in the future. There is potential to accommodate an additional education facility in the south of the eastern precinct incorporating a playing field. It is suggested student numbers be reviewed prior to subdivision.

Mixed-Use Sites

Mixed-use sites within the LSP area are envisaged to accommodate mixed-use commercial development with upper level residential development. As previously described, terrace housing and multiple dwellings are the preferred forms of residential development to be located adjacent Neerabup Road and within these areas. No single dwellings are to be accommodated adjacent Neerabup Road. The corner site at Connolly Drive and Neerabup Road will function as an entrance statement and must be treated appropriately in terms of building design and form and land use.

11.4 PRECINCT 4 – EASTERN

The Eastern Precinct will facilitate development that draws on the opportunities offered by the proximity of the Clarkson Train Station and the proposed freeway access point to the employment node. A direct link is to be developed from the Clarkson Train Station leading to a proposed under-pass beneath a bridged Neerabup Road to the employment node in the eastern precinct. The Tamala Park development has a role to play in supporting the Clarkson Train Station Precinct through improved direct transport linkages, as well as fostering legible connections through continuous built form.

Development will predominantly accommodate residential and commercial uses, which are envisaged to be concentrated within the central linear spine leading to the Clarkson Train Station.

A low-density residential area is also proposed at the southeastern corner of the precinct. This is based upon the protection of existing remnant vegetation, which will affect building typology. The majority of the precinct will feature medium density residential development.

The linear Green Link will be narrower in this precinct, as a result of the commercial built form. Attempts will be made to create the enclosed feeling of a main street type environment.

11.4.2 Land Use and Development

The land use composition depicted in the LSP is detailed below in Table 13.

Table 13 – Eastern Precinct Land Distribution

Eastern Precinct	Percentage (%)	Area (Ha)
Residential	50%	23.8932
Non-Residential		
Centre	1.9%	0.9057
Mixed Use	12%	5.7126
Public Open Space		
Active / Passive Public Open Space	7%	3.276
Green Link	1.94%	.9282
Total Including Roads		47.8396

Residential Development

The TOD and Mixed Use Precinct will provide a variety of medium and higher density housing typologies and a small level of single dwelling developments. Medium density residential development will include cottage lots and grouped dwelling development sites, while portions of the precinct will accommodate lower-density single residential dwelling development, of a form that serves to maintain existing topographies. Apartments being up to six storeys may be established in this precinct also. It is envisaged that higher residential densities would be located adjacent Neerabup Road and Connolly Drive in this Precinct, with single dwellings being prohibited. The following table provides an indication as to dwelling yield in various typologies that will meet the dwelling target yield for this precinct, as identified in the statutory section of the LSP. This will be subject to future design and detailed area planning, which may produce an alternative form of development. Further justification and supporting information would be required in order to exceed the dwelling yield targets for the precinct.

Table 14 – Eastern Precinct - Indicative Dwelling Distribution

Zone	Housing Typology	% Split	Dwelling Yield	% Yield
Low Density	Single Houses	50%	83	9%
	Semi – Detached and Town Houses	25%	41	4%
	Flats, Units and Apartments	25%	41	4%
Medium Density	Single Houses	50%	262	27%
	Semi-Detached / Townhouses	25%	130	13.6%
	Flats, Units and Apartments	25%	130	13.6%
Mixed Use	Single Houses	10%	25	2.7%
	Semi-Detached / Townhouses	55%	140	14.6%
	Flats, Units and Apartments	35%	90	9.5%
Centre	Flats, Units and Apartments	100%	20	2%
Total			962	100%

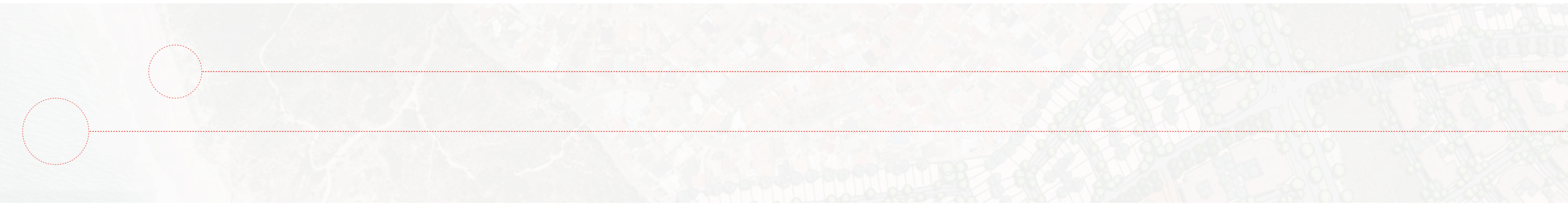


Table 15 – Eastern Precinct - Indicative Housing Typology Totals

Single Houses	Semi – Detached / Townhouses	Flats, Units Apartments	Total
370	311	281	962
78.9%	12.2%	8.8%	100%

11.4.3 Activity Centre Development

The LSP identifies an employment node within Precinct 4 including a local activity centre and mixed-use sites that will accommodate a variety of activities including retail, business, community, civic and social services. Adjoining mixed-use lands in Precinct 3 will complement development on Connolly Drive. This location has a significant advantage in that access from the freeway is to feed directly into the activity centre and in that it also has a major piece of public transport infrastructure in proximity that will be increasingly integral to the transport network within the northwest corridor and greater Perth.

People are more inclined to walk further if there are continuous points of interest along their path and therefore, the eastern activity centre will be developed in a linear 'Main Street' fashion accommodating development at either side through to Neerabup Road, leading to the train station.

Convenience retail is a major driver of consumer behaviour within activity centres. Integrating a small supermarket/super deli, chemist, bottle shop and food outlets into the streetscape and promoting active outwards-facing frontages encourages customers to make multiple transactions as they move through the precinct. This will enhance the local centre component of the locality. The consolidation of a variety of activity throughout this location will decrease the need for multiple trips, activate secondary businesses and contribute to a sense of place. The road will probably also carry regional public transport services, which will further increase the viability of commercial activities through improved exposure. See the Tamala Park Activation Paper prepared by Pracsys economic consultants at Appendix 8 for greater detail.

12.0 COMMUNITY CONSULTATION AND COMMUNITY DEVELOPMENT PLAN

12.1 CONSULTATION PROCESS

12.1.1 Target Audience

The community engagement process focused on the following groups:

- Tamala Park Regional Council;
- City of Wanneroo;
- Residents of Joondalup and the City of Wanneroo Local Government Areas;
- Government and private agencies operating in proximity to the development site; and
- Key stakeholders.

An extensive list of Tamala Park stakeholders is included in Appendix A of the Community Engagement Strategy prepared by Creating Communities, attached at Appendix 9.

12.1.2 Methodology

The community engagement program has involved a number of approaches, including the creation of a web site to capture information from interested persons and the establishment of a community and stakeholder reference group – the Tamala Park People and Places Working Group. The People and Places Working Group have been involved on an ongoing basis during the planning process. In addition, local residents, the Quinn's Rock Environmental Group and the Burns Beach Ratepayers and Residents Association (BBRRA) have enjoyed briefing sessions during the planning process.

To assist in the development of the community engagement methodology and other preliminary community development considerations, meetings were held with the regional managers of State and local government agencies active in the area and 15 one-on-one interviews with other key stakeholder groups. This consultation, plus the demographic analysis, has assisted in the development of the community engagement strategy. Research methods employed to inform the facilities strategy included:

- A stakeholder workshop with City of Wanneroo staff and relevant state government agencies;
- Fifteen consultation meetings with schools, service providers, key community groups and other stakeholders;
- A group briefing of the Quinn's Rocks Environmental Group (QREG) was also conducted, in addition to a briefing to the Burns Beach Ratepayers and Residents Association (BBRRA).

The key elements of the strategy recommended are described in Table 1 – Community Engagement Methodology in the report attached at Appendix 9 – Community Engagement Strategy. The engagement activities were run concurrently throughout the structure planning process.

The purpose of these stakeholder consultation meetings was to gain an understanding of local assets and opportunities for community development. Those interviewed included school principals, government service providers, and church and community leaders. The consultation was based around questions relating to the social aspects of the area, as well as the current and required provision of facilities.

A People and Places Working Group (PPWG) was also initiated to provide input into both the structure planning process and the Community Development Plan. General community input was also sought through a Community Open Day held at the Ocean Keys District Centre.

12.1.3 Consultation Outcomes

The 15 initial individual stakeholder consultation meetings gave an understanding and insight into the Tamala Park development area. The consultation was based around questions relating to the social aspects of the area, as well as the current and required provision of facilities.

The main recurring themes raised in the consultation were:

- People moved to the area because of its proximity to the coast;
- The affordability of the area is an attractor;
- There is a high percentage of migrants in the area;
- There is a high youth population that is not catered for.

Other general comments included:

- Public transport in the area is good, though for lower socio-economic groups who do not have access to a car, intra-suburb transport is difficult. This is especially true for new migrants getting to appointments. Residents close to the station or bus routes say the public transport is good and people in Clarkson believed it to be good, because of the close proximity of the train station.
- Vandalism and graffiti were cited as large problems in the area – most schools were fenced off in an attempt to stop this problem.
- There was no real knowledge of anything historically or heritage significant in the area, with no major geographic sites or landmarks spoken of, or events that were widely known of. There is a very clear divide between the communities on both sides of Marmion Ave.
- Community events that were mentioned included Australia Day events and Christmas Carols at Mindarie Keys, as well as events run by Satterly in the Brighton area.
- The area is going through 'growing pains', however seems to be starting to catch up with its growth.
- There are extreme socioeconomic differences in the area.
- The area could be at risk of becoming a dormitory suburb as people leave for work and recreational pursuits, if more is not provided in the area.
- People move to the area for the lifestyle, components of which include proximity to the beach, cost of land and affordability.
- There are large immigrant populations in the area, particularly from the United Kingdom, South Africa and the Middle East. Word of mouth seems to play a big part in new immigrants moving to the area for support networks.
- WA Police, various schools and Ngala stated that there is a sizeable fly in/out (FIFO) population in the area.

Preliminary responses from the QREG included concerns in relation to the provision of measures to facilitate the passage of fauna across major roads and the treatment of significant tracts of vegetation accommodating rare and priority fauna and flora. Preliminary responses from the BBRRA included a general preference for higher residential densities in the form of apartment buildings within the structure plan area, particularly on the coast. A significant tourist node adjacent the coastal foreshore including accommodation and tourist related facilities, was also encouraged.

12.2 COMMUNITY DEVELOPMENT PLAN

12.2.1 Preamble

The Community Development Plan (CDP) has resulted from community and stakeholder consultations, a comprehensive community audit and social and demographic research.

The CDP identifies optimal community infrastructure and clarifies requirements for a first-rate array of social facilities, services and programs giving full consideration to both opportunities and challenges. The particular strategies to realise the full potential for Tamala Park are focused on connecting people to the outstanding bush and coastal environment, connecting the residents to each other and to the diverse communities surrounding the estate, while addressing some needs of the youth within the area.

The CDP details the social facilities, services and programs to be provided with the estate, as well as community infrastructure provision. Specific matters to be addressed in the plan include:

- The social and economic environments surrounding the Tamala Park development area.
- Relevant social opportunities and constraints associated with the development and how they will be addressed.
- Strategies and an indicative timeframe for the provision of community development within the Tamala Park development.
- Potential partnership opportunities.
- A Community Facilities Provision Strategy (as described in the previous section.

12.2.2 Consultation and Implications

The CDP reflects the ideas and concerns of stakeholders as detailed above in Section 12.1. The community and stakeholder engagement identified the following five key themes.

- Coastal lifestyle and environmental appreciation – appreciation of the proximity of the coast and the bush.
- Regeneration and recreation – opportunities to relax and enjoy the local area.
- Access and connectivity – ease of access to recreational opportunities, essential services and employment opportunities.
- Population diversity – the need to cater for a diverse demographic.
- Youth resources – opportunities for constructive youth engagement and interaction.

These themes provide direction for strategies that will maximise opportunities for residents to interact with each other on an informal basis and through organised activities. Social assessment of the LSP and projected demographics for Tamala Park suggest the following implications for community development:

- Facilities, services and programs for young families and youth are likely to be required. There is a higher than average youth population in the surrounding suburbs of Clarkson, Mindarie and Kinross.
- The range of lot sizes and housing types will attract a diverse community. Community programming will need to cater for this diversity.
- Access to good educational facilities in the early stages of development will be required, especially primary and high schools, to cater for the higher than average age demographics in these age groups.
- Access to childcare facilities will be required to support young families who move to the area.
- Connectivity through the development, to surrounding suburbs and to the Clarkson train station is required, so those who do not rely on cars are not limited in their social interactions.
- Ability for households to connect to the internet at home.
- Indigenous involvement in artwork and signage in the area would provide a link to the Indigenous Heritage in the area.
- The geographical barriers of Marmion Avenue and Connolly Drive should be addressed to bring the community together.
- The integration of new incoming residents with inhabitants in the surrounding areas will be necessary.
- Local social and economic activities are needed to activate the local community and economy in Tamala Park.
- Strong links between the residents and their environment should be a feature of community development.

- A civic space that can become a community hub will be important in establishing a sense of community and connection.
- The waste management history of the area provides an opportunity for initiatives around the theme of regeneration, recycling and state of the art technology for environmentally responsible lifestyles.

The community development and social planning for Tamala Park proposes strategies based on the results of:

- Consideration of the strengths and possibilities of the area.
- The values and aspirations of those living in the surrounding areas and those who are responsible for service delivery in the district.
- The projected demographic profile.
- The opportunities offered by the structure plan.

12.2.3 Strategies

The community facilities strategy previously addressed in Section 10.7 forms a part of the community development strategy. In addition, a theme of regeneration and a suite of proposals form part of an overall community development proposal.

Regeneration

At Tamala Park there is a golden opportunity to design a range of activities around the encompassing theme of 'regeneration.' The concept accords with the desire of the TPRC to develop Tamala Park as an example of environmental excellence and to incorporate the latest technology in waste reduction, environmentally responsible living and recycling.

Although Tamala Park is a name currently linked with a waste disposal facility, an opportunity exists to reframe current thinking in relation to the area. In the 21st century it is increasingly relevant to consider waste management issues in terms of creativity, innovation and environmental responsibility, as well as in the context of sustainable lifestyles. The waste facility can therefore be seen in a positive light as part of the 'heritage' of the area – something the community can develop. Potential 'Regeneration Tamala Park' initiatives include:

- Hosting an annual 'ReGen Festival'.
- Hosting an art competition and exhibition using recycled materials.
- Establishing a 'library' of recycled materials for art supplies and children's activities.
- Initiating an annual artist-in-residence program (exhibitions, community workshops and demonstrations using recycled materials).
- Hosting an expo of new innovations in environmentally responsible lifestyles and waste recycling.
- Holding community swap meets.
- Running organic gardening lessons.
- Holding monthly organic food markets, cooking classes and tastings.
- Community events to connect to the reinvigorating benefits of the natural environment.
- Developing further school links with the graphic artist currently based at the Tamala Park waste facility.
- Designing and constructing estate playground equipment from recycled materials.
- Initiating an innovation award and ceremony for waste management and recycling.
- Hosting an expo of scientific advances in waste management, environmentally sustainable lifestyles etc.

Community Development Activation Plan

The proposed community development activation plan revolves around five key themes, which include the following:

- Theme 1: An Involved Community: Connection to Each Other
- Theme 2: A Place to Grow Up
- Theme 3: Love the Land, Love the Coast (Environment)
- Theme 4: The Diversity Connection: Connecting to the Wider Region
- Theme 5: Retreat and Regeneration: Recreation and New Life

A vast range of strategies are proposed within the activation plan under these themes, which generally include the following:

- Welcome kits and community events.
- Early establishment and co-location of community and education facilities.
- Community newsletters and intranet.
- Develop a youth activity node around the town square.
- Support the establishment of sporting groups and sporting clubs.
- Local engagement in land care and conservation.
- Holiday activities featuring recycling for art, learning etc.
- Link with a graphic artist at Tamala Park waste facility.

Greater detail is provided in the Tamala Park Community Development Plan attached at Appendix 10.

13.0 LOCAL WATER MANAGEMENT STRATEGY

13.1 PREAMBLE

The Local Water Management Strategy (LWMS) prepared by MWH consultants is attached at Appendix 11. It provides guidance and instruction for the preparation of Urban Water Management Plans (UWMP's) associated with detailed area planning exercises informing the subdivision stage of urban developments. UWMP's address specific water management and system design aspects at the subdivision level. The LWMS has been prepared based on the guidelines contained in Better Urban Water Management (WAPC, 2008) and the interim policy - Developing a Local Water Management Strategy (DoW, 2008).

Refer to Appendix 11 – MWH Local Water Management Strategy

13.2 DESIGN CRITERIA

The Tamala Park locality is not subject to a district water strategy or district water management plan. As such, the design objectives contained in Better Urban Water Management (WAPC 2008) provide the basis of design criteria applicable to the LSP. Where relevant, these have been further refined to reflect CoW water management objectives. The following sections describe these objectives in the context of the LWMS.

13.2.1 Water Conservation And Efficiency

Objective

No potable water should be used outside of homes and buildings, with the use of water to be as efficient as possible.

Design Objectives

A consumption target for potable water of 100 kL/person/year, including not more than 60 kL/person/year of scheme water.

Site response

The development will use best practice methods to achieve the efficient use of scheme water and minimise the use of scheme water for non-essential uses.

To achieve the target of not more than 60 kL/person/year scheme water, an alternative to non-scheme water will be required to provide irrigation for house gardens. The availability of alternative sources (such as rainfall capture and re-use systems, wastewater re-use systems and groundwater) requires more detailed evaluation.

The development will seek to achieve zero net groundwater abstraction, based on a balancing of any abstraction by infiltration replenishment. If required, groundwater options should be designed only to meet residual water supply requirements over and above viable rainfall capture and water re-use options.

13.2.2 Water Quantity Management

Principle

Post-development annual discharge volume and peak flows will be maintained relative to pre-development conditions, unless otherwise established through determination of water requirements for sensitive environments as per Better Urban Water Management (WAPC 2008a) WAPC 2008a).

Design Criteria

Ecological Protection - For the critical one-year Average Recurrence Interval (ARI) event, the post-development discharge volume and peak flow rates shall be maintained relative to pre-development conditions in all parts of the catchment. Where there are identified impacts on significant ecosystems maintain or restore desirable environmental flows and/or hydrological cycles as specified by the DoW.

Flood Management - Manage the catchments run-off for up to the 1 in 100 year ARI event in the development area to pre-development peak flows, unless otherwise indicated in an approved strategy or as negotiated with the relevant drainage service provider (WAPC 2008a).

Where water drains to landlocked areas (trapped lows) of medium to high density zoning or areas with important infrastructure a risk assessment shall be provided for the consequences of that area receiving the Probable Maximum Flood (PMF).

Site response

The drainage strategy for the subject land is based on 100% infiltration of stormwater within the site boundaries, in order to emulate the pre-development condition. This will be achieved through a combination of:

- Minimising run-off from hard surfaces through appropriate application of water harvesting and re-use systems and permeable surfacing options.
- Capturing and using run-off to meet POS requirements where feasible.

- Directing residual run-off to detention and infiltration areas. This includes peak flow events. Detention and infiltration structures will be designed to conform to best practice design principles, including the inclusion of vegetation components and aesthetic integration with surrounding land use.

13.2.3 Water Quality Management

Principle

Maintain surface and groundwater quality at pre-development levels (winter concentrations) and, if possible, improve the quality of water leaving the development area to maintain and restore ecological systems in the sub-catchment in which the development is located.

Design Criteria

Contaminated sites are to be managed in accordance with the *Contaminated Sites Act 2003*. For all other land, where the pollutant outputs from the development (measured or modelled concentrations) exceed catchment ambient conditions, the proponent shall achieve water quality improvements in the development area or, alternatively, arrange equivalent water quality improvement offsets inside the catchment. If these conditions have not been determined, the development should meet relevant water quality guidelines stipulated in the National Water Quality Management Strategy (ARMCANZ & ANZECC 2000).

Ensure that all drainage runoff contained within the drainage infrastructure network receives treatment prior to discharge to a receiving environment consistent with the Stormwater Management Manual for Western Australia (2004-07). Swales/ vegetated bio-retention systems (also referred to as rain gardens) are to be sized at two per cent of the constructed impervious area from which they receive runoff. In addition, all outflows from subsoils should receive treatment prior to discharge to the stormwater system.

Site response

The land use history of the subject land suggests that there is a very low probability of any areas of contamination occurring. As such, the study area is not subject to special management requirements under the *Contaminated Sites Act 2003*.

The suitability for reducing the buffer area associated with the MRC landfill facility will be evaluated prior to subdivision. In order to mitigate groundwater contamination risk associated with the landfill site, a groundwater contamination prevention strategy will be completed prior to subdivision.

Potential pollutant outputs from the development have not been quantified. Water quality management practices associated with the development will meet relevant water quality guidelines stipulated in the National Water Quality Management Strategy (ARMCANZ & ANZECC 2000). Stormwater resulting from the development will be treated in accordance with the Stormwater Management Manual for Western Australia (2004-07).

13.2.4 Stormwater Modelling Criteria

If it is proposed to use a stormwater-modelling tool to demonstrate compliance with design objectives, the following design modelling parameters are recommended.

As compared to a development that does not actively manage stormwater quality:

- At least 80% reduction in the average annual load of total suspended solids.
- At least 60% reduction in the average annual load of total phosphorus.
- At least 45% reduction in the average annual load of total nitrogen.
- At least 70% reduction in the average annual load of gross pollutants (WAPC 2008a).

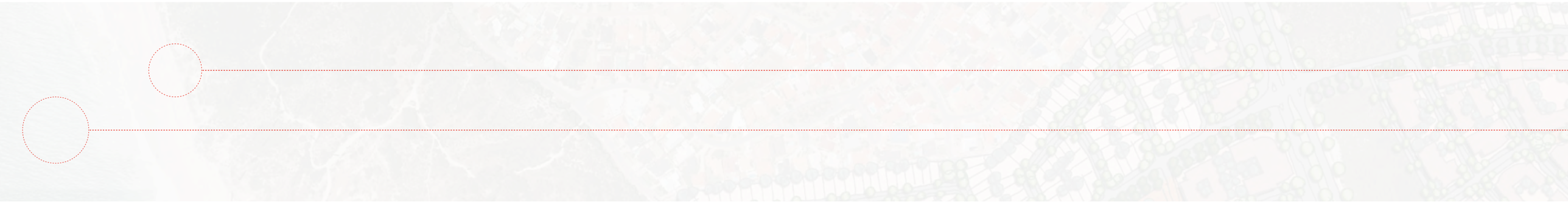
Site response

The requirement for stormwater modelling will be identified at the subdivision stage, to support the development of UWMP's at the subdivision level. Stormwater modelling methods will be selected based on consultation with the Department of Water.

13.2.5 Disease Vector And Nuisance Insect Management

Principle

To reduce health risks from mosquitoes, retention and detention treatments should be designed to ensure that between the months of November and May, detained immobile stormwater is fully infiltrated in a time period not exceeding those shown in table 11.2 of Australian Runoff Quality (IEAust).



Permanent water bodies are discouraged, but where accepted by DoW, must be designed to maximise predation of mosquito larvae by native fauna to the satisfaction of the local government on advice of the Departments of Water and Health (WAPC 2008a).

Site response

Stormwater management systems will be designed to ensure that detained, immobile stormwater is fully infiltrated in a time period not exceeding 96 hours. The development will not involve the creation of any wetlands or permanent water bodies.

13.3 WATER SUSTAINABILITY STRATEGY

This section provides an assessment of possible water conservation initiatives for the Tamala Park development. Water efficiency measures related to household water use, water re-use and irrigation of areas of Public Open Space (POS) are addressed.

The Western Australia State Water Plan (Government of Western Australia, 2007) cites an average individual water consumption figure of 106 kL per person per year for the Perth Metropolitan Area. Water conservation criteria for water sensitive urban design in the Better Urban Water Management Guidelines (WAPC, 2008a) provide a consumption target of 100kL/person/year, including not more than 60 kL/person/year of scheme water. The CoW has adopted this target. The proposed water efficiency measures for the development have been structured to meet these targets to the greatest possible extent.

13.3.1 Demand Reduction

Collectively, future households have the greatest potential to make a significant contribution to reducing water use. Various measures to improve householder water conservation have been identified and assessed, including in-house design measures, ex-house design measures and behaviour modification tools for low water use.

In House Design Measures

It is estimated that 43% of domestic water is used inside the typical residential home in Perth. A number of in-house measures are recommended to reduce householder use at the Tamala Park development.

Stage 1 of 5 Star Plus is a requirement in all new homes (Class 1 and 10) in the State, as a Western Australian addition to the 2008 Building Code of Australia. Water efficiency components of the requirement are contained in the Water Use In Houses Code of 5 Star Plus and include:

- Use of water efficient fittings and plumbing design to minimise the wastage of water.
- Provision for water recycling and re-use.
- Appropriate use of alternative sources of water such as grey water and rain water.

All homes built as part of the Tamala Park Development will be Five Star Plus Stage 1 compliant or better. This includes the use of water wise fittings further to those required by the Five Star Plus Stage 1 Scheme. These measures may reduce water usage in the home by up to 25% (Water Corporation, 2008b).

Additional water conservation measures proposed for inclusion in the Tamala Park development include:

- Insulation of hot water pipes: hot water pipes can be insulated to save water and power by retaining heat and reducing need to flush out cold water from hot water taps.
- Home design for water efficiency: when planning a house, locate the hot water system and bathrooms, ensuites, laundry and kitchen as close to each other as possible. This reduces initial plumbing costs and saves water and energy by reducing the flushing of cold water from hot water taps.

Ex-House Design Measures

It has been estimated that for the average Perth home 47% of household water use is applied to private gardens and lawns. The proposed allotment size for the Tamala Park development is relatively small and this will deliver a reduction in ex-house water use. The CSIRO integrated water management report estimates that ex-house water use in the proposed development has the potential to be around half the current average of 50 kL per person per annum. This translates to an average household ex-house usage of 56 kL/yr or 560 mm/yr. A 50% water–saving on ex-house usage would reduce household demand by 150 ML/yr (CSIRO, 2009).

Ex-house design measures for minimising water use in landscaping can be easily implemented through developer provided landscaping packages and therefore easy to enforce. It is intended that water wise landscape packages will be a requirement

of the Tamala Park development. The landscape package will include the following components:

- Use of native plants or other species suitable for a dry climate with minimal watering requirements.
- Hydrozoning: specify garden designs incorporating watering requirements based on hydrozones, delineated by the following drop icon categories:
    - Primary (3 drops) high water use plants.
    - Secondary (2 drops) moderate water use plants
    - Elemental (1 drop); low water use plants
- Using larger shrubs and trees or cover to provide shaded areas and conserve soil moisture.
- Mandating the use of soil amendments (such as mulch or clayey loamy soils) to improve water and nutrient retention on specific circumstances.

13.3.2 Behaviour Modification Tools

Waterwise Information Package

Waterwise information packages (WIPS) will be provided to all new home owners to ensure they are aware of all possible in house and ex house water conservation measures and how to best apply them. These packages will be distributed individually. The WIPs will provide advice and information on the following:

In house:

- How water conservation can be improved by changing habits such as taking shorter showers, not putting rubbish such as cigarette butts down the toilet, by not letting water run and only using a dishwasher when it is full.
- General maintenance such as checking for leaks and reducing pressure to decrease flow rates.
- Using Water Efficiency Labelling and Standards (WELS) to choose fixtures with greater than four stars for tap fitting and three stars for shower heads, as well as advice about choosing flow regulators, washing machines and relevant rebates available from the DoW.

Ex house:

- A waterwise information package for outside the home containing information on water efficiency measures for ex-house use including how to operate water wise irrigation systems, frequency and timing of irrigation, landscaping packages and use of pool covers.
- Rainwater tanks, requirements, regulatory approvals and information about the installation of tanks, switching systems and plumbing of toilets and/or laundry and relevant rebates.
- Greywater systems including requirements, approved products, regulatory approvals, installation of infrastructure for irrigation and relevant rebates.

Great Gardens Workshop

A 'Great Gardens' Workshops or equivalent will be held for local residents to provide information on waterwise and fertililser wise methods to help gardens thrive in soils endemic to the Tamala Park locality. The workshops will be suitably designed to educate landowners on how sustainable gardening practices can save time money and water.

Waterwise Display Village

The development of a Waterwise Display Village that meets Water Corporation standards is being considered. This Display Village will be viewed by potential and new landowners and will be designed to display and promote waterwise practices inside and outside the house.

As well as conserving water, a waterwise home design can also help reduce household water and energy bills. A typical home in a waterwise Display Village will feature:

- Water efficient taps, showers and other appliances.
- Water heating source positioned within five metres from the laundry (if a solar heater is installed this may vary).
- Waterwise garden design, including a balanced mix of hard stand, garden beds and lawn demarcated into hydrozones.
- Soil improvements using a soil conditioner certified to Australian Standard AS4454 to a minimum depth of 150 mm where lawn is planted and minimum depth of 300 mm for garden beds.

13.3.3 Waterwise Land Development Program

As a component of the development, the possibility of obtaining Waterwise Land Development accreditation from the Water Corporation will be investigated; as a further demonstration of a commitment to water conservation.

Waterwise land development accreditation can be achieved by demonstrating to the Water Corporation that the following targets have been achieved in a land development proposal:

- Water efficiency and water conservation has been addressed in POS.
- All major building within the development address water efficiency and water conservation through innovation.
- There are specific clauses that reflect water efficiency and water conservation within the conditions of sale. These should be in relation to both private and public buildings and display villages.
- The community is educated on water efficiency and conservation.

13.3.4 Greensmart Accreditation

It is intended that Greensmart accreditation or equivalent will be obtained for the Tamala Park development from the Housing Industry Association (HIA). This will publicise the use of environmentally friendly principal's in design and construction stages of the development, with the intention of inspiring residents to meet best practice water efficiency standards. Greensmart homes:

- Demonstrate improved energy, resource and water efficiency.
- Enable homeowners to waste less and recycle more.
- Reduce the waste from the building process.
- Improve site management during construction

13.3.5 Alternative Water Supply

In the typical Perth home, high quality drinking water is predominantly used for all water-using activities in and around the home. Alternative water supplies can be used for toilet flushing, clothes washing and garden watering. There are a number of alternative water sources that can potentially be harvested from the urban environment:

- Roof runoff (rainwater) rainwater collected from roofs and stored in either a tank on a lot or at a common point in a development.
- Superficial groundwater – this is typically the water trapped by backyard bores. Water quality and availability depends on backyard location.
- Domestic greywater-water collected from showers, baths bathroom basins and laundry. This water is typically high in organic content and requires considerable treatment.
- Sewer mining- water extracted from the wastewater system (before it reaches wastewater treatment facilities) and treated locally prior to use.
- Treated wastewater-wastewater that has passed through advanced treatment processes at a wastewater treatment plant.
- These water source options are further described in the following sections.

Rainwater Tanks

The installation of rainwater tanks will be considered for all residential buildings in the Tamala Park development (LSP, 2009). On average a roof area of 100m^2 (approximately 50% of an average house) in Perth can collect about 50 kilolitres of water a year when plumbed for internal and external use. This can supply up to 20% of a households needs. The Department of Health supports the use of rainwater tanks for non drinking water uses. State Government rebates are available for tanks greater than 2 kL that are installed (Water Corporation 2009).

13.3.6 Superficial Groundwater

The current groundwater allocation for this superficial aquifer is 95.84% leaving a possible 1,026,607 kL/year available for future licences. The developer may submit an application to the DoW to use some of this allocation to irrigate the proposed open space (30.74 ha) in the area (Tabec, 2009). At the water source design stage, groundwater is to be considered a last resort option for domestic ex-house water supplies.

13.3.7 Greywater

Grey water can be re-used by installing a grey water diversion system, which diverts greywater directly to a subsurface irrigation system without any treatment. Greywater recycling involves installing a system, which treats grey water to a quality so it is suitable for other uses such as toilet flushing. The installation of a greywater system with treatment is currently being considered for the Tamala Park development. Designs for both diversion and treatment systems need to be approved by the Department of Health. Waterwise rebates are available for greywater systems (Water Corporation, 2009)

13.3.8 Treated Waste Water

A domestic third pipe system using treated wastewater has not yet been approved in Western Australia. The use of a treated wastewater system will be considered for the Tamala Park development, subject to future government policy constraints. Provision has been made in the LSP for the installation of a wastewater recycling plant at the MRC waste disposal facility powered by methane energy from the landfill.

In addition to policy constraints, it is recognised that there are also technical hurdles associated with implementing a treated wastewater scheme including:

- Concerns about health risks and therefore reluctance to license such a scheme by the Department of Health.
- Additional risks in conducting such a scheme in a Priority 3 PDWSA where groundwater is used for potable supply.
- The availability of other wastewater disposal methods with lower health and social risks such as irrigation of vegetation.

13.4 PROJECTED POTABLE WATER CONSUMPTION

A consumption target of 100 kL/person/year including not more than 40-60 kL/person/year scheme of scheme water may be achieved according to the current water yield calculated from given lot yields, Water Corporation and Water wise calculator assumptions and dwelling statistics. It is estimated that a resident living in the Tamala Park development will use less than 65 kL/year on average of scheme water. Full potable water calculations are shown in Appendix C of the MWH Tamala Park Local Water Management Strategy attached at Appendix 11.

The number was calculated assuming that water wise fittings were installed, water wise landscaping was adopted and irrigation was limited. It also assumes that 30% of residents choose to water their gardens from a groundwater bore and that 20% of residents choose to install and use rainwater tanks for garden irrigation and that rainwater was available for 40% of the year.

Note: the use of bore water will be subject to CoW approval. The assumptions were based upon likely take up of water wise measures in-house and ex-house from methods such as distribution of Sustainability Information Packages and attendance of Great Garden Workshops. The potable water calculations also assume that no alternative water source was available for provision via a third pipe system.

Refer to Appendix 11 - MWH Tamala Park Local Water Management Strategy (Appendix C)

Table 16 - Summary of Average Scheme Water Usage in Residential Areas

		kL/day	kL/yr
Single houses	In- house	0.32285	117.8403
	Ex-house	0.279	101.835
	Rainwater augmentation	0.1116	40.734
	Total	0.49025	178.9413
	Total per person (kL/ person/day/year)	0.175717	64.13665
Semi-detached and town houses	In- house	0.20095	73.34675
	Ex-house	0.1054	38.471
	Rainwater augmentation	0	0
	Total	0.30635	111.8178
	Total per person kL/ person/day/year	0.177081	64.63454
Units and apartments	In-house	0.1722	62.853
	Ex-house	0.0502	18.323
	Rainwater augmentation	0	0
	Total	0.2224	81.176
	Total per person kL/ person/day/year	0.15027	54.84865

13.5 WATER BALANCE

A pre and post development water balance for the site was developed by CSIRO as part of the Integrated Water Management Options for Tamala Park study (CSIRO, 2009). The pre-development recharge rate was estimated to be 303 ML. An increase in recharge volume of approximately 56% (388 ML) is estimated post development.

13.6 STORMWATER MANAGEMENT STRATEGY

The stormwater management strategy for the Tamala Park site is based on infiltration of stormwater to maintain pre-development flows, while maintaining and/or improving water quality.

Figure 18 displays the pre-development drainage flow directions of the site, depicted form the natural topography of the site. The majority of surface flows appear to be internally draining to natural low points within the site.

Refer to Figure 18 - Pre-development Conceptual Site Drainage.

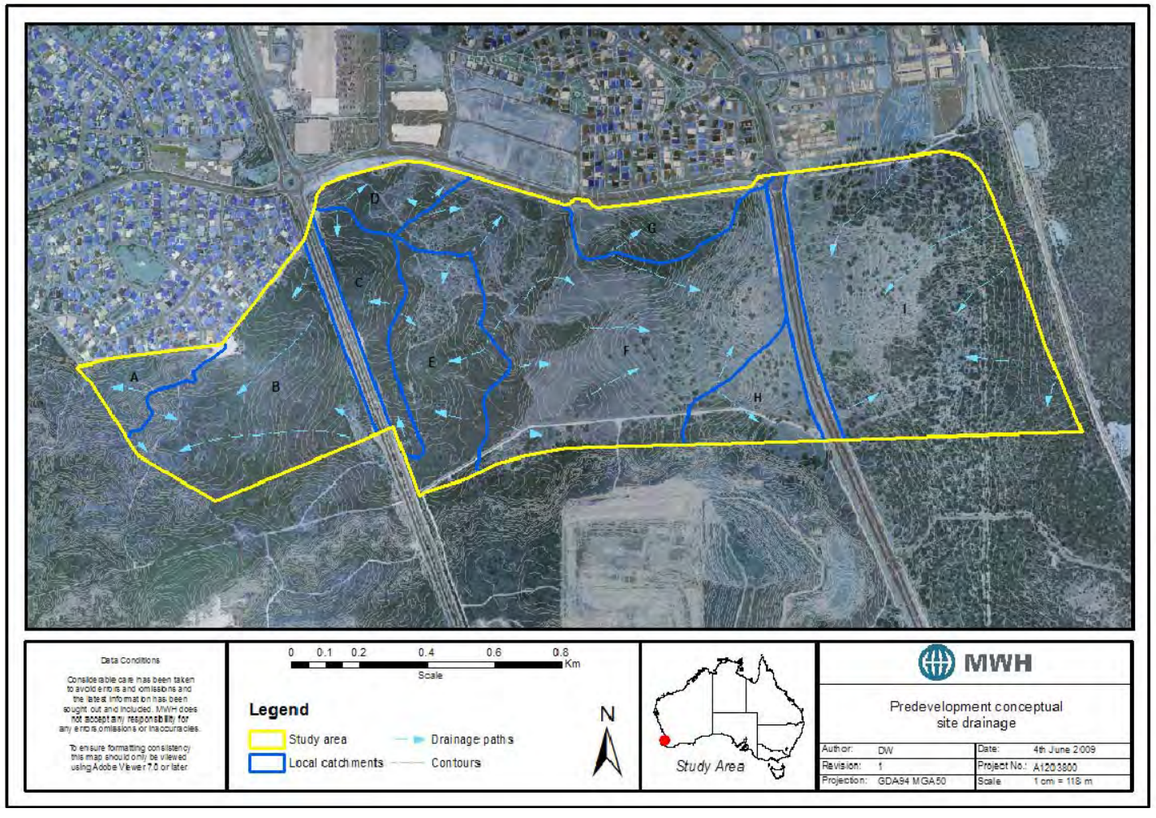
Due to the highly permeable sandy soils of the site and internally draining catchments it has been assumed that there is not any surface water flow off the site in a 1 in 100 year ARI rainfall event, prior to development. A study completed by CSIRO (2009) found that the site is dominated by infiltration and there are no surface flows to or from the site.

To comply with the CoW Stormwater Guidelines and Better Urban Water Management (WAPC 2008a) guidelines, post-development catchment runoff should be managed to pre-development peak flow rates. Therefore, to maintain the pre-development 'no flow' condition of the site, the stormwater management strategy will incorporate:

- Stormwater harvesting and reuse (discussed in previous section).
- Infiltration of all excess stormwater runoff on site using a variety of Best Management infrastructure.
- Porous paving and soak wells.
- Swales and bio retention systems.
- Side entry, open based drainage pits and leaky pipes to increase infiltration throughout the drainage network.
- Infiltration basins and public open space.

Stormwater disposal using infiltration structures such as swales, soakwells and infiltration basins is considered to be suitable for this site due the permeable sandy soils of significant depth overlying limestone. There are a few areas where limestone is less than one metre below the surface (Douglas Partners, 2009). In these areas it is suggested that ripping the area to one metre below the base of infiltration structures should provide adequate drainage (Douglas Partners, 2009). Subsurface rock which is ripped must still drain to an area of sandy soil with an acceptable rate of infiltration and that ripping should not create a local perched water table

Figure 18 - Predevelopment Conceptual Site Drainage



13.7 SURFACE WATER QUANTITY AND MANAGEMENT

13.7.1 Stormwater Management In Road Reserves

It is proposed that stormwater runoff within road reserves will be collected via swales or conventional stormwater infrastructure depending on the steepness of the developed site and adjacent land uses. Where site conditions restrict the use of swales conventional stormwater structures will be utilised.

Swale systems will be used as infiltration systems for frequently occurring rainfall events. Bio-retention areas should not be used for conveyance of larger runoff events, as re-suspension of pollutants and erosion will become a problem. The conventional stormwater system will utilise open based gully pits and 'leaky' pipes to promote infiltration.

Swales and road reserve bio-retention systems will be installed (where applicable) in median strips on main roads and in road reserves adjacent to public open space, including the Green Link. Previous experience on developed sites incorporating Water Sensitive Urban Design has shown that swales adjacent to houses and side verges are prone to being filled in and altered by householders, creating flooding and maintenance issues. For these reasons, swales and rain gardens will not be planned adjacent to houses.

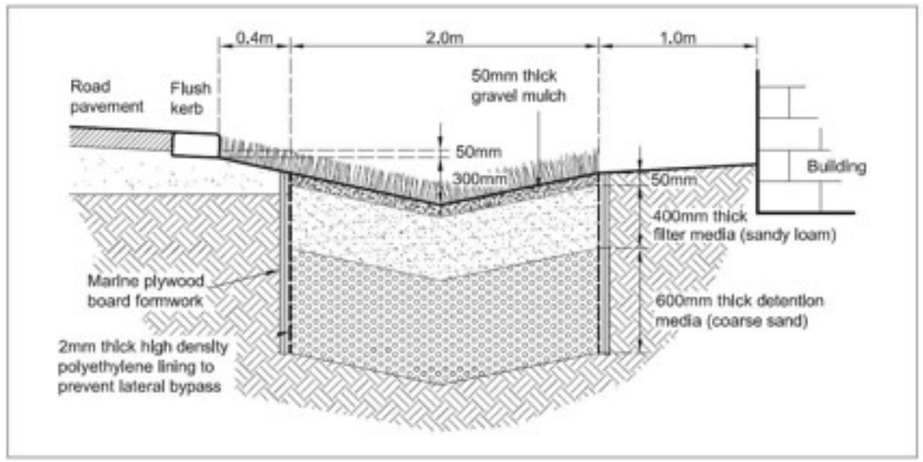
Swales and infiltration structures will generally contain native vegetation, although grass may be used on the edges of POS areas where this is more appropriate to development.

The potential of incorporating swales within the road reserves on the site may be limited in areas where there are steep grades. Swales are not usually suitable on very flat (less than 1%) or steep (exceeding 4%) grades (Engineers Australia, 2006). On slopes that are greater than 4% the velocities of the stormwater runoff increases causing scouring of the system. This can be overcome by constructing riffles at regular intervals to prevent scouring.

Another option in steep terrain is to design, intermittent bio-retention systems. Bio retention systems consist of an excavated basin or trench that is filled with porous media and planted with vegetation. Figure 21 shows a typical arrangement for a pervious bio-retention system. In areas where none of the previous options are suitable, conventional stormwater conveyance systems will be used. Road reserve widths are also a potential constraint for the use of swales and bio-retention systems.

Refer to Figure 19 - Typical liner arrangement for a pervious bio-retention system. In steep areas, if possible, flow may be diverted to flatter side roads where infiltration cells can be used.

Figure 19 - Typical Liner Arrangement for a Pervious Bio-retention System



Source: Department of Water - Stormwater Management Manual, 2007

The site will utilise open based drainage pits, where feasible to increase infiltration throughout the drainage network. Utilising 'leaky' pipe systems such as slotted pipes will also increase infiltration. Soakage pits or infiltration cells may be incorporated into road reserves where there is sufficient area and service alignments permit. The CoW has a preference for avoiding soakage pits in the road pavement due to maintenance and replacement issues (ENV Australia, 2009).

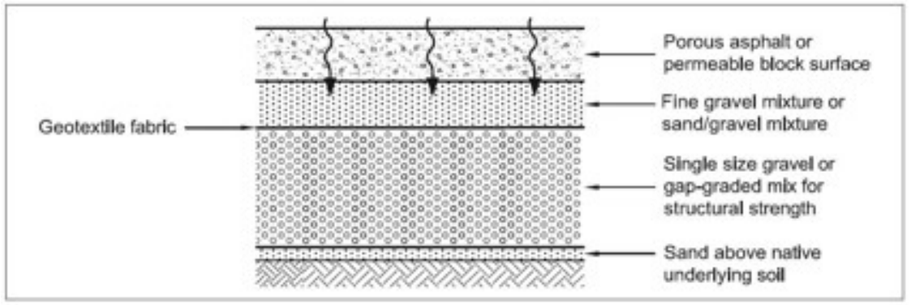
The use of permeable paving surfaces should be considered for parking areas and within public and commercial areas. (Refer to Figure 20 - Schematic of a section through pervious pavement).

Major flow paths will be provided along road reserves, including the Green Link, for the 1 in 100 year flow. Development should ensure finished floor levels are at a minimum of 500mm above the 100 year ARI event.

The permeability of soil underlying infiltration devices shall be geo-technically assessed at the UWMP stage to ensure that design infiltration rates can be achieved, especially where rock is present within 1.2 metres of the finished surface.

The incorporation of the above concepts into detailed design at the subdivision stage will significantly reduce the end of catchment drainage infrastructure required in the development.

Figure 20 - Schematic of a section through pervious pavement



Source: Department of Water - Stormwater Management Manual, 2007

13.7.2 Flood Management In Public Open Spaces

Public open space areas are commonly used in stormwater management systems to assist with the storage and infiltration of peak flow events. A preliminary assessment of potential storage volumes and areas required to store stormwater runoff within the proposed development has been made, based on the IDP contained in the LSP and the CoW basic criteria for preliminary stormwater drainage detention design.

The preliminary estimate of storage area required to store the 1 in 10 year ARI and 1 in 100 year ARI events are approximately 3.1 and 6.7 ha respectively. These figures do not take into account measures to reduce run-off volumes and enhance infiltration at source. As a consequence, the storage volumes and basin areas are likely to significantly overestimate the actual requirement.

Further detailed modelling is required to produce realistic volumes in the post development landscape, based on a finalised stormwater management system design. This will occur prior to subdivision as a component of UWMPs. The stormwater management system will need to be well interfaced with the public open space area, in order to ensure compliance with minimum area thresholds defined in Element 4 of Liveable Neighbourhoods (WAPC 2007).

An area of approximately 14 ha situated east of Marmion Avenue has been proposed as a conservation area. This remnant vegetation in this area is in relatively good condition compared with the majority of the study area. As a component of the protection of this vegetation, stormwater flows from adjacent developed areas will be prevented from entering this area.

Infiltration basins in POS areas should be designed and located to maximise the useability of the POS while maintaining acceptable depths of inundation. The basins will be designed so that the area that is inundated more frequently is limited and separated, preferably to the edge of the public open space. Infiltration areas will be vegetated with native vegetation and aesthetically blended into the surrounding landscape.

Soakwells or other similar structures may be placed under the more frequently inundated public open space areas to reduce the required infiltration area. These structures are recommended in public open space areas that are highly utilised for recreation to reduce 'nuisance' flooding.

13.7.3 Drainage Of Lots

The drainage from residential lots will be managed through soakwells or similar structures with overflow outlets (detention) installed. Porous pavements should be installed where applicable to increase infiltration at source and to minimise downstream stormwater run-off. The minimum setback distance from building footings for infiltration systems in sandy soils is 1.0 metre (Engineers Australia, 2006).

Consideration should be given to installing soakwells on lots (and informing potential owners) specifically for picking up driveway drainage or increasing the road design EIA by 10% to allow for driveway drainage to be picked up by road reserve drainage.

Rainwater tanks will be installed to harvest rainwater to decrease both the demand of water and reduce stormwater entering the street system (Refer to Section 5 of MWH Tamala Park Local Water Management Strategy). In addition, the viability of green roofing installations will be investigated, to provide for a delay in stormwater run-off and further re-use of water.

The stormwater management strategies for commercial lots will mimic those for residential areas, with the only difference being the opportunities to maximise reuse rain and stormwater in commercial precincts. Rainwater tanks will be grouped together in parks and/or under driveways where the tanks can be easily accessed for maintenance purposes.

Residents will be encouraged to be involved and contribute to stormwater management and reduce water and nutrient demand, through the provision of water wise garden education programs and demonstration housing showing examples of a water-sensitive urban on site.

13.7.4 Surface Water Quality

Stormwater quality will be maintained through the use of water quality treatment systems including swales, bio retention systems and infiltration basins to remove nutrients and sediments. Swales are used as both conveyance of runoff from larger storm events and infiltration system for frequently occurring rainfall events. The main advantages of vegetated swales are flow attenuation from frequent rainfall events and flow velocities are decreased, allowing heavier suspended solids to settle out.

Bio-retention systems can provide efficient treatment of stormwater through fine filtration, extended detention and biological uptake. Swales and bio-retention systems and other stormwater structures will be planted with appropriate native species to encourage nutrient and suspended solid removal prior to infiltration and not affect remnant bushland.

Gross pollutant traps will also be incorporated into the stormwater design prior to stormwater discharging to infiltration basins or POS. The purpose of gross pollutant traps is to reduce the load of gross pollutants and coarse sediments to receiving waters or downstream treatment methods. Through the implementation of non-structural systems (public education) the requirement for litter and sediment traps has been significantly reduced in recent years. However they are still recommended as a pre-treatment method to ensure downstream stormwater infrastructure can operate effectively. A higher percentage of gross pollutant traps may need to be incorporated into the designated commercial areas.

In accordance with the CoW Stormwater Guidelines all water quality and water sensitive urban structures must be designed in accordance with the Stormwater Management Manual for Western Australia (DoW, 2007) and Australian Runoff Quality: A Guide to Water Sensitive Urban Design (Engineers Australia, 2006).

13.8 IMPACT ON WATER DEPENDENT ECOSYSTEMS

Therefore, no impact on water dependant ecosystems from changing the on-site drainage regime is anticipated.

In order to eliminate any excess post-development stormwater runoff to surrounding native vegetation and bushland, flows should be diverted towards urban development using appropriate stormwater management techniques. This is critical for a small catchment area in the northwest (Figure 21 - Catchment A) corner of the site, where pre-development surface runoff may flow towards the Bush Forever site on the western boundary during large rainfall events.

13.9 GROUNDWATER MANAGEMENT STRATEGY

13.9.1 Groundwater Levels

The depth to groundwater is not considered to be a significant constraint to development in the study area, due to:

- the regional extent of the superficial aquifer.
- the significant depth to groundwater on site.
- the likely moderate to high regolith permeability within the superficial aquifer.

In accordance with the objective of zero net groundwater abstraction, the post-development groundwater levels are anticipated to be broadly equivalent to the pre-development condition.

13.9.2 Impact On Water Dependant Ecosystem

The results of the Geotechnical Investigation by Douglas Partners indicated that there is a limited possibility of subterranean fauna occurring in the study area (Syrinx, 2009). There are no recorded water dependant ecosystems such as wetlands or springs within one kilometre of the subject land.

13.9.3 Groundwater Abstraction

The subject land is located within the Quinn's sub-area superficial aquifer. Based on advice received by MWH from the Water Corporation on 3 June 2009, the sub-area is currently 95.84% allocated leaving 1,026,607 kL available for future licences. The Leederville and the Yarragadee subareas also encompass the study area but these are fully allocated (pers comm. Matthew Hatch, DoW).

The development may seek to draw a portion of the remaining allocation as water supply for POS. Applications would be subject to DoW approval, which would assess the likely environmental impacts of such abstraction. There may also be minor groundwater abstraction distributed across the site by private users for residential purposes.

13.9.4 Acid Sulphate Soils

As outlined in Section 3.2.1 there is low to no risk of acid sulphate soils occurring with the subject land. This is a consequence of the deep sand and limestone dominated soil profiles and depth to groundwater.

13.9.5 Contamination

The development is primarily residential and will not include any industrial activities. No activities associated with the development are expected to lead to groundwater contamination. As reported in Section 3.4 there is potential for the MRC Landfill Facility to impact groundwater within the study area and a separate study to assess this potential is in progress.

13.10 GROUNDWATER QUALITY MANAGEMENT

13.10.1 Imported Fill

CoW generic ground water management criteria recommend that where a perched water table exists or the predicted mean groundwater level (MGL) is at or within 1.2 metres of natural ground levels the importation of clean fill will be required to ensure that adequate separation of building floor slabs from groundwater is achieved. Due to the significant depth to groundwater over the site, the development will not trigger this requirement.

CoW groundwater management criteria also recommend that clean fill imported onto the site incorporates a band of material that will reduce phosphorous export via soil leaching, while also meeting specified soil permeability and specified soil compaction criteria. No importation of fill is anticipated as part of the development, therefore negating this requirement.

13.10.2 Public Drinking Water Source Area

This subject land is located within a Priority 3 (P3) Public Drinking Water Source Area (PDWSA) space. Land uses that are incompatible with a Priority 3 Public Drinking Water Source Area (PDWSA) will not be permitted in this development. These land uses are listed in Section 3.4.1.

13.10.3 Groundwater Quality

CoW groundwater management criteria state that water quality discharged to groundwater must be in accordance with the requirements of the DEC. It is proposed that no water will be discharged directly to groundwater as part of this development. Stormwater infiltration through soakwells or detention basins is unlikely to impact groundwater quality as stormwater quality is expected to be relatively fresh and a 15 to 40 metres vadose profile is available for sub-surface filtration. CoW groundwater management criteria recommend management of groundwater at predevelopment levels and if possible improvement of the quality of water leaving the development area to maintain and restore the ecological systems in the catchment. At present the property is dominated by infiltration and there are no surface water flows to or from the site. It proposed that there would be no surface water flows from the site post development.

13.10.4 Nutrient Management

Nutrient concentration entering groundwater will be reduced through the use of a mixture of structural and non-structural best management practices including:

- Soil amendments in all POS and landscaping packages to retain phosphorous and water.
- Swales, rain gardens and basins to be vegetated with native vegetation in frequently inundated areas and amended fill to strip nutrients prior to infiltration.
- Limiting the use of fertilizers in POS.
- Provision of education to householders on fertilise wise gardening through the household sustainability package, the display village and workshops such as Great Gardens workshops.

14.0 PUBLIC OPEN SPACE AND LANDSCAPING

14.1 PREAMBLE

The effective design and implementation of public spaces is critical to the success of any urban development. From a social perspective, public spaces represent the spatial mapping of social goods and services. It reflects the opportunities within a development to deliver quality living standards to its inhabitant's wellbeing. Of importance is the primary objective to create strong civic, public realms.

There is a growing global trend towards individual and non-time-based usage of public spaces. As work demands increases, people are becoming more 'time poor'. The increasing subscriptions to digital activities have also reduced the demand and attraction of team-based activities. People have become more insular, and more into personalised experiences. Public spaces will need to adapt to this change. A range of initiatives will need to be designed to create a flexible and robust foundation by which numerous programmes can be engaged over the short, medium and long-term cycle of the development.

Of significance is the connectivity of these spaces; the streetscape as a valid habitable space; and the relationship between public and private spaces to promote non-owner vehicular movement, and to ensure day-to-day movement is easy, equitable, and healthy.

These initiatives must also recognise the importance of human scale: in its tactility and experience to the physical and visual world around it. Such qualities will become invaluable assets – places and reasons for public assembly, habitation and investment.

Active and Passive Public Open Space (POS) areas within the Tamala Park LSP have been estimated through measurements made from the IDP attached at Appendix 14. The exact sizing of POS areas in the IDP has not been reflected in the LSP Map. Instead, indicative sizing and locations have been included in the LSP Map. The proposed conservation reserves are identified in the LSP Map and must be provided in Dip's that are prepared following adoption of the LSP.

Within a larger context, Tamala Park has access to nature reserves, active sporting reserves and community facilities, which have been previously established to service surrounding suburbs. Strategic development of POS along with appropriate community facilities within Tamala Park will assist in addressing the recreational needs of the local community and potentially even the wider community.

Locations of POS have been selected to most effectively allow residents to access recreational areas within a walk able distance from their homes. The distribution and location of POS in the LSP has been informed by a range of planning principles based upon a transit orientated development, amenity requirements for residential and urban nodes, as well as environmental opportunities including:

- Locations of priority flora;
- Significant trees, which provide for fauna habitat and/or have a high amenity value;
- Existing topography and landform.

Landscaping of POS and all public realms will be required to conform with the sustainability objectives of the LSP such as water sensitive urban design, integration of biodiversity into the urban fabric, public amenity and recreational needs of the community.

There are several Bush Forever sites surrounding the Tamala Park Development and a primary objective of the Development is to achieve comprehensive, adequate protection of these adjoining areas. Therefore, the ability to maintain the ecological viability of the vegetation communities present is a high priority and will require the development to respect bushland areas, which have become increasingly vulnerable to urban developments. For example, all urban edges to the Tamala Park Development will be designed to minimise any future 'edge effects', which have long-term impacts on the health of bushland.

14.2 PROTECTION OF URBAN BUSHLAND AREAS

14.2.1 Bush Forever Site 322

Surrounding Precinct 1 of Tamala Park is the Bush Forever Site 322, located next to the coast. Appropriate measures will be required to create an adequate barrier to reduce impact to the edge of the bushland. Visitor access will be controlled through formalised openings leading to designated tracks through the bush as well as to the beach.

The following will be considered to further improve access and the preservation of bushland as much as possible:

- Provision of information signage to keep visitors on designated pathways;
- Interpretive signage will also be appropriate to include as part of a trail to educate users;
- Adequate fencing and balustrades along pathways;
- Maintenance plans to ensure pathways remains safe and easy to use;
- Revegetation / enhancement where required; and
- Drainage from roads should be designed to flow away from the Bush Forever site.
- Education, awareness and restrictions on domestic pets and other non-native animals.
- Education and awareness pertaining to litter and human introduction of weeds and exotic species into Bush Forever sites.
- Interpretation signage and lookouts exploring the range of flora, fauna, and other environmental and historical values of the area.

14.2.2 Neerabup National Park and Bush Forever Site 386

Neerabup National Park is located east of the Tamala Park Development and forms the eastern end of the biodiversity link, which the development seeks to protect. Although there is no formal access or physical connection to the Park from the Tamala Park Development, the biodiversity link will need to be maintained. This can be done through the use of plant species found in Neerabup National Park in the landscaping within the development.

14.2.3 Tamala Park Waste Management Facility and Bush Forever Site 323

Containing a significant part of the biodiversity link between Neerabup National Park and the coast, the northern edge of the Tamala Park Waste Management Facility will be retained and revegetated in order to provide this linkage.

14.3 CULTURAL HERITAGE

The preservation of the Mindarie Waughal strengthens the biodiversity link between the coastal reserve and Neerabup National Park. This parabolic dune ridge formation is located south of Tamala Park and bears Aboriginal significance as a mythological site as it forms part of the Waughal Dreaming Track and thus has the potential for interpretation and education in cultural heritage.

Access to Mt. Tamala from the Tamala Park Development site will be limited to the existing path currently used as part of the operation of the MRC Site. Revegetation along the northern edge of the Mindarie Waughal site will be required in the areas degraded by the waste management facility.

14.4 MOUNT TAMALA

Projected to reaching a future high point of RL 56 metres in 2032, Mt Tamala will be visually prominent in its surrounds. This characteristic will mean that Mt. Tamala is suitable for supporting functions and activities that can help create a sense of community ownership and pride. There is currently a lack of clarity in future planning for Mt. Tamala, however potential exists for the site to include:

- Passive and active recreation.
- Educational / Community facility.
- Energy generation facility through renewable source collection such as solar and wind.

Access to Mt. Tamala through the Mindarie Waughal site from the Tamala Park Development will be limited to the existing roadway currently used by the Waste Management Facility.

14.5 COMMUNITY STEWARDSHIP OF BIODIVERSITY AREAS

Local engagement in bushland conservation is imperative in cultivating an ownership and responsibility of the individual for the environment. Community and bush care groups are often useful avenues to educate the community, and locally organised activities involving residents such as weed control, planting and monitoring can help contribute to the long term sustainability of bush land areas but also contribute to the long term health, lifestyles and attitudes of residents and the wider community.

Educational and training groups can also be involved in maintenance and revegetation projects in these areas. All of the above activities will require the assistance from the CoW environmental officers and ground staff.

14.6 PUBLIC OPEN SPACE PROVISION

As a demonstration development, POS within the Tamala Park Development will include well - utilised areas that are purposeful, easily accessible and connected to a network of pedestrian and cycle paths. Existing areas of excellent quality native bushland, significant trees and priority flora, which require conservation, drive locations of POS. Considered integration of these identified areas of conservation will be expected throughout the development to minimise environmental impact.

Table 17 – POS Schedule is included below and indicates that the IDP would comply with the minimum 10% POS provision required by the WAPC's DC Policy 2.3 – Public Open Space in Residential Areas.

Table 17 – POS Schedule

		Area (ha)	Area (ha)	Area (ha)
A	Gross Area		178.2317	
B	Less Reserves			
	Bush Forever Bushland Reserve	27.9208 11.5784		
C	Net Site Area			138.7325
	Deductions Primary School	 3.5		
	Activity Centres and Commercial Development	3.8692		
	Total			7.3692
E	Gross Subdivisible Area (GSA)			131.3633
F	Public Open Space (POS) (10% GSA) Required			13.13633
H	Minimum 80% Unrestricted POS	10.509064		
I	Maximum 20% Restricted POS	2.627266		
J	Total POS Required (H+I)			13.13633
K	POS Contribution – IDP (Passive / Active Recreation)			18.8753
	Green Link	4,1328		
	Local Parks (up to 3000m2)	1.3827		
	Neighbourhood Parks (3000m2 – 5000m2 or larger)	6.803		
	District Parks (2.5 – 7 ha)	6.5568		
	Total			18.8753

The drainage allocation for each precinct is to be determined at the detailed area planning stage through the preparation of Urban Water Management Plans (UWMP's). It is demonstrated however, that the POS yield and distribution satisfies Liveable Neighbourhoods 4 requirements in terms of the yield of POS.

As described previously in Section 13.7.2, the infiltration basins should always be referred to, and designed as a series of treatment swales and wetlands. These slaws and wetlands should be located and designed into the landscape to maximise the usability and functionality of the public open space while maintaining acceptable depths of detention and inundation. The treatment wetland should be designed so that the area inundated more frequently is limited and separated, preferably to the edge of the public open space. This area will be vegetated with native vegetation.

The preliminary estimate of storage area required to store the 1 in 10 year ARI and 1 in 100 year ARI events are approximately 3.1 and 6.7 ha respectively. These figures do not take into account measures to reduce run-off volumes and enhance infiltration at source. As a consequence, the storage volumes and basin areas are likely to significantly overestimate the actual requirement. Further detailed modelling is required to produce realistic volumes in the post development landscape, based on a finalised stormwater management system design. This will occur prior to subdivision as a component of UWMPs. The stormwater management system will need to be well interfaced with the POS, in order to ensure compliance with minimum area thresholds defined in Element 4 of Liveable Neighbourhoods (WAPC 2007).

14.6.1 Biodiversity Conservation Areas

The conservation area situated east of Marmion Avenue is the largest area of POS at approximately 12 hectares. It is primarily set aside for the conservation of high quality bushland and some priority flora (see Environmental Management Plan). This area will be utilized almost entirely for passive recreation and will require the following protective measures:

- Limit the number of internal pathways through undisturbed bush.
- All pathways to have minimal physical impact and adequate balustrades.
- Adequate information signage to keep visitors on designated paths; and
- Drainage from all adjoining roadways to flow away from conservation areas.

14.6.2 Active Recreation

Provision has been made for a playing oval adjoining the primary school within the LSP. As previously described in Section 10, this will be the primary active space for the Tamala Park Development. A school site of 7.26 hectares in area is provided. This will accommodate a large primary school on a site in the order of five hectares along with other shared use facilities. While the Community Facilities Strategy prepared by Creating Communities identifies the need for a four ha school site, the LSP provides for a four ha school site in order to provide for flexibility in both design and to meet future demand.

Shared active recreational spaces are to be provided on the land, including a senior size AFL football oval in addition to a soccer field or potentially tennis courts being provided. It is noted that sharing the playing fields as a district facility would allow the size of the primary school site to be reduced to 3.5 hectares as per Liveable Neighbourhoods 4 however the LSP does not propose this given that the ultimate demand for school facilities is unknown at this time.

Secondary active spaces generally include neighbourhood parks. These should accommodate informal sporting and other health and fitness activities. Though secondary in classification, these parks provide essential lifestyle amenities. Their designs should be maintain a benchmark in landscape architectural excellence. Usability and functionality should be a priority in the design of public parks. As such, ornamental parks, or 'look-at' parks are not desired. Endemic species should be utilised to maintain the environmental sustainability values of the Development, and avoid the concept of 'dry parks'. These areas will typically incorporate the following:

- Integrate existing significant trees and under storey with grassed areas;
- Use of endemic species in planting for water management purposes where possible;
- Inclusion of adequate shade through appropriate deciduous tree species where required;

- Provision of essential public | community amenities such as play equipment, quality landscapes, sheltered picnic facilities and urban furniture;
- Provide soft-surface pathway on the outer perimeter of all major POS;
- Align entry points to POS with road intersections, apartment entries and anticipated pedestrian movements; and
- Incorporate walking and cycling links to connect public parks throughout the development, and facilitate in particular the between Neerabup National Park and the coast.

14.6.3 The Green Link

The Green Link will be the main spine of the Tamala Park Development that services the development between Clarkson Train Station and the coast. It will provide for a dedicated public transport route and linked activity nodes as well as pedestrian and cyclist traffic. Hinged upon this spine will be a primary school, higher density mixed use areas, convenience shops, sporting clubs, low and higher density residential development and activated landscaped streets leading to neighbourhood parks.

The spine will include, but not be limited, to offering the following features:

- Maximising the journey experience for commuters along the Green Link.
- Incorporating different levels of vegetative structure along the link, including tall trees, shrubs and undergrowth.
- The application of Water Sensitive Urban Design (WSUD) features throughout to aid in managing storm water; and
- Landscaping and interpretive signage to create visual interest and understanding of the purpose of the Green Link.
- Landscaped streetscaping to include quality urban furniture such as a variety of seating, bins, bicycle racks, and shade. Artwork can be stand alone, or incorporated into the urban furniture palette to promote a sense of identity for the Green Link.

14.6.4 Passive Recreation

Passive recreation for Tamala Park include a combination of dedicated activity spaces and conserved bushland. This will provide a variety of recreational experiences suitable for all ages and community groups. Within bushland areas, low-impact activities compatible with preserving the existing natural assets should be encouraged. The conservation areas often run along the higher topographical features of the development. This provides ideal interpretive and passive activities such as lookout nodes; connecting to the greater recreation network around it. An Environmental management Plan for Tamala Park is available.

Regarding other passive recreation spaces, especially those adjoining residential and community facilities, a range of initiatives and spaces should be provided including:

- Provision of different public spaces of different sizes. This allows for a variety of uses and community ownerships or 'domain control'. Certain spaces can lend itself to the 'lunch-time' crowd, whilst other spaces are more focussed on families or extension of alfresco areas.
- Provision of 'pocket parks': public spaces adjoining apartment blocks for 'domain control', or territorial reinforcement. These parks are publicly owned, but by creating a strong link to adjoining residential development, it encourages ownership in terms of usage, and CPTED by the local community. Such ownership can launch community action groups and events, thereby strengthening the community at large.
- Provision of essential public | community amenities such as high-end designed play equipment, quality landscapes, sheltered picnic facilities and urban furniture including a landscape 'package' of seating and shade.
- Reduce buffer and commuter landscapes and replace with activated and 'directional' landscapes.
- Connectivity between POS and place activation nodes through dedicated landscape 'spines'.
- Retention of foreshore as public domain.
- Align entry points to POS with road intersections, apartment entries and anticipated pedestrian movements.

- Provide soft-surface pathway on the outer perimeter of all major POS; new and existing.
- Consolidation of a comprehensive interpretation strategy that includes environmental, historical and cultural.
- Incorporation of educational programmes in the public domain.

14.6.5 Interpretation

'Interpretation makes an essential contribution to the conservation of Australia's natural, social and cultural heritage by raising public awareness and creating opportunities for understanding, appreciation and enjoyment.' Interpretation Australia Association

Given the conditions of Tamala Park and its connection with adjoining urban bush land, an interpretive walk trail network which allows users to be educated with a wide cross section of the natural and cultural aspects specific to the area will be incorporated into appropriate areas. Maintaining an ongoing exposure of interpretive signage through biodiversity areas, the walk trails can also be continued and integrated into the urban development context.

14.6.6 Community Stewardship of POS

In Tamala Park, the resident community will be encouraged to take an active role in caring for the urban bush land and open spaces, It is intended that facilities will be provided within appropriate POS for purposes such as community gardens and small scaled native plant nurseries to propagate seedlings which in turn encourage biodiversity throughout the development.

Soils in the Precinct 4 and Precinct 3 are better suited for these purposes, and for reasons such as surveillance and accessibility these common areas will benefit from being associated with community centres. These types of public spaces should be in close proximity with the proposed primary school in order to expose the younger generation to a healthy lifestyle. Higher density residential areas will also benefit when common spaces are utilised for purposes such as food production, creating a sense of place and community. These areas will be well connected to walking and cycling networks and accessible to all residents.

Local friends groups and management groups will also be able to get involved in organising events around the development such as walks and tours, inviting the participation of local volunteers. Authorities and community groups will promote community involvement in the planning and management of such POS to ensure these activities can be sustained in the long term.

14.7 PUBLIC DOMAIN

14.7.1 Biodiversity

Environments that enhance personal well-being and enjoyment are more likely to be valued and more utilised. Thus there is reason for biodiversity to be integrated into the urban realm as it will contribute into the success and activation of public spaces. Provision for biodiversity in the urban realm allows for plant diversity to be displayed, creating visual interest and appeal for people to engage with the urban environment. Biodiversity in the public domain also encourages fauna habitation, increasing the chance for ecosystems to establish in what has been preserved.

Areas throughout Tamala Park have identified to be retained for their habitat, landscape and amenity value, and areas of parkland have been located or identified in the LSP to include such areas. The following initiatives will ensure that biodiversity is protected and supported in Tamala Park Development:

- Establishment of lost vegetation populations such as Jacksonia sericea and Hibbertia spicata to increase biodiversity.
- Integrate and maintain significant trees and vegetation to minimise impact to the habitats of Carnaby's Black Cockatoo and the Graceful Sunmoth, both endangered species found to utilise areas of Tamala Park. Such trees and vegetation can be integrated into public parks and urban landscapes in ways that contribute to local character while respecting the local ecosystems; and
- Where non-native species are required for reasons such as shade provision, it should not threaten the health of conservation areas and surrounding ecosystems.

14.7.2 Streetscapes

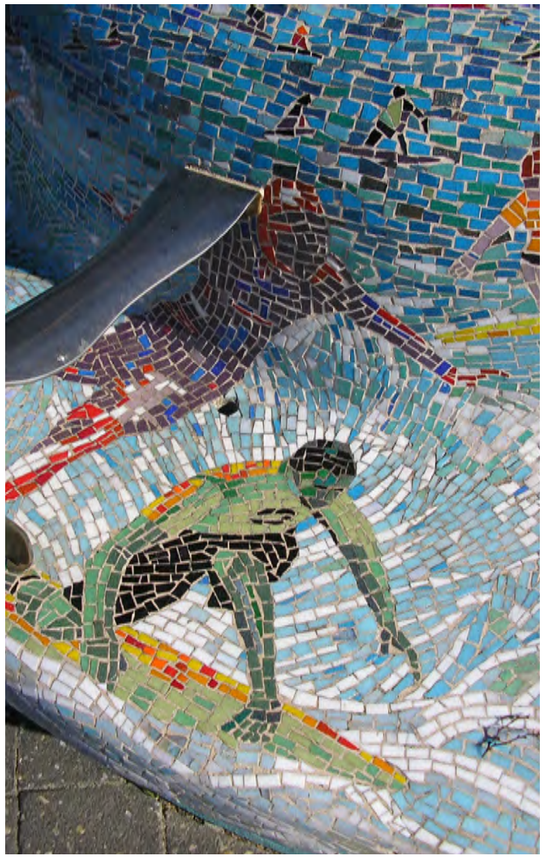
Streetscapes in Tamala Park Development will reflect the development's aspirations to sustain liveable and vibrant neighbourhoods. Streets are valuable platforms that can be designed to do more than adequately support everyday thoroughfare, but to be flexible enough to accommodate for various community activities and neighbourhood events.

Streetscapes in the Tamala Park Development will ensure adequate connectivity between public spaces and will prioritise pedestrian and cyclist comfort and safety. In achieving this, the following will be required:

- Provide adequate social amenities such as urban furniture and shade.
- Balance between soft and hard landscaping.
- Use of endemic species in planting for water management purposes where possible.
- Compliance of tree planting, general street vegetation, and grades to the Local Water Management Strategy and the CoW Street Tree Masterplan.
- If non-native species are to be used for reasons such as shade provision, a selection will be made of those species which best suit the environment and have least environmental impact, for example, species which do not produce much leaf litter, do not spread easily (low weed risk), have a shallow root system and have low water consumption.
- Incorporation of public artwork, interpretation and other relevant educational programmes in the public domain; and
- Integrate appropriate Water Sensitive Urban Designs (WSUD's).

14.7.3 Public Art

A public art strategy will be developed in conjunction with the landscape and interpretation strategies to ensure a coherent integration into the public realm. Public artwork should relate directly to its surroundings in scale and theme and the selection and design of public artwork resonate with the broader spectrum of residents and visitors anticipated in the development.



Landscape Designs

14.8 LANDSCAPE DESIGN

14.8.1 Landscape Vision

The landscapes of Tamala Park will demonstrate landscape architectural excellence, and be reflective of the innovation incorporated into the development. It will showcase sustainable practices and principles in landscape architectural design. It will be a synthesis of environmental responsibility, urban design excellence, and engineering feasibility. Public spaces will maximise economic opportunity and drive public ownership and stewardship. Spaces will foster equitable access, and promote community fitness and wellbeing.

14.8.2 Landscape Objectives and Strategies

'The principle landscape objective for Tamala Park is to ensure the development's landscapes will significantly enhance the recreational use of the area whilst respecting the intrinsic values and sensitivities of the site and its environs.

Complementary to this are the following:

- Provide a comprehensive and unified recreational experience of national standard and quality.
- Creating a sense of place distinctive to the area, through an integration of landscaping, built form and environmental considerations.
- Promoting public appreciation and awareness of the historical, cultural, and environmental significance of the area and the surrounding landscape.
- Facilitating a range of activities and events for individuals and groups.

The natural environment is considered to be a valuable community asset, for current and future generations and in Tamala Park there will be a strong emphasis on landscape design that respects the endemic conditions of the area. Landscape design for the Tamala Park Development will draw upon a thorough understanding of the environmental conditions, principles of social sustainability and relationships of natural reserves and urban developments in the greater context.

A concise and intimate understanding of environmental opportunities and constraints will allow a strategic network of pathways throughout the development to provide the accessibility the community needs to not only encourage non-vehicular day to day journeys but at the same time providing varying experiences of the natural surroundings. Public spaces, streets and road reserves will incorporate trees and bush land areas that are retained for fauna feeding ground and habitat, while planted areas will include endemic species which will strengthen the local ecosystem.

Landscape strategies for Tamala Park will include the following:

- Provide a materials and furniture palette that of quality: in construction; robustness, and ease of maintenance.
- An urban furniture palette that can also be playful, engaging, and formed from public art.
- Minimise hard landscaping where possible, and promote alternative surfaces to reduce surface run-off and urban heat mass.
- Design appropriate widths for pathways that can accommodate a range of activities.
- Design pathways that engage open spaces and key elements of the public domain.
- Minimise and activate 'dead' landscape elements and spaces such as service facilities, barrier walling, buffer landscaping, perimeter landscaping, and green infrastructure.
- Design pathways that promote 'fit-for-purpose' e.g. synthetic or soft-surface pathways or running and multi-purpose exercise tracks.
- Integration of endemic and local species in public and private open spaces including the establishment of lost vegetation populations e.g. Jacksonia sericea and Hibbertia spicata to increase biodiversity.
- Provide a landscaped interface between bushland and constructed spaces.
- Incorporation of interpretation and public art throughout the public domain.
- Creation of a cohesive environment that is visually stimulating and accommodating for natural transitions between various day to day activities.

- Connectivity between place activation nodes and public parks and domains through landscaped streets that provides for pedestrian and cyclists where possible.
- Harness climatic conditions of the area and ameliorate physical conditions and microclimate all public spaces.
- Minimise buffer landscapes and replace with activated and 'directional' landscapes.
- All revegetation and landscaping occuring during or after development, appropriate plant will need to be selected by identifying species that naturally occur at particular topographical locations. This is to ensure success in revegetation and to allow for habitat creation and water wise gardens.
- Use of renewable resources in the construction of landscape design.
- On-site management of stormwater runoff in the form of swales to meet best practice standards and achieve end use objectives and aesthetic aspirations.
- Incorporation of WSUD principles such as bio-retention swales into streetscapes, allowing for water filtering and harvesting, aesthetics and habitat for endemic fauna. Water tanks will be grouped together in parks and/or under driveways where the tanks can be easily accessed for maintenance purposes.

14.8.3 Landscape Themes

Instead of viewing the natural environment as a limitation to development, the landscape principles and thematics for Tamala Park has embraced and promoted the environment as key assets. As such, landscape themes for each precinct have provided a contemporary interpretation of the natural characteristics and values of each area. The synthesis between the built and natural environments will provide the development with a greater appreciation and understanding of local ecologies, and the importance of our environment within the public domain.

The landscape of the site lends itself to the creation of a diverse range of urban characters allowing for the formation of neighbourhoods, each with its own identity. Each theme is derived and finds inspiration from the remnant vegetation on site and follows the natural extent of vegetation communities on site in congruence with the soil types and landforms of the area.

Design guidelines will provide for ways to landscape gardens to support the overall theme and continue to provide suitable fauna habitat, as it is the case for the endangered Carnaby's Black Cockatoo and the Graceful Sunmoth.

Precinct 1

Precinct 1 will emulate the natural growth behaviour in the surrounding coastal area, and in this coastal area it is recommended that local shrubs, herbs and mallees are used in grouped plantings.

Planting in streetscapes and between residences will continue the 'coastal bushland' theme, with a blend of open-habit at low shrubs and groundcovers forming the under-storey and an overhead canopy of endemic tree species.

Due to the shallow depth of the soils in the area it would be difficult to propagate any exotics or large trees beyond the few small patches where the Spearwood complex sands are located. Wind exposure and salt spray also make many commonly used tree species unsuitable for the site and in this respect the native vegetation of the area is stunted, forming heath-lands in order to cope with this environmental factor.

Precincts 2 and 3

The remnant bushland at the western boundary of Precinct 2 set aside for conservation and recreation holds potential of being highly valued in the community. Generally, precincts 2 and 3 are suited to accommodating a transitional, diverse landscape due to a varying topography, from a woodland environment near Connolly Drive to one of a coastal theme in the conservation area and beyond, gradually emulating natural changes in vegetation structure.

Small shrubs and tall grass trees will make way for taller trees as the soil depth to limestone increases. Species such as Allocasuarina fraseriana and Banksia can be planted towards the centre of the site making transition into Eucalyptus woodland towards Connolly Drive. It is imperative to take into consideration existing trees on site E. todtiana and Banksia attenuata and incorporate as many of these trees as possible to retain the vertical aspect that is endemic to the landscape, as most new plants would take a very long time to grow into a similar height in the conditions present on site. Approaching Connolly




Drive across these precincts, larger species of trees such as Eucalyptus gomphocephala (Tuart) can be found. These will also be kept not only for their habitat but also amenity and cultural value.

Trees deemed safe would be retained, while others will be replaced with new trees of the same species. WSUD features such as rain gardens and storm water treatment swales will also be incorporated in the landscaping of this area.

Linking the Waughal site with the development through planting native vegetation significant to local Noongar people will also be beneficial in contributing to the preservation and education of the local indigenous culture.

Precinct 4

The depth of soil in this area lends itself to the possibility of creating the feeling of an urban forest. Endemic Eucalyptus species are suitable to be propagated further to create shady avenues while existing trees can be kept on road verges, reserves as part of public parks or even within private development sites. As this area contains a higher number of mixed use lots and is in closer proximity to Clarkson Train Station, it is likely to be supporting higher pedestrian and cyclist traffic hence more focus will be required to create a safe and pleasant area to commute through. There are possibilities of small stormwater treatment wetlands to include sedge species found in the nearby Neerabup National Park to be incorporated as part of public parks.

Another matter that may influence Precinct 4 is the bushfire management strategy that is recommended in the EMP. Plant species and landscape materials will be selected in relation to their fire retardant properties and management capabilities.

14.8.4 Private Open Space and Landscaping

Private landscaping throughout the Tamala Park Development will incorporate native species, with particular emphasis on local endemic species. Careful consideration will be given to climatic factors and environmental conditions before any plant species is chosen for all private landscaping. The following areas will need to be considered.

Use of endemic species and water-wise vegetation will be encouraged throughout the development, and the use any species with detrimental effects on the biodiversity will be restricted;

Responsible gardening practices in future Design Guidelines to include responsible gardening practices, for example, using non-invasive species to box-out and minimise spread of exotic species; use of low nutrient species and bio-grade nutrients to reduce nutrient impact on site; composting to be mandated on all lots; responsible collection and disposal garden waste.

15.0 RESOURCE EFFICIENCY

15.1 ENERGY

The Tamala Park Development can be an example of best practice energy management for metropolitan development in Western Australia. A number of initiatives have been incorporated into the LSP and will be further developed through future planning and development stages.

A Local Energy Management Strategy will be developed by the TPRC to co-ordinate energy use and production balances for Tamala Park and the MRC Site. The strategy will investigate a range of technology options including geothermal energy technology as well as those outlined below as options for Tamala Park. The initiatives and technologies determined by the strategy will be implemented in the future detailed area plans and design guidelines for Tamala Park.

15.2 DEMAND MANAGEMENT

The primary principle for efficient use of energy is demand management. A number of measures will be implemented through the development process.

Public realm infrastructure will be designed to best practice standards. For example energy efficient street lighting will employ energy efficient lighting technology such as 'LED' to minimise energy requirements.

Developments and buildings will be designed to maximise passive design and energy-use efficiency. The design requirements will be specific to the site and building typologies and be documented in the detailed area plans and design guidelines documents.

Developments and buildings will commit to a maximum energy use based on best practice benchmarks at the time of design and construction.

15.3 RENEWABLE ENERGY PRODUCTION

A range of initiatives for renewable energy production is being developed for implementation at Tamala Park and will be incorporated into the development stages.

Solar energy will be harvested through the installation of a centralised 'solar concentrator' or similar technology on the northern slopes of the 'Mt Tamala' constructed landform within the MRC site. The power generated will be utilised within Tamala Park for projects such as LED lighting and street signage systems, and potentially a small electric dedicated public transport service for people and goods movement along the central Green Link.

Key development sites within the LSP area will be required to install a minimum capacity of photovoltaic solar panels to create a '2.5 hectare solar roof grid' within the Tamala Park Development area. The distribution of solar collection panels will be determined by the Energy Management Strategy and documented in the future detailed area plans and design guidelines.

All developments will maximise energy production through renewable sources applicable to the site, land-use and development typology. Examples of renewable energy technologies are solar water heaters, photovoltaic panels, wind turbines and the renewable energy buyback scheme.

Net power demand will be minimised through district heating/cooling options such as active cogeneration technologies or shallow bore geothermal energy wherever feasible.

15.4 PASSIVE DESIGN

Passive design for buildings will be encouraged and mandated wherever possible at Tamala Park. The topography across the Tamala Park Development area allows for good wind and solar access to all development if appropriate design measures are utilised. Buildings should utilise solar benefits focussed on daytime living and working areas, and cross ventilation by optimising window design and placement based on local wind patterns.

The LSP has been designed to maximise the potential for good building orientation by aligning almost all roads and therefore the majority of lots throughout the site between the orientation limits N20degW and N30degE.

To ensure that the advantages of the passive design potential at Tamala Park are realised. Solar access requirements will be incorporated within design guidelines for all developments:

- Climate data will be sourced and analysed in conjunction with the other physical parameters of development sites to optimise the bioclimatic design in all development. Tools such as bioclimatic charts, as well as 3D modelling software can

be employed to design for solar access, passive ventilation, climate control and energy efficiency in buildings.

- Housing developments will allow for Solar Access Zones (SAZ) within the lot boundary. These requirements ensure that critical areas within the lots remain un-built allowing solar penetration into the built form.
- Multi-residential and commercial developments will need to need to demonstrate that there is adequate direct solar and light penetration into the building fabric, and that overshadowing of the public domain and adjacent lots is minimised to within acceptable standards.
- Where the development lots are outside of optimum orientation ranges or other design constraints, solar and wind access to lots will be improved through the rotation and optimised placement of buildings on the lot ensuring good access to the lot in question and neighbouring properties.

15.5 WASTE AND MATERIALS

The planning at Tamala Park will implement wherever possible the approach that wastes is a resource and ensure that recycling strategies, waste reduction and sustainable procurement processes (using a life cycle approach) are integral to the wider development objectives. Tamala Park will demonstrate a best practice approach to waste minimisation throughout development and in occupancy stages.

The TPRC will engage the MRC or another qualified consultant to prepare a Local Waste Management Plan for Tamala Park providing for the integration of on-site re-use of domestic waste into residential design and the on-site recovery and recycling of building waste. The waste management plans will investigate the following initiatives at a minimum:

- The integration of Tamala Park waste management with the Mindarie / Regional Biodigestor or the incorporation of decentralised bio-digesters and/or composting facilities within the urban fabric
- Compatible land uses to optimise onsite waste reuse at Tamala Park and the MRC site, such as the utilisation of organic waste for compost in community gardens.
- All civil works operations during forward works will utilise excavated material from MRC site in construction where possible.
- The authority will promote occupancy awareness of waste generation and encourage recycling, composting and waste reduction through the provision of appropriate facilities and information to contractors, developers and occupants at all stages of development.

The authority will provide the following services at Tamala Park as a minimum:

- The incorporation of separable waste bins throughout the public domain.
- Community recycling facilities for solid and organic waste.

Contractors, developers and occupants will be encouraged to:

- Recycle construction and demolition materials and reduce the amount of waste being dispatched to landfill.
- Reuse excavated materials for building on site wherever possible
- Use appropriate building materials to reduce the production of waste in the development phase.

15.6 TRANSPORT

Transport is a major factor in total resource demand and greenhouse gas emissions for any development, and will therefore be managed to achieve best practice at Tamala Park.

Transit Oriented Development (TOD) as an approach has been and will continue to be integrated to all stages of the development. TOD planning is demonstrated by the regional planning document Network City: Community Planning for Perth and Peel, which, along with examples of international best practice have been applied to the Tamala Park LSP in formulating transport requirements and solutions.

Generally the reliance on individual car-use by residents will be discouraged and the provision of public transport and utilisation of other alternative modes of transport to fulfil community requirements will be encouraged.

Cycling and walking are encouraged through the integration of pathways and facilities with the road network and location of land-uses such as schools and neighbourhood centres.

A 'small electric tramway' or similar transport facility may be developed by the Authority through the Green Link, linking the Clarkson Rail Station through the site to the foreshore reserve at the western edge of development.

15.7 DENSITY

Density is an integral factor for the sustainability of urban development. While the floor space ratios and allowable building envelopes may increase building fabric in an area, the number of dwellings and therefore number of habitants is a key determinant for the environmental impact and ecological footprint per person for that area.

15.8 SUSTAINABILITY RATING OF DEVELOPMENTS

The use of sustainability ratings tools can ensure a consistent standard of development is being proposed, evaluate the development once built and monitor performance relative to appropriate benchmarks. The choice of tools depends on scale of development, land use, and building size.

All developments at Tamala Park will be required to adopt building sustainability rating tools at the design guideline preparation stage and will be encouraged to monitor performance post construction. The CoW currently requires that all relevant tools may include Homesmart, Green Star, Nabers or other equivalent and more appropriate rating systems, but will be benchmarked against and should achieve the Australian best practice for the type of development proposed. All development will be required to satisfy the City of Wanneroo Smart Growth Tool requirements as per current planning legislation.

15.8.1 Adaptability of Infrastructure

All buildings and urban infrastructure can be made more efficient by including design criteria for their re-use or adaptation as may be required through the life cycle. The following initiatives will be implemented at Tamala Park to optimise the use of infrastructure and assets:

- Incorporation of land banking into the staging plan. By zoning land for a low density/low impact use in the immediate stages to be (re)developed as high density/high value use in later stages of development when land values have risen, key parts of the development can be maximised for density and economic yield.
- Longevity and adaptability of all buildings and infrastructure will be encouraged, for example multi-purpose community facilities will be built so that they provide greater flexibility and adaptability to changing community needs, and a proportion of dwellings within residential developments will be constructed to comply with AS4299 – Adaptable Housing.
- By incorporating a long term staging plan into the development of Tamala Park, the services and infrastructure network within Tamala Park will be capable of accommodating and embracing significant new technologies, such as black-water recycling, the provision of optical fibre to all development and an appropriately scaled electrical grid and connection (amelioration of infrastructure).

16.0 MOVEMENT NETWORK

16.1 PREAMBLE

The LSP area lies directly to the south of Neerabup Road, west of the future Mitchell Freeway reserve. Both Marmion Avenue and Connolly Drive run north south through the LSP area, splitting it into three distinct precincts. The TPRC has made its intentions clear through the LSP, that the proposed development is to be a best practice urban development that sets a new benchmark for future proposals in the north-west corridor. The LSP will implement key sustainability initiatives with the integration of transport infrastructure and the movement network, providing a holistic solution for the development of a strong and well-connected community.

16.2 EXISTING SITUATION

Major roads, being Connolly Drive and Marmion Avenue, bind both the central and eastern cells within the LSP. These cells will be accessed via new intersections from these roads. The western cell, however, abuts directly onto existing residential development south of Anchorage Drive, with possible connections to three existing residential streets to the north of the cell.

Both Marmion Avenue and Connolly Drive are four lane divided roads, while Neerabup Road is a two lane divided road between Marmion Avenue and Key Largo Drive and from Key Largo Drive to Connolly Drive it is a two lane undivided road. Marmion Avenue currently carries approximately 34,000 vehicles per day south of Neerabup Road, while Connolly Drive carries in the order of 20,800 vehicles per day. Neerabup Road carries approximately 10,000 vehicles per day.

Public transport in the vicinity of the LSP area includes the Clarkson Train Station, just north of Neerabup Road adjacent to the future Mitchell Freeway alignment, with a feeder bus network operating to and from the train station via Ocean Keys Boulevard. Of the six bus routes currently servicing the train station, five of these services operate to and from the northern residential areas, while one bus route currently operates between Clarkson Train Station and Marmion Avenue south.

16.3 TRAFFIC AND TRANSPORT DESIGN

The proposed LSP includes a central transport spine (the Green Link) running from Long Beach Promenade in the west and linking with the Clarkson Train Station to the east. The Green Link is proposed to be a central activity corridor, including a Neighbourhood Connector road with public open space for pedestrian and cycle paths and activity spaces, together with provision of a high standard public transport spine.

This public transport service is expected to include a bus service in the short term, with provision for a potential light rail or similar in the long term. The LSP also makes provision for higher density residential and commercial development along the Green Link spine, providing good linkages to the train station as well as to Ocean Keys Shopping Centre and Mindarie Keys Marina. The expectation is that by providing good quality and high frequency public transport, a sustainable urban development can be developed where future residents do not have to rely on a second family car to travel within the neighbourhood, or to commute elsewhere.

Key aspects of the LSP include the intersections of the Green Link with both Marmion Avenue and Connolly Drive, with four way intersections proposed at both locations for good connectivity between the three cells and a continuous route for public transport services.

The recommended road structure in the proposed LSP and Indicative Development Plan (IDP) at Appendix 16 and 17 respectively. The recommended pedestrian/cyclist facilities are shown in Figure 21.

Key aspects of the overall structure plan will be the intersections of the Green Link with both Marmion Avenue and Connolly Drive, with 4-way intersections proposed at both locations for good connectivity between the three precincts and a continuous route for public transport services.

Refer to Figure 21 - Recommended Pedestrian/Cyclist Facilities

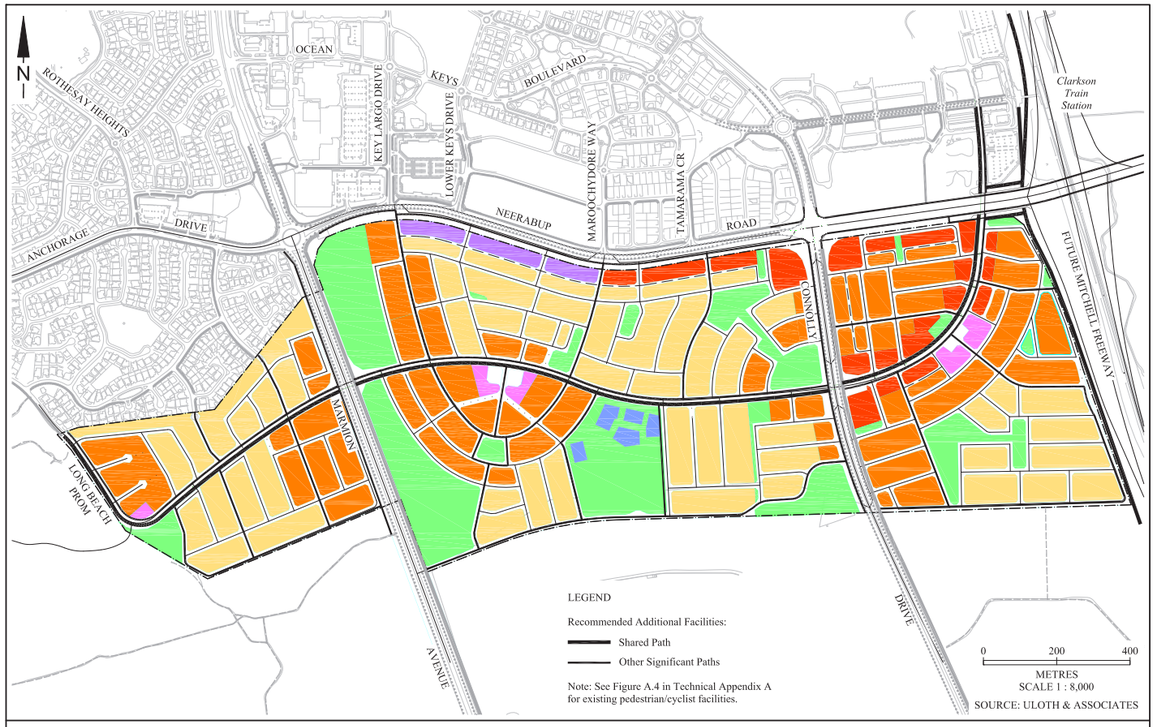
The LSP also makes provision for possible access from a Mitchell Freeway-Neerabup Road northbound off ramp directly into the LSP area. This would provide sufficient accessibility to create business development opportunities at the proposed neighbourhood activity centre within the eastern cell and throughout the green link connection from

this neighbourhood activity centre further north to Clarkson Train Station.

This LSP also foresees the raising of Neerabup Road east of Connolly Drive in order to allow the Green Link to pass under Neerabup Road, linking directly with the Clarkson Train Station precinct to the north. Redevelopment of the existing car park at the station is therefore considered favourably in the long term to provide a continuous active street front between the station and the Green Link.

Two access road connections are proposed along Neerabup Road between Connolly Drive and Marmion Avenue. Both of these locations will create four-way intersections at Neerabup Road, with traffic signals foreseen in the long term providing good pedestrian connectivity across Neerabup Road to the other commercial developments to the north, including Ocean Keys Shopping Centre. A secondary access road is also proposed to the eastern side of Marmion Avenue.

FIGURE 21 - RECOMMENDED PEDESTRIAN/CYCLIST FACILITIES



Recommended Pedestrian/Cyclist Facilities
PROPOSED TAMALA PARK STRUCTURE PLAN

16.4 PUBLIC TRANSPORT

With the development of Ocean Keys Shopping Centre and the adjacent residential area to the east, Ocean Keys Boulevard was constructed between Marmion Avenue and Clarkson Train Station and all existing bus services to and from the train station move along Ocean Keys Boulevard.

With the future extension of the northern train line beyond Clarkson, it is expected that each of these feeder bus routes will run from a northern train station to and from the Clarkson Train Station in a pattern that replicates similar patterns between train stations along the whole of the northern train line.

Transperth has confirmed that with the development of subject land, a typical bus service would operate along the Green Link from Clarkson Train Station, probably with a realignment of the existing Bus Route 481. Traffic signals and four-way intersections at Marmion Avenue and Connolly Drive are seen to be a favourable solution for bus services along the Green Link. However, the lack of connection for this proposed bus route to Ocean Keys Shopping Centre is an area of concern.

An alternative to the realignment of the existing bus route would be the introduction of a new service running from Clarkson Train Station along the Green Link and terminating at Mindarie Keys. However, neither of the above solutions would satisfy the objectives laid down by the TPRC in relation to the provision of a high frequency public transport service as a means of ensuring a high level of sustainability in the future. In order to satisfy these objectives, it is necessary to provide high frequencies of travel along the Green Link, but also to provide good connectivity to local destinations, including Oceans Keys Shopping Centre and Mindarie Keys.

Several possible bus routes have therefore been identified and explored linking each of these destinations while also providing a service as direct as possible to encourage public transport usage for local trips as well as long distance commuter trips via Clarkson Train Station.

It is suggested that the best service possible for public transport usage would include the provision of a figure eight loop from the Clarkson train station via the Green Link to Ocean Keys Shopping Centre, then continuing west to Mindarie Keys. However, in order to provide a direct link to each destination, it would be necessary to operate buses in both directions along this figure eight. Transperth has advised that it is highly unlikely this would ever be funded as one of their normal metropolitan services, and that if it were to be separately funded it would still be difficult to justify the provision of a high frequency service of this type while not providing similar levels of service to nearby residential catchments. The provision of such a service and funding of this service will therefore need to be the subject of considerable analysis and negotiation.

16.5 TRAFFIC MODELING

On the basis of the zonings shown in the IDP, it is estimated that the proposed structure plan could provide in the order of 2,600 dwellings together with 27,000m^2 of mixed-use commercial development plus 15,700m^2 of business floor space, 4,000m^2 of retail floor space and 3,500m^2 of other commercial development.

However, in order to ensure that the traffic analysis carried out is robust enough to allow for some variation, it was decided to increase the residential yield by 10 percent, to a total of 2,840 dwellings for modeling purposes, in order to ensure that the road network proposed in the IDP is acceptable.

It is also important to note that the economic evaluation by Pracsys economic consultants suggests that only 4,700m^2 business development is likely to be justified from an economic prospective within the foreseeable future, so it was also decided that a more conservative outcome might be that mixed-used commercial development only occurs on various key mixed use sites, rather than on all of the mixed use sites identified within the plan (resulting in increased residential development but reduced commercial floor space).

Traffic modeling has therefore also been carried out for a lesser (conservative) scenario, which includes increased residential development of 2,950 dwellings, plus 10,250m^2 of mixed-use commercial floor space and 4,700m^2 of business floor space.

It is estimated that under the full development scenario a total of 25,700 vehicle trips per day will be added to the external road network, while under the conservative scenario this figure would reduce to 20,500 vehicle trips per day. By incorporating these trip generation scenarios with the data obtained from the Main Roads WA regional traffic model, total long-term traffic forecasts for the LSP area have been developed.

It is estimated that in the long term Marmion Avenue will carry approximately 37,000 vehicles per day adjacent to the structure plan area. Neerabup Road is estimated to carry approximately 15,000 vehicles per day between Marmion Avenue and Connolly Drive, increasing to 21,000 vehicles per day east of Connolly Drive.

That portion of Connolly Drive south of Neerabup Road is expected to carry 12,000 vehicles per day, in the long term, reducing to 8,500 vehicles per day south of the LSP area. The proposed Green Link could carry up to 3,400 vehicles per day between Clarkson Train Station and the proposed Freeway access, and then 6,000 to 8,000 vehicles per day between the Freeway access and Connolly Drive.

West of Connolly Drive, the Green Link is expected to carry between 3,000 and 4,000 vehicles per day, while west of Marmion Avenue the Green Link is also expected to carry approximately 4,000 vehicles per day.

16.6 INTERSECTION OPERATIONAL EVALUATION

On the basis of the forecast future traffic flows, key intersections have been analysed to identify their level of operation in the long term and the intersection configuration required.

Analysis shows that the four way intersections of the Green Link with Connolly Drive and Marmion Avenue will both operate at an acceptable level of service during the long-term critical peak hour. Traffic signals are proposed at both of these intersections in order to provide suitable crossing points for pedestrians as well as good connectivity for public transport services. Traffic signals are also proposed at the Neerabup Road intersections with Key Largo Drive and Maroochydore Way, which will both also become four-way intersections under the proposed plan.

Analysis also shows that the existing roundabout at Marmion Avenue - Neerabup Road will fall to an unacceptable Level of Service F in the long term, requiring it to be removed and replaced with a 4-way signalised intersection. The recommended intersection configurations for each of the key access locations for the proposed Structure Plan are shown in Figures 4 to 7 in the Traffic and Transport Report attached at Appendix 14.

Figure 22 - Recommended Intersection Configurations - Marmion Avenue Intersections

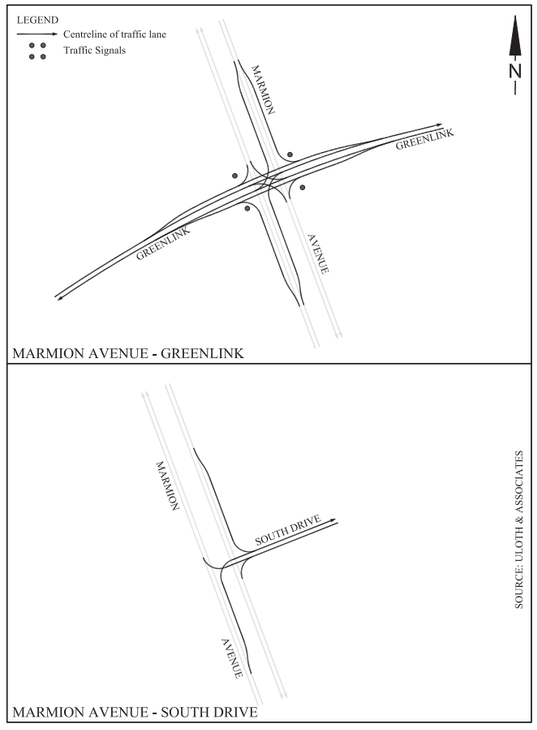


Figure 23 - Recommended Intersection Configurations - Neerabup Road (Western End)

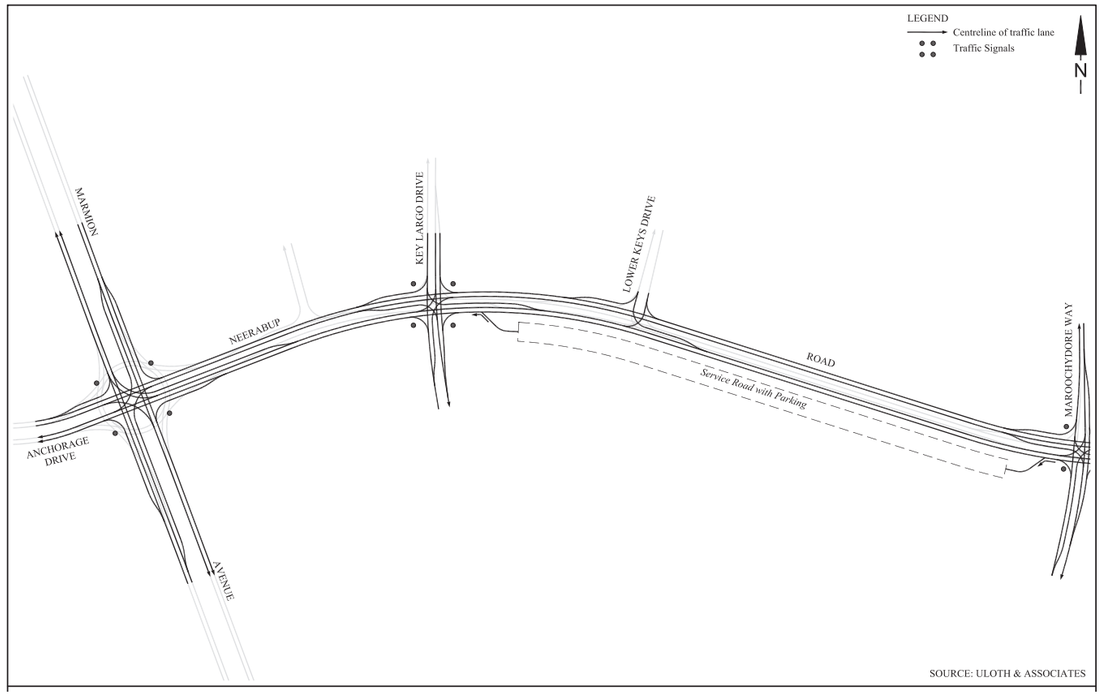


Figure 24 - Recommended Intersection Configurations - Neerabup Road (Western End) and Connolly Drive

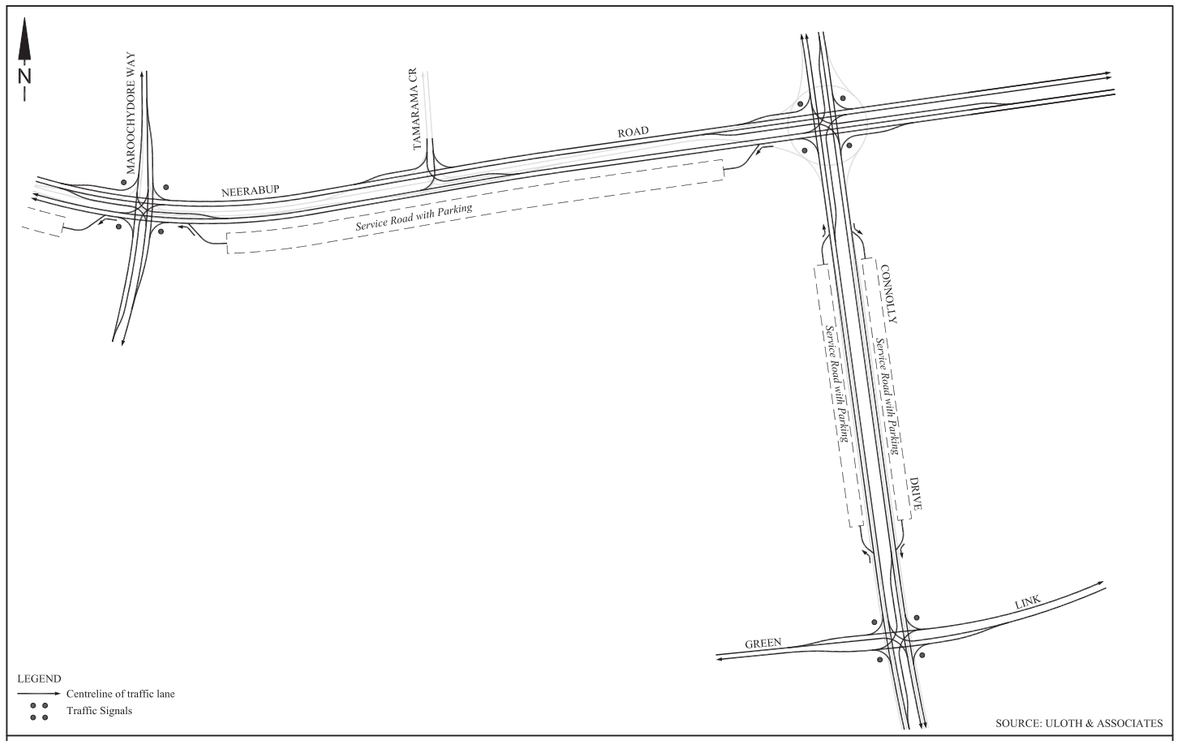
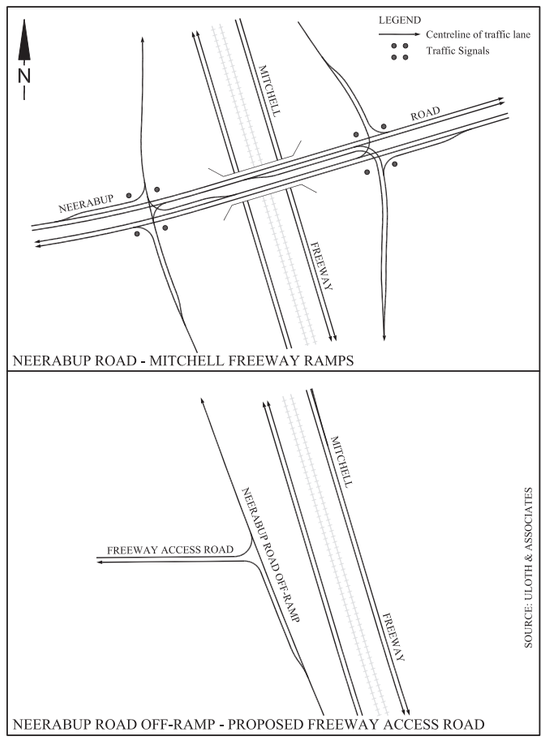


Figure 25 - Recommended Intersection Configurations - Mitchell Freeway Ramps and Proposed Freeway Access Road



16.7 ROAD HIERARCHY AND ROAD RESERVES

It is recommended that the road portion of the proposed Green Link should be designed as a Neighbourhood Connector (in accordance with Liveable Neighbourhoods) with on-street parking and provisions within the carriageway for cycle lanes and bus services. Proposed indicative street cross sections are detailed in section 16.8 below. The Green Link should also provide an adjacent strip of open space with paths and other facilities for recreation along this activity spine. This may be achieved within a reserve width in the order of 30 to 34 metres. All other roads within the LSP area should be Access Streets, with those linking to Marmion Avenue and Neerabup Road.

All other roads within the structure plan area should be Access Streets, with those linking to Marmion Avenue and Neerabup Road plus those in high density areas defined as Access Street B (within 18 metre reserves) and all the rest Access Street C or D (within 14 to 16 metre reserves). Refer to Figures 26, 27 and 28.

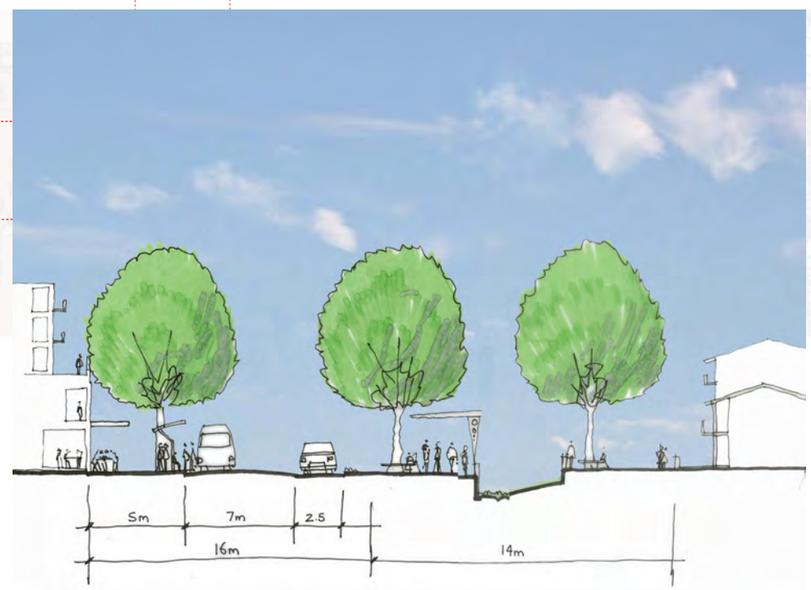


Figure 26 - Common cross-sections of the Tamala Park central Green Link West of Connolly Drive

Figure 27 - Cross-section of the Tamala Park West of Connolly Drive adjacent a neighbourhood activity centre or other activity node.

Figure 28 - Typical Local Centre cross section of the Tamala Park central Green Link East of Connolly Drive.

16.8 GREEN LINK CROSS-SECTIONS

The cross sections below depict a corridor incorporating a 16m wide road reserve and a corridor of POS. The POS and road reserve are collectively called the Green Link. The corridor of POS is intended to vary from a minimum in the order of eight metres to the width of a public square or community park. The intent is to limit traffic speed to 40km along the length of the Green Link, adjacent schools and local activity centres.

17.0 ENGINEERING AND SERVICES

TABEC Civil Engineering Consultants have provided advice in relation to existing major public infrastructure services in the LSP area; in addition to any upgrades required in order to accommodate the future level of urban development envisaged.

Public Infrastructure and upgrade requirements are summarised as follows as described in the Appendix 12 TABEC – Servicing Infrastructure Report

17.1 WATER SUPPLY

Existing major infrastructure in the locality includes the following:

- A 700mm diameter water main to the eastern side of Marmion Avenue;
- A 1000mm diameter water main in Connolly Drive;

It has been determined that major water headworks are not likely to be required. However, the following reticulation works are likely to be required for the development:

- Potential connection to the 1000mm diameter water main in Connolly Drive, via Neerabup Road. This pipe is likely to be a 250mm water main;
- Potential connection to the 700mm water main in Marmion Avenue, again via Neerabup Road. This pipe is likely also to be a 250mm diameter water main;
- The water network will have multiple connections to existing infrastructure to enable sections to be isolated for maintenance purposes.

17.2 SEWERAGE

The existing wastewater network includes the following major infrastructure:

- A 450mm diameter GRP pressure main running along the western side of Connolly Drive.
- A 225mm diameter gravity sewer, with an invert level of 34.50 metres, terminating at the north eastern corner of Marmion Avenue and Neerabup Road intersection.
- A 300mm diameter gravity sewer running south along the eastern side of Connolly Drive, terminating at the intersection of Neerabup Road.

Connection to the existing sewer infrastructure will occur through connection to the Marmion Avenue and Neerabup Road intersection, or the Neerabup Road and Connolly Drive intersection. The following upgrades may be required:

- The 250mm diameter Neerabup Road / Marmion Avenue infrastructure is at RL 34.5 metres, meaning that some parts of the Tamala Park site cannot be gravity serviced.
- The 300mm diamter Neerabup Road / Connolly Drive infrastructure is at invert RL 5.88 metres and may be capable of servicing the lower parts of the Tamala Park site.
- It is expected a network of sewerage pumping stations will be required to Water Corporation approval.
- It is expected a 300mm diameter sewer main in Neerabup Drive connecting to the existing gravity sewer in Connolly Drive.
- Upgrades to the existing network could be expected over time as development yield grows.

17.3 ELECTRICITY

Electricity infrastructure in the locality consists primarily of underground street lighting circuits. The high voltage network in the area is undergrounded and includes:

- A high voltage electricity cable adjacent the southern side of Neerabup Road terminating at the intersection of Lower Keys Drive.
- A high voltage cable running along the western side of Connolly Drive.

The Burns Beach substation is likely to be located on or near the subject land. One potential location is at the eastern side of Marmion Avenue, and the other located on the southern side of Neerabup Road, approximately 500 metres from the proposed Mitchell Freeway extension.

Headworks charges are likely for this area, as a new substation is required. Western Power has advised that consumption is based on a household demand of around 6kVA per household.

17.4 TELECOMMUNICATIONS

The telecommunications in the locality include optic fibres and traditional communication cables.

- An existing telecommunications line runs along the eastern side of Marmion Avenue.
- There is an existing optic fibre running along the eastern side of Marmion Avenue.
- There is existing infrastructure in the housing estate to the north of Neerabup Drive.

Upgrades to the existing telecommunications network will be required to suit the full future development of the subject land. There is potential to negotiate an infrastructure provision deal with a telecommunications carrier.

17.5 GAS

There is gas infrastructure in the locality, with connection opportunities at both the western and eastern boundaries of the site. Locations include the following:

- A 150mm diameter medium pressure gas pipeline adjacent the western side of Connolly Drive.
- A 100mm diameter medium pressure gas pipeline running from the Connolly Drive and Neerabup Road intersection, at the southern side of Neerabup Road.
- A 200mm diameter medium pressure gas pipeline running along the eastern side of Marmion Avenue.
- A 110mm diameter medium pressure gas pipeline located on the northern side of Neerabup Drive between Key Largo Drive and Lower Keys Drive.

It is expected that gas infrastructure upgrades to headwork's will be required as development yields increase through the surrounding areas and on the Tamala Park site.

17.6 STORMWATER

Stormwater drainage for the existing developed areas around the site consists of semi mountable kerbs, with side entry pits. Drainage retention basins and swales consist of man-made feature lakes with landscaping provided to naturally filter the incoming stormwater.

Due to the geo-technical aspects of the soils in the area, infiltration rates are expected to be high. Manholes with permeable bases are not to be used for disposal of the majority of stormwater. Swales, bio-retention areas and linear storage/ infiltration units are the preferred options. Ideally, each individual road will include one downstream location for silt collection when the collection point is situated below ground level. Groundwater tables in the area are below an RL of 1 metre and hence infiltration will not be dependent on the water table contours. Drainage for the major roads consists of a one-way grade, grading to the outside of the road with the drainage consisting of swales.

The current philosophy on stormwater drainage capture allows for more of an 'at source' approach, where runoff generated within a certain catchment is disposed of within the catchment as far as is practical.

The following techniques are recommended where subsoil conditions allow for high rates of permeability:

- Minimisation of impervious areas through the use of permeable areas of pavement – the recently constructed City of Perth car park with open gravel pavement under vehicle engine bays allows for local absorption of surface water while maintaining pavement wearing requirements as the asphalt pavement takes the wheel loading from the vehicles;
- Use of proprietary drainage cells for at-source infiltration into the local ground water.
- Providing 'leaky' pipe systems such as slotted pipes. Leaky pipe systems are not to be used under road pavements.
- Using pits with weep holes and aggregate bases (sometimes the pits can include a detention capacity with the base of the pit lower than both the invert and obvert levels).

The above methods may minimise the reduce the built infrastructure required for on-site stormwater drainage by up to 50%, pending a detailed design analysis. The other key to the use of stormwater as an asset is the choice of landscaping and the consideration of a policy to eliminate the requirement for any irrigation systems. A landscaping plan that utilises local native planting not being reliant on mains irrigation is encouraged. Stormwater runoff detention could be considered to be a suitable source for sporadic summer watering. To minimise the quantity of roof water runoff into the local drainage system, a local native landscaping regime should be considered for roofing areas where dwelling density exceeds Residential - R60 throughout the LSP area.

17.7 EARTHWORKS MODELLING

17.7.1 Preamble

The IDP (Appendix 15) was prepared based on a detailed engineering design model prepared by TABEC Engineers following an assessment of earthworks and development options.

The purpose of the study was to:

- Develop a preliminary earthworks model which meets goals for road grades to be designed to suit pedestrian and bicycle trip generation, particularly along the Green Link.
- Develop an earthworks model that maintains more natural topography, whilst still meeting the requirements of Australian Standards and Universal Access Design requirements.
- Develop an earthworks model that provides flat lot pads for the future development areas.
- Develop an earthworks model that maintains some natural topography within lot boundaries and therefore requires an 'at-source' implementation of building techniques and / or provision of retaining walls.

17.7.2 Modelling

Both a three-dimensional model and CAD drawing of the site were developed, along with preliminary road designs and earthworks showing potential areas requiring retaining and modification to existing topography (cut / fill) for the super lots and major road layouts as depicted on the IDP. The concepts consider both traditional cut to fill building techniques for the development of 'project homes' and terrain / topography design techniques for 'individualised architectural built form' solutions.

It was considered that the western section of the side would benefit from greater maintenance of topography while the eastern sections of the site would benefit from a flattening of grades. The main Green Link through the Tamala Park site should be designed to suit universal access requirements. The general ethos is to maintain as much natural topography as possible while designing roads and accesses to minimum Australian Standards. Four earthworks options were prepared as described below.

17.7.3 Earthworks Option 1 – Flat Building Sites

Option 1 provides the following design guidelines:

- Maximum road grade on Green Link to be 5% to cater for increased pedestrian, bicycle and universal access usage. Grades on minor roads to be built to Australian Standards, (i.e. up to 10% for short sections of roadway).
- Building sites levelled to promote ease of future development.
- General ethos to balance cut and fill operations within the site, so that the site is neither an importer, nor a net exporter of soil material.

17.7.4 Earthworks Option 2 – Natural Topography within Future Lots

Option 2 was guided by the following design guidelines:

- Maximum road grade on Green Link to be 5% to cater for increased pedestrian, bicycle and universal access usage. Grades on minor roads to be built to Australian Standards, (i.e. up to 10% for short sections of roadway).
- Building sites maintained with some topography to keep some link between the topography of the natural site and the future development of the site.
- General ethos is to maintain as much natural topography as possible while balancing the need of the future roadways to promote alternative transportation modal usage.

17.7.5 Earthworks Option 3 - Maintenance of Natural Topography, whilst Meeting Minimum Australian Standards

Option 3 was guided by the following design guidelines:

- Maximum road grade on Green Link to be 8% to cater for increased maintenance of the existing topography whilst catering for pedestrian usage to meet Australian Standards. Grades on minor roads to be built to Australian Standards, (i.e. up to 10% for short sections of roadway).
- Building sites maintained with some topography to keep some link between the topography of the natural site and the future development of the site.
- General ethos is to maintain as much natural topography as possible while designing roads and accesses to minimum Australian Standards.

17.7.6 Option 4 – Increased Grades and Import 250,000 cubic metres of fill

Option 4 was guided by the following design guidelines:

- A final design option steepened local grades on the Green Link to preserve greater natural topography around the lookout.
- More building sites were proposed to maintain existing topography to allow the option of building to suit terrain and therefore offering some alternative built form product to the market.
- The proposed importation of 250,000 cubic metres of additional select fill to preserve additional high points in the site's existing topography. The 250,000 cubic metres of fill is to be treated as spare imported material and provide the developer with flexibility in design – given the sites steep terrain. Also, the additional fill can be used in the POS areas and the proposed school site and ovals.

Refer to Figure 29 – Cut and Fill Option 4

Figure 29 – Cut and Fill Option 4

A definite trend can be ascertained from the studies and analysis undertaken: -

- Increased cut to fill and minimisation of road grades promotes:
    - Increased earthworking construction expenditure.
    - Greater walkable catchment potential through provision of flatter road grades.
    - Reduced requirement for large retaining walls, given provision of flatter worked blocks of land. Reduced maintenance of existing topography forms, and therefore reduced quantity of existing vegetation, particularly outside nominated POS areas.
- Decreasing cut to fill and increasing road grades to 8% maximum grade promotes:
    - Decreased earth working construction expenditure.
    - Requirement for careful urban planning in steeper areas of the site to protect future walkable catchment generation.
    - Maintenance of key site high points such as the lookout.
    - An increased requirement for retaining walls and / or localised architectural design solutions to built form.

18.0 ECONOMY AND EMPLOYMENT

18.1 CONNECTIVITY AND REGIONAL EMPLOYMENT CENTRES

The North-West Sub-Region of Perth faces a dearth of strategic transport infrastructure that restricts local enterprise's access to major state wide, national and international industrial supply chains. The corridor's isolation from heavy rail, port, and airport infrastructure is likely to continue into the future unless significant local, State and Federal Government expenditure is allocated to addressing the issue. Despite this Landcorp's Meridian Park Industrial Estate, Alkimos-Eglinton, and Yanchep-Two Rocks are all aiming to attract and develop significant export–oriented commercial and industrial activity within the sub-region.

The Tamala Park LSP has been designed in a manner that reinforces its connection to larger employment centres, particularly Meridian Park. This will include initiatives such as lobbying for high-frequency public transport between sites, workforce skill matching and maximising accessibility to Tamala Park amenity offerings for businesses and commuters travelling to these estates from the Mitchell Freeway, Marmion Avenue, and Joondalup Train Line.

18.2 RETAIL FLOOR SPACE DISTRIBUTION

The proximity of the Clarkson District Centre and Clarkson Train Station Precinct potentially place constraints on the types of activities that may occur within Tamala Park. The planned retail offering of Clarkson is likely, in the short to medium term, to be sufficient to satisfy the retail needs of Tamala Park residents. Therefore from an economic perspective, Pracsys advises that Clarkson District Centre should be recognised as the retail service centre for the Tamala Park population and that design efforts are made in order to best activate that centre and integrate it with the Tamala Park development. Retail offerings within Tamala Park should be limited to convenience retailing and clustered predominantly in the eastern neighbourhood activity centre.

18.3 EMPLOYMENT PLANNING STRATEGY

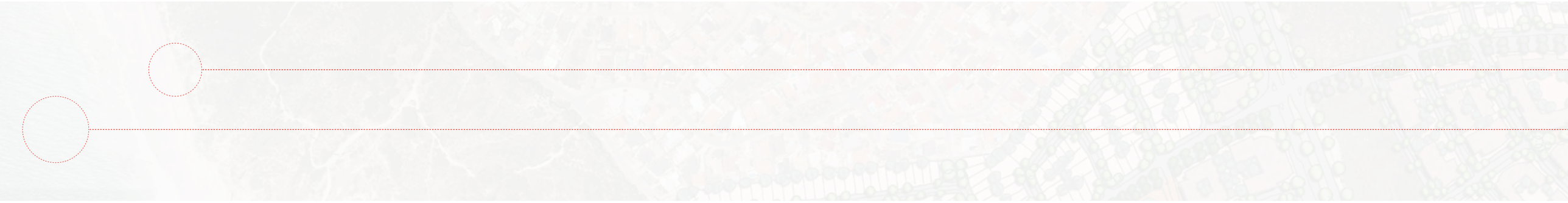
Retail modelling for Tamala Park has been based upon estimates of convenience goods and household expenditure for residents within the development. Assuming a significant proportion (50%) of expenditure will occur within the Clarkson District Centre or further abroad the resulting estimate of viable retail floor space for the development is 3,939m^2 net lettable area by 2018. This floor space equates to approximately 131 employees.

Retail Employment

Table 18: Tamala Park Retail Floorspace Estimate

Tamala Park Parametres	2012	2015	2018
Estimated Occupied Dwelling Units	428	1992	2210
Average Household Sizes	3.1	3.1	3.1
Estimated Population	1,326	6,176	6,850
Average Per Annum Household Expenditure	24,953	24,953	24,953
Available Pool Of Expenditure	$10,674,597	$49,710,776	$55,135,661
Expenditure Leakage %	50%	50%	50%
Expenditure Leakage $	$5,337,298	$24,855,388	$27,567,830
Likely Pool Of Expenditure After Leakage	$5,337,298	$24,855,388	$27,567,830
Average Per m^2 Retail Productivity	7,000	7,000	7,000
Total Required Floorspace For Development Population Only	762	3,551	3,938
Floorspace To Employee Ratio	30	30	30
Number Of Employees	25	118	131

Source: Pracsys Modelling (2009)



Non-Retail Commercial Employment

Table 19 below outlines the provision of non-retail commercial employment floorspace and employment that is considered to be viable along Neerabup Road and within the town centre. This analysis is based on the development of a commercial offering similar to that of benchmark precincts within the Perth Metropolitan Area.

Table 19: Potential Floorspace and Employment for the Neerabup Road Precinct

Employment Type	Full Time Employees	Part Time Employees	Floorspace (m2)
Service	8	4	317
Office	159	48	4,387
Total	167	52	4,704

Source: Pracsys Modelling (2009)

The ability of Tamala Park to attract and sustain knowledge intensive producer service businesses will be contingent on the successful development of nearby employment nodes (such as Meridian Park, Joondalup and Alkimos) and the ability of the development to establish itself as part of the supply chain for these employment nodes. Knowledge intensive producer services often locate near their client businesses, although with low transaction frequency and good communications infrastructure they are to an extent 'footloose'. This means they can choose to locate in a high amenity place with relevant physical infrastructure.

Mixed-Use Employment

The Tamala Park District LSP has allocated 8.2ha of 'mixed use' zoned land within the development. Such zoning allows for flexibility within the development to meet the future market demands based upon changes in economic activity. Employment modelling has not allocated jobs to these mixed-use lots, as there is a high degree of uncertainty as to their future uses. Spatial economic activation and later staging of these mixed use lots will however increase the likelihood of commercial uptake and as such it would be reasonable to assume that further employment will be generated within them.

18.4 EMPLOYMENT RETENTION AND DEVELOPMENT

Throughout the Structure Planning Process the TPRC has remained cognisant of planning for employment within the development. Areas of focus include:

- Activation of a core precinct.
- Maximising the use of available infrastructure.
- Active frontage development of Neerabup Road.
- Staging of development.
- Connectivity with regional employment centres.
- Mixed-use zoning, location and caveats.

18.4.1 Activation of a Core Precinct

The population driven economic activation of a place is determined by the frequency and concentration of transactions that occur there. The users of the place can be characterised as residents, visitors or local workers. The population and expenditure of each group forms the economic base of the place and drives the commercial vitality of office and retail tenants. Recent examples of precincts developed without sufficient consideration of economic activation have resulted in underperforming centres that do not adequately perform the desired functions. These areas often do not provide the level of amenity sought by residents, visitors and workers, and under-perform in the provision of local employment.

Activating the Tamala Park development will involve linking the residents, workers and visitors to a core activity precinct; concentrating retail tenancies to encourage life and vibrancy; maximising possible modes of transport for easy access; and minimising access routes to channel traffic past shop fronts. The most logical core precinct for Tamala Park has been identified within the walkable catchment of the Clarkson Train Station, west of the intersection of the freeway off-ramp within Precinct 4.

Refer to Figure 30 – Core Precinct Location Plan

Refer to Appendix 13 – Pracsys Economic and Employment Strategy

Figure 30 – Core Precinct Location Plan (Pracsys 2009)

This location provides a significant opportunity in the short, medium and long-term due to its proximity and connectivity to a major piece of public transport infrastructure. Such infrastructure will be increasingly integral to the transport network within the North-West Sub-Region and greater Perth Region. Given the infrastructure-poor nature of the sub-region, access to the station will increasingly be a desirable differentiator for the development. Specific outcomes achieved for the eastern activity centre have been the allocation of the majority of the retail floor-space within the development (3,000m^2) as well as a proportion of the non-retail commercial floor space (700-1,300m^2). Activation principles discussed below will best capture expenditure within this offering.

Active frontage development on Neerabup Road

The Neerabup Road precinct will provide continuous active frontage from the Clarkson Train Station to the Clarkson District Centre. Such connection will activate both precincts, as well as providing services in its own right. The high levels of traffic anticipated for Neerabup Road once it is extended to Wanneroo Road, and once the Mitchell Freeway extension intersects it, suggest that this precinct is likely to develop later in the project life, based heavily on passing motor vehicle traffic. A benchmarking exercise has been conducted to identify the appropriate provision of non-retail commercial floorspace along this precinct. The benchmarking of Neerabup Road traffic conditions and the precincts relationship with sub-regional supply chains has resulted in 3,500-4,000m^2 of non-retail commercial floor space being allocated to this precinct.

Staging of development

Economic maturity of an area occurs well after build-out of first generation buildings and lots. The stages of activity centre building strong amenity during Phases I and II of the development (in conjunction with the Clarkson District Centre) to provide an environment for stages III and IV to potentially occur.

18.4.2 Infrastructure Requirements

A limited transport offering results in limited transport choices available for residents in going about their day-to-day activities and as such manifests in a high reliance on private motor vehicle transport being used on multiple trips to perform day-to-day activities.

In ensuring that transport networks best assist with economic activation of the development by its

immediate residents, planning needs to consider the following factors:

- Enhancing residential density within 800 metres of the Clarkson Train Station and Clarkson District Centre.
- Maximising the walkable/cyclable catchment and minimising the 'hassle' factor associated with these transport options (e.g. efficient crossing of major roads).
- Land use design conscious of activation by private motor vehicle users.
- Encouraging multi-transaction trips by encouraging a diversity of activity within realistic walkable distances.

Maximising the interaction of Tamala Park with the Clarkson District Centre is important. Ensuring that the centre is readily accessible to Tamala Park residents travelling by foot, public transport and private vehicles, and that offerings within the development are not of a scale to cannibalise activity within the centre, will best ensure that Tamala Park residents have access to a vibrant, diverse Activity Centre for employment, retail and community usage within close proximity.

To maximise available infrastructure, the Tamala Park Local Structure Plan ensures that 85% of residents are able to access either the Clarkson District Centre or Clarkson Train Station within a ten-minute trip without the use of private motor vehicles (800m walkable catchment).

19.0 SMART GROWTH ASSESSMENT

19.1 PREAMBLE

The CoW Smart Growth Strategy and Assessment tool expressly identifies a triple bottom line approach to development as a priority. The Smart Growth Strategies are as follows:

- Lifestyle and Housing Choice.
- Effective Use of Land and Infrastructure.
- Long Term Health of the Environment.
- Identity, Equity and Inclusiveness.
- Long Term Economic Health.
- People and Government.

The following sections provide an assessment against the CoW Smart Growth Strategy.

19.2 LIFESTYLE AND HOUSING CHOICE

- The LSP features the capacity for a range of lot sizes distributed throughout the LSP area so as to avoid enclaves of higher density residential development. Medium-density residential development sites are predominantly located at the ends of residential cells adjoining major roads, POS areas and in proximity to the train station. The LSP depicts medium density residential development at the western end of the subdivision with higher density and medium density enclaves located in mixed-use lands adjacent to Neerabup Road and Connolly Drive.
- The LSP design incorporates specific allowance for a range of lot sizes, facilitating the development of medium density town houses, apartments, small single - residential dwellings and low - density development including single - residential dwellings on larger traditional lots thus serving to achieve the desired distribution of dwelling typologies.
- Inter-generational housing opportunities are identified in the structure plan area. Larger traditional lots have the capacity to accommodate aged persons dwellings in addition to an average / large size family home.
- Smaller lots are to be provided in addition to sites that would accommodate apartments. This will provide small low maintenance dwellings for aged persons adjacent to the Ocean Keys District Centre. A variety of quality lifestyle options will be provided across the development offered through the differentiation of character among the four precincts.
- Coastal access paths are proposed over the foreshore reserve. Consideration as to the nature of future tourist attractions and related discussions with the WAPC are is to be initiated, in addition to a determination as to the future of the MRC landfill site.

19.3 EFFECTIVE USE OF LAND AND INFRASTRUCTURE

- A mixed-use office / business commercial node is identified at the eastern edge of the site fronting both sides of the central neighbourhood connector, which is envisaged to accommodate office/business and high-density residential development.
- An employment node is planned to be located adjacent to Neerabup Road. Associated guidelines relating to built form, parking location and access standards etc. will establish the desired form of land use and development.
- A major focal point has been planned including a neighbourhood centre, parks and medium density residential development. This community focal point is located near the entrance from Marmion Avenue.
- A range of housing and employment choices are provided at a level suited to the location and potential demand for various forms of employment. Housing and built form are to provide for work at home opportunities in specific precincts.
- Mixed – use and office/business precincts, including higher density residential development are to be located adjacent to Neerabup Road.
- Additional community hubs are located along the Neighbourhood Connector to the east. (An overpass or underpass is planned and identified linking from the commercial node north across Neerabup Road to the Clarkson Train Station).
- Additional community hubs are located along the Neighbourhood Connector to the east. An overpass or underpass is planned and identified linking from the commercial node north across Neerabup Road to the Clarkson Train Station.

- The services and infrastructure network will be planned to accommodate the full range of new technologies expected for the development.

19.4 LONG TERM HEALTH OF THE ENVIRONMENT

- Remnant vegetation, including identified priority rare flora and sites of high habitat value for rare fauna are accommodated in the LSP. Significant trees having high habitat value are intended to be maintained. This also serves to maintain existing landform and slopes.
- Swales will be incorporated to facilitate water treatment and conveyance of stormwater. In addition, POS areas are located and landscaped to include existing trees, to minimise the need for expensive landscaping and to minimise water use in irrigating POS areas.
- Guidelines are required to implement those mandatory outcomes relating to sustainable building and energy use and production.
- Neighbourhood connectors are located and designed to accommodate pedestrian and cyclist movement linking a series of nodes including neighbourhood centres, community squares and facilities.
- Bus or similar services are to be operated at a level encouraging the uptake of public transport in accessing the rail station and neighbouring centres of activity. In addition, the development will accommodate higher density residential development adjacent transit nodes to promote alternative transport choices.
- The proposed community development plan encourages the involvement of the local community in land and bush care groups.

19.5 IDENTITY, EQUITY AND INCLUSIVENESS

- The proposed distribution of activity centres and arrangement of the road network will provide a range of facilities in proximity to residents in addition to accessible public transit services.
- Community meeting places are established adjacent neighbourhood centres.
- Community hubs are diverse in activity, incorporating community squares and are located at key locations on the movement network that feed and facilitate efficient movement.
- Community services and facilities are to be integrated into community hubs and activity centres, with Ocean Keys District Centre providing district/ regional level services.
- Neighbourhood centres are well linked by neighbourhood connectors and provide efficient connection to the Ocean Keys District Centre and train station.
- The impact of Marmion Avenue is reduced to the east by vegetation screening.
- Neerabup Drive will feature activity both complementing and acting as a buffer to the Ocean Keys District Centre.
- The 'Waughal site' to the south of the structure plan area is acknowledged and protected by the POS link at the south of the site that traverses this location.
- Lots will not back onto POS areas. Housing is to be separated by roads where fronting POS areas. Pedestrian links and POS would be overlooked by dwellings to provide more secure conditions.
- Connolly Drive will feature business, high and medium-density residential development and parklands. The nature of activity would slow traffic movement.
- Interpretative mechanisms are to be investigated more fully at a later date.
- The community facilities strategy and community development plan identify the needs of the community in terms of local and district level community services.

19.6 LONG TERM ECONOMIC HEALTH

The economic and employment aspiration of the LSP seek to achieve the following:

- Build on local industry strengths and opportunities.
- Promote investment consistent with strategic vision.
- Advocate the provision and enhancement of communications infrastructure.
- Promote business assistance and support networks.
- Promote lifelong learning and targeted industry training. This is to include working with educational

institutions and industry to map training requirements in line with industry growth.

- Encourage workforce participation and local employment placement.

The CoW Smart Growth economic branch focuses on developing local jobs for residents in an attempt to improve the LGA's poor employment self-sufficiency and self-containment. It seeks to build upon and promote local industries whilst attracting investment and ensuring that the local workforces skills match the high-value industries in the area.

Smart Growth's economic relevance to Tamala Park lies in the importance that the document places on the development of local industry through which employment can be generated with the view of increasing employment self containment. This has implications in regards to the usage of strategic commercial and industrial areas such as that in close proximity to the Clarkson Train Station, the diversity of activity promoted within activity centres, as well as the ability of the population to be trained in skills that match the needs of the local economy. In terms of satisfying the strategies and principles of the Smart Growth Strategy, the following measures will be undertaken:

- Future design guidelines will be prepared guiding built form in various locations where home employment is encouraged.
- Communications infrastructure will be provided as per the TPRCs objectives for development of the subject land.
- The implementation of an economic and employment strategy identifying the needs and gaps associated with facilitating employment growth in the locality.

19.7 PEOPLE AND GOVERNMENT

The preparation of the LSP has involved citizen and stakeholder participation. Adoption of the LSP will occur following public advertisement of the LSP.

20.0 IMPLEMENTATION

20.1 METROPOLITAN REGION SCHEME AND CITY OF WANNEROO DISTRICT PLANNING SCHEME PLAN NO. 2 AMENDMENTS

It will be necessary to lodge an application to lift the 'Urban Deferred' zoning of those portions of the subject land east of Marmion Avenue and in order to accommodate the Bush Forever Reserve to the west of Marmion Avenue. Refer to Figure 5 – MRS Zoning. A local town planning scheme amendment will also be required to include and identify the floorspace for each of the proposed centres within Schedule 3 of the CoW DPS2.

The CoW proposes to adapt the current local scheme reserves in the next Local Planning Scheme to reflect the changed vesting purpose and management. This could be achieved in a number of ways:

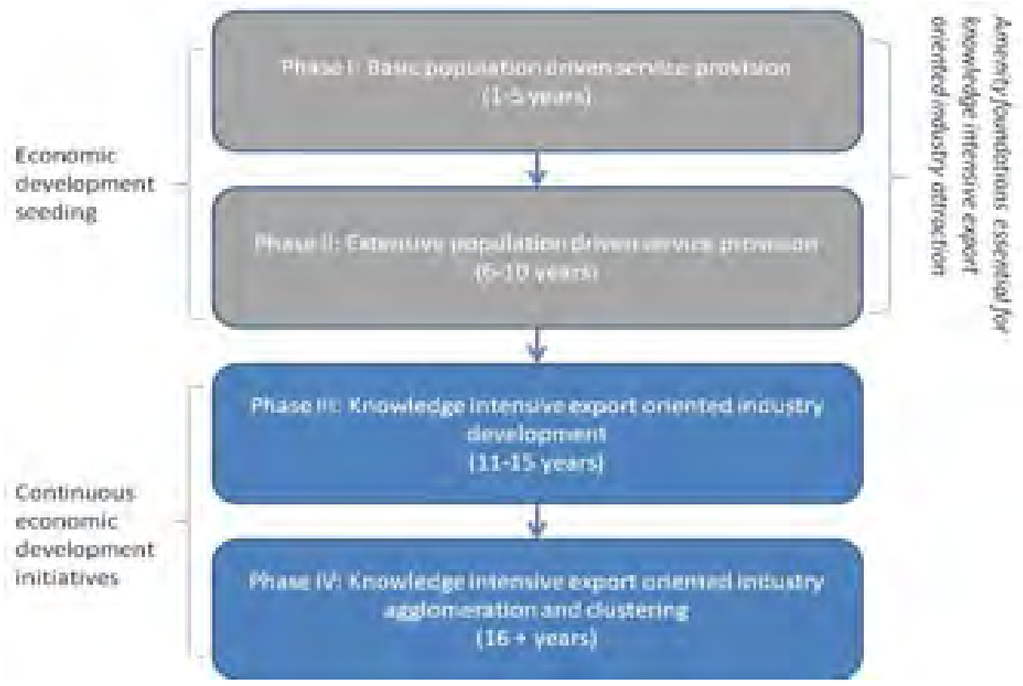
- By expanding the local reserve classifications to include 'Conservation and Recreation'. This includes an explanation that the recreation element is restricted to passive recreation, which allow for further protection and provide clear direction as to the use of City reserves; or
- By including City reserves managed for conservation in a specific 'Conservation' zone, which details the purpose and specific uses within these areas; or
- By including the protection and management of these local reserves as provisions of the scheme. For example in Schedule 5 (sub-clause 5.3.1) Places and objects having significance for the purpose of protection of the landscape or environment. It has been assumed that better protection of natural areas in public open space will be implemented across most planning precincts and for the achievement of a number of different biodiversity targets.

20.2 ECONOMICS OF STAGING

Economic maturity of an area occurs well after build-out of first generation buildings and lots. The stages of Activity Centre maturity are shown in Figure 31. Tamala Park needs to initially focus attention on building strong amenity during phases one and two of the development (in conjunction with the Clarkson District Centre) to provide an environment for phases three and four to potentially occur.

Refer to Figure 31 - Activity Centres Maturity Model

Figure 31 - Activity Centres Maturity Model



Source: Pracsys Modeling (2009)

Within a primarily residential development such as Tamala Park it is therefore imperative to stage the release of non-retail commercial, and mixed-use properties if they are to be desirable to potentially expanding and successful enterprises at the time of sale. As was witnessed within the Clarkson Train Station precinct release of mixed-use land prior to the development of an available catchment, or an obvious commercially viable business case, has seen a majority of the offering being utilised for residential activity. Figure 27 shows potential strategic sites that will be managed to best activate Tamala Park over the development's life.

Refer to Figure 32 - Strategic Sites Activating Tamala Park

The development of an active frontage down Neerabup Road with non-retail commercial activity is an area where careful staging of sites has been considered. Such sites are likely to become increasingly viable once Neerabup Road connects with the Neerabup Industrial Estate and passing traffic increases significantly. The site will also benefit in the medium term with the Mitchell Freeway extension terminating at Neerabup Road and from an increase in activity within the Clarkson District Centre, the Clarkson Train Station Precinct, and Tamala Park itself.

Figure 32 - Strategic Sites Activating Tamala Park

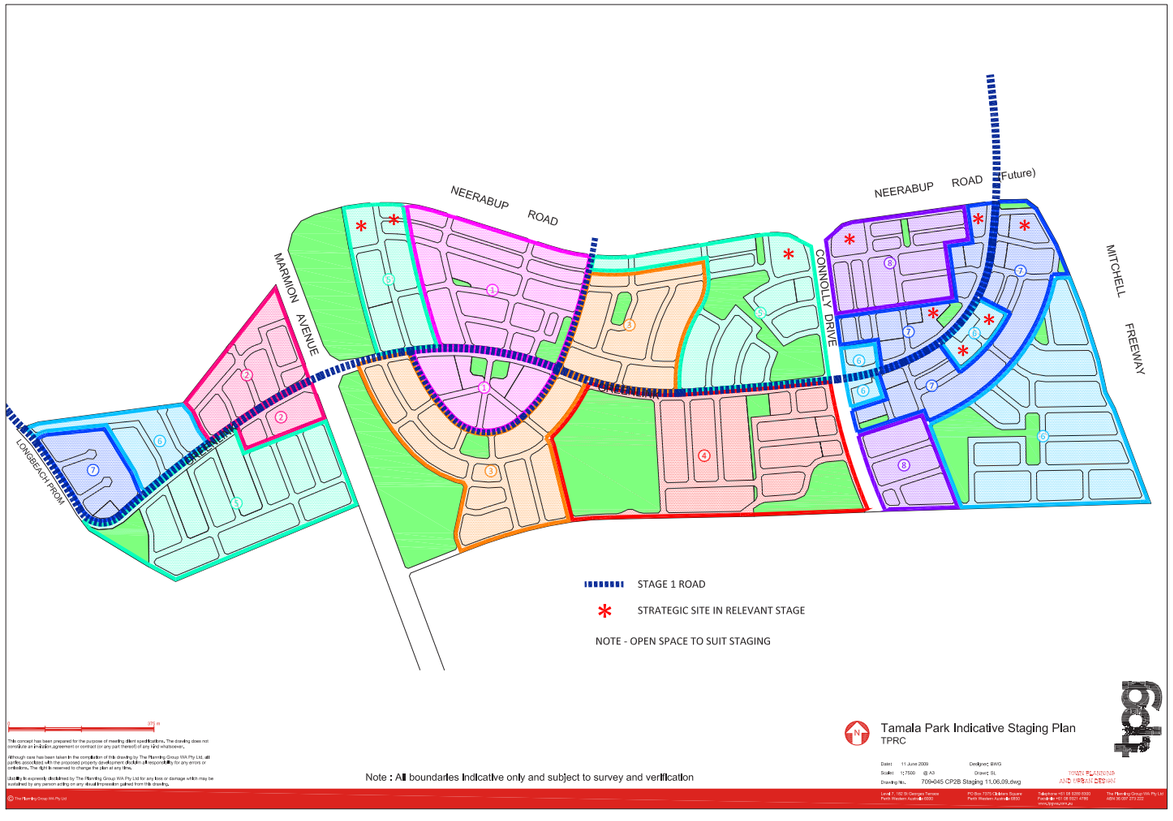
Source: Pracsys Modeling (2009)

20.3 INDICATIVE STAGING PLAN

The plan below depicts an indicative form of staging that may be implemented with the development of Tamala Park, in a manner realising the abovementioned economic objectives for the development in relation to the activation and protection of strategic sites. The location and timing of the release of future stages will be guided by market forces over time.

Refer to Figure 33 - Indicative Staging Plan

Figure 33 - Indicative Staging Plan



20.4 DESIGN GUIDELINES AND DETAILED AREA PLANS

Future planning over the subject land will include the preparation of Detailed Area Plans (DAP's) and Design Guidelines, or Covenants to be advertised and adopted by the CoW and the WAPC.

DAP's endorsed by the CoW must achieve the statutory dwelling target yields identified for each precinct which may occur through the use of R-Code zonings and/or Design Guidelines that identify target dwelling yields within each precinct for each street block.

These DAP's are to be prepared and endorsed at or prior to the time subdivision applications are lodged and assessed. The DAP's shall also address built form and amenity considerations for commercial sites, mixed use sites, activity centres and the public realm. This is reflected in the statutory framework guiding the development of each precinct.

21.0 CONCLUSION

The Tamala Park Local Structure Plan report and associated technical reports have been prepared in keeping with the requirements of DPS2, the City of Wanneroo Smart Growth Strategy and Local Planning Policies, in addition to all relevant State Strategic and Statutory Planning Policies.

The LSP provides significant guidance in terms of development intent, in addition to a statutory framework, that will facilitate realisation of the objectives of the TPRC through subsequent planning processes, providing for a form of development that will serve as a benchmark for similar land developments in the Perth Metropolitan Region.

The CoW has been engaged thoroughly throughout the process of preparing the LSP, in conjunction with the TPRC.

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APPENDIX 15

INDICATIVE DEVELOPMENT PLAN (IDP)

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Low Density (Single Dwelling / Semi Detatched)

Medium Density (Single Dwelling / Semi Detatched / Apartments)

Mixed Use (Single Dwelling / Semi Detatched / Apartments / Commercial)

Business (Showroom / Office)

Centre (Apartments / Office / Commercial / Retail)

Reserve

Community / Educational

0 250 / 125 500 / 250m

Note : All boundaries indicative only and subject to survey and verification

Tamala Park Indicative Development Plan

TPRC

Date: June, 2009 Designer: BWG

Scale: 1: 10000/ 5000 @ A3/A1 Drawn: MK

Drawing No. 709-045 CP1B 10.06.09.dwg

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Artists Impression
Tamala Park Structure Plan

Date: 9 September 2009 Designer: BWG

Scale: NTS @ A3 Drawn: BWG/SL

Drawing No. 709-045 CP3A 09.09.09.fh10

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APPENDIX 16

LOCAL STRUCTURE PLAN MAP

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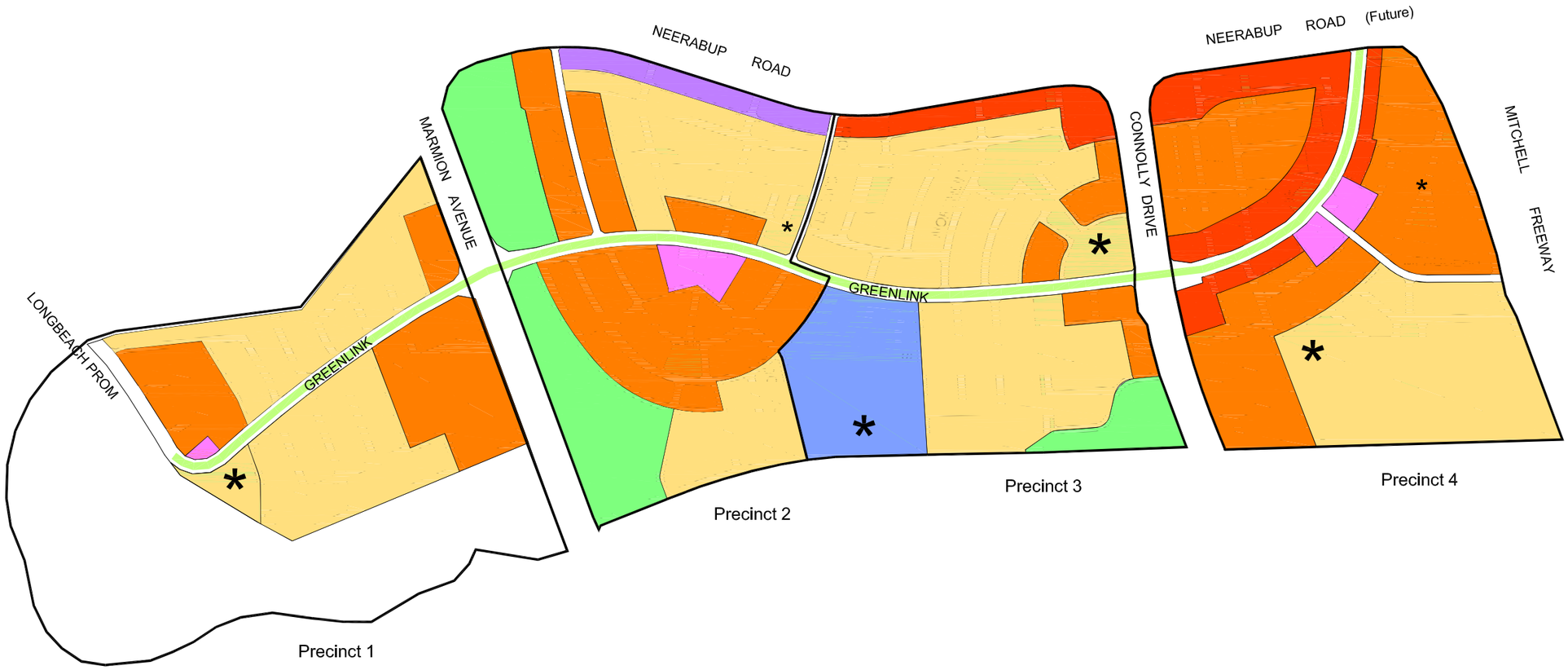

Low / Medium Density (Single Dwelling / Semi Detatched)

Medium / High Density (Single Dwelling / Semi Detatched / Apartments)

Mixed Use (Single Dwelling / Semi Detatched / Apartments / Commercial)

Business (Showroom / Office)

Centre (Apartments / Office / Commercial / Retail)

Reserve - Conservation

Community / Educational

Preferred Locations -

* Passive Public Open Space

* Active Public Open Space

Note : Actual residential densities to be determined through a detailed area planning process and subsequent approval for each precinct.

0 250 500 m

Note : All boundaries indicative only and subject to survey and verification

Tamala Park Local Structure Plan Map

TPRC

Date: April, 2009 Designer: BWG

Scale: 1: 10000 @ A3 Drawn: MK

Drawing No. 709-045 ST1A 01.05.09.dwg

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