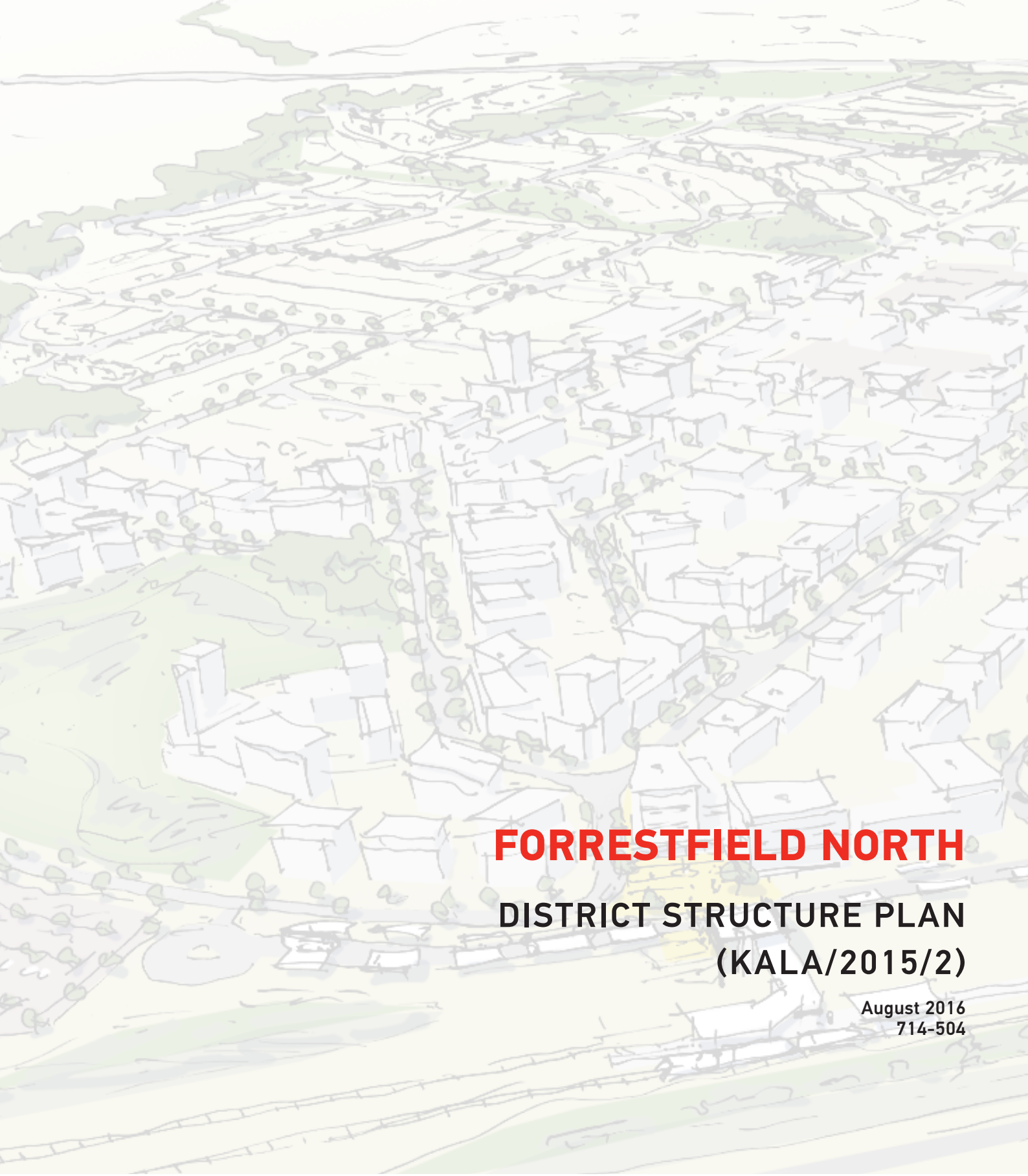


FORRESTFIELD NORTH

DISTRICT STRUCTURE PLAN (KALA/2015/2)

August 2016
714-504

STRATEGEN
environmental consultants

kctt

tpg
TOWN PLANNING
URBAN DESIGN AND HERITAGE

shire of kalamunda

Document Control

Document ID: PG 2014/714-504 Forrestfield, Prep of DSP for Forrestfield LIA/6 Draft Documents/1 Draft Report/714-504 Forrestfield Folder/714-504 Forrestfield DSP - 02.10.15.indd						
Issue	Date	Status	Prepared by		Approved by	
			Name	Initials	Name	Initials
1	19.02.2015	Draft	Murray Casselton		David Caddy	
2	31.08.2015	Final	Murray Casselton		David Caddy	
3	02.10.2015	Modified in Response to Council Resolution 29.09.2015	Murray Casselton		David Caddy	
4	01.08.2018	Modified in response to WAPC Schedule of Modifications 28.07.2016	Lewis Shugar		Murray Casselton	

Table of Amendments

Amendment No.	Summary of the Amendment	Amendment Type	Date approved by WAPC

This structure plan is prepared under the provisions of the Shire of Kalamunda Local Planning Scheme No.3

IT IS CERTIFIED THAT THIS STRUCTURE PLAN WAS APPROVED BY RESOLUTION OF THE WESTERN AUSTRALIAN PLANNING COMMISSION ON: 29 September 2016

Signed for and on behalf of the Western Australian Planning Commission

an officer of the Commission duly authorised by the Commission pursuant to Section 16 of *the Planning and Development Act 2005* for that purpose, in the presence of:

Witness

29 September 2016 Date

Date of Expiry: 29 September 2026

This page has been left blank intentionally.

Contents

Part 1 – Implementation

This page has been left blank intentionally.

1.1 Governance and Planning

The following table sets out the governance and overarching planning requirement for the future development of the Forrestfield North area in accordance with the strategic planning intent established through the preparation of the Forrestfield North District Structure Plan.

1.1.1 Governance and Planning - Implementation Table

Item	Description	Responsibility
Planning and Approval		
Forrestfield Station TOD Precinct	Prepare local structure plan.	SoK or other structure plan proponent
Forrestfield North Activity Centre Precinct	Prepare local structure plan.	SoK or other structure plan proponent
Forrestfield North Residential Precinct	Prepare local structure plan.	SoK or other structure plan proponent
Forrestfield/High Wycombe Light Industrial Area	Prepare local structure plan.	SoK or other structure plan proponent
Forrestfield North Metropolitan Region Scheme Amendments	Metropolitan Region Scheme Amendment for the original Stage 3 of the DSP area (currently underway).	SoK and Department of Planning
Forrestfield North - Shire of Kalamunda Local Planning Scheme No. 3 amendments	Preparation of local planning scheme amendments for Development Areas and Developer Contributions (where not already applied).	SoK
Forrestfield North Built Form Guidelines	Preparation of development guidelines to guide future development on a precinct or zone basis.	SoK
Forrestfield North Land Assembly	Identification of appropriate agency and mechanism to progress land assembly to facilitate future development.	To be established.
Development Costs		
Development Contributions	Identify/establish mechanisms for securing reasonable contributions to development costs.	SoK or responsible proponent
Engagement and Consultation		
Stakeholder Consultation	Proponents responsible for all statutory and non-statutory consultation with affected landowners.	SoK or responsible proponent
Public Consultation	Proponents responsible for all statutory and non-statutory consultation with affected public and residents.	SoK or responsible proponent

1.2 Preparation of Local Structure Plans under the Shire of Kalamunda Local Planning Scheme No. 3

Part 4 – Structure plans of the *Planning and Development (Local Planning Schemes) Regulations 2015* (the Regulations) Deemed provisions for local planning schemes (Deemed Provisions) sets out the requirements for the preparation of structure plans under the Shire of Kalamunda (the Shire) Local Planning Scheme No. 3 (LPS3).

Key parts of Clauses 14 to 29 of the Deemed Provisions relating to the preparation of local structure plans are as follows:

"15. When structure plan may be prepared

A structure plan in respect of an area of land in the Scheme area may be prepared if —

(a) the area is —

(i) all or part of a zone identified in this Scheme as an area suitable for urban or industrial development; and

(ii) identified in this Scheme as an area requiring a structure plan to be prepared before any future subdivision or development is undertaken;

(c) the Commission considers that a structure plan for the area is required for the purposes of orderly and proper planning.

16. Preparation of structure plan

(1) A structure plan must —

(a) be prepared in a manner and form approved by the Commission; and

(b) include any maps, information or other material required by the Commission; and

(c) unless the Commission otherwise agrees, set out the following information —

(i) the key attributes and constraints of the area covered by the plan including the natural environment, landform and the topography of the area;

(ii) the planning context for the area covered by the plan and the neighbourhood and region within which the area is located;

(iii) any major land uses, zoning or reserves proposed by the plan;

(iv) estimates of the future number of lots in the area covered by the plan and the extent to which the plan provides for dwellings, retail floor space or other land uses;

(v) the population impacts that are expected to result from the implementation of the plan;

(vi) the extent to which the plan provides for the coordination of key transport and other infrastructure;

(vii) the proposed staging of the subdivision or development covered by the plan.

27. Effect of structure plan

(1) A decision-maker for an application for development approval or subdivision approval in an area that is covered by a structure plan that has been approved by the Commission is to have due regard to, but is not bound by, the structure plan when deciding the application.

(2) A decision-maker for an application for development approval or subdivision approval in an area referred to in clause 15 as being an area for which a structure plan may be prepared, but for which no structure plan has been approved by the Commission, may approve the application if the decision-maker is satisfied that —

(a) the proposed development or subdivision does not conflict with the principles of orderly and proper planning; and

(b) the proposed development or subdivision would not prejudice the overall development potential of the area.

28. Duration of approval

(1) The approval of a structure plan has effect for a period of 10 years commencing on the day on which the Commission approves the plan, or another period determined by the Commission, unless —

(a) the Commission earlier revokes its approval; or

(b) an amendment to the Scheme that covers the area to which the structure plan relates takes effect in accordance with section 87 of the Act."

Prior to any application for development or subdivision being approved in the Forrestfield North area (unless otherwise approved under Clause 27(2)(a) and (b) of the Deemed Provisions), the Shire and Western Australian Planning Commission (WAPC) require the adoption of local structure plans. These local structure plans are required to be consistent with the future development intent and objectives of the Forrestfield North District Structure Plan in accordance with the provisions of LPS3 and applicable Deemed Provisions relating to structure plan preparation as set out in the Regulations. The specific requirements as detailed in the local structure plan technical requirements implementation table below must be appropriately addressed where considered relevant by the Shire/WAPC.

1.2.1 Local Structure Plan Technical Requirements - Implementation Table

Item	Description	Responsibility
Investigation and Modelling - Undertake all necessary investigations and assessments to support proposed local structure plans		
Protection of environmental values	Prepare detailed environmental assessment and management strategy and local biodiversity strategy. The environmental management and biodiversity strategies are required to address planning and other mechanisms that are intended to ensure the protection of the environmental values of the area, and specifically the use of local reservations for this purpose under the Shire's LPS3. Strategies are to include a local reserve system that establishes strong and viable environmental linkages between Bush Forever sites and other areas of high conservation value that retain and rehabilitate ecological linkages. Strategies are required to specifically address the protection and/or enhancement of the following environmental assets: 1. Populations of Wavy-leafed smokebush (*Conospernum undulatum*) and *Banksia attenuata*. 2. Areas of *Eucalyptus calophylla – Kingia australis woodlands*. 3. The integrity of and buffers required to support the environmental values of Bush Forever Site 45 – Poison Gully Bushland, incorporating the recommendations as contained in the Poison Gully Creek Foreshore Assessment. 4. The most significant roosting, foraging and potential breeding habitat for Carnaby's and Forest Red-tailed Black Cockatoos. 5. Habitat for the Quenda/Southern Brown Bandicoot.	SoK or responsible proponent
Urban water management	Prepare local water management strategy for each precinct in consultation with the Department of Water.	SoK or responsible proponent
Local traffic and transport management strategy	At the local structure planning level assess the impact of proposed land use and network changes on local movement and access.	SoK or responsible proponent
Local economic, employment and retail strategy	Local structure plans are to be supported by a detailed local economic, employment and retail strategy. This may be prepared on a holistic basis for the entire Forrestfield North area and then used to support precinct based local structure planning processes. The local structure plan for the Forrestfield North Activity Centre Precinct is to be supported by a retail needs assessment to determine the size, composition and staging of the activity centre development. The retail needs assessment is to be prepared in accordance with the requirements of the WAPC's State Planning Policy 4.2 – Activity Centres for Perth and Peel and any associated guidelines.	SoK or responsible proponent
Local community development strategy	Local structure plans are to be supported by a detailed local community development strategy. This may be prepared on a holistic basis for the entire Forrestfield North area and then used to support precinct based local structure planning processes.	SoK or responsible proponent

Item	Description	Responsibility
Noise and vibration assessments	Local structure plans are to be supported by: 1. An acoustic assessment prepared by a competent professional in accordance with the requirements of the WAPC's State Planning Policy 5.4 – Road and Rail Transport Noise and Freight Considerations in Land Use Planning and the associated Implementation Guidelines for State Planning Policy 5.4 – Road and Rail Transport Noise and Freight Considerations in Land Use Planning. The acoustic assessment is to specifically consider the preferred land use distribution within the precinct, noise mitigation measures and the potential requirement for a noise management plan for implementation during future subdivision and development, in order to protect potentially noise sensitive development from: (a) Noise associated with the new Forrestfield Airport Rail Link and Forrestfield Railway Station. (b) Noise associated with major road infrastructure in the area including but not limited to Roe Highway, Berkshire Road and Dundas Road. (c) Noise associated with the on-going operation of the Forrestfield Freight Yard and Mainline Freight Rail. (d) Noise associated with the operations of Perth Airport within the 20ANEF contour. 2. An appropriate best practice vibration assessment prepared by a competent professional that specifically considers the preferred land use distribution within the precinct and vibration mitigation measures for implementation during future subdivision and development in order to protect potentially sensitive uses from vibration associated with the on-going operation of the Forrestfield Freight Yard and Mainline Freight Rail.	SoK or responsible proponent
Bushfire Management	Local structure plans are to be supported by a Bushfire Management Plan prepared in accordance with the WAPC's State Planning Policy 3.7 - Planning in Bushfire Prone Areas.	SoK or responsible proponent
Residential densities	Local structure plans for the Forrestfield Station TOD Precinct, Forrestfield North Activity Centre Precinct and Forrestfield North Residential Precinct are to incorporate R-Codes (density ranges) that will apply to various areas of the structure plan. A variety of density ranges are to be nominated in line with the district structure plan intent and in response to the opportunities and constraints presented by specific areas within the precincts.	SoK or responsible proponent
Aged persons accommodation	Local structure plans for the Forrestfield Station TOD Precinct and Forrestfield North Residential Precinct are to incorporate specific sites and associated development requirements for aged persons accommodation in response to emerging community need and the shortage of such facilities within the Shire.	SoK or responsible proponent
Infrastructure Provision - Undertake all necessary infrastructure and servicing investigations and assessments to support proposed local structure plans		
Roads	Unless addressed through developer contribution arrangements, proponents responsible for all road infrastructure or upgrades necessary to support proposals.	SoK or responsible proponent
Pedestrian and Cycling	Unless addressed through developer contribution arrangements, proponents responsible for all pedestrian/cycle infrastructure or upgrades necessary to support proposals.	SoK or responsible proponent
Water and Sewer	Proponents responsible for all infrastructure or upgrades necessary to support proposals.	Responsible proponent
Power, Gas & Communications	Proponents responsible for all infrastructure or upgrades necessary to support proposals.	Responsible proponent

*SoK – Shire of Kalamunda

1.3 Structure Plan Summary

Forrestfield North comprises an area of approximately 264.1 hectares bounded generally by Poison Gully to the north, Roe Highway to the east, Berkshire Road to the south, and the Forrestfield Freight Yard and Mainline Freight Rail to the west. It includes the area that is proposed to be developed with the Forrestfield Train Station associated with the Forrestfield Airport Rail Link.

Forrestfield North is located approximately 13 kilometres east of the Perth CBD. It is in close proximity of the Kewdale-Hazelmere area, being a major strategic area for the freight industry in Perth and Western Australia and a significant employment hub.

Roe Highway is located immediately east of the Forrestfield North area, and is identified under the Metropolitan Region Scheme (MRS) as a Primary Regional Road (PRR) and in conjunction with Berkshire Road, Dundas Road and Maida Vale Road, currently services the area.

Located immediately north of the Forrestfield North area are Poison Gully Creek (Bush Forever Site 45) and the High Wycombe residential area. Existing light industrial uses and the initial Stage 1 of the Forrestfield/High Wycombe Industrial Area are located to the south, which provide a buffer to nearby general industrial land uses.

Forrestfield North is also located within close proximity of the Forrestfield Freight Yard, Access Park bulk grain depot and Mainline Freight Rail.

Forrestfield North is also strategically located within:

- Four kilometres of the Kewdale Industrial Area.
- Three kilometres of the Perth International Airport.
- Five kilometres of Kalamunda Central.

The long term vision for Forrestfield North is to create an attractive, vibrant and sustainable urban setting within a landscaped context, focussed on medium and high-density housing with local employment opportunities. The area will have direct access to Perth's regional road network and will be serviced by high quality public transport, focussed on the new Forrestfield Train Station. Forrestfield North will include the following key elements:

- Medium and high-density urban neighbourhoods focussed around a new activity centre and commercially focussed Transit Oriented Development (TOD) based around the train station.
- Significant new parklands that ensure the protection of the existing ecological assets in the area, including Poison Gully Creek, whilst providing opportunities for passive and active recreation for an increased local population.
- New centres of employment within the activity centre and TOD precinct around the train station.

The purpose of the Forrestfield North District Structure Plan (Forrestfield North DSP) is to provide strategic guidance for the Forrestfield North Area. Subsequent local structure plans will support the assessment, coordination and implementation of development around, and feeding into, the Forrestfield Train Station.

The principal objectives of the Forrestfield North DSP are to:

- Place Forrestfield North in its emerging regional context and identify any factors that might influence the future planning and development of the area;
- Confirm the role and function of Forrestfield North in the context of the State Government's metropolitan planning strategy, Directions 2031 and the recently released North-East Sub-regional Planning Framework (draft, May 2015);
- Develop a spatial plan that defines planning and development precincts based on projected land use, and informs the preparation of local structure plans, planning scheme amendments, and statutory planning and development proposals;
- Identify existing environmental assets and district level water management considerations applicable to the area and to confirm what additional studies and investigations are necessary to support planning and development decisions;
- Consider the impacts of future development in Forrestfield North on the established transport network and identify what modifications may need to be made as part of a future staged development process to meet future development requirements; and
- Identify any key services and infrastructure constraints, and options for the coordinated delivery of additional capacity to the area.

The Forrestfield North DSP will be used by both State and local government as the basis for the preparation of precinct based local structure plans and to inform planning and development decisions across the Forrestfield North area. This may also involve amendments to the existing Forrestfield/High Wycombe Industrial Area Stage 1 - Local Structure Plan (March, 2013), generally corresponding with Precinct 4 - Forrestfield/High Wycombe Light Industrial Area as identified in the Forrestfield North DSP.

Structure Plan Summary Table

Item	Data	Structure Plan Ref (section no.)
Total area covered by structure plan	264.1 hectares	3.1
Area of each land use proposed: • Residential • Commercial • Industrial • Rural Residential	 • 100.6 hectares • 27.6 hectares ('Activity Centre' and 'Mixed Use' areas) • 74.7 hectares • N/A Estimated lot yield to be determined at local structure planning stage	5.2 and 5.3
Total estimated lot yield	Estimated lot yield to be determined at local structure planning stage	N/A
Estimated number of dwellings	4,250-5,250	5.3, 6.1, 6.2 and 6.3
Estimated residential site density	33.2 – 40.1 dwellings per hectare, inclusive of 'Residential', 'Activity Centre' and 'Mixed Use' areas	5.2 and 5.3
Estimated population	9,350-11,550 (@2.2 persons per household)	5.3, 6.1, 6.2 and 6.3
Number of high schools	Nil	5.5.3
Number of primary schools	To be determined at local structure planning stage	5.5.3
Estimated commercial floor space	Retail - 23,000-32,500m^2 net lettable area Commercial - 229,000-394,500m^2 net lettable area	5.3, 6.1 and 6.2
Estimated area and percentage of public open space given over to: • Regional open space • District open space • Neighbourhood parks • Local Parks	 • 16.3 hectares 6.1% • To be determined at local structure planning stage • To be determined at local structure planning stage • To be determined at local structure planning stage	4.3, 4.4, 4.5, 4.6 and 4.9
Estimated percentage of natural area	24.2 hectares 9.2% Natural areas include those designated as 'Parks and Recreation – Local and Regional' incorporating Bush Forever and identified conservation areas Additional natural areas may be identified for conservation purposes at local structure planning stage	4.3, 4.4, 4.5, 4.6 and 4.9

This page has been left blank intentionally.

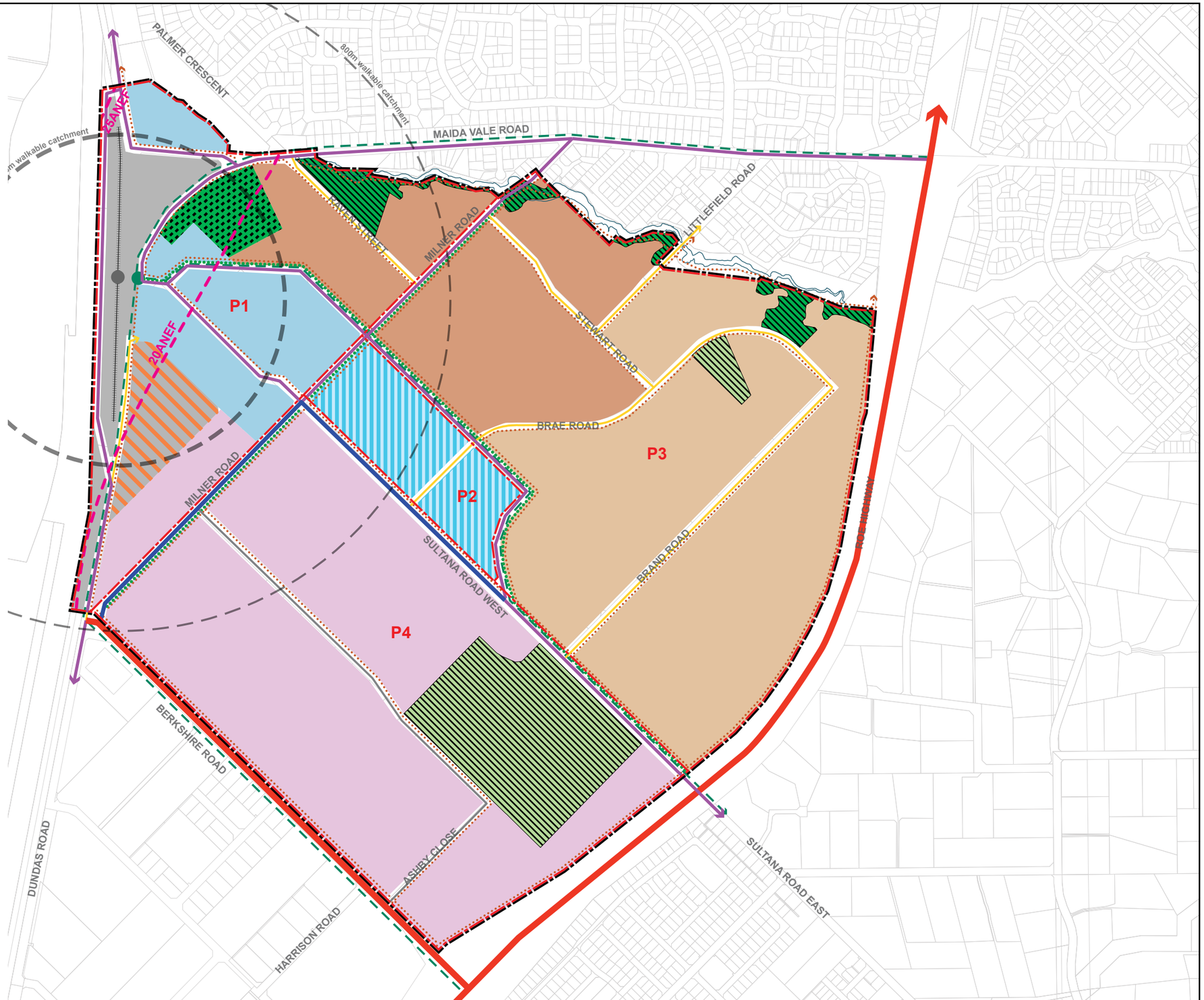
LEGEND

- Medium Density Residential
- High Density Residential
- Activity Centre
- Mixed Use
- Light industry
- Parks and Recreation - Local
- Parks and Recreation - Regional
- Bush Forever
- Conservation
- Railway
- ANEF Contour
- Primary distributor road
- District distributor integrator A
- District distributor integrator B
- Neighbourhood connector
- Industrial road
- Shared Path
- On-road cycle paths
- Railway Line
- Bus route
- Transit station
- Railway station
- Walkable catchment (400m)
- Walkable catchment (800m)
- Precinct boundary

P1	Forrestfield Station TOD Precinct
P2	Forrestfield North Activity Centre Precinct
P3	Forrestfield North Residential Precinct
P4	Forrestfield / High Wycombe Light Industrial Area

- Structure plan boundary
- Existing cadastre
- Preferred ultimate permanent parking location (subject to further investigation).

It is noted that Precinct 3 features a concentration of Threatened Ecological Communities and Declared Rare Flora sites which may affect development potential. Refer to Figure 7 of the District Structure Plan report.



Structure Plan

Forrestfield North District Structure Plan

0 50 100m

N

Project Manager: MC Date: 24 Aug 2016
Drawn: OP Scale: 1:5,000 @ A3
Checked: MC Drawing No. 714-504 ST-12A

TOWN PLANNING
URBAN DESIGN AND HERITAGE

Level 7, 182 St Georges Terrace
Perth Western Australia 6000
Telephone +61 08 9289 8300
Facsimile +61 08 9321 4786
www.tpgwa.com.au

The Planning Group WA Pty Ltd
ABN 36 097 273 222

This page has been left blank intentionally.

Part 2 – Explanatory

This page has been left blank intentionally.

1. Introduction

1.1 Vision for Forrestfield North

The Perth and Peel region is experiencing a period of significant economic and population growth. The State Government's strategic plan for the region, *Directions 2031 and Beyond* (Directions 2031), estimates that in less than 20 years Perth's population will grow from 1.7 million to 2.2 million, with an additional 328,000 homes and 353,000 jobs required to support the 500,000 new residents. Actual population growth may well exceed these projections.

The Forrestfield North area provides an excellent opportunity to meet growing population needs and provide employment options in an accessible and relatively central location that maximises the benefits of its proximity to established residential areas, employment hubs and key transport infrastructure including Roe Highway and the future Forrestfield Airport Rail Link. This potential is recognised by the Western Australian Planning Commission (WAPC) in the recently released North-East Sub-regional Planning Framework (draft, May 2015), which identifies Forrestfield North as a significant urban expansion area for the sub-region with the opportunity to achieve a more intensive transit-oriented development form.

The long term vision for Forrestfield North is to create an attractive, vibrant and sustainable urban setting within a landscaped context, focussed on medium and high-density housing with local employment opportunities. The area will have direct access to Perth's regional road network and will be serviced by high quality public transport, focussed on the new Forrestfield Train Station. Forrestfield North will include the following key elements:

- Medium and high-density urban neighbourhoods focussed around a new activity centre and commercially focussed Transit Oriented Development (TOD) based around the train station.
- Significant new parklands that ensure the protection of the existing ecological assets in the area, including Poison Gully Creek, whilst providing opportunities for passive and active recreation for an increased local population.
- New centres of employment within the activity centre and TOD precinct around the train station.

1.2 Purpose of the District Structure Plan

Major projects are either planned or underway which will transform the Forrestfield North area into an urban growth opportunity area, and establish a new context around which the area will develop and evolve into the future.

The purpose of the Forrestfield North District Structure Plan (Forrestfield North DSP) is to provide strategic guidance for the Forrestfield North Area. Subsequent local structure plans will support the assessment, coordination and implementation of development around, and feeding into, the Forrestfield Train Station.

The principal objectives of the Forrestfield North DSP are to:

- Place Forrestfield North in its emerging regional context and identify any factors that might influence the future planning and development of the area;
- Confirm the role and function of Forrestfield North in the context of the State Government's metropolitan planning strategy, Directions 2031 and the recently released North-East Sub-regional Planning Framework (draft, May 2015);
- Develop a spatial plan that defines planning and development precincts based on projected land use, and informs the preparation of local structure plans, planning scheme amendments, and statutory planning and development proposals;
- Identify existing environmental assets and district level water management considerations applicable to the area and to confirm what additional studies and investigations are necessary to support planning and development decisions;

- Consider the impacts of future development in Forrestfield North on the established transport network and identify what modifications may need to be made as part of a future staged development process to meet future development requirements; and
- Identify any key services and infrastructure constraints, and options for the coordinated delivery of additional capacity to the area.

The Forrestfield North DSP will be used by both State and local government as the basis for the preparation of precinct based local structure plans and to inform planning and development decisions across the Forrestfield North area.

1.3 Background to the District Structure Plan

In 2014, the State Government announced the development of the Forrestfield Airport Rail Link, including the Forrestfield Train Station at the western edge of the Forrestfield North area. This significant new infrastructure initiative, in conjunction with other major projects in the area such as the Gateway WA Perth Airport and Freight Access Project, instigated a major re-thinking of the broad land use and planning objectives for Forrestfield North, which had for some time focused primarily on an industrial land use planning outcome.

This process resulted in a redefining of the strategic planning intent for Forrestfield North focused around the delivery of higher density forms of residential development not currently well represented in the Shire of Kalamunda (the Shire), a new activity centre to meet the needs of an expanding local population, and a commercially focussed TOD precinct based around the new Forrestfield Train Station.

These land use planning initiatives have been incorporated into the Forrestfield North DSP, and will ensure that ongoing planning processes for the area, including the preparation of future more detailed local structure plans, will be consistent with the intent and requirements of the district structure plan.

The Forrestfield North DSP has been prepared by the Shire in consultation with key State agency stakeholders, including the Department of Planning and Public Transport Authority (PTA).

2. Context

2.1 Local Context

Roe Highway is located immediately east of the Forrestfield North area, and is identified under the Metropolitan Region Scheme (MRS) as a Primary Regional Road (PRR) and in conjunction with Berkshire Road, Dundas Road and Maida Vale Road, currently services the area.

Located immediately north of the Forrestfield North area are Poison Gully Creek (Bush Forever Site 45) and the High Wycombe residential area. Existing light industrial uses and the initial Stage 1 of the Forrestfield/High Wycombe Industrial Area are located to the south, which provide a buffer to nearby general industrial land uses.

Forrestfield North is also located within close proximity of the Forrestfield Freight Yard, Access Park bulk grain depot and Mainline Freight Rail.

Forrestfield North is also strategically located within:

- Four kilometres of the Kewdale Industrial Area.
- Three kilometres of the Perth International Airport.
- Five kilometres of Kalamunda Central.

Refer to Figure 1 – Context Plan

2.2 Regional Context

Forrestfield North is located approximately 13 kilometres east of the Perth CBD. It is in close proximity of the Kewdale-Hazelmere area, being a major strategic area for the freight industry in Perth and Western Australia and a significant employment hub.

The Kewdale-Hazelmere area is the major origin-destination in the Perth Metropolitan Region for heavy freight vehicles as it includes WA's primary intermodal facility located at Kewdale, the Perth Airport and significant areas of industrial land located in close proximity to these facilities.

Forrestfield North is also strategically located adjoining Roe Highway which is an important PRR, connecting Perth and the State to a larger transport network. Access to Roe Highway will be significantly improved by the currently underway upgrading of the Roe Highway/Berkshire Road intersection to a grade separated intersection as a result of improvements associated with the Gateway WA Perth Airport and Freight Access Project.

The proposed Forrestfield Train Station will enable a 20 minute commute time to Perth Underground Station. This convenience will play a major role in ensuring the future growth and viability of the Forrestfield North Area.

Refer to Figure 2 –Opportunities/Constraints Plan

2.3 Landscape Setting

Another important contextual consideration is the relationship of Forrestfield North to its landscape setting. Much of Forrestfield North has historically been used for rural residential purposes with large lots featuring substantial remnant vegetation and other landscaped features, with the Perth Hills then providing a vegetated backdrop to these environs.

The further planning and development of Forrestfield North provides an opportunity to retain and enhance the ecological values of the area and contribute positively to the established landscape setting.

Through subsequent local structure planning processes the intention is to develop a network of parklands that retain and protect environmentally sensitive areas and that provide linkages and connections to established high value ecological areas including Poison Gully Creek and Bush Forever areas. Appropriate definition of intended use will result in a suite of active and passive parklands that retain and enhance the rich composition of the landscape and that protect existing environmentally sensitive areas.

Figure 1. Context Plan

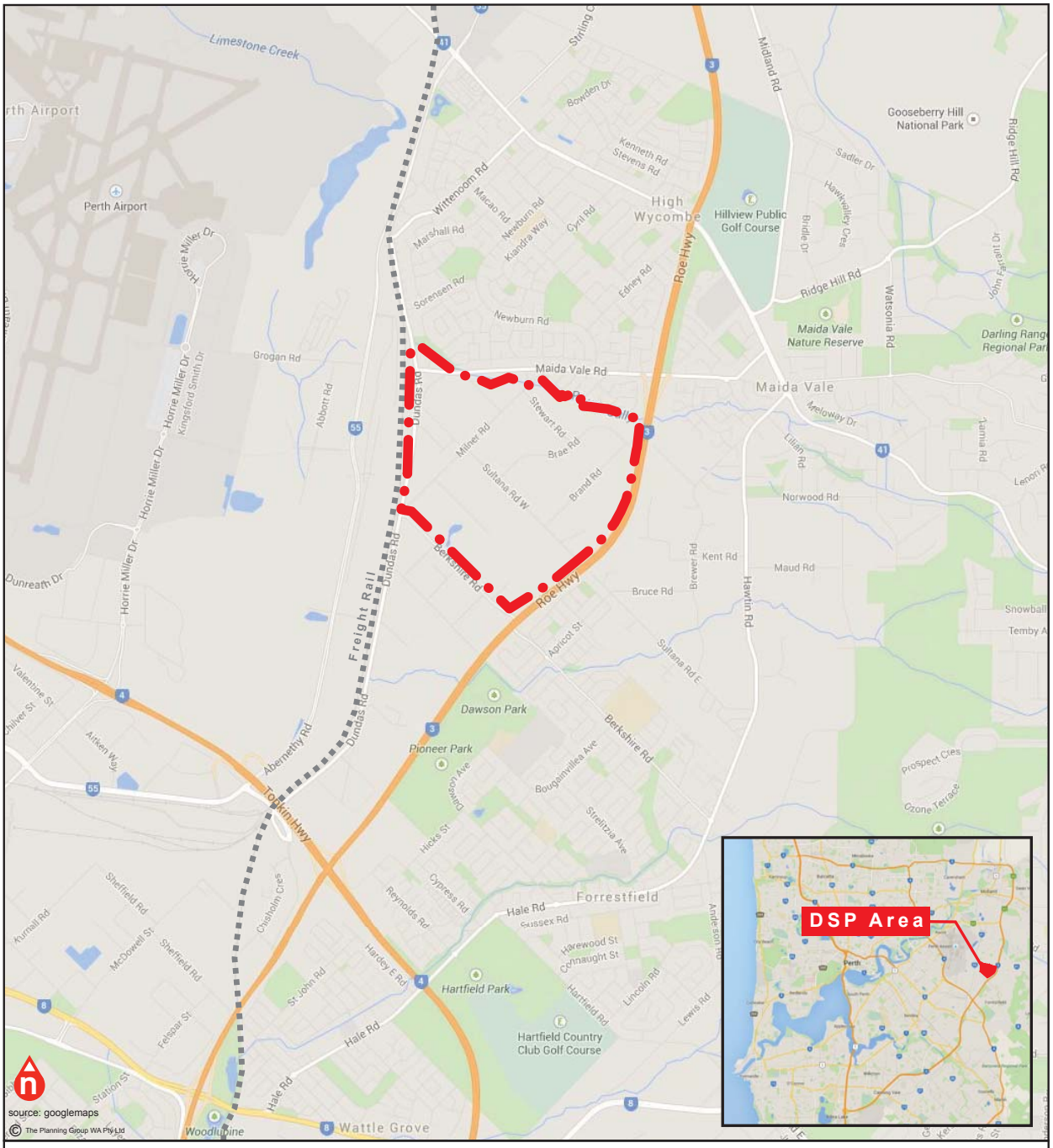
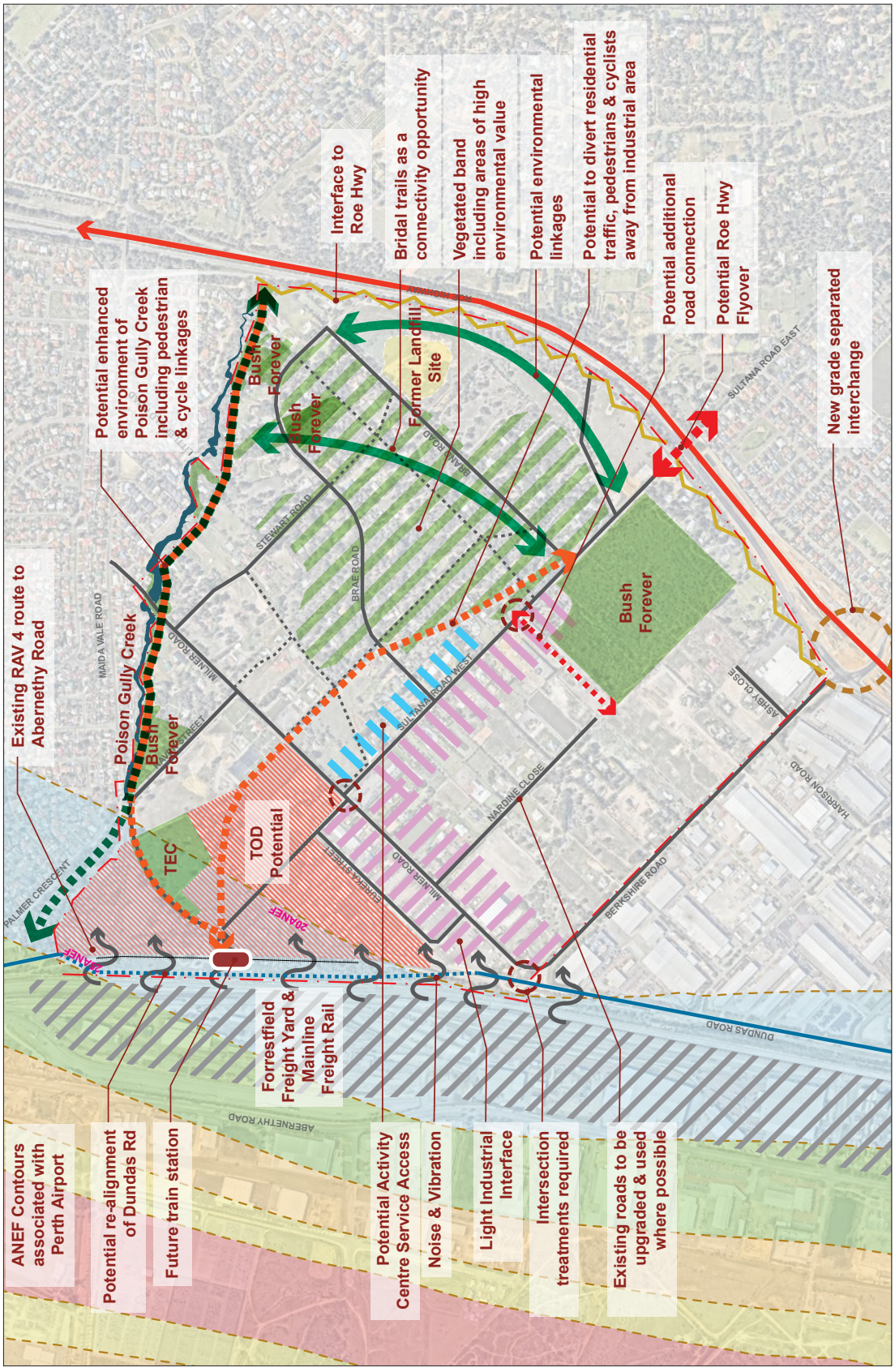


Figure 2. Opportunities/Constraints Plan



2.4 Relationship to Surrounding Centres

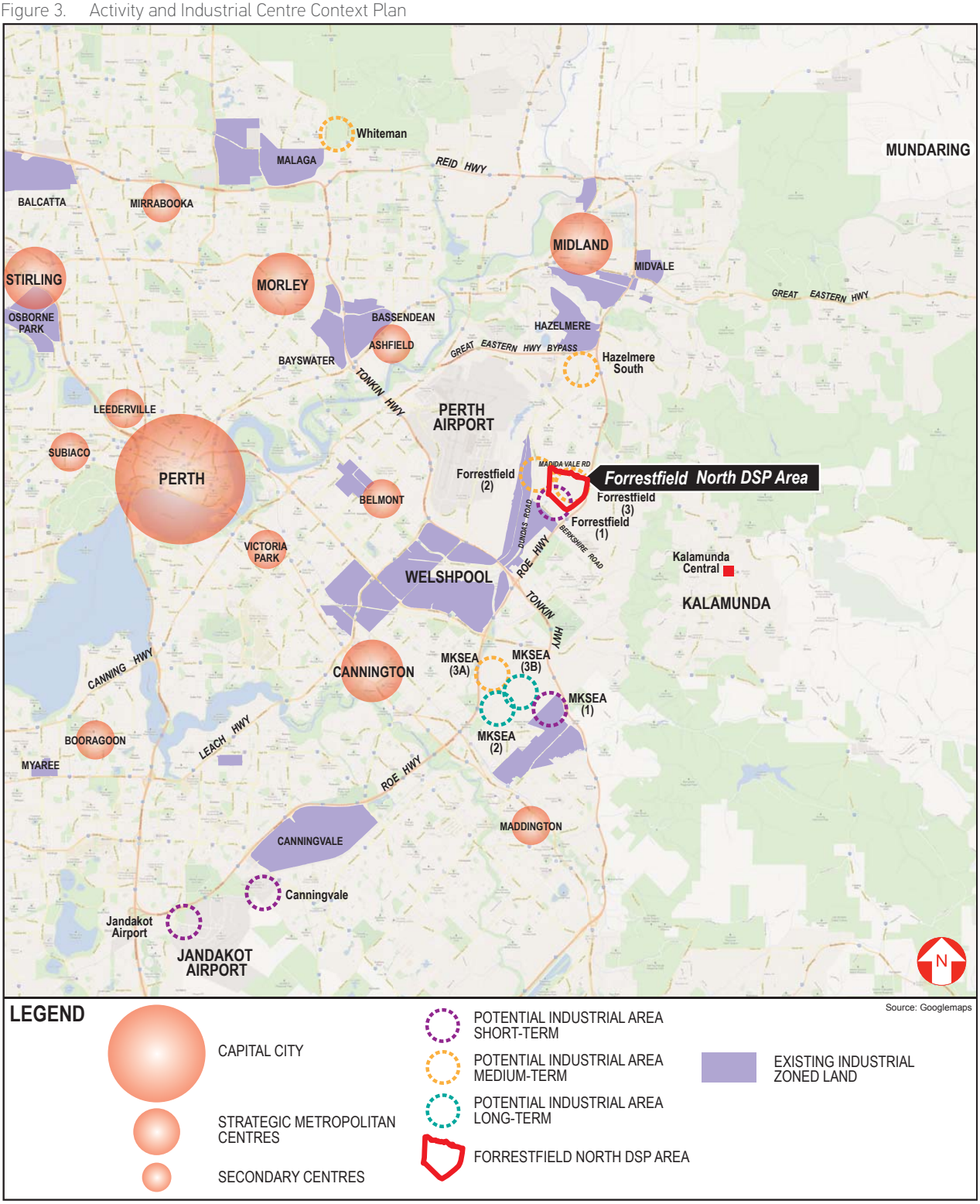
Forrestfield North does not exist in isolation. It is part of an established and emerging network of places and centres that perform or will perform certain roles and functions. In planning for the future development of Forrestfield North it is important to acknowledge the relationship of the area with surrounding centres.

Primary employment, retail and service functions are located in the Perth CBD, while secondary functions are situated in Midland, Cannington, Belmont, Kalamunda Central, and Forrestfield Forum. The planning and development intent for Forrestfield North is to reinforce and support the role and function of existing centres, while also providing a complementary range of land uses to meet the requirements of local residents and the wider catchment population accessing the Forrestfield Train Station and the proposed activity centre.

An economic analysis and high level retail demand assessment conducted for the area by AECgroup (February 2015) suggests that a significant activity centre could potentially be supported in Forrestfield North, and would serve to accommodate commercial floorspace for local business and household services that respond to population and employment growth. The size, land use composition and future staging for the activity centre will be assessed and considered as part of a more detailed retail needs assessment at the local structure planning stage for the Activity Centre Precinct.

Refer to Figure 3 – Activity and Industrial Centre Context Plan

Figure 3. Activity and Industrial Centre Context Plan



This page has been left blank intentionally.

3. Forrestfield North

3.1 Structure Plan Area

Forrestfield North comprises an area of approximately 264.1 hectares bounded generally by Poison Gully to the north, Roe Highway to the east, Berkshire Road to the south, and the Forrestfield Freight Yard and Mainline Freight Rail to the west. It includes the area that is proposed to be developed with the Forrestfield Train Station associated with the Forrestfield Airport Rail Link.

The area features fragmented land ownership with land parcels of various sizes being held in public and private ownership. The fragmented land ownership is a significant constraint to the future development of the area and will need to be a key consideration in future local structure planning processes. Appropriate land assembly and release may ultimately require State Government intervention to achieve desired outcomes.

Refer to Figure 4 – Site Plan

3.2 Site History

Current and historical land uses within the Forrestfield North area include residential, rural, rural-residential (with a focus on equestrian uses), plant nurseries, orchards, storage facilities, commercial, light industrial and transport businesses.

The area the subject of the North Forrestfield DSP displays highly varied usage and landscape characteristics, reflective of the eclectic nature of historic uses within the locality.

The former Brand Road landfill is located on 9.63 ha of land within the district structure plan area, on its eastern boundary.

Refer to Figure 5 – Aerial Plan

3.2.1 European Heritage

The Shire has recently reviewed its Municipal Heritage Inventory and updated the State Heritage Office's inHerit database. This has confirmed that there are no identified registered places of historic heritage value within the Forrestfield North DSP area.

Figure 4. Site Plan

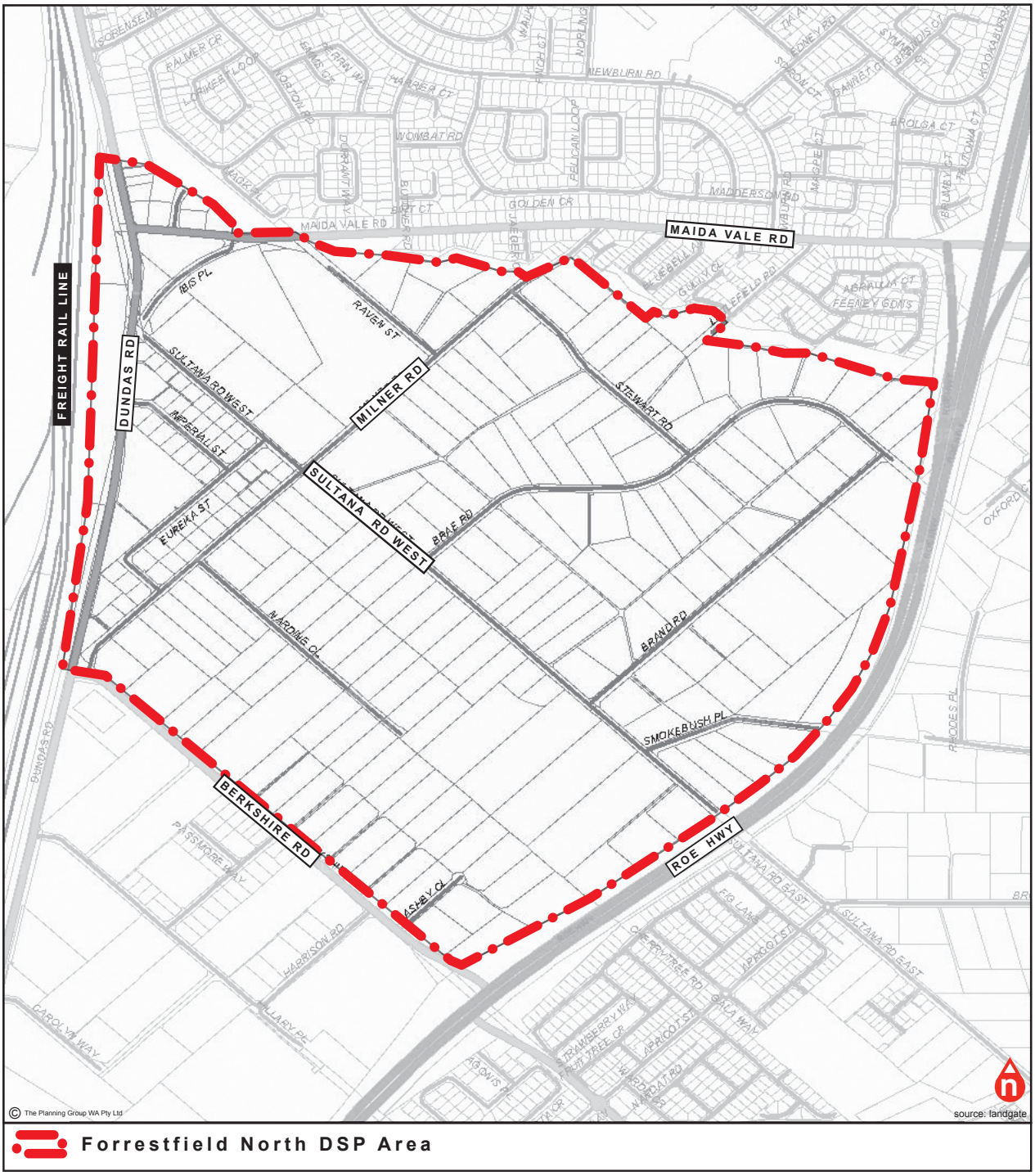


Figure 5. Aerial Plan

3.2.2 Aboriginal Heritage

A search of the Department of Aboriginal Affairs Aboriginal Heritage Inquiry System has been undertaken to identify whether there are any registered Aboriginal Sites or Other Heritage Places within the district structure plan area. The following places were identified:

Site ID	Name	Assessment Status	Restrictions	Type
25023	Poison Gully Creek	Registered Site	Female Access Only	Not stated.
3667	Crumpet Creek, Forrestfeild	Other Heritage Place: Stored Data/Not a Site	No restrictions	Artefact Scatter
3637	High Wycombe: Brooklands ES	Other Heritage Place: Lodged	No restrictions	Artefact Scatter

Refer to Figure 6 – Aboriginal Heritage Plan

The assessment status of each place under the *Aboriginal Heritage Act 1972*, is noted below:

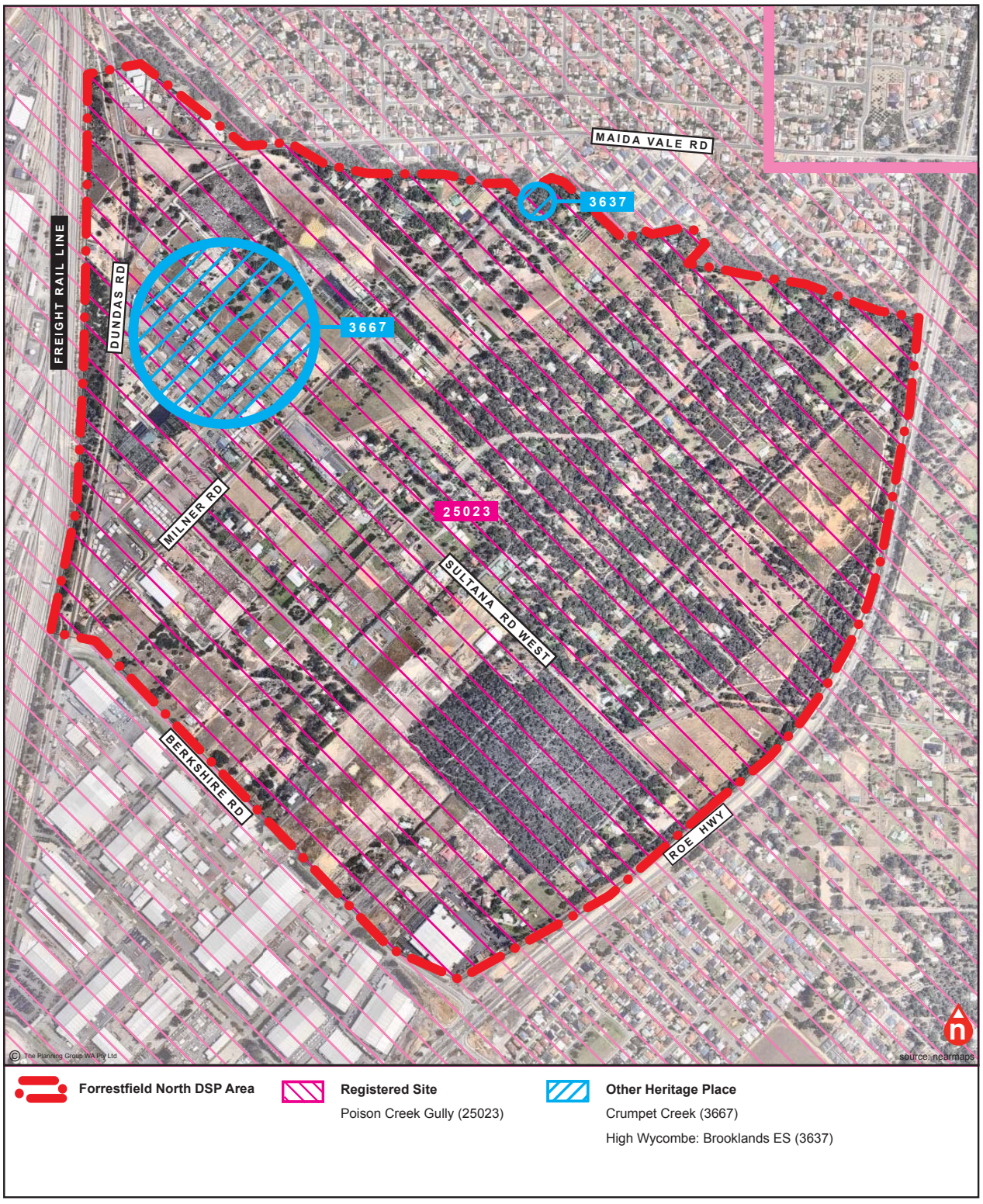
- **Registered Site:** The place has been assessed as meeting Section 5 of the *Aboriginal Heritage Act 1972*.
- **Other Heritage Place** which includes:
    - *Stored Data / Not a Site:* The place has been assessed as not meeting Section 5 of the Aboriginal Heritage Act 1972.
    - *Lodged:* Information has been received in relation to the place, but an assessment has not been completed at this stage to determine if it meets Section 5 of the *Aboriginal Heritage Act 1972*.

There is potential that future development within the district structure plan area may pose a risk to the registered site known as *Poison Gully Creek*. However, it is likely that this will be addressed by this area becoming a designated vegetation protection/enhancement area as identified through future local structure planning processes.

Whilst not yet a Registered site it is prudent to treat the Other Heritage Place known as *High Wycombe: Brooklands ES* as if it is an Aboriginal Site until a determination has been made. These will also be a consideration as part of subsequent local structure planning processes.

Given the above, consideration may need to be given to undertaking consultation with appropriate Aboriginal representatives as part of future planning processes and if the project is determined to impact the sites then a Section 18 Notice under the *Aboriginal Heritage Act 1972*, should be sought to use/disturb the land.

Figure 6. Aboriginal Heritage Plan



3.3 Forrestfield/High Wycombe Light Industrial Area

The development of Stage 1 of the Forrestfield/High Wycombe Light Industrial Area was a response to the WAPC's Kewdale-Hazelmere Integrated Master Plan (August 2006) (KHIM), a higher level transport and land use master plan that contained a number of associated recommendations and identified the need to review opportunities for integrated land use planning and development between Perth Airport and the Forrestfield Industrial Area.

The precinct was also subsequently identified as a potential industrial area in the medium term as part of the WAPC's Economic and Employment Lands Strategy: Non-Heavy Industrial Perth Metropolitan and Peel Regions (April 2012) (EELS).

A local structure plan and developer contribution arrangements were ultimately put in place to facilitate the development of Stage 1 of the industrial area for logistics and transport based industries that could take advantage of its location and proximal relationship with key transport infrastructure.

However, with the advent of the Forrestfield Airport Rail Link and the identification of alternative higher order urban land use opportunities for Forrestfield North associated with this infrastructure investment, the originally envisaged industrial development for the remainder of the area will no longer proceed.

3.4 Perth Airport Master Plan

Airport Master Plans are prepared by all major federal airports every five years under the requirement of the *Airports Act 1996* (Commonwealth), and outline proposed developments for the next 20 years.

The final Perth Airport Master Plan 2014 provides for significant developments, including the third runway and the Forrestfield Airport Rail Link project.

The Master Plan also includes information about how the impact of aircraft noise on communities surrounding Perth Airport will be managed, and is intended to ensure that the public is well informed on this aspect of airport operations. The Master Plan also provides the basis for the effective management of the environment, allowing for sustainable development of the airport estate.

Perth Airport is a major employment centre within the Perth and Peel region, supporting more than 17,000 jobs and contributing an estimated $2.61 billion to Gross Regional Product (GRP). These figures are projected to increase to more than 42,000 jobs and a GRP contribution of $7.04 billion by 2034.

The final Perth Airport Master Plan 2014 was published in August 2015.

3.5 Forrestfield Freight Yard and Mainline Freight Rail

The Forrestfield Freight Yard (FFY) and supporting mainline freight rail infrastructure was established in the late 1960's as part of a national standard gauge programme. A major freight rail facility had been envisaged at that location in the previous decade's Stephenson Hepburn Plan that mapped out key transport corridors and hubs for the Perth Metropolitan Area.

The FFY and associated mainline freight rail were carefully planned to provide an efficient and functional freight transport network to connect key intermodal trading ports (Fremantle Ports' Inner and Outer Harbours) and freight hubs (Perth Intermodal Freight Terminal and the FFY) with the State's resource and grain producing regions and the east coast of Australia, providing efficient and cost effective access to global markets for local producers and a continuous supply of fast moving consumer goods and general freight from the east coast to support a growing population and economy.

The FFY has developed from its inception to a point where it now covers an area of some 280 hectares (4.5 kilometres long, 0.6 kilometres wide) comprising a wide range of rail-related activities including:

- inter and intrastate main line freight train movements;
- Aurizon's Intermodal Terminal, Train Control Facility, Maintenance Depot and Construction Workshop;
- GEMCO's Rail Repair Depot;
- Specialised Container Transport's intermodal terminal;
- CBH's Metropolitan Grain Terminal that receives and delivers grain;
- Intermodal Link Services' terminal and empty container park that handles 15 per cent of international shipping containers to and from Fremantle Ports; and
- Blue Scope Steel's internal rail terminal.

The section of mainline rail infrastructure abutting the eastern boundary of the FFY is now an essential component of the State's freight network, carrying the majority of freight rail movements between metropolitan sea and rail intermodal hubs, regional Western Australia and the eastern seaboard.

The colocation of the FFY rail-related activities and the freight mainlines, together with the operational relationship between some of the activities (such as the CBH Metropolitan Grain Terminal and the adjoining Joe White Maltings), is unique in Western Australia (with the exception of the recent development of the Perth Intermodal Freight Terminal at Kewdale) and demonstrates freight and logistics efficiencies of significant benefit to the State, its industries and the overall community.

The freight mainlines through the FFY typically see some 600 train movements each week, with the volume of movements varying according to seasonal fluctuations and the state of commodity markets. These movements are predominantly long-haul interstate freight trains and those hauling grain from the Wheatbelt and the South West. Intrastate freight trains and those hauling other bulk commodities (for example, iron ore) make up the balance.

While the majority of movements are on the freight mainlines through the FFY, there is also a significant level of on-site shunting activity and other internal operations that occur within the facility. The FFY comprises a highly complex arrangement of multiple tracks working at different times and performing different functions, an operation unique in this State to the FFY.

Along with the Perth (Intermodal) Freight Terminal in Kewdale and the Inner and Outer Harbours at Fremantle, the FFY is one of the main generators of freight and logistics activity in the metropolitan area. The standard measurements of economic activity that occur within the FFY such as employment, freight charges, local government rates and value of product hauled, when added to the indirect operational and commercial benefits arising from the operation, indicate an importance to the State of the facility that cannot be over-estimated.

By its very nature, the FFY necessarily operates on a 24/7 basis. Noise, vibration, light-spill and other negative impacts on the surrounding area are unavoidable, continuous and often severe. Land uses adjacent to the FFY that are sensitive to such impacts should be cognisant that freight activity in this State is forecast to double by 2030 and potentially triple by 2050, a growth trajectory likely to be mirrored at the FFY and in movements on the adjoining rail freight mainlines.

Any constraints (for example, night time curfews on operation) that may be suggested for the FFY operation because of sensitive adjacent land uses would seriously disrupt rail freight schedules across metropolitan Perth, regional Western Australia and the national network providing connections to the eastern seaboard. Such disruption would add significant costs in the form of extra rolling stock to compensate for less efficient train cycles, together with the development of sidings and yards to accommodate trains being held over until daylight. In the case of long distance trains in particular, this cost impost would be passed directly to Perth customers including households. Moreover, new terminals and yards would have to be built further out in the metropolitan area which would impose greater heavy truck activity on the community (connecting rail yards to businesses) and higher operating costs on industry that would inflate local prices and reduce export competitiveness.

3.6 Gateway WA Perth Airport and Freight Access Project

The Gateway WA Perth Airport and Freight Access Project is the largest infrastructure project ever undertaken by Main Roads WA.

This billion-dollar project involves a major upgrade to the road network surrounding Perth Airport and the freight and industrial hubs of Kewdale and Forrestfield.

It focuses primarily on Tonkin Highway, between Great Eastern Highway and Roe Highway, and Leach Highway, between Orrong Road and Perth Airport. It also includes the grade separation of the Roe Highway/Berkshire Road intersection, which is a major enabling factor for the future development of the Forrestfield North area.

The need for the project was driven by the expected doubling of passenger air travel and road freight requirements over the next decade, coupled with the proposed consolidation of the Perth Airport terminals.

This area of Perth is arguably WA's most important transport interchange, where road, rail and air services meet to facilitate the movement of people and goods that are essential to the economy of both the State and the nation.

3.7 Forrestfield Airport Rail Link

The Forrestfield Airport Rail Link was announced by the WA State Government in 2014. The aim of the Forrestfield Airport Rail Link is to connect Forrestfield to the Perth CBD via a new train line. The objective is to open up Perth's eastern suburbs to the rail network and provide Perth Airport users a more efficient option than using private transport. The majority of the rail link will be tunnelled underground.

The proposed rail link is the largest economic infrastructure project to benefit the North-East sub-region, improving connectivity to benefit business investment and stimulate jobs and housing growth. As a direct consequence, the region is expected to undergo extensive change and urbanisation in the future, with high expectations and aspirations for future development in the Forrestfield North area. This includes increased residential densities and commercial opportunities to support local economic and employment growth, leveraging the $2 billion investment in the airport rail link and train station.

3.8 Contemporary Comparisons

The type of infrastructure investment that will influence the future development of Forrestfield North is not unique to Perth. Cities across Australia and around the world have invested in major passenger rail, transport infrastructure and urban consolidation initiatives to support the needs of growing populations. Joondalup represents an earlier, albeit larger example of where this has occurred in Perth with Cockburn Central and Wellard being more recent examples.

However, there are few comparable locations in Perth that offer the same opportunities as Forrestfield North which has a relatively central location and sits within a crucible of established and emerging residential areas such as High Wycombe and Maida Vale as well as employment lands including established industrial areas in Kewdale/Hazelmere and Perth Airport. Subject to achieving an acceptable environmental solution and an appropriate response to noise and vibration associated with the operation of the Forrestfield Freight Yard and Mainline Freight Rail, the relatively unconstrained land within Forrestfield North has the opportunity to provide higher density residential development and employment opportunities that are currently under represented in the North-East Sub-region, and that capitalise on investment in key transport and services infrastructure.

3.9 Future of Forrestfield North

Forrestfield North will become an important urban development area in the future. It will provide complementary higher density residential and employment opportunities to surrounding development and leverage the opportunities created by significant investment in transport and services infrastructure.

The land use character of the area will become more diverse with the introduction of a new activity centre and TOD precinct. These centres will offer a new range of housing, shopping and employment opportunities for the local and wider population without unduly adversely affecting the established network of centres within the sub-region and beyond.

The landscape setting of Forrestfield North will be retained and enhanced through the protection of and improved linkages between ecologically sensitive areas. Additional parklands will be created along with a network of pedestrian pathways and cycleways to provide access to the activity centre, TOD precinct, train station and beyond.

These initiatives will transform Forrestfield North from a relatively isolated rural residential enclave into a new exciting and vibrant urban hotspot where people want to live, work and play.

4. Area Analysis

4.1 Environmental Overview

Various environmental studies have been undertaken previously over the area encompassed by the Forrestfield North DSP. These have assessed environmental opportunities and constraints associated with proposed changes in land use to support MRS amendment processes and associated referrals to the Environmental Protection Authority (EPA) under section 48A of the *Environmental Protection Act 1986* (EP Act).

The Forrestfield North area currently supports a wide range of land uses including residential, plant nurseries, earthmoving contractors, horse agistment parks and commercial and industrial businesses. It also contains the Poison Gully Creek Bush Forever site, remnant native vegetation of predominantly open Jarrah and Marri with Wandoo and Banksia and one threatened species. Three vertebrate fauna species of conservation significance have been recorded in the area including Forest Red-tailed Black Cockatoo, Carnaby's Black Cockatoo and Quenda. One *Environment Protection and Conservation Act 1999* (EPBC Act) listed flora species, the Wavy-leaved smokebush is widespread throughout the area.

Ongoing groundwater quality monitoring has reported some elevated levels of certain pollutants above guideline values, and these are most likely due to historic land uses including landfill at the former Brand Road landfill site.

Consideration will also need to be given to noise and vibration associated with the operation of Perth Airport and the Forrestfield Freight Yard and Mainline Freight Rail. The continued successful operation of these important facilities is a key issue that needs to be taken into consideration in future more detailed levels of land use planning at the local structure planning stage. In this regard the suitability of affected areas for sensitive uses will need to be carefully considered as part of subsequent local structure planning processes having regard to the requirements as set out in the WAPC's State Planning Policy 5.1 – Land Use Planning in the Vicinity of Perth Airport (SPP 5.1), State Planning Policy 5.4 – Road and Rail Transport Noise and Freight Considerations in Land Use Planning (SPP 5.4) and the Implementation Guidelines for State Planning Policy 5.4 – Road and Rail Noise and Freight Considerations in Land Use Planning.

Potential impacts to identified environmental values within Forrestfield North will be managed through implementation of the following measures:

- Retention of significant habitat trees identified as being in 'good condition' or better, for the two species of black cockatoo;
- Establishment of vegetation protection and enhancement areas including retention and rehabilitation of ecological linkages where possible;
- Avoidance of known populations of flora species of conservation significance, including *Conospernum undulatum, Eucalyptus calophylla – Kingia australis* and *Banksia attenuate;*
- Avoidance or appropriate management of known registered heritage sites;
- Establishment of a Poison Gully Creek buffer zone along the northern boundary of the subject land as determined in the Poison Gully Creek Foreshore Assessment;
- Careful consideration of potential future uses for the Brand Road landfill site, including non-sensitive recreational or commercial land uses and additional contamination investigations if required to support such uses at the local structure planning stage; and
- The outcomes of noise and vibration assessments undertaken at the local structure planning stage to ensure that the continued successful operation of Perth Airport and the Forrestfield Freight Yard and Mainline Freight Rail are not adversely impacted by the inappropriate location of sensitive land uses within Forrestfield North in accordance with applicable State Planning Policy requirements.

It is predicted that with the refinement of these measures as part of future local structure planning processes and that with the ultimate implementation of these

management measures probably in the form of local reserves to protect the significant environmental assets in the locality, the proposal to urbanise Forrestfield North is unlikely to have a significant impact on the identified environmental values of the area.

4.2 Geology, Soils and Topography

4.2.1 Geology And Soils

The geology of the majority of the Forrestfield North area consists of a mixture of Bassendean Sands and sands of the Yoganup Formation (Gozzard 1986). The majority of the DSP Area is dominated by Bassendean Sands which are described as 'light grey fine to medium grained quartz sands of eolian origin' over the sands and silts of the Guildford Formation soils (Gozzard 1986). The Yoganup Formation predominantly occurs in the northeast of the DSP Area and consists of yellow, fine to medium grained quartz sand with some feldspar and variable silt content of colluvial origin (Gozzard 1986). The small area of peaty clay appears to be associated with a wetland.

As part of previous environmental work that largely focussed on the Stage 3 area, a total of nine bores have been drilled by Strategen in the Stages 2 and 3 area in September 2011). The lithology of the bores can be summarised as:

- predominantly sand, except MB03, which had clayey sand throughout the profile.
- gravelly sand sometimes present at the surface (MB01, MB03, MB04 and MB07).
- clayey sand present at depth in all bores except MB04 and MB05 at the eastern edge of the DSP area, at a depth varying from approximately two metres below ground level (bgl) to 14 mbgl, although generally within six metres of the surface (Appendix 2 of DWMS).

This may represent the presence of Guildford Formation soils underneath the sand formations. No obvious perching layers were observed during bore construction.

ENV (2012) indicate that soils in the Stage 1 area consist predominantly of Guildford Formation material with a layer of sand present in depths up to from 0.5 m to 3 mbgl. Towards the south west of the site, this sand layer overlaid pale grey or orange silty sand (ENV 2012). In the central part of Stage 1, cream and pale grey to white clayey sand was found at depths below 4.2m to 5.2m (ENV 2012).

Layers of orange, grey, brown, cream or white sandy clay or clayey sand, with occasional gravelly bands, were found below the surface sand layer in all of the other bores (ENV 2012).

4.2.2 Acid Sulphate Soils

The Forrestfield North area is classified as having a low to moderate probability of acid sulfate soils (ASS) occurring within three metres of the ground surface (CSIRO 2006). The exception to this is the peaty clay area in the south of the DSP area, which is mapped as high to moderate risk.

During bore installation in September 2011, samples were collected at depths of 25 centimetre intervals from the surface to four metres and results analysed. Soils sampled were yellow to gray sandy soils, with no sulfidic smells and no evidence of waterlogging. Results indicate relatively neutral pH and pH fox results, with minimal difference between these. It is likely that no ASS will be disturbed in the area based on field observations and analytical results. It is therefore considered that no additional ASS work is required at the local structure planning stage, although some work may be required at the subdivision stage if dewatering is required to support railway tunnelling or to construct deep sewers in the area.

4.2.3 Topography

The land within Forrestfield North generally slopes in a westerly direction. It ranges in elevation from 27 metres Australian Height Datum (AHD) in the west to 45 metres AHD in the east (Landgate 2011). Poison Gully Creek, located at the northern boundary of the area is also deeply incised.

4.3 Hydrological Conditions

4.3.1 Groundwater

The Second Edition of the Perth Groundwater Atlas (DoE 2004) indicates that groundwater flows on the Forrestfield North area are in a north-westerly to south-westerly direction. Summer groundwater levels are anticipated to be greater than 17 metres AHD (DoE 2004). The area is close to the eastern boundary of the mapping and lies between the 17 metres AHD contour and the edge of the mapping at the Darling Scarp. The Perth Groundwater Atlas (First Edition) (WRC 1997) does not cover the area. There are no Department of Water (DoW) groundwater bores within the area. The closest DoW bore with a long

monitoring record is at the corner of Abernethy and Kewdale Roads in Kewdale, approximately four kilometres south-east of the area (DoE 2004).

4.3.2 Stage 1

ENV installed seven groundwater monitoring bores in Stage 1 in October 2010 (ENV 2012, Appendix 3 of DWMS). A monitoring event was undertaken in October 2010 at the seven monitoring bores installed at the DSP area for water level and quality (ENV 2012). ENV also undertook monitoring for six months from July 2011 to December 2011 at six bores, as one groundwater bore was damaged (ENV 2012).

Groundwater monitoring undertaken for Stage 1 indicates that groundwater in this area flows in a southerly direction, with a depth to annual average maximum groundwater level (AAMGL) of 25 to 26 mAHD (ENV 2012). Depth to AAMGL varied from 2 to 11 m (ENV 2012). Both studies by ENV and Strategen noted that groundwater was closest to the surface in the west of the DSP Area.

4.3.3 Stages 2 and 3

Groundwater levels recorded in the area by Strategen between September 2011 and March 2012 indicate that groundwater is present between 23 and 33 metres AHD. The highest groundwater levels to date were recorded in October 2011. At this time, depth to groundwater was generally greater than nine metres. Depth to groundwater in Stage 2 varied from less than one metre to 10 metres Groundwater in Stage 3 appears to flow towards the south or southeast. Results of the Strategen monitoring will be provided at the Local Water Management Strategy (LWMS) stage.

Groundwater quality monitoring indicates a pH range of 4.62 to 7.21 with a median across fall bores of 5.84, which indicates that groundwater is generally neutral to acidic. Groundwater is fresh with a median electrical conductivity (EC) level of 0.438 mS/cm. This mean EC level is within the expected range of 0.3- 1.5 mS/cm for slightly disturbed ecosystems in south-west Australia (ANZECC 2000). EC levels were less than 1.1 mS/cm for all bores.

Total nitrogen (TN) levels varied from 0.31 mg/L to 25 mg/L throughout the monitoring period with a median of 2.1 mg/L. This median exceeds the Swan Canning Water Quality Improvement Plan's (SCWQIP) long-term and short-term target for TN (1 mg/L and 2 mg/L respectively) (Swan River Trust 2009). The Australian Drinking Water Guidelines for nitrate of 30 mg/L nitrate as nitrogen were exceeded in MB07 and MB08 on two occasions each.

Total phosphorus (TP) results varied from <0.01 to 5.7 mg/L, with a median value of 0.72 mg/L. These levels are above the SCWQIP long-term and short-term target for TP (0.1 mg/L and 0.2 mg/L respectively).

4.3.4 Surface Water

The results of geological investigations, groundwater and wetlands mapping to date indicate that the DSP area contains areas with varying properties from a drainage perspective. These areas can be considered to be:

1. East of Milner Road. Monitoring undertaken in Stages 1 and 3, east of Milner Road, indicates that these areas largely contain sandy soils and a good depth to groundwater. Such conditions are generally suitable for infiltration of stormwater.
2. West of Milner Road. The area to the west of Milner Road appears to have shallower groundwater and less permeable soils, and thus runoff may occur during larger rainfall events (i.e. 1 in 1-year ARI event or greater). Additional studies are anticipated to be required at the LWMS stage to confirm the properties of this area.

The use of Milner Road as a dividing line is indicative, and may be reviewed at the LWMS stage.

Informal drains are present in the DSP area, including in the Milner Road and Sultana Road West areas. If these drains are to be utilised during or after the development period, the drains should be surveyed at the LWMS stage and, if necessary, monitored for water quality, as discussed in Section 6.2.1 of the District Water Management Strategy (DWMS).

4.3.4.1 Poison Gully

Surface water in the area is dominated by Poison Gully, which collects water from higher areas to the east of the district structure plan area and flows in a westerly direction via Perth Airport Main Drain and Limestone Creek into the Swan River. Poison Gully is an ephemeral creek that flows during the winter months. Water monitoring in Poison Gully commenced in September 2011, but water was only present in September and October 2011.

Poison Gully is part of the Shire's drainage network and has an extensive catchment to the east of the area (Water

Corporation 2010). Poison Gully flows into Perth Airport and is formalised into the Northern Main Drain (identified by Water Corporation as Limestone Creek, one of two major drainage channels on Perth Airport). Limestone Creek, once off Perth Airport is managed by Water Corporation.

A portion of the area is considered part of the Poison Gully Catchment. Drainage on the remainder of the area is considered likely to infiltrate on site due to the sandy nature of the topsoils and generally high depth to groundwater.

Flood level modelling for the 1 in 100-year ARI event in Poison Gully was undertaken by Water Corporation (2010). This flood modelling indicates a 1 in 100-year ARI flood level ranging between 39.81 metres AHD at Roe Highway and 32.36 metres AHD at Maida Vale Road. The flood height at Roe Highway is considered likely to be underestimated, as the invert level of the creek at this point is greater than 40 metres AHD, above the Water Corporation Flood level. Based on the Water Corporation modelling, Poison Gully will overtop the road at Milner Road in the 1 in 100-year ARI event.

Flood levels and extent of flooding were interpolated from the Water Corporation modelling by Strategen along Poison Gully. Extents of flooding and levels shown have been estimated for the purpose of the foreshore assessment based on this modelling. The accuracy and results of this modelling have not been checked by Strategen. The mapping is therefore considered indicative and persons undertaking construction or other works adjacent to Poison Gully should make their own assessments of the flooding risks involved.

The width of flooding is variable, ranging from less than 10 metres to approximately 40 metres at the widest point. The Water Corporation modelling does not identify a separate floodway (area of fast flow) and flood fringe (area of slower water movement).

Culvert Sizes

Road culverts for Poison Gully are as follows:

- Roe Highway – four 1500 mm diameter culverts
- Littlefield Road – 2000 x 3000 mm box culvert
- Milner Road – one 1350 mm diameter culvert
- Maida Vale Road – two 1350 mm diameter culverts (Water Corporation 2010).

The modelling undertaken by Water Corporation (2010) considered that these culverts were adequate for the current flows in Poison Gully, based on the level of development. Should overtopping at Milner Road be considered unacceptable from a serviceability perspective, the design of the road and culverts should be reviewed.

Foreshore Assessment

A foreshore assessment for Poison Gully has been undertaken by Strategen. The foreshore boundary has been delineated based on consideration of bank steepness, presence of native vegetation and the 1 in 100-year ARI floodway. The most important factor has generally been the floodway and the presence of native vegetation that stabilises the banks and strips nutrients. The steep banks that may require stabilisation are generally within this area, as these banks are difficult to clear and generally avoided. The 1 in 100-year ARI floodway extends beyond the vegetation boundary at only a few locations, most notably to the east of Milner Road.

Water Quality

DoW indicated that they have no surface water level or quality monitoring records for Poison Gully. Only one set of water quality results has been obtained from the monitoring in September 2011. This showed a total nitrogen level of 0.42 mg/L and a total phosphorus concentration of less than 0.01mg/l, both of which are below the SCWQiP guidelines.

4.4 Vegetation And Flora

4.4.1 Vegetation Complexes

Heddle et al (1980) broadly mapped vegetation complexes across the Swan Coastal Plain. The area comprises the Southern River Complex and the Forrestfield Complex.

The Southern River Complex occurs in the western portion of the area and is described as 'open woodland of *Corymbia calophylla* (Marri) – *Eucalyptus marginata* (Jarrah)– Banksia spp. with fringing woodland of *E. rudis* (Flooded Gum) – *Melaleuca rhaphiophylla* along creek beds' (Heddle et al 1980).

The Forrestfield Complex occurs in the eastern portion of the area and is described as 'vegetation ranges from open forest of *C. calophylla – E. wandoo – E. marginata* to open forest of *E. marginata – C.calophylla – C. Fraseriana – Banksia spp*. Fringing woodland of E. rudis in the gullies that dissect this landform' (Heddle et al 1980).

The Threatened Wavy-leaved smokebush, Conospermum undulatum has been recorded in the Stage 3 area (Shire of Kalamunda 2012).

4.4.2 Vegetation Type and Condition

A flora and vegetation survey conducted by the Shire identified that the majority of the area is degraded. Some pockets of remnant Banksia and Marri Woodland remain and to a lesser extent, Jarrah woodland and scattered large Jarrah specimens and Flooded Gums with a cleared understorey. The condition of remnant vegetation ranges from very good to degraded. The survey did not include assessment of the foreshore reserve.

4.4.3 Threatened Ecological Communities (TEC) And Priority Ecological Communities

Related correspondence from the DEC (February 2008) indicates stated that the conservation site located in the northwest of the area in the TOD precinct *'... contains a mosaic of TEC that are most likely to include..":*

- *Eucalyptus calophylla – Kingia australis woodlands*
- *Banksia attenuata*
- Eastern shrublands and woodlands.

The protection and enhancement of this highly significant area will be a key consideration of future local structure planning processes.

The Threatened Wavy-leaved smokebush, *Conospernum undulatum* (Shire of Kalamunda 2012) is also recorded throughout the area.

4.4.4 Bush Forever

Bush Forever Site No. 45 (Poison Gully Bushland, High Wycombe) is located along the northern boundary of the area, and contains Poison Gully Creek. This site is inferred to contain TEC 3a: *Corymbia calophylla* (marri) – *Kingia australis* woodlands on heavy soils, Swan Coastal Plain (Government of Western Australia 2000).

Bush Forever Site No. 123 (Sultana Road West Bushland, High Wycombe) is located adjacent to the site on the southern boundary. This site contains TEC 20a: *Banksia attenuata* woodland over species rich dense shrublands.

In addition to the Bush Forever Sites, the DSP area contains scattered areas of remnant vegetation.

The Bush Forever Sites will be maintained as part of the planning process and in this regard it is noted that arrangements are required to be made with the WAPC regarding any improvements and/or public access to Bush Forever areas.

4.4.5 Wetlands

The southern and western portion of the DSP area is largely mapped as a Multiple Use Category wetland (MUW), although groundwater monitoring in at least parts of the wetland area are greater than two metres.

The DSP area contains four Resource Enhancement Category Wetlands (REW), being:

- Poison Gully
- wetland adjacent to Ibis Place in the northwest
- a small wetland parallel to Dundas Road in the west
- Sultana Road West wetland (part of Bush Forever Site No. 123) in the south.

A portion of the Ibis Place wetland consists of vegetation, which, although previously cleared, is considered to represent a Threatened Ecological Community, although the exact community is unclear (Morgan 2013). This vegetation is proposed to be retained through the DSP process and subsequent local structure planning processes.

The Environmental Protection Authority (EPA) recommends that all reasonable measures should be taken to minimise the potential impacts on REW and appropriate buffers are provided to such wetlands. These wetlands have the potential to be restored to the higher, conservation category and rehabilitation is encouraged. As MUW are wetlands that have been predominantly cleared and highly modified, development of such wetland areas is generally considered acceptable.

The REW area covers most of Poison Gully to the west of Littlefield Road. The area within the foreshore boundary discussed in Section 3.5 of the DWMS is anticipated to remain as a REW. The foreshore to the east of this area is considered to be of a similar or better quality to the foreshore within the REW area. The foreshore should therefore be afforded a similar buffer to that applied to a REW. This buffer should be assessed at the local structure planning stage.

4.4.6 Ecological Linkages

Ecological linkages are important for maintaining ecological processes and natural systems. The Shire's Local Biodiversity Strategy (Shire of Kalamunda 2008) identifies ecological linkages within the Forrestfield North area as running east-west along Poison Gully Creek, and north-south through the eastern portion of the area. A targeted fauna survey report also identified ecological linkages within the area.

4.4.7 Threatened Flora

Searches have been conducted of the DER's Threatened and Priority Flora Database, the WA Herbarium database and the Threatened and Priority Flora Species List for the area. This search identified thirteen flora species of conservation significance as potentially occurring in Forrestfield North.

In addition, an EPBC Protected Matters Search was undertaken on 18 October 2011, which identified nine flora species of conservation significance that potentially occur in the area.

Of the species identified as potentially occurring in the area, only one species has been formally recorded as a result of flora and vegetation surveys, the Wavy-leaved smokebush, *Conospernum undulatum* (Shire of Kalamunda 2012), which was recorded throughout the locality.

4.5 Fauna

A targeted fauna survey was conducted in Autumn 2012 to record black cockatoo and quenda presence, assess black cockatoo habitat value and to record other fauna species of conservation significance. This survey confirmed the presence of the Forest Red-tailed Black Cockatoo, Carnaby's Black Cockatoo and Quenda, and recorded a further 47 fauna species, of which ten are considered of local significance, based on distribution (Bamford 2012). These are:

- Hooting Frog, Western Marsh Frog (*Heleioporus barycragus*)
- Common Bronzewing (*Phaps chalcoptera*)
- Collared Sparrowhawk (*Accipiter cirrocephalus*)
- Weebill (*Smicrornis brevirostris*)
- Yellow-rumped Thornbill (*Acanthiza chrysorrhoa*)
- Western Wattlebird (*Anthochaera lunulata*)
- New Holland Honeyeater (*Phylidonis novaehollandiae*)
- White-cheeked honeyeater (*Phylidonyris niger*)
- Varied Sittella (*Daphoenositta chrysoptera*)
- Golden Whistler (*Pachycephala pectoralis*).

4.6 Matters of National Environmental Significance

The Australian Government EPBC Act protects threatened and migratory species listed under Schedule 1 of the Act. The current list differs from the various State lists, however, some species are common to both. There is currently no direct State protection of Threatened Ecological Communities (TECs).

The EPBC Act objectives are to:

- provide for the protection of the environment, particularly Matters of National Environmental Significance (MNES).
- promote ecologically sustainable development through the conservation and ecological sustainable use of natural resources.
- control the international movement of wildlife, wildlife specimens and products made or derived from wildlife.

A search of SEWPAC's SPRAT database on 18 October 2011 identified fifteen (15) threatened species, five (5) migratory species and one TEC as potentially occurring within the area.

4.6.1 Threatened Species

As indicated previously, threatened species considered known or likely to occur within the area are:

- Carnaby's Black Cockatoo
- Forest Red-tailed Black Cockatoo
- Wavy-leaved smokebush.

4.6.2 Migratory Species

Migratory species considered to be likely to occur in the area due to the availability of suitable habitat are *Ardea alba* (Great Egret) and *Merops ornatus* (Rainbow Bee-eater).

4.6.3 TEC

The TEC *Corymbia calophylla – Kingia australis* woodlands on heavy soils of the Swan Coastal Plain; Endangered, is listed as potentially occurring within the area. As indicated above, analysis indicates that the TEC may be present within the area although its distribution is likely to be limited.

4.7 Contamination

Current and historical land uses within the area include landfill, plant nurseries, orchards, storage facilities, commercial, industrial and transport businesses and illegal waste dumping, all of which are potentially contaminating activities.

The former Brand Road landfill is located on 9.63 ha of land within the district structure plan area, on its eastern boundary. A Preliminary Site Investigation (PSI) for the former landfill was completed in 2010 (GHD 2010). This site is considered 'Possibly Contaminated – Investigation Required' under the Contaminated Sites Act 2003 (Reference: DEC10015). Land use planning for the site as part of future local structure planning processes will need to into account the contaminated nature of the site. Any future reporting or remediation required for the site will be the responsibility of the landowner.

No other sites of known contamination are listed within the DSP area boundary. Sites where potential contamination exists will be managed through the land use planning process in accordance with the *Contaminated Sites Act 2003*.

4.8 Bushfire Management

The Department of Fire and Emergency Services Map of Bushfire Prone Areas 2016 identifies portions of land within the DSP area as falling within, or partially within a bushfire prone area. As such, additional planning and building requirements may apply to developments within those areas that are designated as being bushfire prone.

Bushfire management plans are required to be prepared at the local structure planning stage to inform more detailed land use and built form considerations and requirements in accordance with the WAPC's State Planning Policy 3.7 – Planning in Bushfire Prone Areas (SPP 3.7).

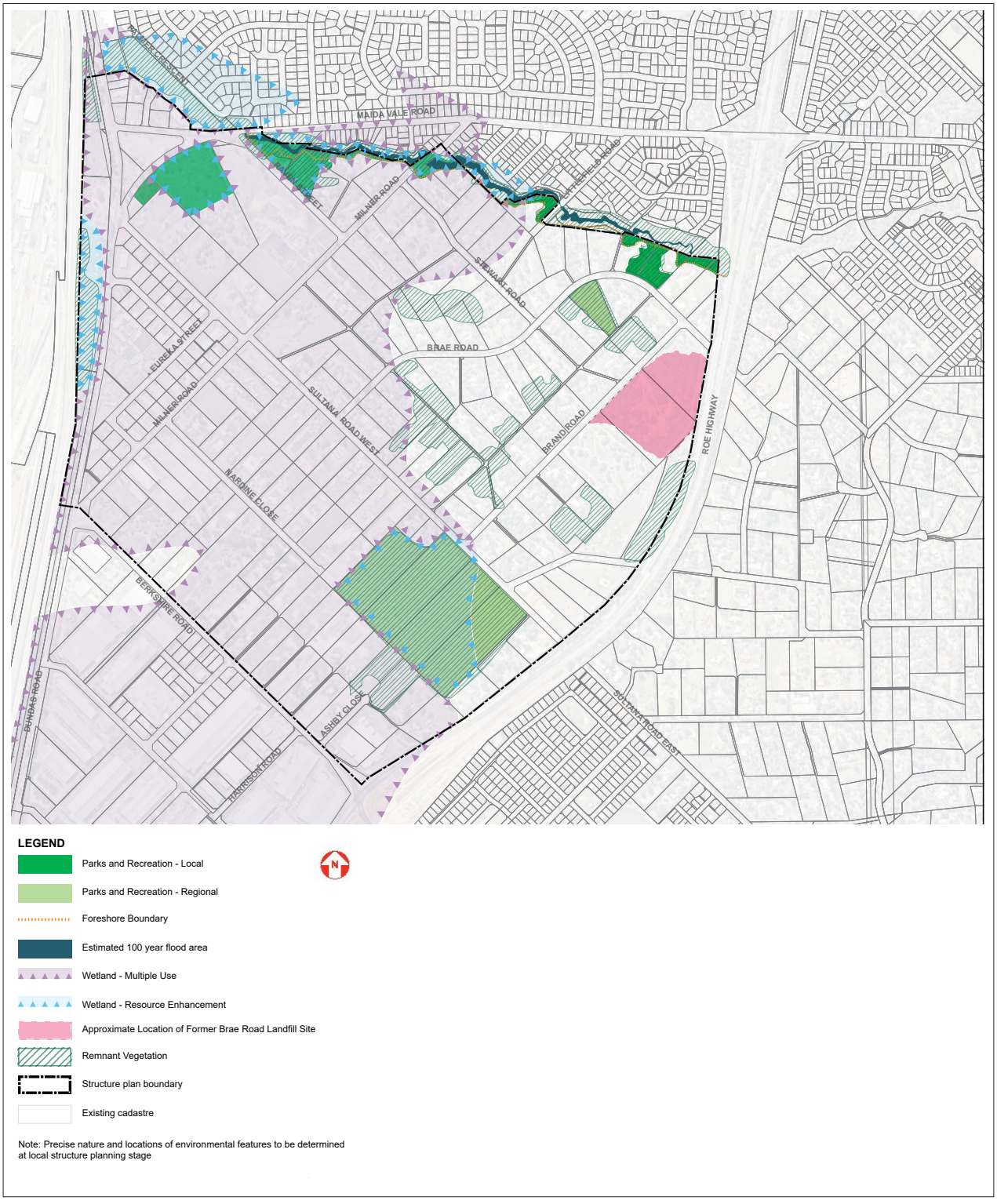
4.9 Consolidated Environmental Features

To assist in the local structure planning process for the Forrestfield North Area a consolidated enviromental features plan is provided at Figure 7.

Refer to Figure 7 - Consolidated Environmental Features Plan - Forrestfield North Area

This page has been left blank intentionally.

Figure 7. Consolidated Environmental Features Plan - Forrestfield North Area



This page has been left blank intentionally.

5. Structure Plan

5.1 Forrestfield North District Structure Plan

District structure plans are generally prepared by a local government or the WAPC, and may apply to several suburbs or all or part of a town site. Generally a district structure plan addresses 'fatal flaws' of a potential development area and provides for the major structural elements, including major roads, open space network, commercial and industrial areas, and environmental conditions.

A district structure plan can provide the basis for zoning and lead to more detailed structure planning through the preparation of a local structure plan. In this case, the primary purpose of the Forrestfield North DSP is to establish future land use and development intent for the area, and to clearly identify precinct based areas that require additional detailed planning and investigation through the preparation of local structure plans consistent with Part 1 of the district structure plan.

Part 4 – Structure plans of the *Planning and Development (Local Planning Schemes) Regulations 2015* (the Regulations) Deemed provisions for local planning schemes (Deemed Provisions) sets out the requirements for the preparation of structure plans under the Shire of Kalamunda (the Shire) Local Planning Scheme No. 3 (LPS3).

Prior to any application for development or subdivision being approved in the Forrestfield North area (unless otherwise approved under Clause 27(2)(a) and (b) of the Deemed Provisions), the Shire and WAPC require the adoption of local structure plans. These local structure plans are required to be consistent with the future development intent and objectives of the Forrestfield North District Structure Plan in accordance with the provisions of LPS3 and applicable Deemed Provisions relating to structure plan preparation as set out in the Regulations.

Refer to Figure 8 – Forrestfield North District Structure Plan

5.2 Forrestfield North Land Uses

The vision, anticipated uses and intended form of future development in the land use zones identified in the district structure plan is summarised below.

5.2.1 Mixed Use

5.2.1.1 Vision

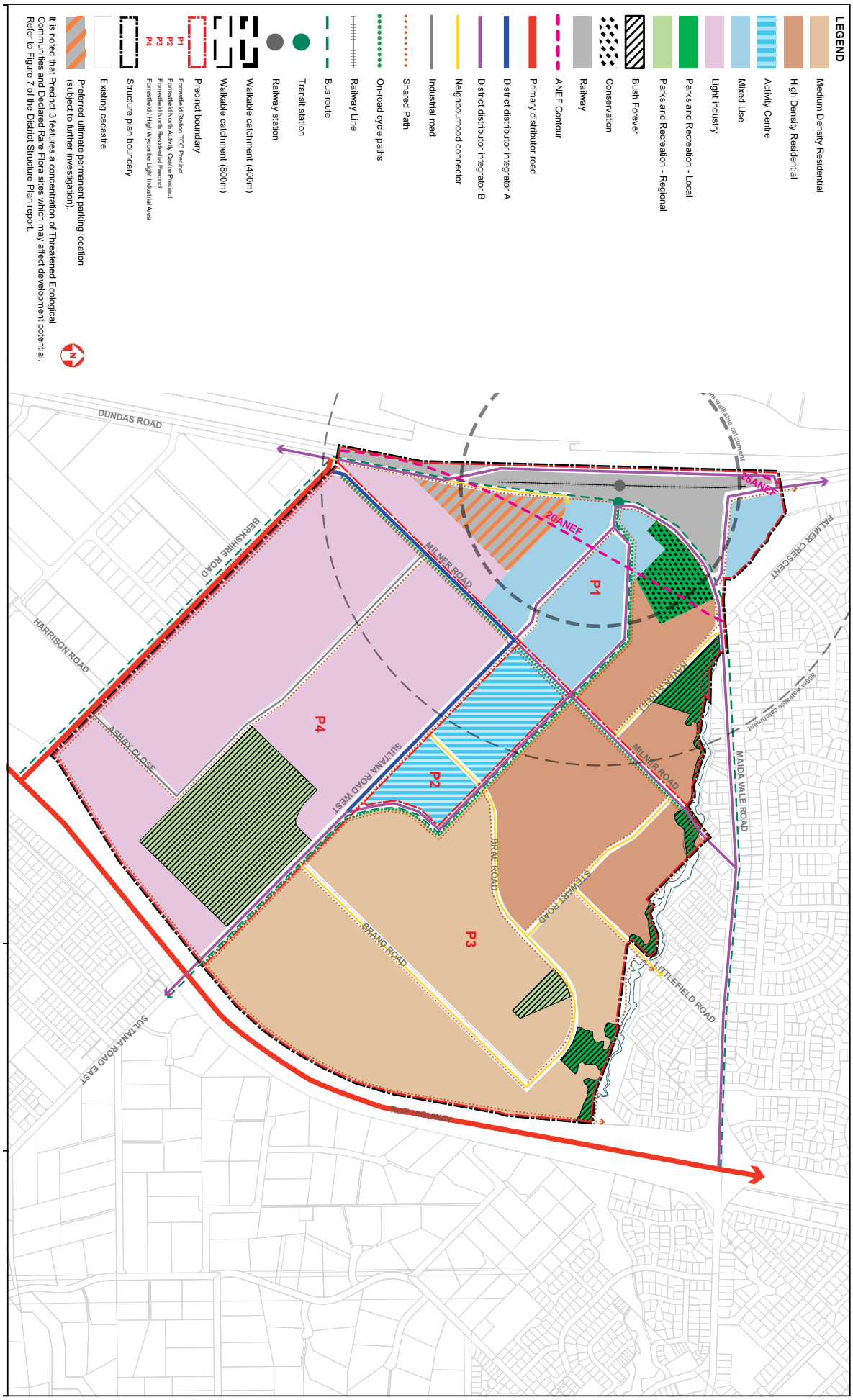
This area is intended to take the form of a substantial new TOD development with significant commercial development opportunities and associated high quality employment focussed around the new train station. Mixed use and residential development will also feature where it has been designed or located to mitigate noise and vibration associated with the operation of the Forrestfield Freight Yard, Mainline Freight Rail and Perth Airport. The area will also be highly accessible via all transport modes, particularly public transport and provide a range of retail, entertainment and food and beverage opportunities for commuters, residents and employees of business located within the area.

Local open spaces will also be provided that meet the active and passive recreational requirements of residents and users of the area and that protect the environmental values of the nearby TEC and Poison Gully Creek.

5.2.1.2 Anticipated Uses

Anticipated uses include offices, medical, community and residential uses, supported by small-scale retail, entertainment and food and beverage uses.

Figure 8. Forrestfield North District Structure Plan



5.2.1.3 Form

Built form in the mixed-use area is anticipated to include substantial commercial, mixed use and high density residential buildings with minimal street setbacks and basement or screened car parking areas. The initial focus of development will be immediately around the train station, with further opportunities becoming available once short-term PTA P&R facilities are relocated to their optimal location as shown on the district structure plan, with this land then becoming available for development purposes.

5.2.2 Activity Centre

5.2.2.1 Vision

This area is intended to take the form of a new main street based activity centre strategically located to buffer industrial uses in the light industrial area from future residential uses, primarily serviced from Sultana Road West. The main street environment is intended to be the main location for entertainment and other recreational activities within Forrestield North with a strong focus on activated food and beverage uses. It will also be highly accessible via all transport modes, including public transport and provide a node for the provision of community facilities to support a growing population.

5.2.2.2 Anticipated Uses

Anticipated uses include small scale and large format retailing, entertainment, food and beverage, medical, community and limited office and residential uses.

5.2.2.3 Form

Built form in the short term will likely initially be a local or neighbourhood scale shopping centre. In the longer term the centre will evolve into a larger more diverse and intense multi-level centre to meet the needs of a growing population, including other commercial uses and residential apartments. Street front development will be focussed on to the proposed main street with servicing occurring via Sultana Road West.

5.2.3 High Density Residential

5.2.3.1 Vision

This area is intended to take the form of a series of new accessible high density residential neighbourhoods within a landscaped context that will set a benchmark for residential development within the North-East Sub-region. A key element of future development will be the preservation and protection of the significant environmental assets in the area.

5.2.3.2 Anticipated Uses

Anticipated uses include residential apartments and limited local retail and other commercial uses to meet the day-to-day requirements of future residents.

5.2.3.3 Form

Built form is expected to include low-rise apartment developments in the short to medium term and apartment towers in the longer term to maximise hills and city views to the east and west respectively. A new permeable street and pedestrian/cycle network will also be featured that provides excellent access to the train station and activity centre for all modes of transport.

Substantial well designed local open space will be provided that meets the active and passive recreational requirements of residents and users of the area, that enhances linkages within the proposed movement network and that protects the environmental values of the area, including the nearby TEC and Poison Gully Creek.

5.2.4 Medium Density Residential

5.2.4.1 Vision

This area is intended to take the form of a series of new accessible medium density residential neighbourhoods within a landscaped context that will set a benchmark for residential development within the North-East Sub-region. A key element of future development will be the preservation and protection of the significant environmental assets in the area.

5.2.4.2 Anticipated Uses

Anticipated uses include medium density residential development including low-rise apartment development in the longer term, with limited local retail and other commercial uses to meet the day-to-day requirements of future residents.

5.2.4.3 Form

Built form is expected to include medium density terrace, townhouse and low-rise apartment developments. A new permeable street and pedestrian/cycle network will also be featured that provides excellent access to the train station and activity centre for all modes of transport.

Substantial well designed local open space will be provided that meets the active and passive recreational requirements of residents and users of the area, that enhances linkages within the proposed movement network and that protects the environmental values of the area, including Poison Gully Creek.

5.2.5 Light Industry

5.2.5.1 Vision

This area is intended to emerge as a high quality light industrial area with a freight and logistics focus that leverages excellent access to the freight transport network including Roe Highway. It is expected that the close proximity of the area to the new train station will further enhance development potential.

5.2.5.2 Anticipated Uses

Land uses will include high quality industrial and service commercial uses, generally with a freight and logistics focus in the short to medium term, In the longer term, land uses in the area may evolve to become more diverse and intense with enhanced local employment opportunities.

Residential uses and industrial uses that are unable to contain their operations on site and that as a consequence are likely to cause adverse amenity impacts on neighbours or the wider area due to emissions or other negative impacts as a result of their operations, will not be permitted.

5.2.5.3 Form

Built form is expected to include large industrial and commercial buildings with associated high quality office buildings and associated service areas and car parking, within a heavily landscaped context as required by the applicable design guidelines.

5.3 Population, Housing and Employment

Directions 2031 estimates that the population of the Perth and Peel region will have grown to 2.2 million within the next 20 years. To mitigate some of the negative impacts of continued urban expansion, Directions 2031 has set a target to accommodate 47 percent of the new growth as infill development within existing urban areas.

In August 2010, the State Government released the Outer Metropolitan Perth and Peel Sub-Regional Strategy. The sub-regional strategy provides guidance at the sub-regional level for delivering the objectives of Directions 2031 and how to achieve housing and employment targets.

Rather than adopting a blanket approach to increased population and housing densities, Directions 2031 and the sub-regional strategy have targeted growth in key activity centres and activity corridors.

Future urban development at Forrestfield North represents a significant opportunity to meet infill development and employment targets in a consolidated form in a relatively central, highly connected strategic location. The State Government commitment to the delivery of the Forrestfield Airport Rail Link and Forrestfield Train Station also reinforces the TOD potential of the area, further enhancing connectivity and creating the potential for higher residential densities and employment intensive land uses.

The urban expansion potential of Forrestfield North is recognised in the recently released WAPC draft North-East Sub-regional Planning Framework which confirms that the DSP area represents an opportunity to achieve more intensive transit-oriented development due to its location in close proximity to a proposed rail station.

Detailed projected development yields in Forrestfield North will be established as part of subsequent local structure planning processes that are responsive to environmental and transport constraints and limitations, and also land use restrictions associated with the operation of Perth Airport and the Forrestfield Freight Yard and Mainline Freight Rail. The likely range in potential development yields within the area is as follows:

Potential Total Dwellings	4,250-5,250
Potential Total Population (@2.2 persons per household)	9,350-11,550
Potential Employment (@10 employees per hectare – industrial and @40 employees per hectare – commercial, including retail and office)	1,500 – 2,000
Potential Retail Floorspace (m^2)	23,000-32,500
Potential Commercial Floorspace (m^2)	229,000-394,500
Potential Industrial Floorspace (m^2)	134,000-141,933

5.3.1 Population And Housing

The sub-regional strategy identifies Forrestfield to the east of Roe Highway as an urban investigation area on the draft expansion plan with the capacity to support 5,300 dwellings under the connected city scenario.

Since the release of the sub-regional strategy, the identification of Forrestfield North as an additional urban development opportunity has confirmed that the area has a significantly greater dwelling potential. This is also reflected in the draft sub-regional framework. This additional capacity is considered achievable due to the proximity of the area to high order upgraded road infrastructure and new passenger rail facilities, and the ability to achieve higher residential densities on what essentially constitutes a greenfields development area, without impacting on lower density neighbourhoods. Notwithstanding this, the potential for growth will need to be further assessed and confirmed as part of detailed local structure planning processes for the proposed new urban development areas.

5.3.2 Precincts

The Forrestfield North DSP has defined four precincts each with its own character and combination of land uses.

1. **Forrestfield Station TOD Precinct:** A high-density primarily commercial development that leverages opportunities associated with the development of Forrestfield Train Station. Opportunities exist for mixed-use and higher density residential development outside of existing aircraft noise contours and where it can be demonstrated that noise and vibration associated with the Forrestfield Freight Yard and Mainline Freight Rail can be adequately mitigated.
2. **Forrestfield North Activity Centre Precinct:** A new well-connected main street based activity centre that will service the future needs of both the immediate local and wider catchment population.
3. **Forrestfield North Residential Precinct:** A medium and high density residential area with excellent access to Forrestfield Train Station and that embraces and protects the significant environmental assets within the locality.
4. **Forrestfield/High Wycombe Light Industrial Area:** The original Stage 1 of the Forrestfield/High Wycombe Light Industrial Area, the development potential of which has been further enhanced due to proximity to the Forrestfield Train Station and investment in transport infrastructure generally.

5.3.3 Affordability

One of the key objectives of Directions 2013 is to plan for a 'Liveable' city that, 'promotes and increases housing diversity, adaptability, affordability and choice'. As a result of the nature of the planned development, Forrestfield North will introduce greater diversity and choice into the Perth metropolitan housing market, which, despite a gradual shift to more compact housing forms, remains overwhelmingly dominated by single detached dwellings.

In the medium to long term it is anticipated that the level of housing diversity and choice in the Shire and North-East Sub-region will be further increased with the provision of a range of dwelling sizes and prices, offering a level of 'relative affordability' as lower density house prices in the area increase, making higher density living a more attractive economic proposition.

5.3.4 Employment

Another key objective of Directions 2031 is to improve the relationship between where people live and work, to reduce commuting time and cost, and the associated impact on transport systems and the environment.

Forrestfield North provides an important opportunity to improve employment self sufficiency in areas outside the Perth CBD and Central Sub-region, and increase contraflow travel on the City's road and rail network. There are already substantial employment lands within close proximity of the area including Access Industrial Park and Perth Airport, and it is expected that mutually beneficial linkages and relationships will be developed between Forrestfield North and these areas.

The delivery of a future activity centre in the Forrestfield North Activity Centre Precinct and vibrant commercial uses in the Forrestfield Station TOD Precinct, in conjunction with the intensification of industrial land use within Stage 1 of the Forrestfield/High Wycombe Light Industrial Area are expected to create significant and diverse employment opportunities for the local population. Overcoming issues associated with land assembly and providing suitable transport infrastructure will be a key focus of future local structure planning processes and developer contribution initiatives, and will catalyse the delivery of economic development and employment opportunities.

5.4 Built Form

The term built form is used to describe the spatial characteristics of buildings; their height and scale, how much land they occupy, how they are designed, and how they relate to the surrounding buildings, streets and public spaces.

Built form across the Perth and Peel region is typically characterised by low scale, low density housing and retail development, with pockets of higher density housing and large format retail. The Perth CBD and other locations generally within the Central Sub-region offering some form of defining amenity, have been the primary locations for large scale, high density and large scale office, commercial and residential development.

In the longer term, it is expected that high-density residential development will occur in Forrestfield North when supported by market conditions and demand. These forms of development are an appropriate response to the significant investment in and TOD opportunities afforded by the Forrestfield Airport Rail Link. They also have the added benefit of providing the opportunity to protect and enhance the significant environmental values of the area through both on-site protection and recognition in more formalised ecological protection areas.

It is anticipated that where additional development guidance is required, that built form guidelines will be prepared to support local structure plans addressing setbacks, design quality, passive surveillance, height, bulk, and design requirements to manage/mitigate noise and vibration associated with the operation of Perth Airport and the Forrestfield Freight Yard and Mainline Freight Rail.

5.4.1 Noise and Vibration Considerations

Noise and vibration surveys will be undertaken to determine the current (primarily from road and freight rail, including the Forrestfield Freight Yard and Mainline Freight Rail) and future (from the construction and operation of the Forrestfield Airport Rail Link) noise and vibration levels near the proposed Forrestfield Train Station.

Depending on the levels, restrictions on the location of sensitive land uses such as residential development and/or mitigation measures may need to be considered as part of the detailed structure planning processes for affected areas, to ensure that inappropriate land use conflicts do not occur.

Mitigation required due to the construction of the Forrestfield Airport Rail Link will be provided by the PTA. Mitigation required due to the proximity of future land sensitive land uses such as residential development to existing road and freight rail is a requirement of the developer.

Further advice related to the specific design and location of future development adjacent to the train station will be considered in future detailed planning studies, including local structure planning processes and through stakeholder engagement, and will be addressed through the preparation of design guidelines where appropriate.

5.5 Community Facilities

The population of Forrestfield North is expected to increase significantly over time, resulting in an increased demand for community facilities. In response to a more detailed assessment of existing/future demographic profiles undertaken as part of future planning processes, an appropriate hierarchy of community facilities will be established as part of future detailed local structure plans to ensure that:

- State level services continue to be located in the Perth CBD;
- Regional services continue to be located in Midland, Belmont or Cannington;
- District level facilities that rely on higher densities should be encouraged to locate in the Shire, including within the Kalamunda Townsite, Forrestfield North Activity Centre Precinct and Forrestfield Forum; and
- Local community facilities relevant to the Forrestfield North population should be located within the immediate area, including within the Forrestfield Station TOD Precinct.

Community and social infrastructure requirements include:

- Provision of a range of facilities to cater for people of different abilities and cultural backgrounds;
- Spaces and places for interaction to promote social inclusion and connection;
- Services that provide support for individuals, families and groups;
- Services that provide passive and active recreational opportunities for all community sectors;
- Facilities that can provide a central and easily accessed location for service provision and/or community initiated activity; and
- Visual markers of community identity including public art, environmental features, streetscape, landscaping and gardens.

Based on a preliminary understanding of the likely future demographic profile of the North-East Sub-region and applying relevant benchmarks for provision of services and facilities to meet the needs of the future catchment of Forrestfield North, the following conclusions have been drawn.

5.5.1 Health Services

As the population increases over time, local health services are expected to be provided in the area to meet emerging needs. These could be located within the Forrestfield North Activity Centre Precinct or the Forrestfield Station TOD Precinct. Local structure planning should provide for the establishment of health facilities where appropriate.

5.5.2 Aged Care

The provision of residential care places is a significant issue in the Shire. Additional facilities will be required to meet both existing and likely future demand. Home and community care services will also need to be expanded to meet emerging need, with demand increasing as the population aged 70 years and older increases.

The preparation of detailed local structure plans for Forrestfield North are expected to specifically consider and provide:

- Locations for aged care accommodation and allied facilities within close proximity and with excellent linkages to the proposed activity centre and TOD precinct;
- Spaces for a range of activities for an active ageing population;
- Space for allied health services provided through the public health system on an outreach basis;
- Affordable office accommodation for not for profit organisations that provide support services to the elderly; and
- Neighbourhood based respite day care centres, particularly for people with dementia who live at home.

5.5.3 Schools

Secondary education is typically provided at a regional or district level rather than local or neighbourhood level. Current and future needs for secondary education for Forrestfield North residents should be adequately provided through schools in the surrounding suburbs, and specialist high schools throughout the metropolitan area.

It is anticipated that the capacity of government and non-government primary schools in the suburbs surrounding Forrestfield North is sufficient to meet current demand. Children of primary school age generally attend school in their local community and primary schools play an important role in community building.

The need for an additional primary school in the area in the longer term will be determined in conjunction with the Department of Education as part of detailed local structure planning processes in due course if required in response to projected population growth. If required, the location of a primary school will be determined as part of this process and, should be located to take advantage of public transport opportunities and any proposed sporting and recreational facilities. Consultation with key stakeholders will be required as well as detailed site investigations to inform the ultimate location of any required primary school.

5.5.4 Spaces for Children and Young People

Balancing the needs of children and young people with other communities can be a difficult but important task. At a local neighbourhood level, availability of youth friendly spaces is an important consideration.

Its is important that the needs of young people are recognised in the planning of public space at a neighbourhood/local level as well as at district and regional levels.

5.6 Open Space

One of the defining characteristics of Forrestfield North is its open semi-rural landscaped appearance.

Whilst the intensity of development will increase across the area, the landscaped character of Forrestfield North will be retained and enhanced through the retention and protection of areas of remnant vegetation and with the creation of new publicly accessible parklands.

It is expected that detailed planning and development of the new parklands will balance the need for waterway edge stabilisation associated with Poison Gully, ecological protection, stormwater management and limited availability of groundwater for reticulation purposes, with public access and the provision of active and passive recreation uses.

The minimum total area of local Public Open Space (POS) within the area is estimated at approximately 13 hectares, of which an estimated 2.6 hectares will require irrigation. The majority of the POS is to be rehabilitated/ landscaped with native vegetation and will require limited, if any, irrigation. This approach is proposed to allow for conservation of environmentally significant values such as populations of the Wavy-leaved Smokebush (*Conospermum undulatum*), Black Cockatoo habitat and Bush Forever sites.

It is noted that a minimum of 10% local POS will need to be provided as a result of detailed local structure planning processes and that additional local POS beyond the 10% minimum may be required in order to ensure adequate protection of the significant environmental values of the area.

5.7 Environmental Protection

Potential impacts to identified environmental values within the Forrestfield North area will be considered at the local structure planning stage and are likely to be managed through implementation of the following measures:

- Retention of significant habitat trees identified as being in 'good condition' or better, for the two species of black cockatoo;
- Establishment of vegetation protection and enhancement areas as local parks and recreation reserves including retention and rehabilitation of ecological linkages where possible;
- Avoidance of known populations of flora species of conservation significance, including *Conospernum undulatum, Eucalyptus calophylla – Kingia australis and Banksia attenuata;*
- Avoidance or appropriate management of known registered heritage sites;
- Establishment of a Poison Gully Creek buffer zone as a local parks and recreation reserve along the northern boundary of the subject land as determined in the Poison Gully Creek Foreshore Assessment; and
- Ceding of land at subdivision stage to protect significant flora and the Poison Gully Creek foreshore reserve in line with WAPC policy provisions.

It is predicted that with implementation of these management measures, the proposed urbanisation of Forrestfield North is unlikely to have a significant impact on the identified environmental values of the area.

5.8 Urban Water Management

5.8.1 Summary

The District Water Management Strategy (DWMS) prepared to support the structure planning process proposes to manage water resources in a sensitive manner in line with the principles and objectives of water sensitive urban design. This includes the development of a stormwater management system based on treatment and infiltration of stormwater within the road reserve and lots to maintain pre-development flows and manage water quality.
The development will also be connected to the Water Corporations reticulated water and sewerage schemes.

Refer to Technical Appendix 1 – Forrestfield North District Structure Plan – District Water Management Strategy

5.8.2 Key Guiding Principles

This DWMS identifies and describes a range of design elements and management measures that are being considered for Forrestfield North. The principal objective of this DWMS is to achieve better urban water management outcomes by designing a development that manages the total water cycle in a sustainable manner and meets objectives for water sensitive urban design. This includes consideration of water conservation and efficiency (water use), water quantity management (groundwater levels and surface water flows), water quality management (groundwater and surface water quality) and disease vector and nuisance insect management.

The Better Urban Water Management (BUWM) guidelines (WAPC and DPI 2008) outline the principles of stormwater management as a component of Water Sensitive Urban Design (WSUD), which are:

- protect natural systems – protect and enhance natural water systems and their hydrological regimes in urban developments.
- integrate stormwater treatment into the landscape – use stormwater in the landscape by incorporating multi-use corridors that maximise the visual and recreational amenity of developments.
- protect water quality – protect from draining from urban development and minimise outputs of phosphorous, nitrogen and other pollutants.
- manage run-off and peak flows – reduce peak flows from urban development by using local detention measures and minimising impervious areas.
- add value while minimising development costs – minimise the drainage infrastructure cost of development.

5.8.3 Water Sustainability Strategy

5.8.3.1 Water Use

Water conservation in developments can be managed at both a development and lot scale. Water use at a lot scale depends on the land use. The use of fit for purpose water sources is encouraged to minimise the use of potable scheme water where this is not required.

5.8.3.2 Lot Water Use

As the development will be of a medium to high density nature (anticipated density of R30 to R100 or greater), potable water use per person is anticipated to be low. The area of private garden will be comparatively small and the volume of water used for irrigation will be limited. Garden areas are likely to be managed by the strata body rather than individual householders. Ex-house water use is consequently expected to be well below the Perth average of 41 kL/person/year (Water Corporation, undated publication). In-house water use in Perth averages 65 kL/person/year (Water Corporation, undated publication). The per capita domestic water use in the development is consequently expected to be less than 80 kL/person/year, below the targeted100 kL/person/year. (WAPC and DPI 2008).

The medium to high density nature of the development means that many lots are likely to be strata titled, with numerous owners or tenants per lot. Such lot developments will be developed and then managed by a strata company. This type of development provides opportunities for on-lot recycling of rainwater and/or wastewater (including greywater) because of the large number of potential users and presence of a strata agency that can manage and maintain such systems at a lot scale. Consideration will be given at the LWMS stage to design guidelines requiring on-lot recycling of rainwater and/or grey water for low risk internal uses such as toilet flushing and outdoor purposes such as watering of gardens. Construction and implementation of alternative water supplies at a development scale is not proposed, as such systems are likely to be better managed and operated by a strata agency.

5.8.3.3 Public Open Space

As indicated previously, the majority of the POS is to be rehabilitated/landscaped with native vegetation and will require limited, if any, irrigation.

The total volume of water required for irrigation is consequently estimated at 19,500 kL/yr, based on a standard irrigation rate of 7,500 kL/ha/yr. This area and volume will be confirmed at the local structure planning stage. The area is located within the Shire of Kalamunda subregion of the Perth Groundwater Area. The DoW have advised that groundwater in the area is close to being fully allocated (Slodeki C [DoW] 2015, pers. comm. 7 January 2015). As such, a groundwater allocation is unlikely to be obtained that will allow for irrigation of all the proposed POS. To address this, alternative options for water supply were investigated.

Potential sources for irrigation water have been identified including:

- purchase of another user's groundwater allocation, if available;
- recycling of wastewater; and
- reducing groundwater use by Shire at other locations and transferring the surplus allocation to the site.

Purchase of another user's groundwater allocation is possible, although sale of licences is also uncommon in Western Australia. Given the area of POS involved, it is unlikely that enough water could be provided to irrigate all the POS in Forrestfield North.

Recycling of wastewater is anticipated to be costly and require licensing. Licensing can be a protracted process, as the licensing standards are high and extensive.

Water would require treatment and disinfection and possibly filtration prior to irrigation. Such treatment is expensive in terms of both capital and operating costs. The system would also need to be licensed by Department of Health. Ongoing monitoring would be required to confirm that Department of Health water quality standards are met. The system would need to be operated by a licensed service provider licensed by the Economic Regulation Authority (such as the Water Corporation), or the Shire would be required to become a licensed service provider.

Preferred conceptual options for alternative water supplies for irrigation will be prepared in consultation with the Shire, and presented in the applicable LWMS. Measures to reduce POS irrigation rates will also be investigated at the LWMS stage.

5.8.3.4 Servicing

Potable Water Supply

Service planning has indicated that upgrades to existing water supply pipework may be required to support future development (Shawmac 2012). This matter will be discussed with the Water Corporation as part of future planning processes.

Wastewater

The Forrestfield North area is not fully serviced by sewer reticulation (Shawmac 2012). The Water Corporation has advised that sewer forward planning for this area has been completed (Shawmac 2012). The area is intended to be connected to the reticulated sewer system. Developers will be required to meet the cost of reticulated sewerage up front and seek reimbursement of the construction costs under a prefunding agreement with the Water Corporation.

5.8.4 Water Management Strategy

5.8.4.1 Surface Water Management Strategy

The results of geological investigations, groundwater and wetlands mapping to date indicate that the DSP area contains areas with varying properties from a drainage perspective. These areas can be considered to be:

1. East of Milner Road. Monitoring undertaken in Stages 1 and 3, east of Milner Road, indicates that these areas largely contain sandy soils and a good depth to groundwater. Such conditions are generally suitable for infiltration of stormwater.
2. West of Milner Road. The area to the west of Milner Road appears to have shallower groundwater and less permeable soils, and thus runoff may occur during larger rainfall events (i.e. 1 in 1-year ARI event or greater). These areas are less suitable for infiltration of stormwater.

In both areas, the objective will be to maintain pre-development flows off the DSP area and comply with the Water Corporation (2010) requirement of a maximum flow rate across the Poison Gully catchment of 7 L/s/ha in a 1 in 100-year ARI event. In areas to the east of Milner Road stormwater is anticipated to be managed by infiltration on DSP area, up to the 1 in 100-year ARI event. To the west of Milner Road, flow off the DSP Area is anticipated to occur in the pre-development scenario.

The stormwater management concept for the DSP area is to maximise infiltration and treatment of drainage within the road reserve and POS. Structures used may include swales, rain gardens / biofilters, infiltration/ detention basins and underground storage systems (e.g. Stormtech or Atlantis cells). Some areas adjacent to Poison Gully may contain clayey soils and roadside swales with overflows of treated water to Poison Gully could be required in these areas. All stormwater discharged to waterways or drains will be treated prior to discharge.

Vegetation will be used in swales, rain gardens/ biofilters and infiltration areas with a minimum area 2% of the connected impervious area to ensure that nutrient stripping occurs.

This approach is considered to be consistent with consistent with the Stormwater Management Manual for Western Australia (DoW 2004 – 2007).

5.8.4.2 Stormwater Strategy

For the purposes of the DWMS, the DSP area has been conceptually divided into two catchments, being:

- a 100 ha northern catchment that grades towards Poison Gully.
- a 152 ha southern catchment that grades towards the corner of Berkshire Road and Milner Road (refer to Figure 5-1 of DWMS).

Conceptually, outlets from the Northern Catchment may be placed where roads are adjacent to Poison Gully (refer to Figure 5-1 of DWMS). Stormwater in the Southern Catchment is anticipated to be primarily managed through infiltration on site, as proposed in the previous LWMS (ENV 2012) and consistent with the significant depth to groundwater in the eastern portion of this catchment. Stormwater volumes and storage requirements have been estimated for each catchment by KCTT (2015) as shown in Table 5-1 of the DWMS. Locations of these storage structures will be addressed in the LWMS. The stormwater strategy, and the associated provision of POS, will be refined at the LWMS stage, as discussed in Section 6.6 of the DWMS.

5.8.4.3 Flood Management

Development shall ensure that finished floor levels shall be a minimum of 0.5 m above the 1 in 100-year ARI flood level in streamlines and basins or 0.3 m above the 1 in 100-year ARI flood level for other drainage paths such as road reserves.

Defined major arterial roads should remain passable in the 1 in 100-year ARI event.

Road serviceability will be maintained in the 1 in 10-year ARI event level for all areas except where roads are located within areas identified as light industry (i.e. Nardine Close and Berkshire Road, as the area to the south of the Site is also industrial). These roads will be designed to be serviceable in the 1 in 5-year ARI event. Where roads have light industry zoning on one side and another land use on the other side, a 1 in 10-year ARI level of service will be required.

5.8.4.4 Lot Drainage

Medium to high density developments often include large areas of roof and/or hardstand. These areas can generate large volumes of runoff. At the lot scale, soak wells are proposed to be used for stormwater management. All lots will be required to infiltrate stormwater on site in events up to the 1 in 1-year ARI, 1-hour event of 16 mm.

A range of infiltration options is available for lots, depending on the area available for infiltration. Suggested management methods include:

- rainwater tanks.
- soakwells situated at low points (in line with standard practice).
- swales with or without soak wells to provide additional volume.
- underground storage cells (e.g. Stormtech or Atlantis cells).

5.8.4.5 Groundwater Management Strategy

Depth to groundwater is unlikely to be a constraint in the area to the west of Milner Road. Depth to groundwater levels recorded east of Milner Road is generally greater than three metres (refer to Figure 3-3 of DWMS). As such, control of groundwater levels is not anticipated to be required in this area.

Depth to groundwater is anticipated to be less than three metres in parts of the area to the west of Milner Road. As a consequence, control of groundwater may be required in this area depending on depth to groundwater.

Groundwater shall be managed such that:

1. Where a perched water table exists or the predicted maximum groundwater level is at or within 1.2 metres of the natural surface, imported clean fill or subsoil drainage will be required to ensure adequate separation from building floor slabs to groundwater is achieved.

2. Subsoil drainage will be installed with free draining outlets. Subsoil drainage shall be treated prior to leaving the DSP area.
3. Development shall ensure finished lot levels a minimum of 0.8 metres above the phreatic line.

Areas requiring groundwater control and associated subsoil drainage design will be determined at the LWMS stage.

5.8.5 Implementation

Local structure planning will be undertaken in a manner that implements the principles and objectives of the DWMS as described in the table below.

Category	Principles	Objectives	Proposed Implementation Measures
Water use	• consider all potential water sources in water supply planning. • integration of water and land use planning. • sustainable and equitable use of all water sources having consideration for the needs of all users, including community, industry and the environment.	• minimise the use of potable water where drinking water quality is not essential. • limit water consumption to less than 100 kL/person/year based on the State Water Plan target.	• the comparatively small lot sizes will limit water use within the development area. • consideration will be given to mandating water conservation measures such as rainwater tanks at the LWMS stage.
Groundwater levels and surface water flows	• to retain natural drainage systems and protect ecosystem health. • to protect from flooding and water-logging. • to implement economically viable stormwater systems. • post development annual discharge volume and peak flow rates to remain at pre-development levels or defined environmental water requirements.	• where there are identified impacts on significant ecosystems, maintain or restore desirable environmental flows and/or hydrological cycles. • for flood management, manage up to the 1 in 100-year ARI event within the development area to predevelopment flows and the requirements of Water Corporation (Water Corporation 2010).	• Lots to retain stormwater on site in events up to the1 in 1-year ARI, 1-hour event. • maintain pre-development flows off the site in the 1 in 100-year ARI event to through swales, rain gardens/biofilters, infiltration/ detention basins and underground solutions. • develop roadside swales with overflows of treated water to Poison Gully if required in areas where soil types are not suitable for infiltration.
Groundwater and surface water quality	• to maintain or improve groundwater and surface water quality. • where waterways/open drains intersect the water table, minimise the discharge of pollutants from groundwater. • where development is associated with an ecosystem dependent upon a particular hydrologic regime, minimise discharge or pollutants to shallow groundwater and receiving waterways and maintain water quality in the specified environment.	• Maintain surface water and groundwater quality. • ensure that all runoff contained in the drainage infrastructure network receives treatment prior to discharge to a receiving environment consistent with the Stormwater Management Manual for Western Australia (DoW 2007).	• use of swales, rain gardens/ biofilters, infiltration basins and underground solutions to maintain water quality. • treatment structures shall be located in POS and road reserves. • All stormwater discharging to waterways will be treated prior to discharge.
Disease vector and nuisance insect management	• to reduce the health risk 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 within a time period not exceeding 96 hours.	• permanent water bodies are discouraged, but where accepted by DoW, must be designed to maximize predation of mosquito larvae by native fauna to the satisfaction of the local government on advice of Departments of Water and Health.	• permanent water bodies are not proposed for this development.

5.8.6 Monitoring

5.8.6.1 Pre-development Monitoring

Pre-development monitoring has been undertaken in Stages 1, 2 and 3 of the DSP area. These monitoring programs included water quality and water levels over two winter peaks and are considered acceptable for the purposes of preparation of future LWMS documents. Areas outside these stages may require additional monitoring. Such monitoring programs should be undertaken in line with the *Water Monitoring Guidelines for Better Urban Water Management Strategies/Plans* (DoW 2011) and discussed with the DoW prior to monitoring commencing.

As outlined in Section 3.5 of the DWMS, informal drains that are proposed to be retained as part of the development process will need to be surveyed to determine invert levels and top of bank levels. Hydraulic conductivity testing may also be required to support the design of stormwater management structures.

5.8.6.2 Post-development Monitoring

Post-development monitoring will be undertaken in line with the *Water Monitoring Guidelines for Better Urban Water Management Strategies/Plans* (DoW 2011); or the final guidelines when these are developed. Post-development monitoring will occur from the completion of first subdivision stages until two years following the completion of construction.

Any change in the water quality parameters during this period will be investigated. A post-development monitoring plan will be included as part of the first Urban Water Management Plan (UWMP) and will contain:

- details of monitoring required.
- baseline results from the pre-development period.
- methods to determine whether the development's design criteria are being met.
- contingency plans and management responses should variation occur between pre and post-development monitoring results.

Monitoring is expected to be undertaken by the developer. Monitoring reports will be provided to the Shire and DoW on an annual basis.

5.8.6.3 Surface Water Modelling

The Water Corporation has undertaken hydraulic and hydrological modelling of Poison Gully as part of the *Limestone Creek (Perth Airport Northern Main Drain) Capacity Review* (2010). The intention is that the development maintains the pre-development flows into Poison Gully in events up to the 1 in 100 year ARI event. As flows into Poison Gully from the development will be maintained, Water Corporation modelling will remain relevant with regards to Poison Gully.

Provided that pre-development flows are maintained and these assumptions are confirmed, the DoW has advised that the flood modelling and results developed by Water Corporation (2010) are adequate for the purposes of a LWMS (Lyons B [DoW] 2015, pers. comm. August 11]. The Water Corporation assumptions with regards to flows from Forrestfield North would be confirmed as part of the LWMS process.

5.8.6.4 Funding and Ongoing Maintenance Responsibilities

Stormwater management infrastructure will be constructed by the developer with funding through a developer contribution scheme. The developer will be responsible for maintenance of stormwater infrastructure for two years prior to handover to the Shire.

Connection to the sewerage system will be undertaken by the developer meeting the cost upfront and then seeking reimbursement of the construction costs under a prefunding agreement with the Water Corporation.

5.8.6.5 Matters to be Addressed at the Local Water Management Strategy Stage

Matters to be addressed at the LWMS stage as part of local structure planning processes will include:

- results of any additional geotechnical, survey and groundwater investigations.
- confirmation of peak groundwater levels and groundwater quality.
- predevelopment hydrology including surface water flow direction, catchment areas, in 1-year ARI, 1 in 10-year ARI and 1 in 100-year ARI flows.
- assessment of appropriate buffers to wetlands and foreshore areas and existing issues (e.g. erosion) in accordance with *Operational Policy 4.3: Identifying and Establishing Waterways Foreshore Areas* (DoW 2012).

- measures to address foreshore management issues.
- identification of areas of POS, including areas required for the conservation of natural values.
- POS water conservation measures, water source and volume of water required for POS irrigation.
- lot scale water conservation measures.
- drainage strategies based on the refined modelling, including:
    - design assumptions including runoff coefficients, catchment boundaries, flow rates and volumes, including comparison to the previous Water Corporation (2010) Poison Gully modelling.
    - figures showing post-development stormwater systems including flow paths and drainage structures (swales, rain gardens, infiltration areas and underground storage structures) for the 1 in 1-year ARI, 1 in 10-year ARI and 1 in 100-year ARI flood events.
    - conceptual cross sections for road and swale arrangements for the 1 in 1-year ARI, 1 in 10-year ARI and 1 in 100-year ARI flood events.
- finished lot levels.
- design of groundwater control systems including indicative vertical separation of finished lot levels and proposed measures to achieve the separation considering mounding.
- clarification of responsibilities for preparation of UWMP documents, design guidelines and post-development monitoring.

5.9 Movement and Access

5.9.1 Summary

A Transport Impact Assessment (TIA) has been completed to inform the preparation of the Forrestfield North DSP in accordance with the WAPC Transport Impact Assessment Guidelines – Part 2 (Structure Plans). Key outcomes and recommendations of the TIA are summarised below.

Refer to Technical Appendix 2 – Forrestfield North District Structure Plan – Transport Impact Assessment

5.9.2 Road – Current Situation

The existing road network in Forrestfield North is generally a series of one lane in each direction roadways of varying width and composition. Berkshire Road, Maida Vale Road and Dundas Road are nominated as District Distributor B roads, with Milner Road nominated as a Local Distributor and Sultana Road West nominated as a Urban Local Road.

Each of these roads will play an important role in the distribution of traffic through the Forrestfield North DSP area. The potential future volumes of traffic being discussed for these roads necessitate that significant improvements will be required in the form and composition of each of these roads to enable strong connectivity between:

- High Wycombe generally to the north (via Newburn Road);
- Forrestfield to the east (via Maida Vale Road, Berkshire Road and via a bridge connection to re-connect Sultana Road East and Sultana Road West);
- Dundas Road / Abernethy Road;
- Roe Highway; and
- Tonkin Highway to the south.

5.9.3 Road – Future Situation

Projected future road requirements within the Forrestfield North DSP area are sumnmarised below. Detailed traffic generation calculations, future road classifications and recommended cross sections are detailed in the TIA provided at Technical Appendix 2.

A consolidated plan showing the potential ultimate configuration of intersection treatments for the DSP area is provided at Figure 9. The timing of the proposed upgrades is provided in the TIA provided at Technical Appendix 2.

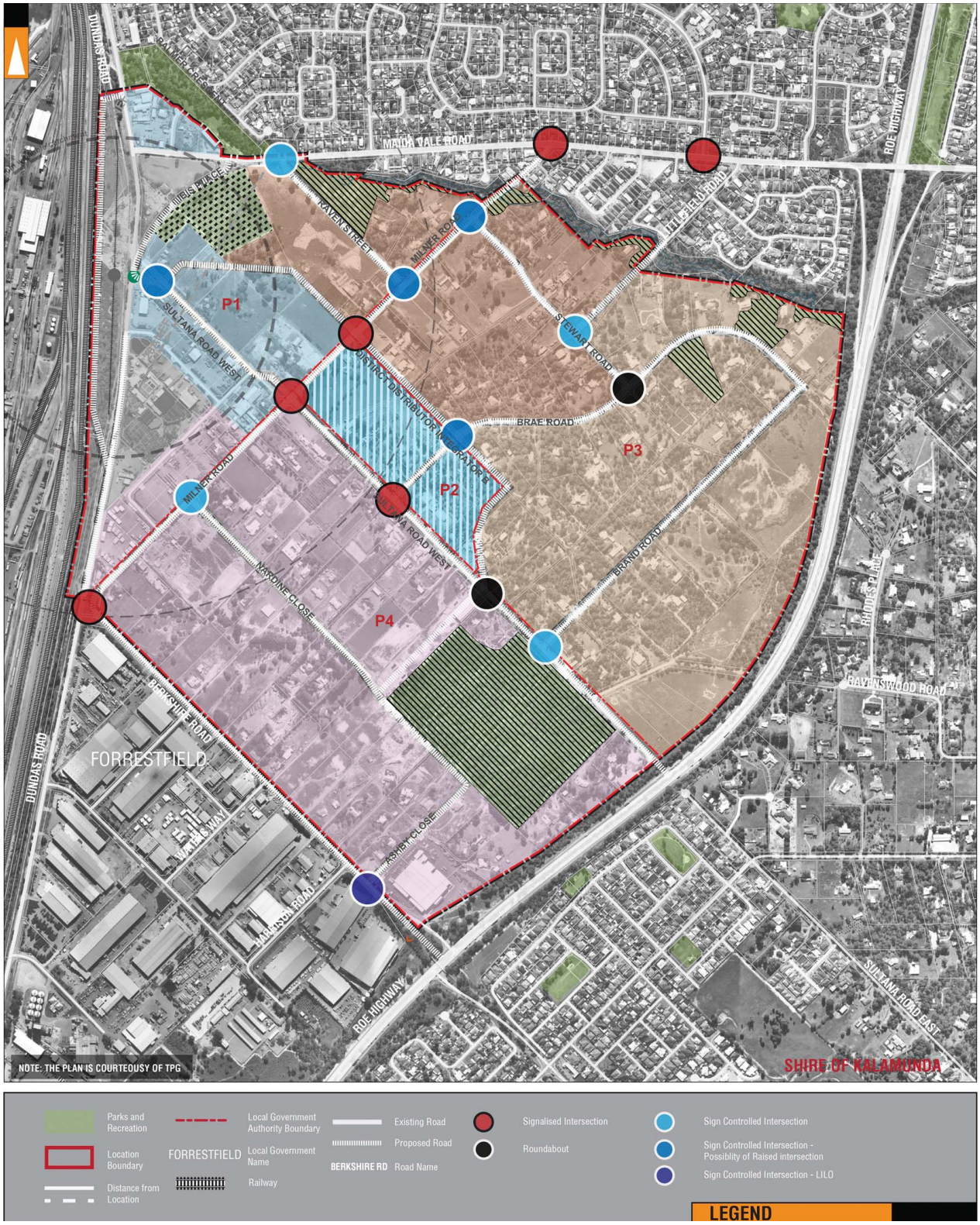
Refer to Figure 9 – Potential Ultimate Configuration of Intersections

5.9.3.1 Berkshire Road

Berkshire Road is an existing single carriageway roadway with one five metre width lane in each direction within a 20 metre wide reservation. Berkshire Road will require significant upgrades to deal with the increase in traffic proposed under the development scenarios presented for the Forrestfield North DSP area.

The modelling reveals that Berkshire Road northwest from the intersection with Roe Highway will potentially require upgrade from a two lane undivided carriageway to a four-lane divided carriageway. Berkshire Road may carry up to approximately 35,000 VPD upon the completion

Figure 9. Potential Ultimate Configuration of Intersections



of the development. Upgrading to a four-lane undivided carriageway will require the widening of the road reserve. Two key intersections for this portion of Berkshire Road are the intersections with Roe Highway and Dundas Road / Milner Road. Both of these should be configured as signalised intersections.

Depending on ultimate development yields, all other intersections along this section of Berkshire Road are likely to be required to be configured as Left-In-Left-Out intersections, unless there is sufficient space to develop appropriate right turn deceleration lanes within the Berkshire Road reservation.

5.9.3.2 Milner Road

Milner Road is an existing single carriageway roadway with one 3.5 metre width lane in each direction within a 20 metre wide reservation. The existing intersection with Berkshire Road is in close proximity to the intersection of Dundas Road,(approximately 37 metres separating the respective centrelines). Given the downgrading of Dundas Road between Maida Vale Road and Berkshire Road, a reconfiguration of the intersection of Berkshire Road / Dundas Road to a 4-way intersection is recommended including priority from Dundas Road (south of Berkshire Road) into Milner Road north of Berkshire Road.

The design of Milner Road is of high importance to the future form and function of the Forrestfield North DSP area. Milner Road is likely to have two important roles and functions:

- Between Maida Vale Road and Sultana Road West as a local distributor of residential traffic; and
- Between Sultana Road West and Berkshire Road as a distributor of industrial traffic.

Milner Road may carry between 26,000 VPD (in the vicinity of the intersection with Dundas Road and Berkshire Road) and 15,000 VPD (in the proximity of the intersection with Maida Vale Road), which implies that this road will require a significant upgrade to cater for traffic demand. On this basis it is likely that Milner Road should be upgraded to a four lane divided carriageway for all its length. The upgrade of the carriageway will require widening of the road reservation.

The intersection with Sultana Road West divides the road into two distinctive sections. Southwest from this intersection, the carriageway should be designed to carry a higher percentage of heavy vehicles and should be fit for industrial purposes. Most of the other intersections and access/egress points on this section of Milner Road should be configured to Left-In-Left-Out. Northeast from the intersection with Sultana Road West, Milner Road should be designed to accommodate a higher percentage of light vehicles, cyclists, on-street parking, bus movements and pedestrian movements. Intersections in this area can be configured as full movement intersections.

5.9.3.3 Dundas Road

Dundas Road is an existing single carriageway roadway with one 3.9 metre width lane in each direction within a 20 metre wide reservation. Several options for realignment of Dundas Road were examined. It is certain that Dundas Road will be realigned to the west of the future Forrestfield Railway Station.

Dundas Road is currently used for b-doubles on the Main Roads WA RAV network to access industrial properties located near the intersection of Dundas Road and Maida Vale Road. The movement of vehicles from these properties to connect to the existing road network at Dundas Road / Berkshire Road needs to be considered. Should Dundas Road remain in this alignment by the time full development is completed, it is expected that Dundas Road might carry 13,000 - 15,000 VPD.

5.9.3.4 Maida Vale Road

Maida Vale Road is an existing single carriageway roadway with one 4.4 metre width lane in each direction within a 20 metre wide reservation. The function of Maida Vale Road is largely a distributor of residential traffic. Given the proximity of existing residences on the northern side of the Maida Vale Road reservation, the design of intersections to Maida Vale Road will be of critical importance to maintain low percentages of heavy vehicles.

In response to daily potential projected traffic volumes in the order of 17,000 VPD it is proposed that Maida Vale Road be upgraded to an undivided four-lane carriageway and that it be diverted at its western end to provide priority access to the Forrestfield Train Station. This will be achieved through the connection of the current road alignment to Ibis Place. An additional connection to Raven Street is also proposed in a staggered intersection arrangement with an appropriate separation distance. The detailed design of this intersection arrangement will be confirmed at the local structure planning stage.

5.9.3.5 Sultana Road West (East of Milner Road)

Sultana Road West is an existing single carriageway roadway with one 3.0 metre width lane in each direction within a 20 metre wide reservation. The existing function of Sultana Road West is to distribute a low volume of residential traffic. Under the development outcome envisaged for Forrestfield North, Sultana Road West will be one of the key distributors of both local and regional residential traffic and industrial traffic to properties on the southern side of Sultana Road West.

The district structure plan identifies a desirable future connection of Sultana Road West and East across Roe Highway. This link is anticipated to be of local and district importance. Funding, timing and engineering requirements will need to be established through more detailed planning, including the potential for it to be funded through a developer contribution plan.

The modelling shows that the road will be intensively utilised between the intersections with Milner Road and Brand Road (having between 18,000 and 24,000 VPD) and the intensity of the traffic will drop towards the Roe Highway flyover where the road will have a residential district distributor function, similar to that for Milner Road. Therefore, it is likely that Sultana Road West will need to be upgraded to a four lane divided carriageway between the intersections with Milner Road and the eastern Service Road Access approximately 200 metres west of the intersection with Brand Road. East from this location, Sultana Road West is expected to have approximately 9,000 VPD. In this location the road geometry will need to be reduced to a two-lane two-way carriageway, with significant signage stating the roadway is no longer suitable for heavy vehicles, and that these vehicles must turn right at the Eastern Service Road Access.

The future design of the intersection of Sultana Road West and Milner Road is of great importance to the function of the proposed residential area between Sultana Road West and Maida Vale Road. This design should limit the ability of vehicles larger than semi-trailers to enter the section of Sultana Road West between Milner Road and the future Forrestfield Railway Station. Likewise on the eastern side of the industrial development, a major intersection should be developed approximately 200 metres west of the intersection of Brand Road which will be the location for b-double turning movements.

The design at this intersection should consider the following to assist the traffic flow in this location:

- In the eastbound approach Sultana Road West will have four lanes – the median-side lane should be configured as a right turn movement only with a truck symbol painted on the lane and signage provided showing that Sultana Road West (east of this intersection) is no longer an approved heavy vehicle route;
- Sultana Road West on the eastern side of this intersection will be a two-lane, two-way road with cross section designed for residential traffic in accordance with Liveable Neighbourhoods design requirements; and
- The Service Road East Access can be designed with a dedicated left-turn lane into Sultana Road West (westbound). This lane would be designed suitably for b-double movements.

The intersection of the proposed District Distributor Integrator B and Sultana Road West should then, based on the nature and volume of projected traffic movements, be considered for further traffic management in the form of a roundabout.

5.9.3.6 Sultana Road West (West of Milner Road)

Sultana Road West to the west of Milner Road is anticipated to function as a key access road into the new Forrestfeld Station TOD Precinct and a focus for substantial commercial and potentially mixed use development. The exact nature of the street will be determined during the detailed structure planning stage but it is envisaged to take the form of a two-way one lane road with on street parking and shared paths, potentially accommodating peak bus priority movements depending on final route selection by Transperth. In the approach to the plaza / station precinct it could potentially be brick-paved (or some other type of the tactile surface) that would slow down vehicles as an appropriate response to a mixed traffic environment with increased activity levels as you move closer to the train station.

Shared paths should be provided on both sides of the road reserve providing direct connection to the station precinct for pedestrian and cyclists.

5.9.3.7 Service Road East

The proposed Service Road East south of Sultana West Road and to the east of Milner Road will provide an important transport linkage into the Stage 1 light industrial area and will encompass a compulsory right turn movement for heavy vehicles travelling east on Sultana Road West. The design of the road and intersection will be required to accommodate b-double turning movements and a dedicated left-turn lane into Sultana Road West (westbound). This lane would also need to be suitably designed for b-double movements.

The carriageway should be approximately 10 metres wide, appropriate for a thoroughfare in an industrial estate. If a north-south connector is provided adjacent to the Bush Forever site, it should also intersect the service road. The detailed design of the road will be confirmed during subsequent local structure planning processes.

5.9.3.8 New District Distributor Integrator B and Main Street

A new district distributor integrator B road is proposed to deviate off the alignment of Sultana Road West generally in the vicinity of Service Road East, traverse to the north of the proposed activity centre, cross Milner Road and then provide private vehicle, bus, bicycle and pedestrian access to the new train station.

It is intended that the road function as a high amenity treed boulevard with an activity node focussed around the intersection with a new main street running generally south-west to north-east on the current alignment of Brae Road bisecting the proposed activity centre. The exact nature of the boulevard will be confirmed at the local structure planning stage but is envisaged to include on street parking and cycle lanes, priority bus movements, shared paths and a high quality landscaped environment. The nature of adjacent development is expected to transition as you move east to west with a medium density residential and activity centre interface to the east and a higher density residential, mixed use and commercial environment as you move west approaching the train station. Building scale is expected to increase and street setback decrease as you move west. A key function of the boulevard will be to provide for the safe and pleasant movement of pedestrians and cyclists accessing the activity centre and train station with separation from the industrial and commercial traffic utilising Sultana Road West accessing the light industrial area and servicing the activity centre.

The proposed main street is envisaged to encompass active retail and food and beverage uses focussed around the intersection with the new boulevard transitioning to less intensive and less active commercial uses as you move to the south west. Nil building setbacks and building frontages that promote an interactive environment will be required on the main street.

Parking should be provided on both sides of the main street. Visual side friction will further contribute to the reduction of vehicle operating speeds in this environment. Pedestrian movement should be encouraged through the provision of wide shared paths on both sides of the street with pedestrian crossings unambiguously designed to prioritise pedestrian movement.

5.9.3.9 Light Industrial Area North-South Connector

At the local structure planning stage, further consideration will be given to an additional north-south connection between Sultana Road West (via Service Road East) and Nardine Close, potentially adjacent to the Bush Forever site, to enable better freight movement and circulation through the light industrial area. The potential for this road to extend through to Berkshire Road will also be considered.

This connector should be designed to suit the requirements of the RAV4 network. Should it be extended to intersect Berkshire Road, the design should be upgraded to the standard of a RAV7 network. The connector should be designed to suit the requirements of industrial development (carriageway approximately 10 metres wide, kerb radii 15-18 metres at the intersections).

5.9.4 Public Transport

The following bus routes are available within proximity of the Forrestfield North DSP area:

- Route 296 – Perth to Kalamunda
  - Maida Vale Road (between Roe Highway and Newburn Road)
- Route 287 – Perth to Forrestfield
  - Berkshire Road (east of Roe Highway)
- Route 298 – Perth to Maida Vale
  - Maida Vale Road (between Roe Highway and Newburn Road)

In terms of future public transport planning to suit projected needs within the Forrestfield North area, the PTA have confirmed the following:

- There is a preference for bringing new bus routes into the railway station via Maida Vale Road / Ibis Place.
- They are open to running some routes via Berkshire Road into the railway station.
- Consideration could also be given to running one or more bus services via Sultana Road if Sultana Road East and West are reconnected by a bridge over Roe Highway.

Preliminary discussions were held with the PTA regarding the potential to bring bus services into the heart of the future Forrestfield North DSP residential, activity centre and TOD precincts. One of the key objectives of the Forrestfield North DSP is to push the potential of alternative transportation mode usage, and to be aspirational in thought toward the potential for the area. Although not formally included on the Forrestfield North DSP, the following bus routes warrant further consideration as part of future service planning:

For services via Maida Vale Road:

- Maida Vale Road to Ibis Place.

For services via Sultana Road West:

- Sultana Road West to Brand Road.
- Brand Road to proposed District Distributor Integrator B.
- Proposed District Distributor Integrator B to Ibis Place and Forrestfield North Bus Station.

For services via Berkshire Road:

- Berkshire Road to Railway Station Access Road.

One or more of these services can be re-routed during school holidays to service a primary school (if required) and any recreational or sporting precinct within the area as identified through future local structure planning processes.

After initial stakeholder consultation, the PTA have confirmed that their preferred alignment for additional bus routes would be via Sultana Road West. The condition of this service being introduced is the construction of the Sultana Road West overpass (Roe Highway flyover) which is expected to be completed in the longer term (10-20 years). The proposed alternative routes (via Berkshire Road and Maida Vale) can be considered in the interim.

A map of proposed public transportation routes is provided in the TIA provided at Technical Appendix 2.

5.9.5 Parking

5.9.5.1 PTA Parking

The PTA is intending to provide approximately 2,500 parking bays to support long term parking demand for the proposed Forrestfield Railway Station. Ideally, in the longer term, parking areas will be located along the western edge of the Forrestfield North DSP area within the walkable catchment from the railway station as shown on the district structure plan. Development of commercial and mixed-use facilities in the TOD precinct will be facilitated by a staged redevelopment process involving the full relocation of initial parking facilities to the immediate east and north of the train station to their ultimate locations as depicted on the district structure plan.

Dispersion of parking areas and multiple access/egress points will also spread traffic volumes and help avoid putting significant pressure on any one street.

Kiss and Ride and vehicle parking requirements are likely to add around 6,000 VPD into the surrounding road networks, so the design of the access around the station is very important and will need to be determined in collaboration with the PTA.

5.9.5.2 On-street Parking

On-street parking should be provided through each of the main linkages in the Forrestfield North DSP area. It is considered that the following streets as a minimum should have some form of on-street parking:

- Milner Road north from the intersection with Sultana Road West;
- Sultana Road West, west of Milner Road;
- Imperial Street;
- Ibis Place (in the vicinity of the railway station forecourt, mainly for kiss and ride parking);
- Proposed District Distributor Integrator B Road and Main Street; and
- Brae Road south of Stewart Road.

On-street parking will contribute to overall street amenity and will help reduce average operating speeds on these roads. In the section of Milner Road north of the intersection with Sultana Road West a dual use for the parking lane can be considered. Parking lanes can potentially function as AM / PM bus priority lanes if high frequency bus routes were introduced on this section of road.

5.9.5.3 Parking Provisions for the Proposed Uses

The Shire's LPS3 provides guidance on the general parking provision requirements for future individual developments. Given that the Forrestfield North DSP area is in close proximity to the future railway station and that additional bus routes are likely to service the local and wider residential catchments, the area should adopt the parking related principles of TOD. This would include principles that aim to stimulate the use of public transport and de-stimulate the use of private vehicles.

Therefore establishing a site specific set of parking provision ratios for the future planned land-uses as part of the local structure planning process or design guidelines preparation is recommended for consideration in this area, similar to the modified parking ratios considered in Cockburn Central for example.

5.9.5.4 Parking Management

The variety of options for parking will require an effective parking management plan. A plan of parking zones detailing the permitted dwell time and eventual charges should be developed once the district structure plan is ratified. In general, lower dwell times should be permitted for bays with likely high demand such as parking bays in the activity centre precinct and parking bays in proximity (within 400 metres) to the railway station, while longer dwell time could be permitted in other car parking areas where demand is more suitably met by longer term parking.

Efficient parking management will prevent an overflow from PTA parking consuming parking spaces in the proposed TOD and activity centre precincts and reduce the possibility of illegal parking.

5.9.6 Walking and Cycling

Existing pedestrian and cyclist access through the Forrestfield North DSP area is very limited due to the low intensity of current land-uses. The extent of development for the area envisaged under the district structure plan will have a significantly higher intensity of activity, and therefore the requirement for good quality pedestrian and cyclist linkages emerges. One of the key goals of the district structure plan document is to identify key linkages within the proposed district structure plan area generally based around the pre-existing road network. This network will be further expanded and refined as part of the future local structure planning processes.

5.9.6.1 Cyclist Access

Alternative transport modes should be promoted as much as possible. With a strong mix of urban uses it is reasonable to provide high quality cycling infrastructure. Secure bicycle storage can be provided in various locations for appropriate land-uses within the district structure plan area which would further encourage cycling.

Public bike storages can be provided in the TOD and activity centre precincts and associated with eventual recreation areas. These can be coupled with potential bicycle rental locations, which would further reinforce the potential use of this alternative transportation mode.

Bicycle lanes should be provided on the following streets:

- Berkshire Road (between Roe Highway and Dundas Road).
- Milner Road (between Berkshire Road and Maida Vale Road).
- Sultana Road West transitioning into Proposed District Distributor Integrator B Road (between the Roe Highway overpass and Forrestfield Train Station).
- District Distributor Integrator B.

The fine-grain cycling network should be designed as part of the subsequent local structure planning process to satisfy the requirements of a 'good riding environment'.

5.9.6.2 Shared Paths

Shared path connections should be provided through every POS area within the district structure plan. The shared path should be 2.5-3.0 metres wide and should follow existing trails (including the potential use of existing bridle paths) as much as possible.

The following roads and other locations have also been identified as the key connections for integrated movement:

- Brand Road (full length)
- Brae Road (from the intersection with the proposed District Distributor Integrator B Road)
- Sultana Road West (between the roundabout and Ibis Place)
- Stewart Road (between Brae Road and Milner Road)
- Littlefield Road (full length)
- Raven Street (between Milner Road and Maida Vale Road)
- Nardine Close (full length)
- Ashby Close (full length)
- Poison Gully Creek.

5.9.6.3 Pedestrian Paths

It is essential to develop a solid and permeable network of pedestrian paths in order to encourage pedestrian movement.

The major pedestrian routes that have been identified are as follows:

- Poison Gully Creek (as a shared path)
- Imperial Street (between Milner Road and Forrestfield Railway Station)
- Sultana Road West (between Eureka Street and Forrestfield Railway Station)
- Eureka Street (between Imperial Street and proposed District Distributor Integrator B Road)
- Proposed District Distributor Integrator B Road (between Sultana Road West and Forrestfield Railway Station)
- Milner Road (between Sultana Road West and Maida Vale Road)
- Brae Road (between Sultana Road West and Stewart Road)
- Raven Street (between Milner Road and Maida Vale Road)
- Brand Road (between Sultana Road West and Brae Road)
- Stewart Road (between Brae Road and Milner Road).

Pedestrian and cyclist movements through the light industrial precinct are expected to be less frequent when compared to that of the residential, TOD and activity centre precincts, however key linkages for consideration in this area include:

- Berkshire Road (Roe Highway to Milner Road)
- Milner Road (Berkshire Road to Sultana Road West)
- Nardine Close (Ashby Close to Milner Road)
- Ashby Close (Nardine Close to Berkshire Road).

The logical form of connection on these roads is a 2.5m width shared path, enabling both cycle and pedestrian connectivity. Shared paths in Berkshire Road and Milner Road already exist.

Pedestrian crossings on Maida Vale Road should enable the continuity of pedestrian and cyclist movement between High Wycombe and Forrestfield North. The most appropriate positioning of crossing facilities would be at the following intersections:

- Maida Vale Road / Milner Road
- Maida Vale Road / Newburn Road
- Maida Vale Road / Littlefield Road.

The upgrade of the Maida Vale Road / Milner Road intersection and the Maida Vale Road / Newburn Road intersection should be designed to enable a safe pedestrian environment.

All pedestrian and shared paths should be designed to be accessible by all members of the community in accordance with the Shire's Disability Access and Inclusion Plan 2012-2017 or any other subsequent document of this nature.

5.10 Services and Infrastructure

Preliminary investigations have revealed that there is limited provision of existing infrastructure in Forrestfield North to service the anticipated levels of development. New service infrastructure will be required to service any major new development within Forrestfield North. Service infrastructure requirements will be investigated in detail at the local structure planning stage.

5.10.1 Power

The Forrestfield North area is generally supplied with 22kV power from the Forrestfield Zone Substation on Abernethy Road and Dubs Close. Overhead HV lines currently service all lots within the area.

Within the exception of train station works being undertaken by the PTA and without the intervention of a State Government Agency or major land developer, development in Forrestfield North is likely to proceed on an ad-hoc basis. Western Power has previously advised that it does not have capacity concerns associated with natural growth in the area, but this will need to be investigated further as part of detailed local structure planning processes where more precise projected development yields are established.

In early 2013, Western Power's Network Capacity Mapping Tool indicated a future capacity of between 10MVA and 15MVA by 2020 within the area.

It was also previously noted that at a future point in time once a number of developments have taken place, a new feeder will be required to be installed to the Forrestfield Zone Substation to service the area. It is not known at this stage whether the cost will be borne by Western Power as part of their capital works, or whether the cost will be borne by the individual development which triggers the requirement.

All new developments would require existing overhead connections to be converted to underground.

5.10.2 Gas

A large portion of the Forrestfield North Area is presently serviced through medium pressure PVC gas reticulation. The existing mains are located along Sultana Road West and Smokebush Place, and up Milner Road, Brae Road and Brand Road, approximately to the extent of Stewart Road. High pressure steel mains are currently in place along Dundas Road and Maida Vale Road to the west and north, respectively.

In early 2013, Atco Gas advised that they did not have any plans to alter or upgrade the existing infrastructure in this location.

It is understood that existing medium pressure infrastructure would have the capacity to service gas loads typically associated with domestic, commercial and light industrial applications. If capacity upgrades were required for particularly large gas loads it should be possible to source a supply from the high pressure gas mains.

On the assumption that a supply is not required to be sourced from the high pressure gas main, the only upgrades required would consist of extensions of the medium pressure gas mains along existing roads to service individual properties.

5.10.3 Telecommunications

In early 2013 it was established that Telstra have no plans for expansion of their infrastructure to suit ongoing development and thus do not have any planning information for this area. Telecommunication connections are currently provided to each existing lot. Advice received indicates that future planning is subject to National Broadband Network Company (NBNCo) considerations. Where there are greater than 100 lots NBNCo will install the cabling without cost to the developer however the developer is required to fund the telecommunication design and installation of the pipe and pits.

No constraints were identified that would restrict the installation of telecommunications and typical construction rates would apply.

5.10.4 Water

All existing lots are currently serviced by water mains running along property frontages within road reserves. It is anticipated that upgrades to existing infrastructure will be required to service the anticipated levels of development across Forrestfield North. Responsibility for detailed planning and funding of this infrastructure will be the responsibility of project proponents and developers.

5.10.5 Wastewater

The area is not presently serviced by sewer reticulation. The Water Corporation has previously advised that sewer forward planning has been completed with the intention that the area is to be serviced by a reticulated gravity system draining to a main sewer line located in Abernethy Road to the west. It will need to be confirmed with the Water Corporation whether this approach will be suitable for the scale and extent of development envisaged under the Forrestfield North DSP.

The topography of the area is likely to permit all potential development sites to be serviced by gravity mains, without a requirement to import fill.

The development timing of various cells within the precincts will be likely to depend on a number of temporary works until more substantial downstream permanent works are completed. It is unlikely that the Water Corporation has allocated capital for the completion of headworks prior to development within the area commencing. As such, the developers in each area will need to complete these as required and seek reimbursement of the construction costs under a pre-funding agreement with the Water Corporation.

Costs for sewage installation would depend on ground conditions and the required sewer depth.

5.10.6 Development Contributions

In order to service the proposed levels of development across Forrestfield North a range of infrastructure upgrades are going to be required. Beyond those items set out in any associated development contribution plan for the area under the Shire's LPS3, the proponent of each project will be responsible for the provision of all services and infrastructure necessary to support their individual development.

The identification, prioritising and funding of regional infrastructure not identified under a development contribution plan or associated with individual developments, will be the responsibility of the relevant government agency or service provider. The reason for this approach is described below.

In Western Australia, development contributions are typically levied through one of the following methods:

1. Standard conditions of subdivision or strata subdivision.
2. Conditions of development.
3. Voluntary legal agreements.

In the case of methods 1 and 2, financial and/or 'in-kind' contributions can be levied under local town planning schemes, such as the Shire's LPS3, through development contribution plans, made in accordance with Part 7 - Development Contribution Plans of the Regulations, and *State Planning Policy 3.6 – Development Contributions for Infrastructure* (SPP3.6). SPP3.6 provides for the levying of contributions towards a range of hard infrastructure and community facilities where certain principles can be demonstrated. Key amongst these is the principle of 'need and nexus', where the demand for infrastructure can be demonstrated (need) and the connection between a development and the demand created can be clearly established (nexus).

The application of this principle makes development contribution plans suitable for the levying of contributions towards local infrastructure, but less effective for the co-funding of regional infrastructure (i.e. major essential services headworks) where the benefit accrues to a much wider group than the immediate local community.

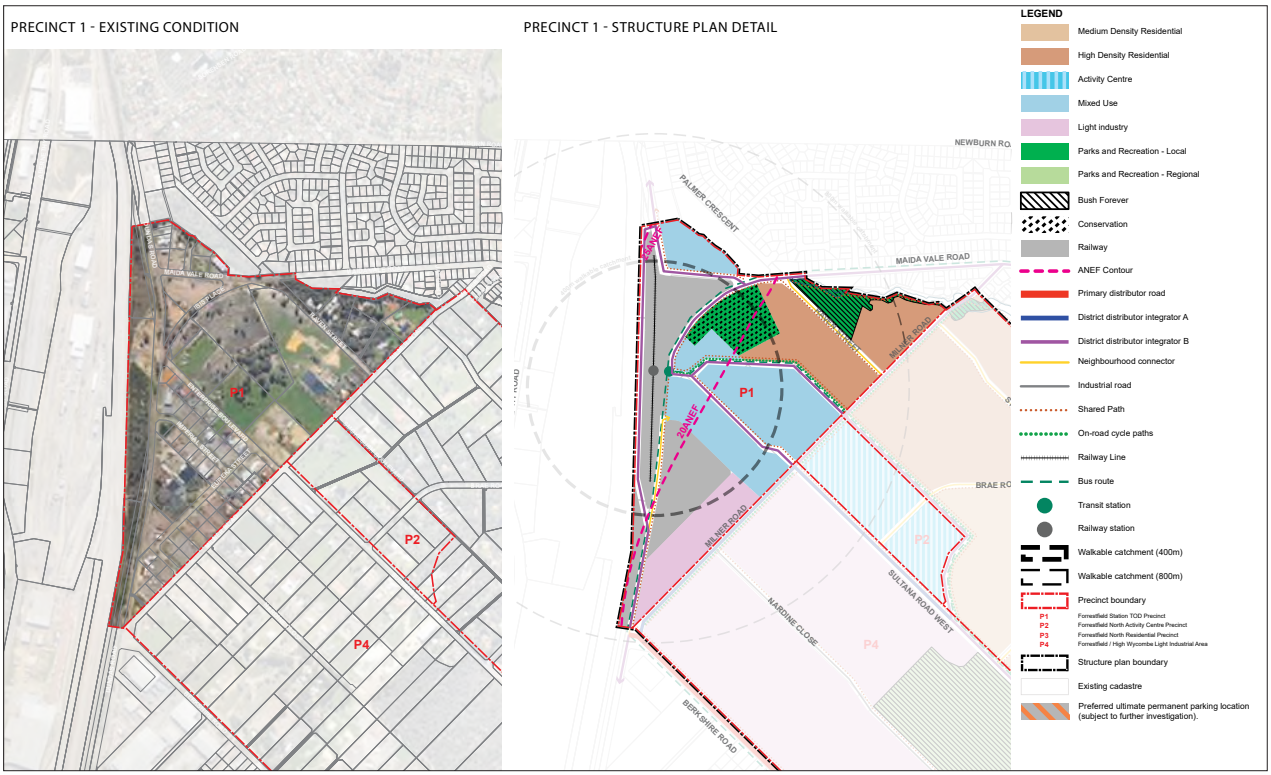
5.10.7 Earthworks

Earthworks will generally only be required on an individual subdivision or development basis and may, where supported by a local structure plan, include clearing to remove existing structures and vegetation. Earthworks will need to ensure that final lot levels are a minimum of 0.5 metres above 100-year flood levels.

This page has been left blank intentionally.

6. Development

6.1 Forrestfield Station TOD Precinct



6.1.1 Precinct Character

- A new TOD precinct based around the eastern side of the Forrestfield Train Station, planned in close consultation with the PTA, offering commercial, mixed-use and higher density residential development opportunities that are responsive to noise and vibration associated with the nearby Forrestfield Freight Yard, Mainline Freight Rail and Perth Airport ANEF contours.
- Built form including medium density terrace, townhouse and low-rise apartment development in the short to medium term and apartment towers in the longer term to maximise hills and city views to the east and west respectively.
- A new permeable activated street and pedestrian/ cycle network that provides excellent access to the train station for all modes of transport.
- Additional local open space that meets the active and passive recreational requirements of residents and users of the area and that protects the environmental values of the TEC area and Poison Gully Creek.

6.1.2 Potential Development Yields

Potential development yields for the Forrestfield Station TOD Precinct are as follows:

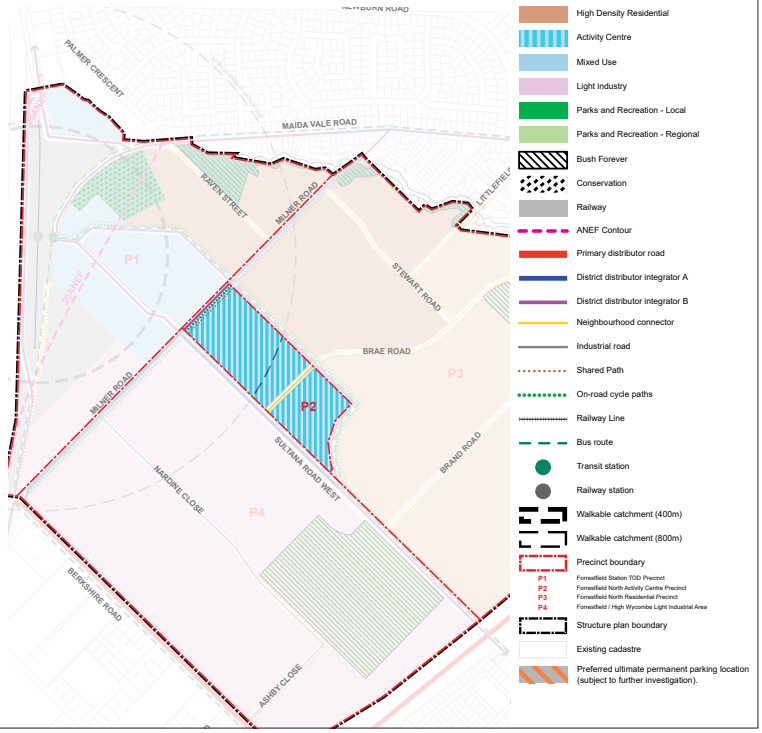
Potential Total Dwellings	1,000-1,500*
Potential Total Population (@2.2 persons per household)	2,200-3,300*
Potential Employment	500 – 1,000
Potential Retail Floorspace (m^2)	500-1,000
Potential Commercial Floorspace (m^2)	229,000-394,500
Potential Industrial Floorspace (m^2)	10,000-10,500

*Ultimate residential development yields will be determined following noise and vibration assessments at the local structure planning stage to consider the appropriate response to the operations of Perth Airport and the Forrestfield Freight Yard and Mainline Freight Rail.

6.2 Forrestfield North Activity Centre Precinct

PRECINCT 2 - EXISTING CONDITION

PRECINCT 2 - STRUCTURE PLAN DETAIL



6.2.1 Precinct Character

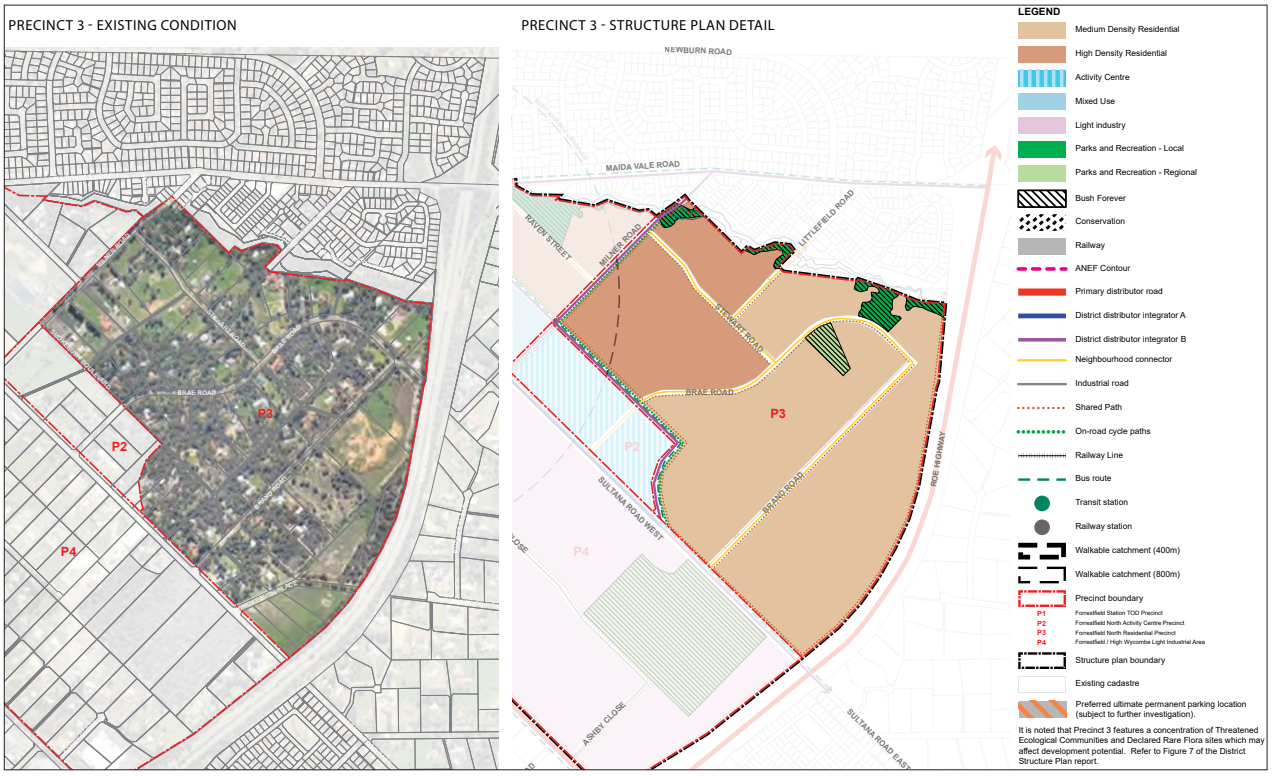
- A new main street based activity centre precinct strategically located to buffer industrial uses in the light industrial area from future residential uses, primarily serviced from Sultana West Road.
- A key focus for the provision of community facilities to support a growing population.
- A mixture of shops, offices, restaurants and entertainment are encouraged to ensure the centre meets the needs of the local population.

6.2.2 Potential Development Yields

Potential development yields for the Forrestfield North Activity Centre Precinct are as follows:

Potential Total Dwellings	150-200
Potential Total Population (@2.2 persons per household)	330-440
Potential Employment	1,500 – 2,000
Potential Retail Floorspace (m^2)	20,000-32,000
Potential Commercial Floorspace (m^2)	5,000-10,000
Potential Industrial Floorspace (m^2)	Nil

6.3 Forrestfield North Residential Precinct



6.3.1 Precinct Character

- A new medium and high density residential neighbourhood that will set a benchmark for residential development within the North-east Sub-region, and that responds to and protects the significant environmental assets in the area.
- Built form including medium density terrace, townhouse and low-rise apartment development in the short to medium term and apartment towers in the longer term to maximise hills and city views to the east and west respectively.
- A new permeable street and pedestrian/cycle network that provides excellent access to the train station and activity centre for all modes of transport.
- Additional local open space that meets the active and passive recreational requirements of residents and users of the area, that enhances linkages within the proposed movement network and that protects the environmental values of the area and Poison Gully Creek.

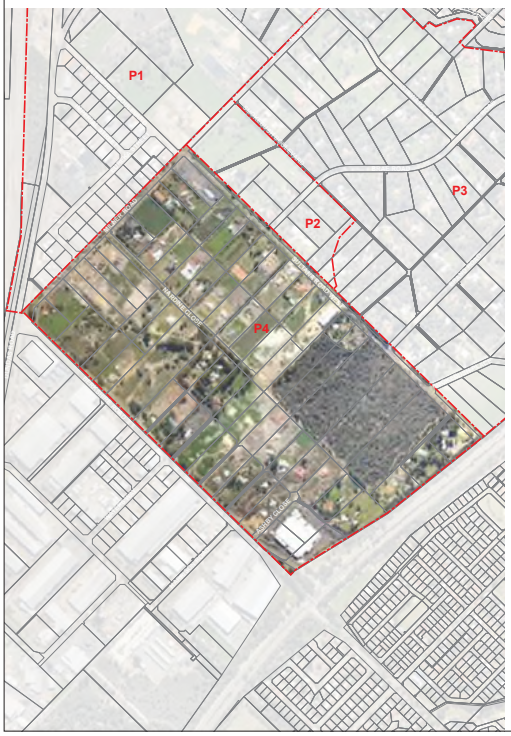
6.3.2 Potential Development Yields

Potential development yields for the Forrestfield North Residential Precinct are as follows:

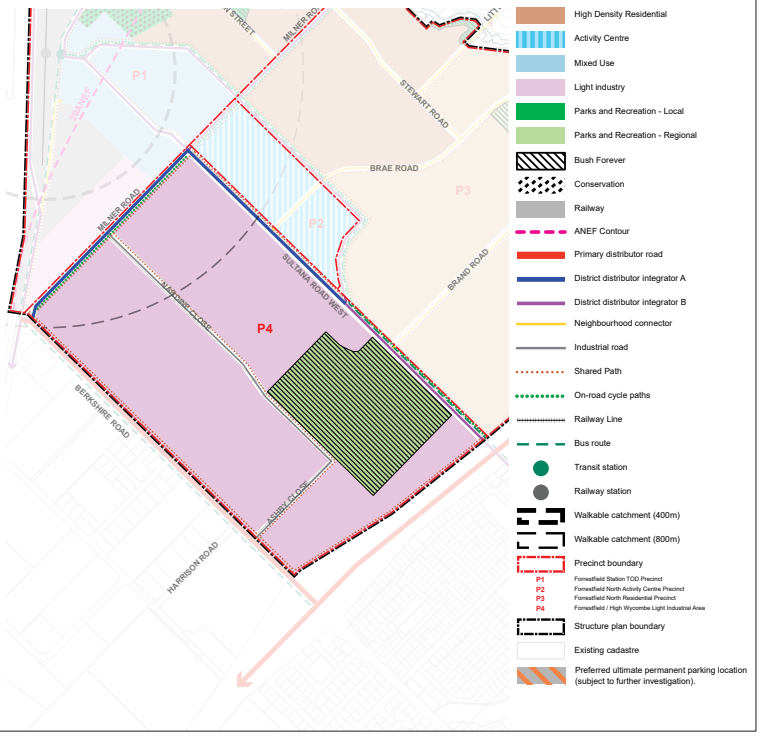
Potential Total Dwellings	3,350-5,000
Potential Total Population (@2.2 persons per household)	7,370-11,000
Potential Employment	Home based business and local retail based employment only
Potential Retail Floorspace (m^2)	Minor to meet local needs only
Potential Commercial Floorspace (m^2)	Nil
Potential Industrial Floorspace (m^2)	Nil

6.4 Forrestfield/High Wycombe Light Industrial Area

PRECINCT 4 - EXISTING CONDITION



PRECINCT 4 - STRUCTURE PLAN DETAIL



6.4.1 Precinct Character

An emerging high quality light industrial area with a freight and logistics focus that leverages excellent access to the freight transport network including Roe Highway.

6.4.2 Potential Development Yields

Potential development yields for the Forrestfield/High Wycombe Light Industrial Area are as follows:

Potential Total Dwellings	Nil
Potential Total Population (@2.2 persons per household)	Nil
Potential Employment	700 – 1,000
Potential Retail Floorspace (m^2)	Nil
Potential Commercial Floorspace (m^2)	Nil
Potential Industrial Floorspace (m^2)	135,000-150,000

Schedule 1 – Planning Framework and Governance

S1.1 State And Regional Planning Context

S1.1.1 Metropolitan Region Scheme

The MRS is the overriding statutory land use planning scheme for the Perth Metropolitan Region. The MRS provides the statutory basis for land use and development and identifies land use patterns based on broad zones and reservations. The MRS reflects the agreed strategic direction for land within the Perth Metropolitan Region with all local planning schemes being required to be aligned to it in terms of planning controls at the local level, including local area planning and development processes.

Under the MRS, the Forrestfield North area is predominately zoned 'Urban'. An MRS amendment was initiated in 2013 to rezone a portion of the district structure plan area from 'Rural' to 'Urban', in order to facilitate the subdivision and development of the land in a manner consistent with the intent of the Forrestfield North DSP. The MRS amendment has been approved with the land now being zoned for urban, rural and parks and recreation purposes.

Refer to Figure 10 – Metropolitan Region Scheme

S1.1.2 Directions 2031 and Beyond (August 2010)

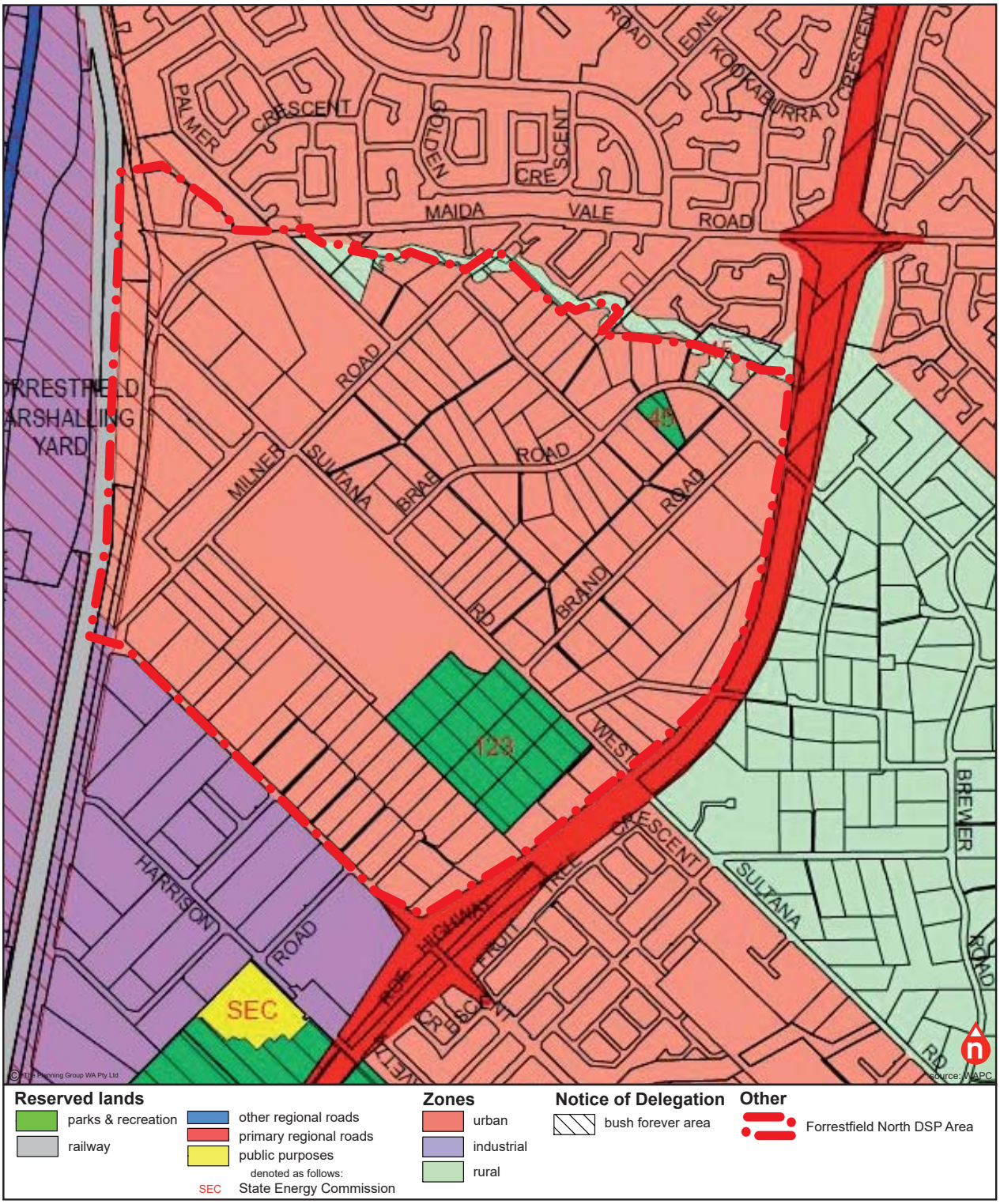
The current land use strategy for the Perth Metropolitan and Peel region, Directions 2031 was released by the WAPC in 2010. The plan builds upon the previous metropolitan strategy *Network City* (2004) and encourages a polycentric city model with development concentrated in a number of activity centres across the metropolitan region.

The Strategy states its visions as: *"By 2031, Perth and Peel people will have created a world class liveable city; green, vibrant, more compact and accessible with a unique sense of place"*

Directions 2031 identifies the connected city model as the preferred medium-density future growth scenario for the Perth Metropolitan and Peel region. Key characteristics of a connected city pattern of urban growth are:

- Promoting a better balance between greenfield and infill development;
- Protecting and enhancing the natural environment, agricultural land, open spaces and heritage and community wellbeing;
- Reducing energy dependency and greenhouse gas emissions;
- Developing and revitalising activity centres as attractive places in which to invest, live and work;
- Ensuring that economic development and accessibility to employment inform urban expansion;
- Planning for an adequate supply of housing and land in response to population growth and changing community needs;
- Facilitating increased housing diversity, adaptability, affordability and choice;
- Planning and developing key public transport corridors, urban corridors and transit oriented developments to accommodate increased housing needs and encourage reduced vehicle use;
- Creating and enhancing transport and freight movement networks between activity centres and industrial centres; and
- Maximising essential service infrastructure efficiency and equity and identifying and prioritising the coordination of projects to support future growth.

Figure 10. Metropolitan Region Scheme



Whilst not specifically recognized in Directions 2031, the Forrestfield North area represents a significant opportunity to reinforce connected city objectives with housing diversity and employment opportunities proposed to be provided within an established urban context supported by excellent accessibility to public transport and the broader transport network.

Importantly, the Forrestfield North DSP will supports the aspirations of Directions 2031 in that it will closely align the existing and emerging transport system with a land use pattern that will optimize accessibility and amenity.

S1.1.3 Draft North-East Sub-regional Planning Framework (May 2015)

The draft North-East Sub-regional planning framework is one of three frameworks prepared for the outer sub-regions of Perth and Peel that, combined with the draft Central Sub-regional Planning Framework, establish a long-term and integrated planning framework for land and infrastructure vision. The frameworks build upon the principles of Directions 2031 and are key instruments for achieiving a more consolidated urban form that will reduce dependence on new urban greenfield developments to accommodate the anticipated population growth by increasing residential density and urban infill development targets.

The frameworks will be finalised as sub-regional structure plans that will provide guidance for:

- The preparation of amendments to the MRS and Peel Region Scheme, local planning strategies/schemes and district, local and activity centre structure plans; and
- The staging and sequencing of urban development to inform public investment in regional community, social and service infrastructure.

The framework identifies Forrestfield North as a proposed urban expansion area and indicates that the areas location immediately east of a proposed rail station represents an opportunity to achieve more intensive transit-oriented development. It also confirms that planning studies to consider urban design options are currently underway.

S1.1.4 Draft Outer Metropolitan Perth and Peel Sub Regional Strategy (August 2010)

The WAPC's Draft Outer Metropolitan Perth and Peel Sub-Regional Strategy is intended to provide guidance to assist with the application of Directions 2031 at the local level. It addresses issues that extend beyond local government boundaries and that require a regional response, as well as commonly shared issues such as the provision of housing choice, affordability and employment.

It identifies a strategic plan of actions, agency responsibilities and delivery timeframes and links State and local government strategic planning to guide the preparation and review of local planning strategies. The draft strategy informed the preparation of the Shire's Local Planning Strategy and will ultimately inform the new local planning scheme as outlined in the key planning actions required for the north-east sub region.

The development of Forrestfield North as envisaged under the district structure plan will support achieving the housing targets as identified in Directions 2031 and associated planning and delivery of land for employment growth and economic development.

S1.1.5 Western Australian Planning Commission – Economic and Employment Land Strategy, Perth Metropolitan and Peel Regions (April 2012)

The WAPC's EELS was prepared in response to the ongoing pressures of industrial land supply in the Perth metropolitan market and to ensure that industrial land constraints and shortages such as those that occurred in the mid 2000s did not reoccur. EELS' primary aim is the adequate provision of land over the next 20 years within the Perth Metropolitan and Peel region for the purposes of employment generating activities (industrial and commercial land uses), with identification of land that is suitable for non-heavy industrial activity in the long term, and strategies to address land supply constraints.

A significant proportion of the Forrestfield North area precinct was identified as a potential industrial area in the medium term under EELS.

S1.1.6 Kewdale – Hazelmere Integrated Masterplan (August 2006)

The KHIM identifies the Kewdale-Hazelmere area as a major strategic area for the freight industry in Perth and Western Australia. The KHIM was prepared by the Department of Planning in consultation with a number of stakeholders, to provide a broad framework to facilitate the rapid expansion and change that is occurring in the freight industry and to accommodate the existing population of residents within the area.

The Forrestfield North area formed part of the Forrestfield Precinct. The Forrestfield Precinct was identified as being 'a significant freight related industrial precinct adjacent to the main interstate freight rail line, the airport and the residential suburb of High Wycombe'. Existing industrial land uses in this precinct include SCT, Australian Railroad Group, and Co-operative Bulk Handling.

The development of Stage 1 of the Forrestfield/High Wycombe Light Industrial Area was a response to the KHIM. This included the preparation of a local structure plan and developer contribution arrangements to facilitate the development of the industrial area for logistics and transport based industries that could take advantage of its location and proximal relationship with key transport infrastructure.

However, with the advent of the Forrestfield Airport Rail Link and alternative higher order urban land use opportunities for Forrestfield North associated with this infrastructure investment, the originally envisaged industrial development for the remainder of the area as identified under both the EELS and KHIM will no longer proceed. Nevertheless, a key consideration of the district and local structure planning processes will be the integration of the original Stage 1 of the Forrestfield/High Wycombe Light Industrial Area into the proposed urban framework.

S1.1.7 Department of Premier and Cabinet - Strategic Assessment of the Perth and Peel Regions

The Strategic Assessment of the Perth and Peel Regions is being led by the Department of Premier and Cabinet in partnership with a number of government agencies. It will assess the impact of the future development proposed under the following State level and use planning documents on matters of regional significance listed under the EPBC Act:

- Directions 2031;
- the WAPC's forthcoming sub regional structure plans; and
- a revised State Planning Policy – Basic Raw Materials.

Whilst the outcomes of the strategic assessment are currently unknown it is considered that an appropriate environmental response for the Forrestfield North area can be established through district and local structure planning processes as the ecological values of the area are known and can be factored into associated planning processes, including the preparation of local structure plans.

S1.1.8 Western Australian Planning Commission State Planning Policy 2 – Environment And Natural Resources Policy

The WAPC's State Planning Policy 2 – Environment And Natural Resources Policy (SPP 2) acts as a broad overarching sectoral policy for environmental and natural resource planning in Western Australia and includes measures that identify those areas of high biodiversity and conservation value, such as Bush Forever sites. The protection of environmental assets in Forrestfield North identified in accordance with SPP 2 is a key consideration of the planning processes underway for the area.

S1.1.9 Western Australian Planning Commission State Planning Policy 2.8 – Bushland Policy For The Perth Metropolitan Region

The WAPC's State Planning Policy 2.8 – Bushland Policy For The Perth Metropolitan Region (SPP 2.8) provides an implementation framework for the protection and management of regionally significant bushland within the Perth Metropolitan Region, identified as Bush Forever sites. These areas are intended to secure the long-term protection of biodiversity and associated environmental values within the Perth Metropolitan Region.

The Forrestfield North DSP identifies the Bush Forever sites within the area and seeks to integrate these within the intended form of future development through appropriately locating land uses that balance the wider environmental, social and economic considerations associated with the area. Further details in terms of the protection and enhancement of Bush Forever sites within Forrestfield North will be identified during subsequent local structure planning processes.

S1.1.10 Western Australian Planning Commission State Planning Policy 3 – Urban Growth and Settlement

The WAPC's State Planning Policy 3 – Urban Growth and Settlement (SPP 3) applies throughout Western Australia and seeks to promote a sustainable and well planned pattern of settlement across the State, with sufficient and suitable land to provide for a wide variety of housing, employment, recreation facilities and open space.

The Forrestfield North DSP will consolidate and expand upon the existing residential development to the north and east and existing industrial uses in the wider area and represents an appropriate response to SPP 3 objectives. This includes:

- Locating higher residential in locations accessible to transport and services.
- Concentrating commercial uses in and around activity centres and corridors with good access to public transport.
- Protecting biodiversity.
- Clustering retail, employment and other activities that attract large numbers of people at major transport nodes.
- Directing urban expansion that are or will be well serviced by employment and public transport.
- Proposing an urban structure of walkable neighbourhoods clustered to reduce car dependence for access to employment, retail and community facilities.

S1.1.11 Western Australian Planning Commission State Planning Policy 3.1 – Residential Design Codes

The WAPC's State Planning Policy 3.1 – Residential Design Codes (R-Codes) provide a comprehensive basis for the control of residential development throughout Western Australia. The R-Codes aims to address the emerging design trends, promote sustainability, improve clarity and highlight assessment pathways to facilitate better residential design outcomes throughout Western Australia.

Local governments are responsible for the day-to-day administration and application of the R-Codes through the implementation of their respective planning schemes.

The Forrestfield North DSP has responded to the opportunities and constraints within the area by proposing higher residential density codings within the 800 metre walkable catchments of the train station and proposed activity centre, and medium densities outside of these areas. Further detail will be determined for future residential densities as part of future local structure planning processes.

S1.1.12 Western Australian Planning Commission State Planning Policy 3.6 – Development Contributions For Infrastructure

In WA, as in other Australian states, local governments face increasing pressures on the services they provide. These pressures arise from population and economic growth and increasing expectations of the community for new and upgraded infrastructure.

The WAPC's State Planning Policy 3.6 – Development Contributions For Infrastructure (SPP 3.6) sets out the requirements and considerations for establishing development contributions for infrastructure that are required to support the orderly development of an area. It also aims to provide a consistent, accountable and transparent system for local governments to plan and charge for development contributions over and above the standard provisions through Development Contribution Plans (DCP's).

Requirements for and implementation of development contributions for the Forrestfield North Area will be established through subsequent local structure planning processes with the identification of Development Contribution Areas (DCA's) and preparation of DCPs for implementation under the Shire's LPS3.

S1.1.13 Western Australian Planning Commission State Planning Policy 3.7 – Planning in Bushfire Prone Areas

The WAPC's State Planning Policy 3.7 – Planning in Bushfire Prone Areas (SPP 3.7) intends to assist in reducing the risk of bushfire to people, property and infrastructure by taking a risk minimisation approach to development proposed in bushfire-prone areas.

The Forrestfield North DSP provides the broad land use planning for the area. Detailed bushfire management considerations will be further assessed as part of subsequent local structure planning processes.

S1.1.14 Western Australian Planning Commission State Planning Policy 4.1 – State Industrial Buffer Policy

The purpose of the WAPC's State Planning Policy 4.1 – State Industrial Buffer Policy (SPP 4.1) is to provide a consistent Statewide approach for the protection and long-term security of industrial zones, transport terminals (including ports) other utilities and special uses. The policy is to provide for the safety and amenity of surrounding land uses while having regard to the rights of landowners who may be affected by residual emissions and risk.

Whilst buffers are not likely to be required for the types of industrial uses currently found or envisaged in the Forrestfield/High Wycombe Light Industrial Area, there will need to be further consideration given at the local structure planning stage for the Forrestfield Station TOD Precinct to buffer requirements associated with the operation of the Forrestfield Freight Yard and Mainline Freight Rail.

S1.1.15 Western Australian Planning Commission State Planning Policy 4.2 – Activity Centres for Perth and Peel

The WAPC's State Planning Policy 4.2 – Activity Centres for Perth and Peel (SPP 4.2) specifies the broad planning requirements for the planning and development of new activity centres and the redevelopment of existing centres in the Perth and Peel region. It mainly concerns the distribution, function, broad land use, urban design criteria and coordination of land use and infrastructure.

The Forrestfield North DSP reflects the aims of SPP 4.2 in that it has coordinated the location of land uses with the existing and proposed key infrastructure available to the area. The TOD and activity centre precincts will actively encourage connection to the Forrestfield Train Station and will form new desirable component of the Shire's activity centres hierarchy to meet current and future population needs in terms of access to services, facilities and employment.

S1.1.16 Western Australian Planning Commission State Planning Policy 5.1 – Land Use Planning in the Vicinity of Perth Airport

The general intent the WAPC's State Planning Policy 5.1 – Land Use Planning in the Vicinity of Perth Airport (SPP 5.1) is to consider the planning of areas in close proximity of Perth Airport having regard to the impacts of aircraft noise with reference to the Australian Noise Exposure Forecast (ANEF).

The Forrestfield North DSP is located three kilometres to the west of Perth Airport. Based on current ANEF contours, development in the area will be minimally impacted by aircraft noise. A small portion of the area is noted as being within the 20-25 ANEF contour with the majority of the district structure plan area being located outside of the 20 ANEF contour. Table 2.1 within Appendix 1 of SPP 5.1 lists a number of building types and their acceptability within each of the ANEF contours. The Forrestfield North DSP meets the requirements of Appendix 1 given that all building types below the 20 ANEF contour are deemed to be acceptable and the proposed

land uses that fall within the 20-25 ANEF contour are deemed to be either conditionally acceptable or acceptable. The district structure plan has also responded to the ANEF contours appropriately by locating particular land uses that are acceptable within the relevant ANEF contour.

A small portion of high density residential is located within the ANEF 20-25 contour adjacent to Maida Vale Road. The provisions of SPP5.1 will need to inform more detailed land use and built form considerations in this area.

S1.1.17 Western Australian Planning Commission State Planning Policy 5.4 – Road and Rail Transport Noise and Freight Considerations in Land Use Planning

The WAPC's State Planning Policy 5.4 – Road and Rail Transport Noise and Freight Considerations in Land Use Planning (SPP 5.4) applies to proposals for new noise-sensitive developments, new railways or major roads, major redevelopments of existing railways or major roads, and new freight handling facilities.

Noise and vibration surveys are currently being undertaken to determine the current (primarily from road and freight rail) and future (solely from construction and operation of the Forrestfield Airport Rail Link) noise and vibration levels near the proposed Forrestfield Train Station. Depending on the levels, mitigation measures could be considered to ensure that potential future land uses, such as residential development, will not be prohibited. Mitigation required due to construction and operation of the rail link will be provided by the PTA. Mitigation required due to the proximity of future land uses such as residential development to existing road and freight rail will be a consideration during subsequent local structure planning processes.

S1.1.18 Western Australian Planning Commission Development Control Policy DC 4.1 - Industrial Subdivision

The WAPC's Development Control Policy DC 4.1 - Industrial Subdivision (DC 4.1) is a State wide policy that applies to the subdivision of industrial land and provides guidance on matters the WAPC considers when determining applications for industrial subdivision. There are a number of policy measures that are relevant to future subdivision within the light industrial precinct including access and road layout, the provision of adequate infrastructure services, and the supply of appropriately sized and shaped lots.

S1.1.19 Western Australian Planning Commission Development Control Policy DC1.6 – Planning to Support Transit Use and Transit Oriented Development

The WAPC's Development Control Policy DC1.6 – Planning to Support Transit Use and Transit Oriented Development (DC 1.6) seeks to maximise the benefits to the community of an effective and well used public transit system by promoting planning and development outcomes that will support and sustain public transport use.

This policy applies to all areas of the State, within transit precincts as defined under the policy, and is intended to inform government agencies, local government, landowners and prospective developers of the policy approach which will be applied by the WAPC.

The Forrestfield North DSP provides an overarching land use planning response to the Forrestfield Airport Rail Link project and has the objective of maximizing the use of the public transport system to support the efficient use and development of land within the area.

S1.1.20 Western Australian Planning Commission Planning Guidelines – Better Urban Water Management

The WAPC's planning guidelines for Better Urban Water Management have been prepared to facilitate the better management of our urban water resources by ensuring an appropriate level of consideration is given to the total water cycle at each stage of the planning system.

In accordance with guideline requirements, a DWMS has been prepared for the Forrestfield North DSP area.

S1.1.21 Western Australian Planning Commission Planning Guidelines – Acid Sulfate Soils Planning Guidelines

The WAPC's planning guidelines for ASS outline a range of matters to be addressed at various stages of the planning process to ensure that the development of land containing ASS is planned and managed to avoid potential adverse effects on the natural and built environment.

There is the potential that ASS may occur within the Forrestfield North area, with the majority of the area being classified as having a 'moderate to low' risk of ASS. The impacts associated with ASS can be associated with the increase in acidity and/ or the release of heavy metals into the environment, resulting in a number of detrimental impacts. The impacts of ASS can be avoided through a number of methods that deal with the issue, which will be addressed in an ASS Management Plan at the time of development.

S1.2 Local Planning Context

S1.2.1 Shire of Kalamunda Local Planning Scheme No. 3

The Shire's LPS3 is a statutory document that forms the basis for assessing and determining proposals for the use and development of land within the Shire.

Under the Shire's LPS3 the majority of the Forrestfield North Area is zoned 'Special Rural', 'Industrial Development' and 'Light Industry'.

The implementation and application of LPS3 is supported by a number of local planning policies prepared and adopted as required under local planning scheme requirements.

Refer to Figure 11 – Shire of Kalamunda Local Planning Scheme No. 3

S1.2.2 Shire of Kalamunda Local Planning Strategy

The Shire has developed a comprehensive local planning strategy to guide the future evolution of the district. The Local Planning Strategy was endorsed by the WAPC in February 2013.

In response to WAPC strategic planning direction at the time including the KHIM and EELS, a key element of the Local Planning Strategy was the identification of additional industrial lands for further investigation in Forrestfield North as part of the Forrestfield/High Wycombe Light Industrial Area.

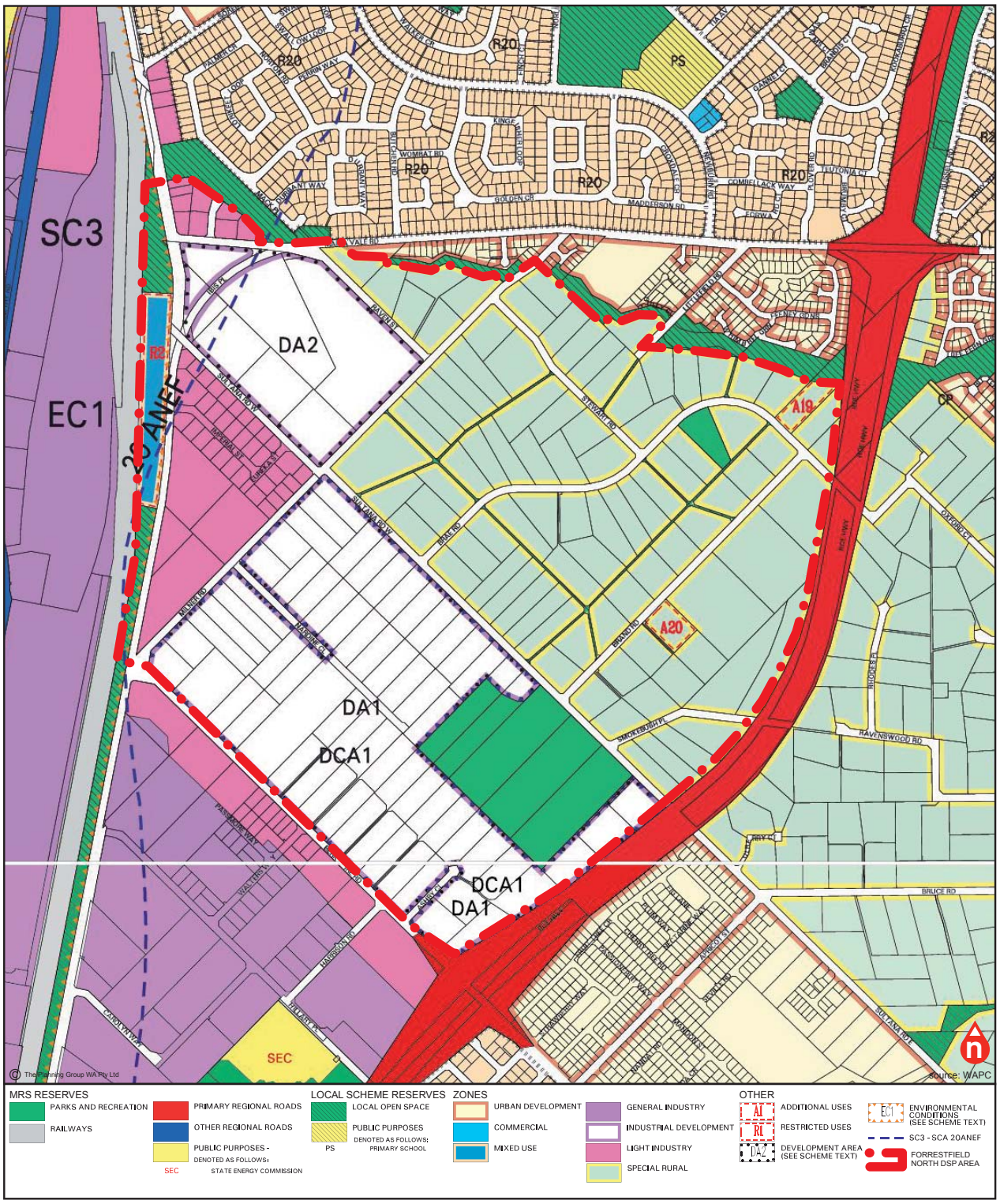
This thinking pre-dated announcement of the Forrestfield Airport Rail Link, which has necessitated the re-thinking of the optimal planning outcomes for this area as part of the Forrestfield North DSP preparation process.

S1.2.3 Shire of Kalamunda Local Biodiversity Strategy

The Shire's Local Biodiversity Strategy has been developed in anticipation of future development encroaching into natural assets. The strategy aims to strategically plan natural area protection so that biodiversity conservation is incorporated into the Shire's planning and decision making processes.

The Local Biodiversity Strategy identifies ecological linkages within or adjacent to the Forrestfield North area running east-west along Poison Gully Creek and north south through the eastern portion of the project area, generally picking up high quality remnant vegetation including the corridor adjacent to Roe Highway. It also states that there are opportunities to protect natural areas in public open space contributions within Forrestfield North.

Figure 11. Shire of Kalamunda Local Planning Scheme No. 3



This page has been left blank intentionally.