



**BROOME NORTH**  
**DISTRICT STRUCTURE PLAN**  
AUGUST 2022 REV F (AMENDMENT NO.2)

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## TECHNICAL APPENDICES

1.	Planning Report
2.	Planning Design Forum Summary Documents
3.	Engineering and Servicing Report
4.	Traffic Assessment
5.	District Water Management Strategy
6.	Environmental Reports
7.	Landscape Report
8.	Commercial Analysis
9.	Housing Report
10.	Social Directions Paper
11.	Social Context Paper
12.	Bushfire Management Plan

# ENDORSEMENT

IT IS CERTIFIED THAT AMENDMENT NO.2 TO BROOME NORTH DISTRICT STRUCTURE PLAN WAS APPROVED BY  
RESOLUTION OF THE WESTERN AUSTRALIAN PLANNING COMMISSION ON:

.....  
**08 SEPTEMBER 2022**  
.....

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







# PART 1 IMPLEMENTATION

## 1.0 STRUCTURE PLAN AREA

This Structure Plan applies to the land contained within the inner edge of the red line of the Broome North Structure Plan (Plan No,1).

## 2.0 CONTENT

The Structure Plan report comprises:

- (a) Part One - Implementation
- (b) Part Two - Explanatory
- (c) Technical Appendices

## 3.0 INTERPRETATION

All words and expressions used in this Structure Plan have the meanings given to them in the Shire of Broome operating Local Planning Scheme (the Scheme).

## 4.0 REQUIREMENT FOR LOCAL STRUCTURE PLANS TO BE PREPARED

Further to Schedule 2 - Deemed provisions for local planning schemes, Part 4 - Structure plans, of the Planning and Development (Local Planning Schemes) Regulations 2015, a Local Structure Plan may be required before any future subdivision or development is undertaken.

The Local Structure Plan is to elaborate and enhance the detail contained in this District Structure Plan as the basis for subdivision and development.

## 5.0 STATEMENT OF ROLES AND RESPONSIBILITIES

The Statement of Roles and Responsibilities for Broome North agreed between Development WA (then LandCorp), the Shire of Broome, the Department of Planning, Lands and Heritage (then Department of Planning) and the Commission, identifies that the objective of the development is to endeavour to deliver where possible the range of benefits detailed at Figure 1.

Local Structure Plans are to detail how they deliver the objectives described at Figure 1.

Figure 1 - Broome North Statement of Roles and Responsibilities

Economic Health	Provide affordable housing and a mix of housing types and land solutions
	Meet public and social housing land requirements
	Ensure an economically viable project, which provides opportunities for the private sector and Local Government
	Deliver mixed use local activity centres and industrial/commercial areas for increased employment opportunities
Community Wellbeing	Provide local community facilities and an accessible safe public realm
	Focus on addressing 'local' needs through consultation.
	Provide opportunities for the expression of cultural needs, especially in the public realm
Environmental Leadership	Estate design to maximize micro climate benefits including breezeways
	Water Sensitive Urban Design (WSUD) and third pipe water recycling opportunities
	Multi use corridors for environmental protection, WSUD
	Management, cultural uses & linkages, transport network and trails
Design Excellence	Cardinal connectivity in the design for maximum flexibility
	A contemporary interpretation of "old Broome style" to be a basis for design especially in the public realm
	Design to achieve climate responsive built form outcomes
	Recognise cultural needs in design



## **6.0 DEVELOPMENT REQUIREMENTS**

- 6.1 Local Structure Plans are to incorporate specific standards for the development of Thoroughfares, Landscape and Built Form within the relevant Local Structure Plan area in accordance with the objectives set out at Part One clause 6.3 for each of the zones identified on Plan No.1.
- 6.2 A Local Structure Plan may contain standards and requirements different from those in the Residential Design Codes and the provisions in the Local Structure Plan shall prevail over an inconsistent provision in the Residential Design Codes.
- 6.3 **OBJECTIVES OF ZONES**  
The objectives for each of the zones identified on Plan No.1 is described below.

The objectives will guide the exercise of discretion where:

- (a) It is proposed to vary a provision or standard relevant to the zone, including the development requirements required to be prepared in accordance with clause 6.1 above and/or
- (b) Where a variation to the intent of the District Structure Plan is proposed via a Local Structure Plan.

### 6.3.1 Transect - Nature (Reserve)

Description: Consists of land in a natural condition, including land set aside for reserves, and/or land that is otherwise unsuitable for development for reasons of topography or conservation value.

Objectives:

- Preserve ecological qualities, landscape character, landforms and cultural significance;
- Provide an edge to neighbourhoods and a connection between neighbourhoods;
- Offer walking, cycling and passive recreational opportunities in a natural setting;
- Provide a vegetated buffer to busy roads;
- Facilitate better urban water management through the incorporation of drainage where it is not harmful to the natural values of the zone;
- Allow for the development of low key amenities (including public buildings, paths and fencing) that blends with the natural landscape and is not detrimental to the natural values of the zone.

The following graphic illustrates some potential design responses for the development of community spaces, roads and buildings in the Nature transect in Broome North.



community spaces



roads



buildings

### 6.3.2 Transect - Bush Living (Residential - Low Density R2-10)

Description: Consists of areas of low density residential development with a semi-rural character.

Objectives:

- Allow for low intensity development distinguished by natural landscape character;
- Provide a transition from urban areas to nature;
- Enable the retention of landform and vegetation in a natural setting where possible;
- Allow for the application of residential density codes between R2 – R10;
- Promote generous front setbacks to buildings to preserve low density character and the use of building envelopes to retain vegetation;
- Promote informal landscaping of the public realm to preserve more natural character;
- Paths designed to blend with natural vegetation;
- Low key streets with minimal engineering, narrow pavements and no kerbs.

The following graphic illustrates some potential design responses for the development of community spaces, roads and buildings in the Bush Living transect in Broome North.



community spaces



roads



buildings

### 6.3.3 Transect - Neighbourhood Living (Residential R12.5 - 25)

Description: Consists of areas of low-medium density residential development adjacent to areas of higher density residential development and some mixed-use activity.

Objectives:

- Develop residential areas reflecting the characteristics of the traditional neighbourhoods of “Old Broome”;
- Allow for the application of residential density codes between R12.5-R25;
- Provide for a range of recreational opportunities and open space types in the form of local and neighbourhood parks;
- Promote semi-formal landscaping in streets and parks, with a focus on providing shaded streets and paths for pedestrians and cyclists;
- Highly connected streets comprising regular or modified grids;
- Enable the provision of breezeways through the development;
- Contain primary schools and high schools.

The following graphic illustrates some potential design responses for the development of community spaces, roads and buildings in the Neighbourhood Living transect in Broome North.



community spaces



roads



buildings

### 6.3.4 Transect - Urban Living (Residential - Medium Density R25-40)

Description: Consists of areas of medium density residential development and mixed use activity adjacent to areas of higher density and local commercial centres.

Objectives:

- Develop more urban and compact neighbourhoods that continue to reflect the “Broome style”;
- Increase the number of households located within walking distance of shops, other commercial and community services and areas of higher amenity;
- Provide a transition from local centre zones and areas of high amenity to adjoining residential neighbourhoods ;
- Allow for smaller, more affordable housing and live-work opportunities;
- Allow for the application of residential density codes between R25-R40;
- Allow for reduced front setbacks to buildings and more formal landscaping in streets and parks;
- Provide a high quality, shaded pedestrian and cyclist environment.

The following graphic illustrates some potential design responses for the development of community spaces, roads and buildings in the Urban Living transect in Broome North.



community spaces



roads



buildings

### 6.3.5 Transect - Centre

Description: Consists of areas of higher density, residential, mixed-use and commercial activity within walkable catchment of surrounding residential neighbourhoods.

Objectives:

- Provide a social activity hub that caters for the needs of the community with high quality, walkable access from adjacent residential areas;
- For local and neighbourhood centres encourage a public realm centred on main street / town square design principles;
- Offer a mixture of retail, commercial, community, cultural, recreational or residential uses;
- Promote local cultural expression through public art, landscaping and civic buildings;
- Encourage formalistic landscaping within public space and publicly accessible private space such as squares, streets and pedestrian areas;
- Promote pedestrian activity through the use of wide, shaded paths and streets, alfresco dining and awnings for weather protection;
- Allow residential accommodation above commercial development;
- Allow for the application of residential density codes to R60 (and greater where appropriate, for instance within the District Centre);
- Encourage the development of buildings that engage the street and key pedestrian areas and that make a positive contribution to the public realm;
- For local and neighbourhood centres, facilitate parking on the street and screened behind buildings;
- Have regard for the Guiding Design Principles for District and Local Centres at Table 14 of the Local Commercial Strategy (2017).

The following graphic illustrates some potential design responses for the development of community spaces, roads and buildings in the Centre transect in Broome North.



community spaces



roads



buildings

# DISTRICT STRUCTURE PLAN (PLAN NO.1)



## LEGEND

STRUCTURE PLAN BOUNDARY

### LOCAL SCHEME RESERVES

NATURE (Environmental Cultural Corridor)

NATURE (Open Space)

PUBLIC PURPOSES

ES Electricity Supply

HS High School

PE Private Education

PS Primary School

WS Water Supply

### ZONES

CENTRE

URBAN LIVING

NEIGHBOURHOOD LIVING

BUSH LIVING

LIGHT AND SERVICE INDUSTRY

TOURISM

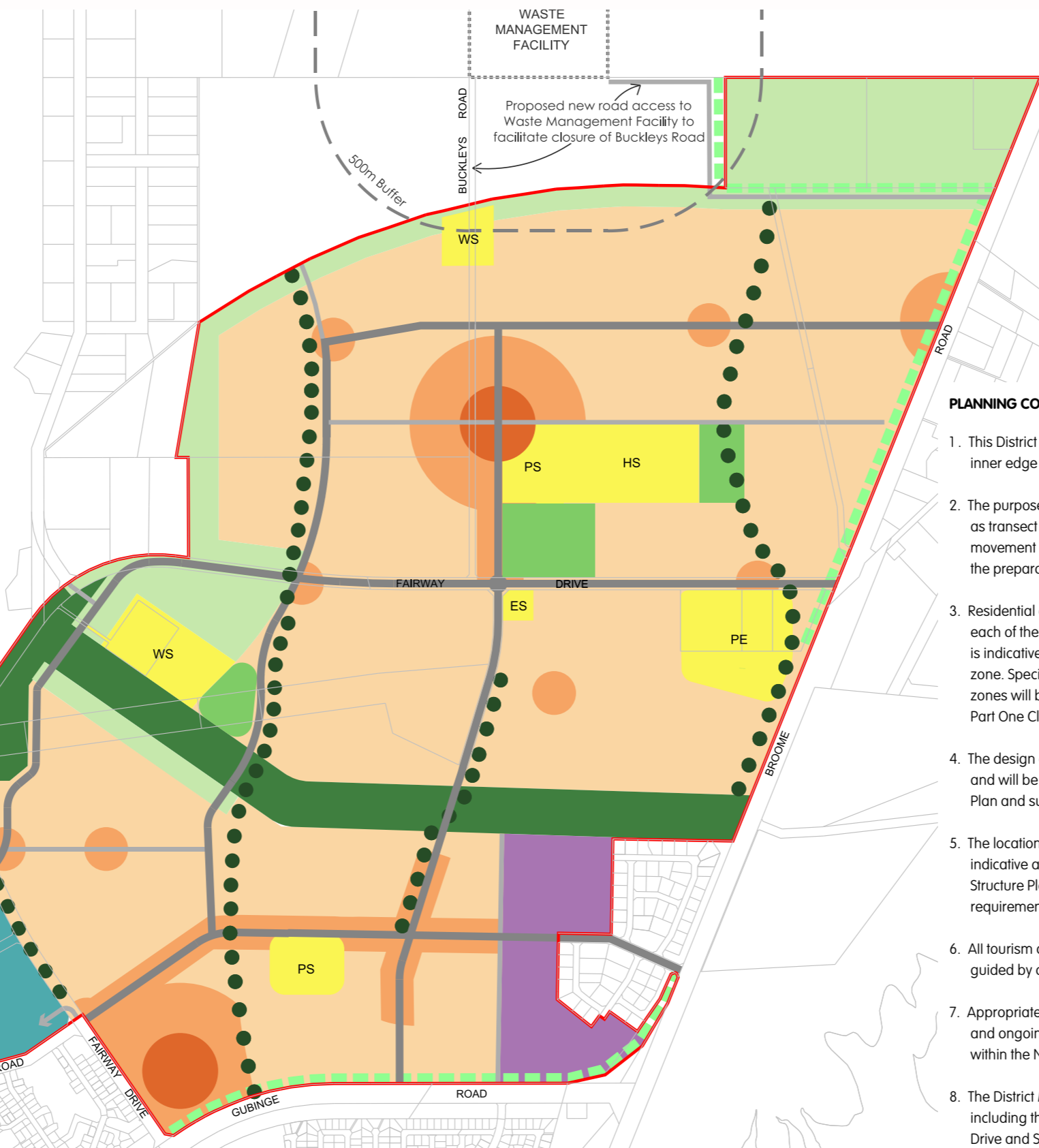
NEIGHBOURHOOD CONNECTOR

LOCAL ROAD CONNECTION

INDICATIVE ACCESS

MULTIPLE-USE OPEN SPACE CORRIDOR

OPEN SPACE BUFFER



## PLANNING CONDITIONS

1. This District Structure Plan (Plan) applies to the land contained within the inner edge of the red line.
2. The purpose of this Plan is to describe the broad land uses (expressed as transect zones), the location of major service infrastructure, main movement systems and major conservation and recreation areas to guide the preparation of Structure Plans within the Plan area.
3. Residential density throughout the Plan area is expressed as a range for each of the relevant zones depicted on the Plan. The extent of the zones is indicative and not intended to describe the spatial boundaries of each zone. Specific residential density codes and land use within each of the zones will be applied by a Structure Plan prepared as a requirement of Part One Clause 4 of the Broome North District Structure Plan report.
4. The design of any lots and local streets depicted on the Plan is indicative and will be subject to further refinement and modification at the Structure Plan and subdivision stages respectively.
5. The location and design of Public Open Space (POS) depicted on the Plan is indicative and will be subject to further refinement and modification at the Structure Plan and subdivision stages respectively in accordance with the requirements of Liveable Neighbourhoods.
6. All tourism development on land identified for tourism purposes is to be guided by a Local Development Plan.
7. Appropriate land tenure arrangements are to be made for the protection and ongoing access to the Water Corporation's infrastructure contained within the Nature Reserve.
8. The District Movement Network realignments, closures and construction, including the roundabout access to the future Caravan Park on Fairway Drive and Sanctuary Drive, is to be at the developer's cost.







# 1.0 DESIGN APPROACH

## 1.1 LIVEABILITY

The prosperous development of regions and cities is ultimately measured by the ability to enhance the quality of human life. In defining what it is that creates a place of beauty, human vitality and lasting value it is useful to consider settlements in terms of 'liveability'. We consider Liveability across 7 key areas, each of which needs to be addressed in order to create a truly sustainable and successful settlement:

**Landscape and Culture:** a sense of identity and belonging, the expression of the character and history of the community.

Considerations: character, public spaces, streetscapes, parks, songlines, plants, microclimate, shade, water, connection to country

**Natural Environment:** our life support system

Considerations: ecology, restorations, conservation, sustainable living, efficiency, recycling, biodiversity, water sensitive urban design

**Transport and Access:** movement of the people, arteries of the community

Considerations: connectivity, legibility, walking, cycling, vehicular movement, public transport, road types, setbacks, landscaping, parking

**Housing:** the foundation for living, safety and comfort

Considerations: diversity of housing types, density, architecture, climate sensitive design, affordability, demographics

**Community:** Economy and Wellbeing: empowered and cohesive communities with thriving commerce

Considerations: community facilities, physical activity, education, town centres, employment, industry, social networks, community groups, health facilities, cultural expression, interaction and celebration.

**Urban Design and Place:** our living environment, sense of identity

Considerations: neighbourhood structure, streetscapes, public spaces, character, density, land use, town centres, lifestyle choice, safety, accessibility, breezeways,

**Servicing:** the mechanics of the settlement

Considerations: water supply, wastewater, stormwater, drainage, recycling, renewable energy, telecommunications, earthworks

The design process used for Broome North was developed specifically to ensure each of these elements was considered thoroughly, equally and in conjunction with the other elements to reach mutually beneficial outcomes.

## 1.2 TRANSECT

The Transect is a concept from ecology used to describe the transition of ecological communities across the landscape. Each transect zone reflects its place in the landscape with a unique character defined by its particular combination of vegetation, soils, climate, hydrology and landform. Each element of the community is coordinated with one another to function in harmony within that transect. This means that individual parts of the transect, such as flora and fauna, can't simply be transplanted into a different transect because the right conditions don't exist.

Often the community in one transect interacts with the communities in an adjoining transect in a mutual synergy, and over time transect boundaries can move as one community type evolves into another. Therefore healthy ecosystems usually have a number of transect types, in order to remain robust and functioning in the face of changes in such aspects as the climate, food and water.

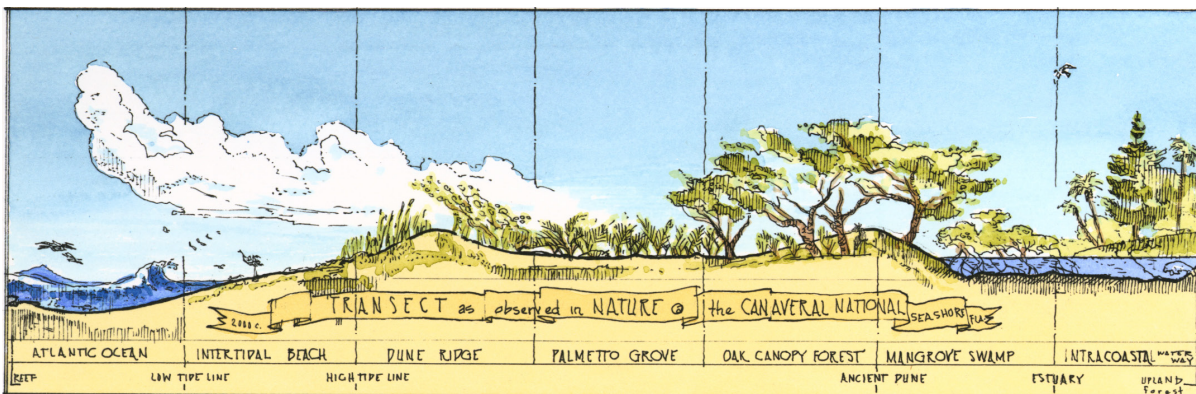
Just as the Transect can be used to map the transition of ecological communities, it can be applied to urban design as an organising principle for the pattern of human settlements. Using the ecosystem as a model, a range of living environments with varying intensity and character

are necessary in order to develop healthy and robust human settlements that cater for the full cross-section of the community and are adaptable to change over time.

The transect of human settlements transitions from town centres through to the surrounding natural environment. Each transect zone reflects its place in the landscape with its own character defined by its streets, public spaces and buildings. Each element is coordinated with one another to fulfil the needs of that particular community type. Town centres, for example, are the most urban areas and are intended to offer a wide range of services and opportunities for the entire community. As such they are characterised by:

- Wider and shaded footpaths for greater pedestrian activity;
- Formal public spaces such as town squares;
- Public art that expresses the cultural diversity of the community;
- Zero front setbacks to facilitate interaction between commercial activity and the street;
- Higher density housing including housing above shops and grouped/multiple dwellings; and
- Narrower street pavements accompanied with on-street parking to slow vehicles.

A Natural Transect Illustration. Source: James Wassell

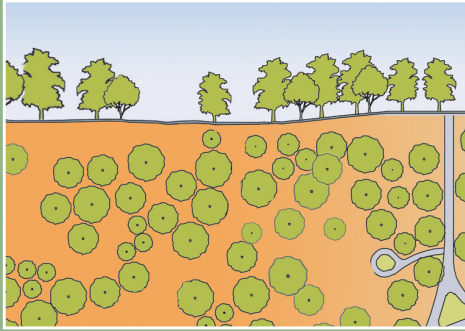


# BROOME NORTH TRANSECT



As observed  
diverse. Usi  
required in  
the coast fo  
use this as

## NATURE



Untouched natural land  
Song lines  
Learning

## BUSH LIVING



Natural landform preservation  
Under-engineered  
Tread lightly

## NEIGHBOURHOOD LIVING



Old Broome style

### DEFINING CHARACTER

transect graphics derived from DPZ

transect graphics derived from DPZ

### COMMUNITY SPACES



Interpretive signage | Paths | Natural



Natural landscape | Informal spaces | Little grass

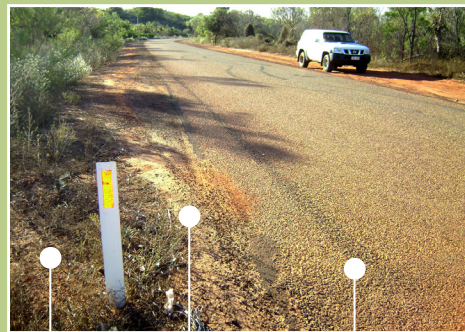


Cultural corridors and breezeways | Formal active spaces

### STREETS



Unsealed surface | Narrow lane width | Unkerbed, vegetated edges



Larger setbacks | Unkerbed edges with natural style footpaths | Narrow pavements



Semi-formal landscaping

### BUILDINGS



Blend with natural landscape | Picnic shelters, toilets and public facilities



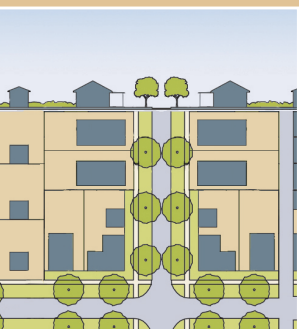
Work sheds | Defined building envelopes | Larger lots and large setbacks | Single storey near sensitive areas or 2 storey to minimise footprint



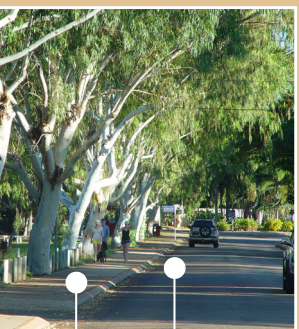
Schools | Single houses

In natural ecosystems, a community will function properly and sustain life in the face of change if it is full and functioning. Viewing the ecosystem as a model for human settlements suggests that places of varying intensity and character are needed in order to cater for the full cross-section of the community. The change in vegetation complexes as you move away from the coast forms the basis for the creation of distinct transect zones. Our task is to identify the nature of the Broome transect and provide the foundation for the northern extension of the town.

## BOURHOOD



Informal and formal play areas  
Shaded landscape  
Links to nature reserves and the active open space



Shaded footpaths  
Narrow pavements with landscaped setback areas



Houses and townhouses  
Wide usable verandahs

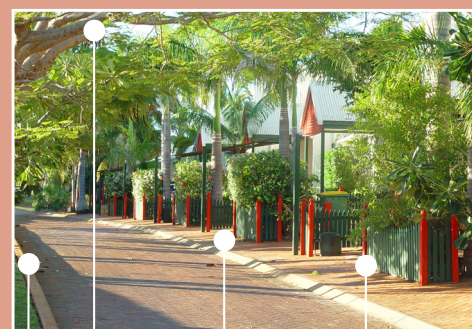
## TOWN LIVING



New Broome style (contemporary reflection of Old Broome style)  
Mixed use



Shaded landscapes  
Cultural interpretations and expressions through landscaping, public art and community spaces  
More formal public spaces



Kerbing  
Formal shade landscaping  
Continuous shaded footpaths  
Reduced setbacks  
Mixture of wide and narrow urban streets with tight corners



Awnings to provide shelter  
2 storeys and reduced setbacks  
Single houses, townhouses, apartments, tourist accommodation  
Smaller lots

## TOWN CENTRE



Convergence of Old Broome and New Broome style  
Shops, commercial and civic buildings



Cultural interpretations and expressions through public art, community spaces, streets, lanes, community buildings and events  
Formal public spaces, squares  
Shaded landscapes and breezeways for maximum comfort



Landscaped medians  
Street parking  
Verandahs and alfresco seating  
Generous footpath width



2 to 3 storeys, zero setbacks  
Mixed commercial, civic, tourist uses  
Awnings to provide shelter  
Active shopfronts, alfresco seating

Moving out from the town centre into neighbourhood areas, the streets and landscaping may become less formal, the houses are set back further from the street to offer more vegetation and the housing types create a lower density environment. Transitioning to natural areas, the streets are less engineered, the landscaping becomes more natural and the lots become larger to preserve vegetation amongst the housing.

The images on pp.14-15 depict some potential design responses for each of the transect zones in Broome North and illustrate how the coordinated design of the streets, public spaces and buildings can collectively form an identifiable character within each transect.

There is not always a smooth transition between transect zones, and in fact juxtaposing different transects can create a point of interest and offer hybrid living environments, such as higher density housing set in a natural context. However the key aspect is that the design of public spaces, streets and buildings needs to be coordinated together within each transect zone in order to effectively reflect its character and to create identifiable communities with a distinct sense of place. For example, highly urban streets are not suited to a natural context and low density development with a large setback from the street does not fulfil the needs of a town centre.

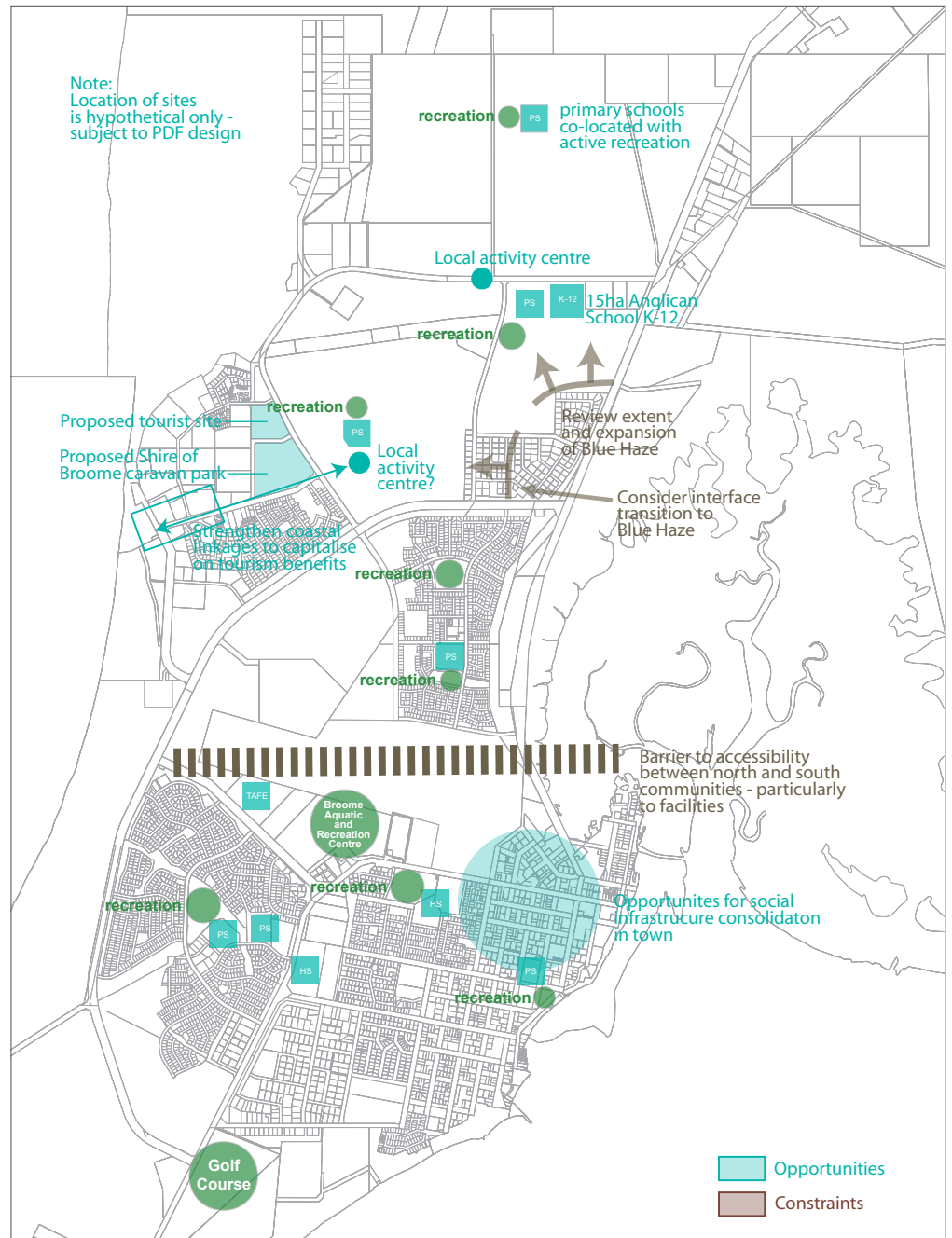
By using the Transect concept as the organising principle for the urban structure we are able to not only create a stronger sense of place but also:

- Create a legible urban fabric;
- Facilitate housing diversity;
- Maximise lifestyle opportunities;
- Offer landscape diversity;
- Guide land use and density distribution;
- Provide coordinated design guidance for streets, landscaping and buildings;
- Allocate resources logically; and
- Create the necessary diversity for a robust settlement

# 2.0 SITE ANALYSIS

In order to develop a full contextual understanding of the Broome North site, the pillars of liveability described in Section 1.0 were used as the basis for undertaking a thorough analysis of the site. Through technical investigations and liaison with the Shire, opportunities and constraints were identified for each liveability area. The opportunities and constraints plans were converted into posters for the use of participants at the Planning Design Forum and were continually referenced throughout the design process to ensure that all opportunities were explored and constraints addressed.

- schools
- tourism areas
- light industry expansion
- recreation areas
- local centres
- social infrastructure
- major sporting fields will need to be provided for schools - the co-location and use of these fields will be reviewed at the time of establishment



Economy

- retail catchments

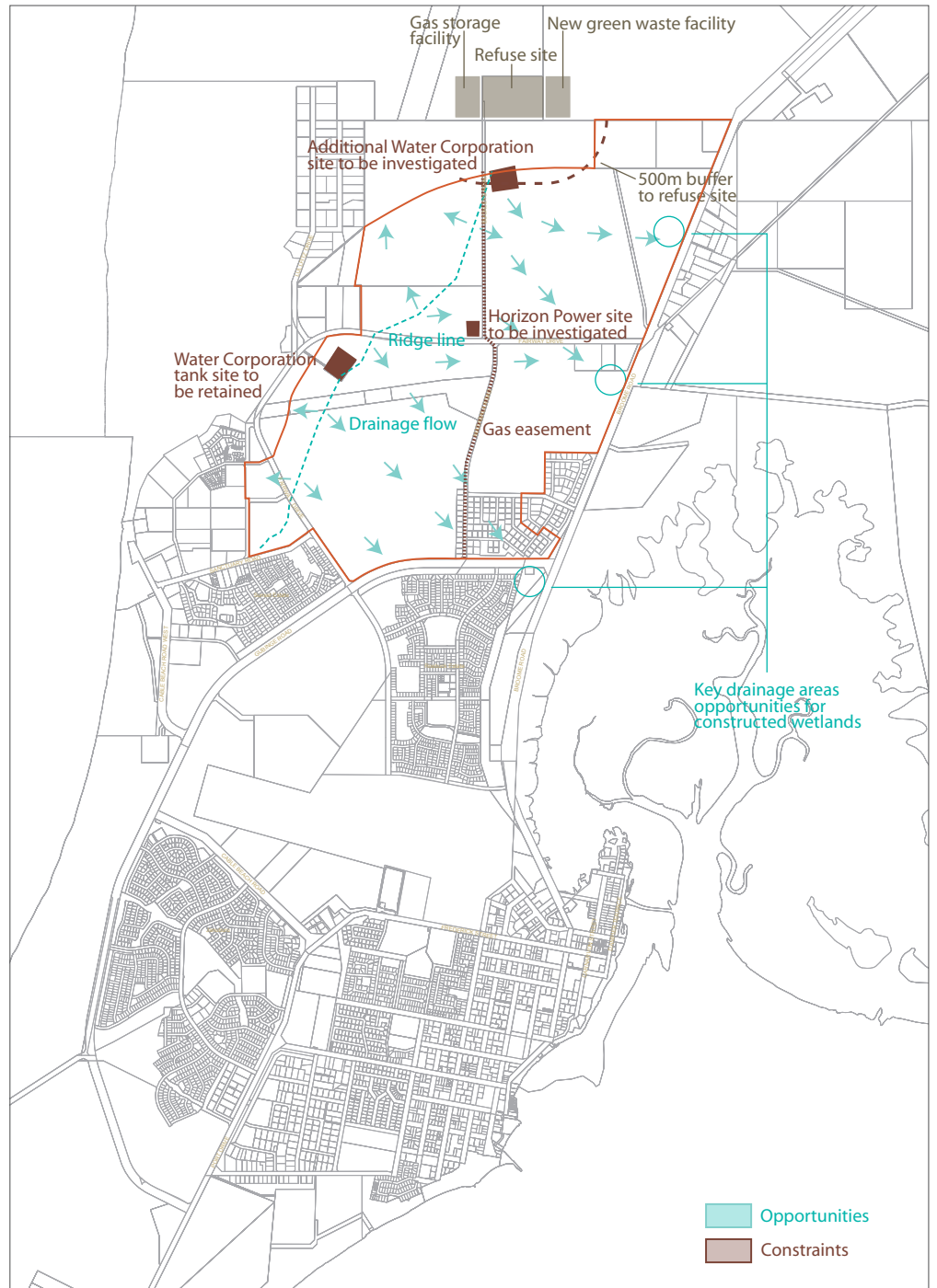


Per original structure planning



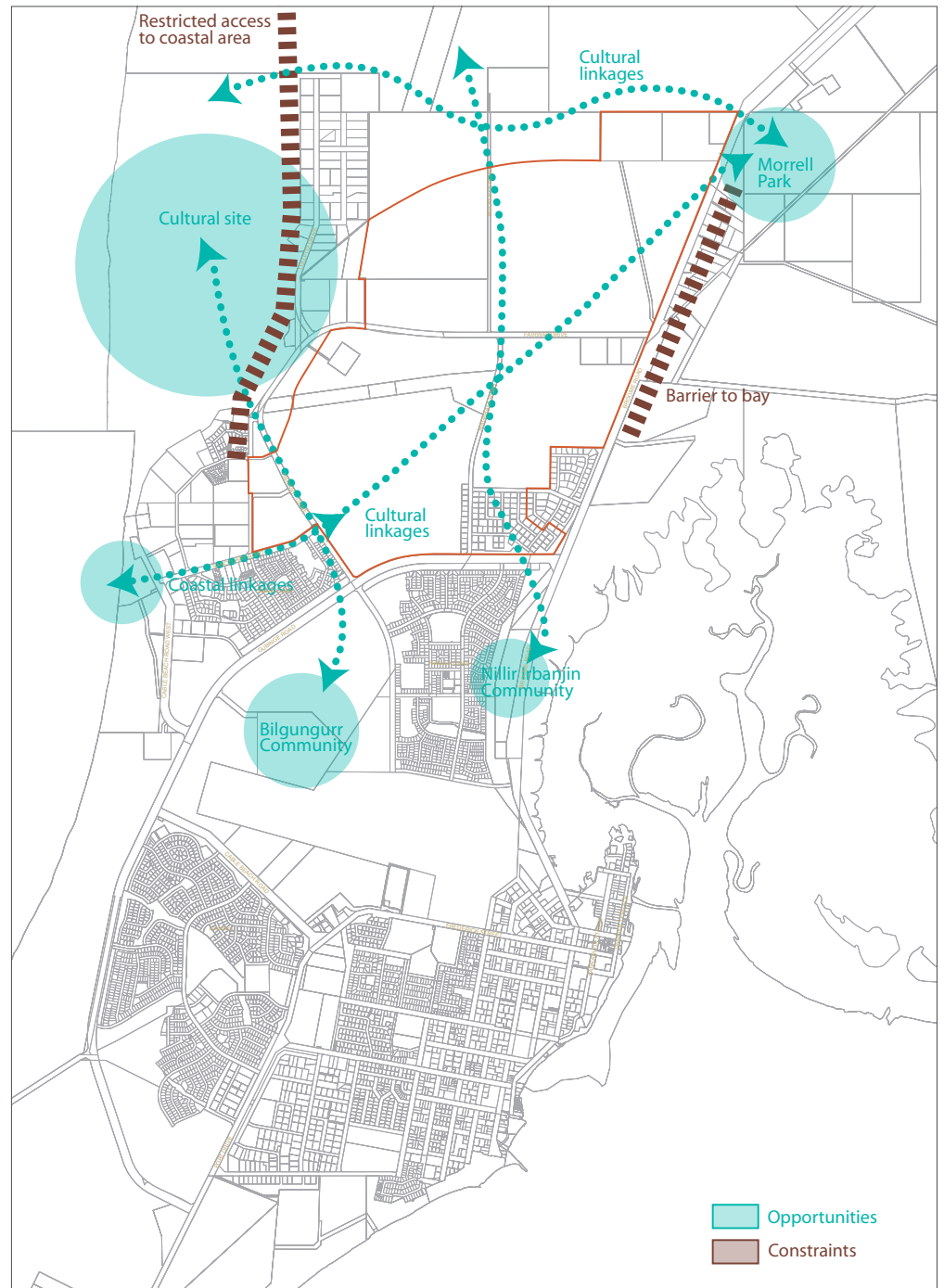
Servicing

- drainage
- utility sites



Landscape + Culture

- landscape linkages to important cultural sites
- native vegetation



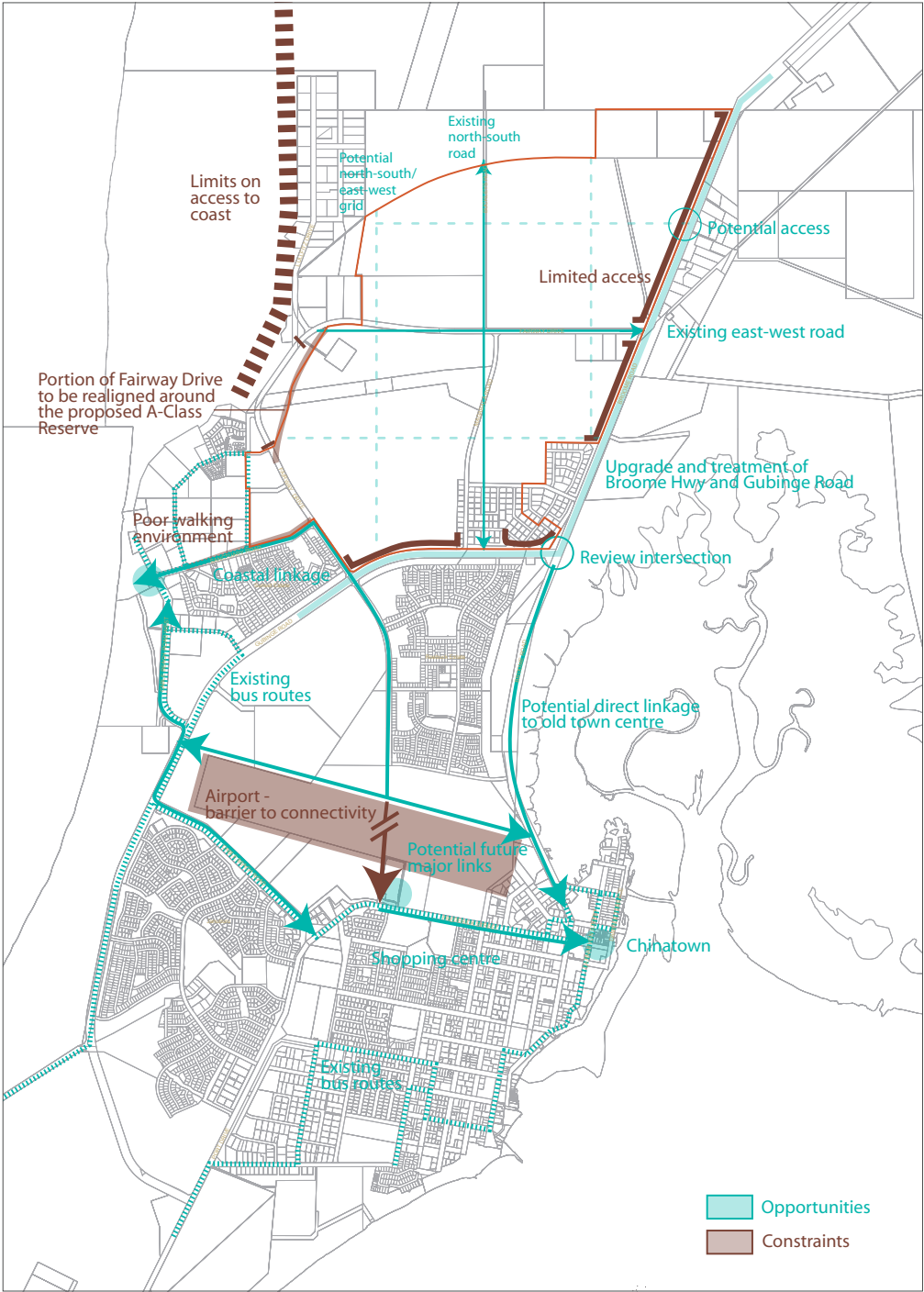
Housing

- variety of housing to cater for the different lifestyles of a diverse community



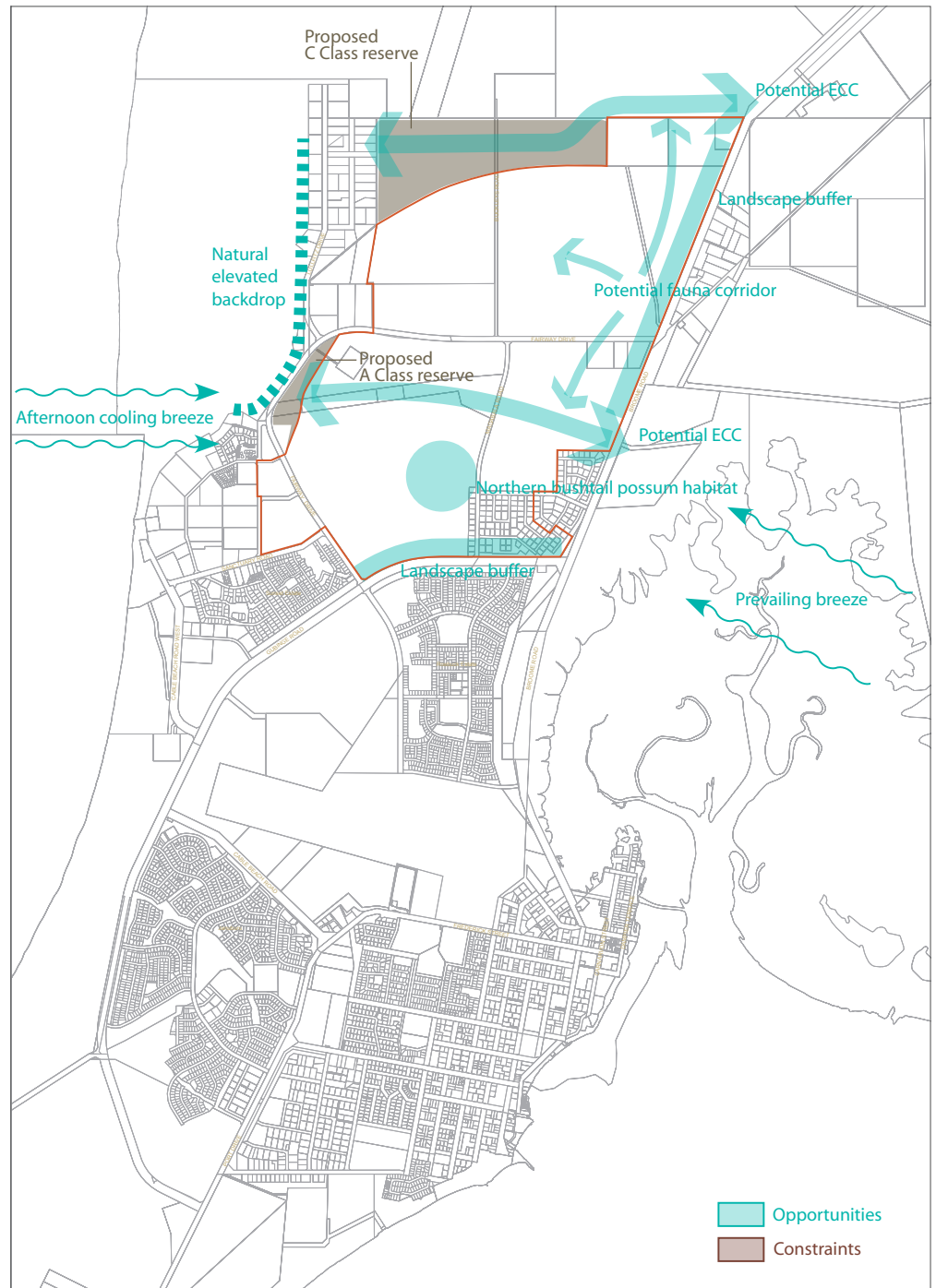
Transport + Access

- structure
- interface to existing areas
- character references
- local centres
- key road connections



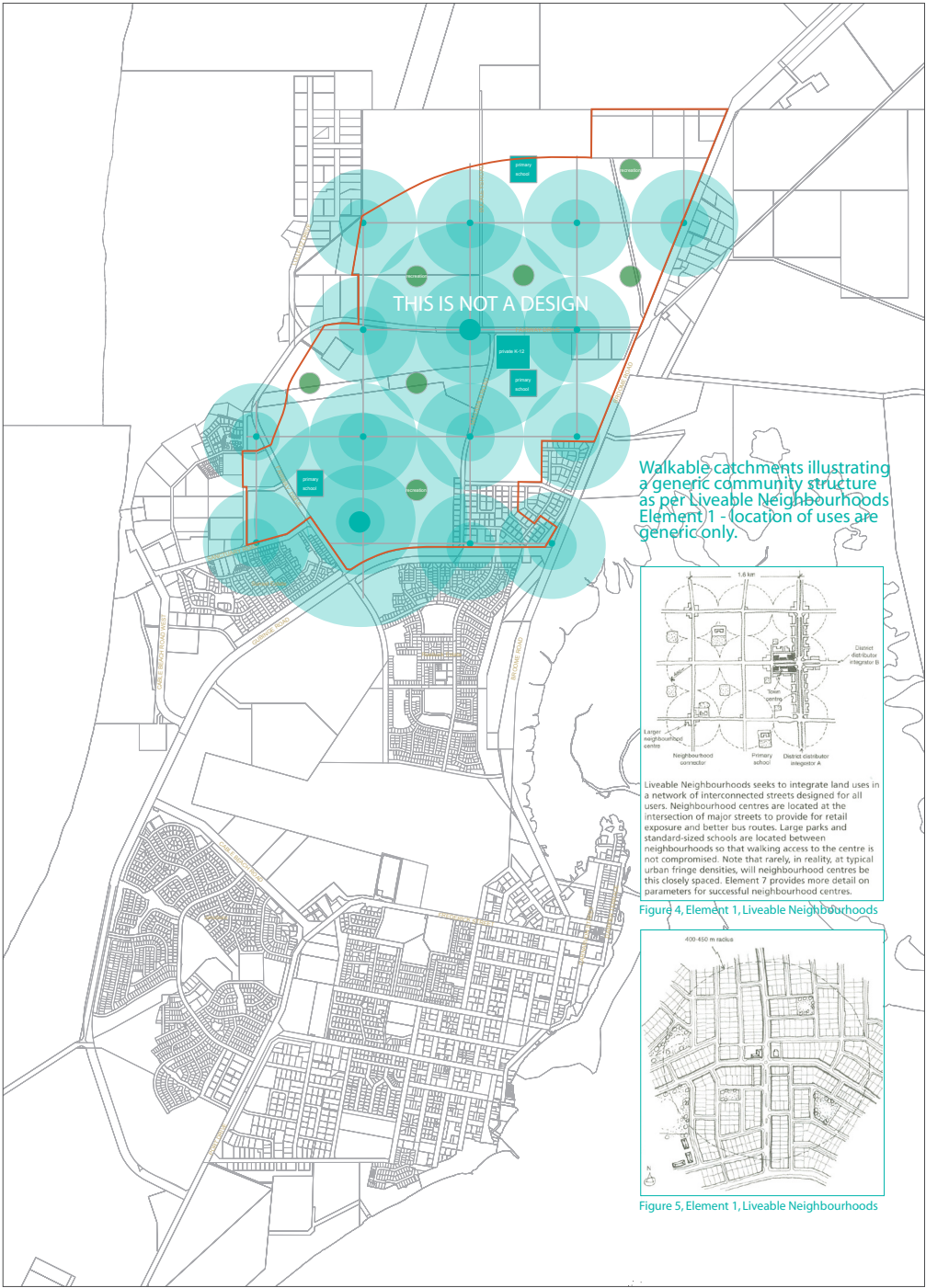
## Natural Environment

- conservation reserves
- environmental and cultural corridors
- fauna movement
- microclimate
- buffers



Urban Structure

- structure
- interface to existing areas
- character references
- local centres
- key road connections



## 3.0 DESIGN PROCESS

### PDF Process



Development WA (then LandCorp) recognised early on that the successful development of Broome North would require the active participation and support of the local community and key agency stakeholders. To ensure a collaborative vision for the future development Broome North, Development WA (then LandCorp) and its project team facilitated a four-day Planning Design Forum (PDF) at the Mangrove Resort in Broome from 19-22 August 2009. The purpose of the PDF was to:

- Identify what matters to the local community and other key stakeholders in the development of the land;
- Detail the issues, opportunities and values of the site;
- Establish the overarching design principles for future development and how these can be incorporated into a Masterplan;
- Agree on the best urban design and built form outcomes that celebrate the land's values; and
- Prepare a final design concept that has the support of forum participants.

### Participants at the PDF included:

- Local landowners and community members;
- Yawuru representatives;
- Local Federal MP
- Shire of Broome President, Councillors and staff;
- Department of Planning, Lands and Heritage (then Department of Planning);
- Department for Education and Training
- Department of Indigenous Affairs
- Indigenous Business Australia
- Kimberly Development Commission
- Department of Biodiversity, Conservation and Attractions
- (then Department of Environment and Conservation)
- Department of Communities (then Department of Housing and Works)
- Government Regional Officers Housing
- Department for Communities
- Broome Chamber of Commerce
- Water Corporation
- Horizon Power
- Main Roads
- Tafe
- Tourism WA
- Foundation Housing
- WA Police
- Environs Kimberley
- Minyirr Park
- Bishop of Broome
- Anglican Church
- Anglican Schools Commission
- Uniting Church
- Catholic Education Commission
- Cedar Woods
- H&M Constructions
- Williams Homes
- Summit Homes
- Planning Solutions
- Willie Creek Pearls
- Broome Caravan Park
- PRD Nationwide
- LJ Hooker
- Hutchinson Real Estate

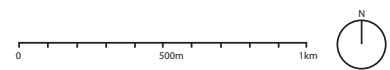
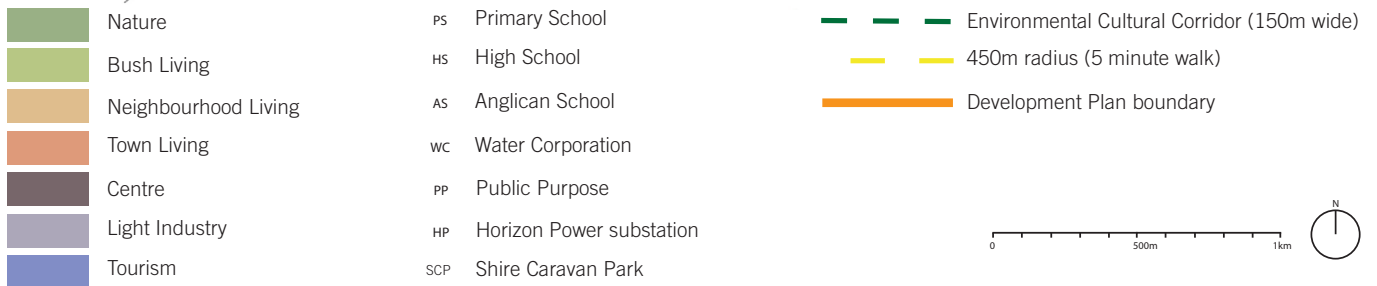
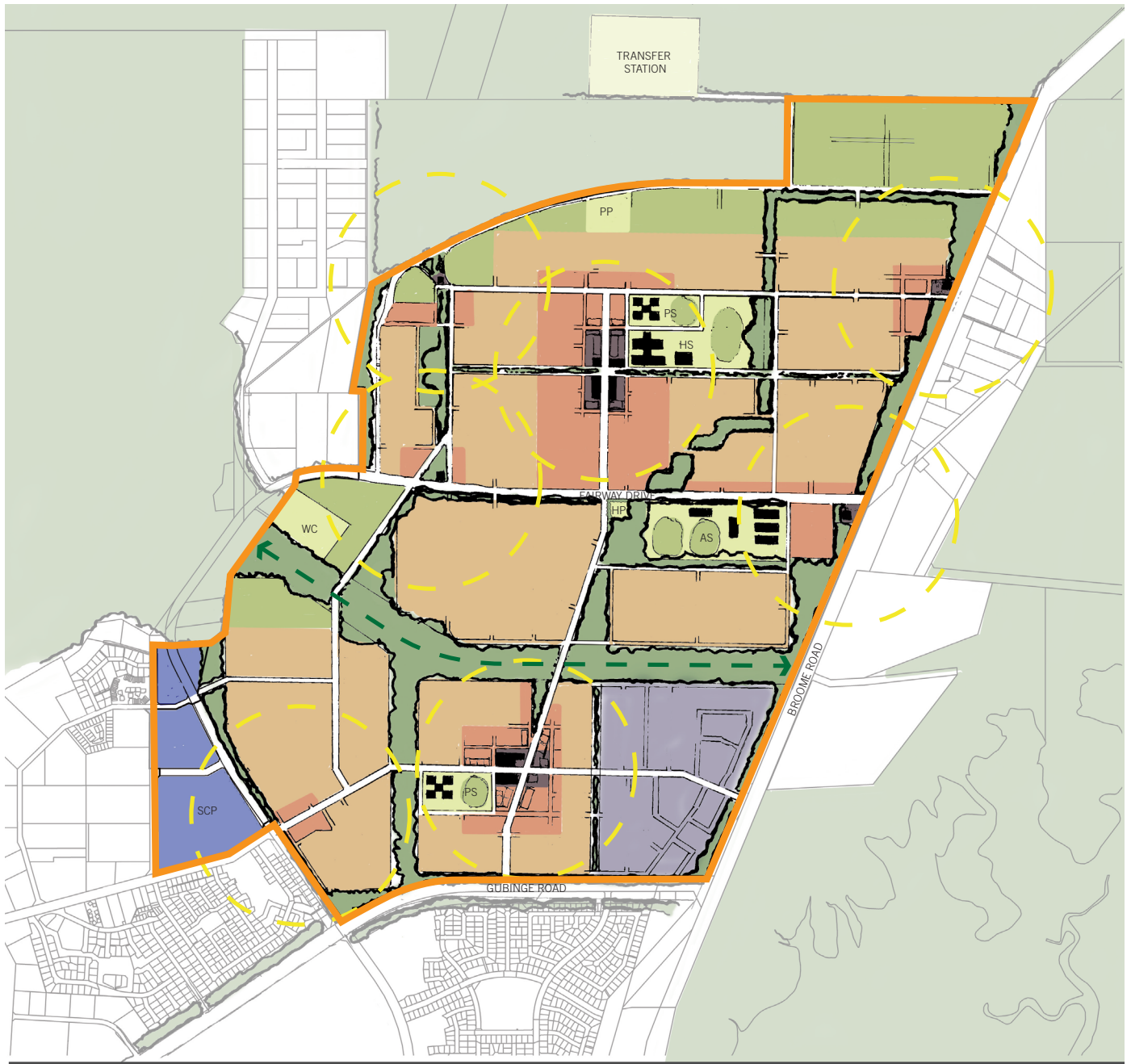
The first day of the PDF involved a “dream and nightmares” tour of Broome to visit both aspirational and avoidable examples of urban design, a tour of the subject site plus interactive group sessions exploring the various issues and opportunities relevant to the site. The second and third days were devoted to a series of technical sessions with invited technical professionals and community representatives to work through detailed matters to translate the broad ideas and objectives into a final tangible design concept. The PDF allowed continuous real-time design that responded to the ideas and issues being raised each day. On the fourth a design concept was presented to the public for comments.

DAY 1 WEDNESDAY	DAY 2 THURSDAY	DAY 3 FRIDAY	DAY 4 SATURDAY
<p>OPENING PRESENTATION 8.30AM - 10.00AM</p> <ul style="list-style-type: none"> <li>- Welcome to Country</li> <li>- Welcome to Forum</li> <li>- Liveability Presentation</li> </ul> <p>SITE AND CONTEXT TOUR 10.00AM - 12.00PM</p> <p>LUNCH 12.00PM - 1.00PM</p> <p>INFORMATION SHARING, VISIONING &amp; ISSUE IDENTIFICATION 1.00PM - 3.00PM</p> <ul style="list-style-type: none"> <li>- Facilitated sessions</li> </ul> <p>SUMMARY SESSION (open to public) 3.00PM - 4.00 PM</p>	<p>INTRODUCTION 9.00AM - 9.30AM</p> <p>TECHNICAL SESSIONS:</p> <p>CULTURE &amp; LANDSCAPE 9.30AM - 11.00AM</p> <p>NATURAL ENVIRONMENT 11.00AM - 12.30PM</p> <p>WORKING LUNCH 12.30PM - 1.30PM</p> <p>TRANSPORT, ACCESS &amp; SERVICING 1.30PM - 3.00PM</p> <p>HOUSING 3.00PM - 4.30PM</p> <p>SUMMARY SESSION (open to public) 4.30PM - 5.30PM</p>	<p>INTRODUCTION 9.00AM - 9.30AM</p> <ul style="list-style-type: none"> <li>- Recap Day Two</li> </ul> <p>TECHNICAL SESSIONS:</p> <p>URBAN DESIGN &amp; PLACE 9.30AM - 11.00AM</p> <p>COMMUNITY, ECONOMY &amp; WELLBEING 11.00AM - 12.30PM</p> <p>WORKING LUNCH 12.30PM - 1.30PM</p> <p>INTERNAL DESIGN STUDIO 1.30PM - 4.30PM</p> <p>SUMMARY SESSION (open to public) 4.30PM - 5.30PM</p>	<p>INTERNAL DESIGN STUDIO 8.00AM - 2.00PM</p> <p>CLOSING PRESENTATION (open to public) 2.00PM - 3.30PM</p> <p>FELLOWSHIP &amp; REFLECTION 3.30PM - 4.30PM</p> <ul style="list-style-type: none"> <li>- includes opportunity for informal review and one on one discussions with project team</li> </ul>



The key outcomes of the PDF as reflected on the concept plan were:

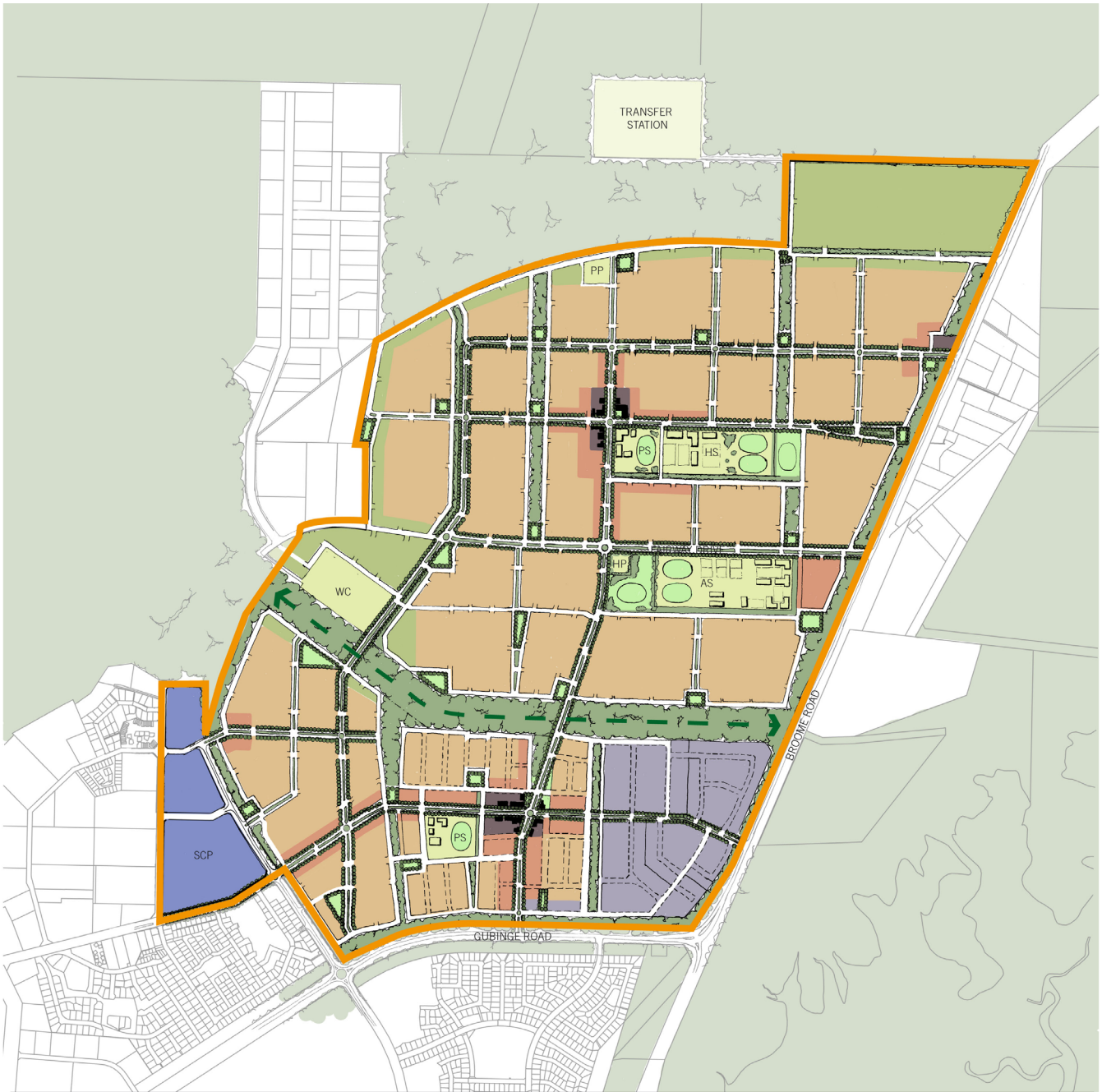
- Structure of cardinal neighbourhood connectors providing connectivity through the site and establishing the framework for a cardinal grid of local streets within discrete neighbourhood cells;
- Agreement to an environmental cultural corridor 150m wide traversing east to west across the site;
- North-south multi-use POS/drainage corridors interwoven through the site and assisting to create edges to discrete neighbourhood cells;
- Expansion of the “Blue Haze” light industrial area;
- Separation of light industrial from residential uses with a wide landscaped boulevard;
- Designation of tourism areas in the south-west portion of the site adjacent to Cable Beach tourist precinct;
- Two local Town Centres (approx 3000m<sup>2</sup> retail floorspace each)
- Opportunity for service station(s) on Broome Road
- Several local nodes (park/ community centre) to ensure areas residents are within the 400m (5 min walk) ped shed of a Town Centre, service station or local node
- Town Living around the town centres, service stations and local nodes to maximise the number of residents within walking distance of these areas
- Bush Living located as a transition to the A and C Class reserves
- Provision of 2 primary schools, 1 high school and 1 private K-12
- Provision of expanded Water Corporation site, 1ha Horizon Power site and a second site for potential use by Water Corporation in the future













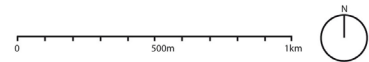
The concept plan was made available for public comment immediately following the PDF and with the inputs from the community, the Shire and relevant agencies, the project team continued to address detailed matters and refine the plan. The next iteration of the concept plan was presented at a Community Open Day to inform the community of the design progression and to provide the opportunity for further feedback. The Open Day was held on Saturday 19 September 2009 at the Boulevard Shopping Centre in Broome with almost 280 people attending throughout the day. The draft concept respected the key outcomes agreed at the PDF and also:

- Refinement of the transect zones
- Refinement of north-south multi-use POS/ drainage corridors
- Refinement of school locations
- Additional local streets to give a clearer picture of neighbourhood structure
- Indicative distribution of local/neighbourhood parks
- Indicative local street network in Stage 1

The comments received at the Open Day, together with continued collaboration with the Shire, the community and relevant agencies, resulted in further refinement to the concept plan and the preparation of the final concept that forms the basis of the District Development Plan.



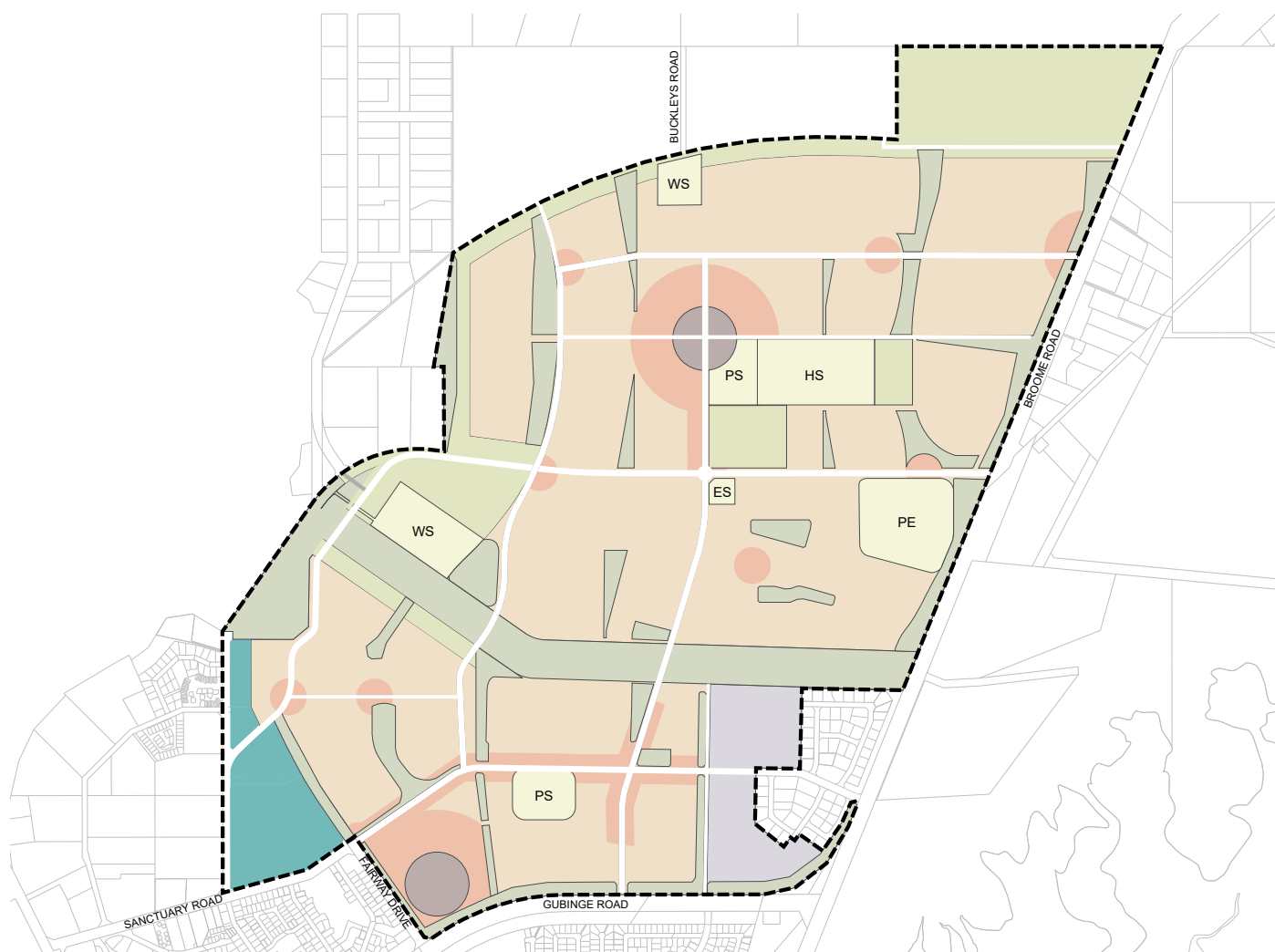
- |   |                      |     |                          |  |   |
|---|----------------------|-----|--------------------------|--|---|
|  | Natural Landscape    | PS  | Primary School           |  | Environmental Cultural Corridor (150m wide) |
|  | Active Open Space    | HS  | High School              |  | Development Plan boundary                   |
|  | Bush Living          | AS  | Anglican School          |  |   |
|  | Neighbourhood Living | WC  | Water Corporation        |  |   |
|  | Town Living          | PP  | Public Purpose           |  |   |
|  | Centre               | HP  | Horizon Power substation |  |   |
|  | Light Industry       | SCP | Shire Caravan Park       |  |   |
|  | Tourism              |     |                          |  |   |



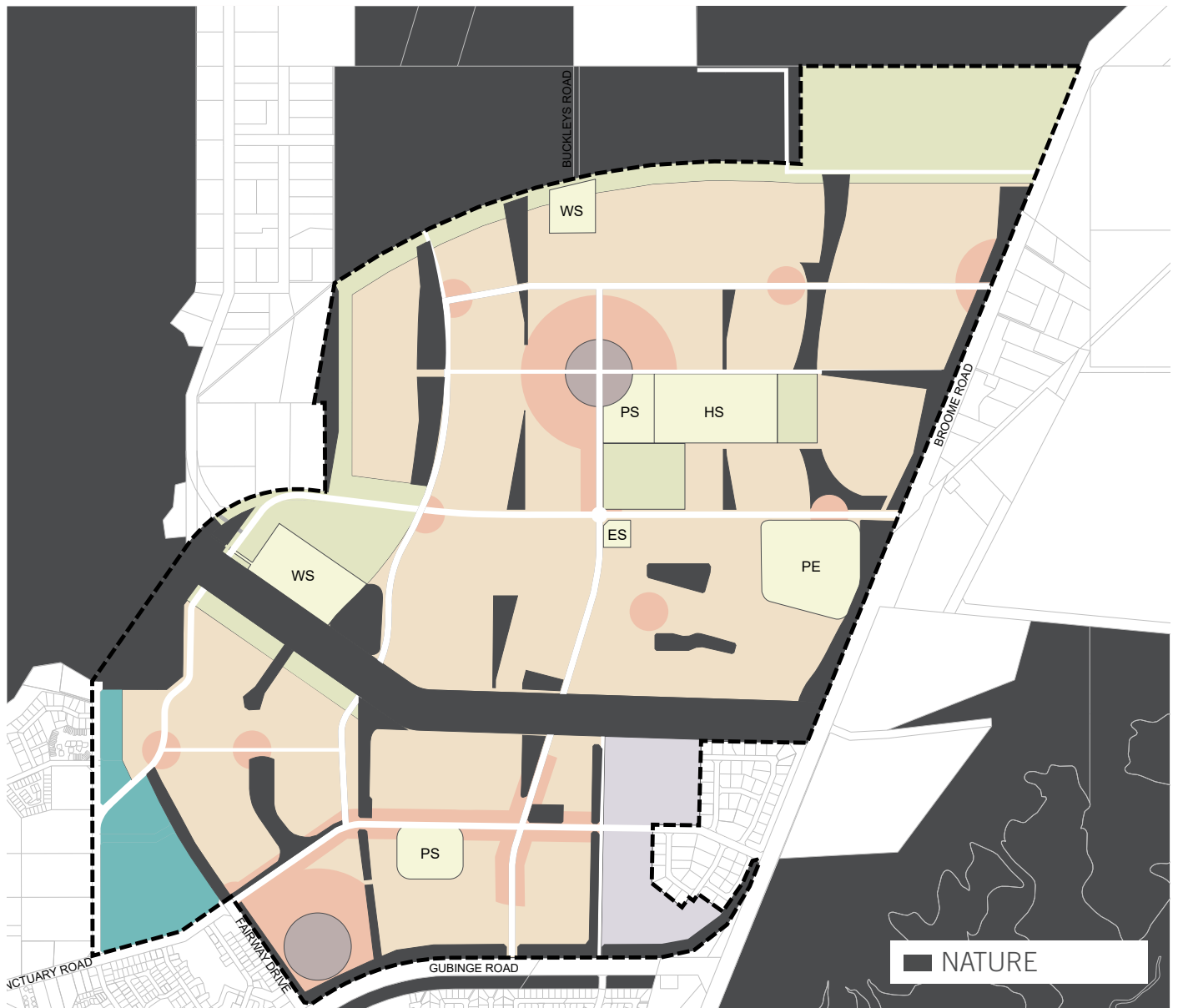
The Concept Plan is a design response to the opportunities and constraints identified in the site analysis (Section 2.0), the issues identified through the stakeholder engagement process (Section 3.0) and the liveability areas described at Section 1.0. The District Structure Plan (Plan No.1) represents a higher order, diagrammatic version of the Concept Plan, and has been designed to enable flexibility in response to future changes. The District Structure Plan requires further refinement and detail to be provided through the preparation of Local Structure Plans, which is likely to result in some variations to the structure proposed at the district level.

The general principles agreed upon throughout the design process and expressed in this Concept Plan should continue to be upheld and referred back to as the detailed design is undertaken. The various elements of the Concept Plan are summarised below to clarify the general principles and provide a point of reference in the preparation of Local Structure Plans.

For clarity the "final" Concept Plan and the plan series at Sections 4.1 – 4.11 have been updated to reflect the design modifications the subject of Amendment No. 2.



# 4.1 NATURE



## NATURE

The Plan provides a variety of open space areas that combine recreation, preservation, education/interpretation and natural drainage systems, combined and linked where possible through a series of multiple use open space corridors. The above plan describes the indicative location of the various open space types which comprise environmental cultural corridors, multiple use public open space (POS) corridors and traditional parks (district, neighbourhood and local).

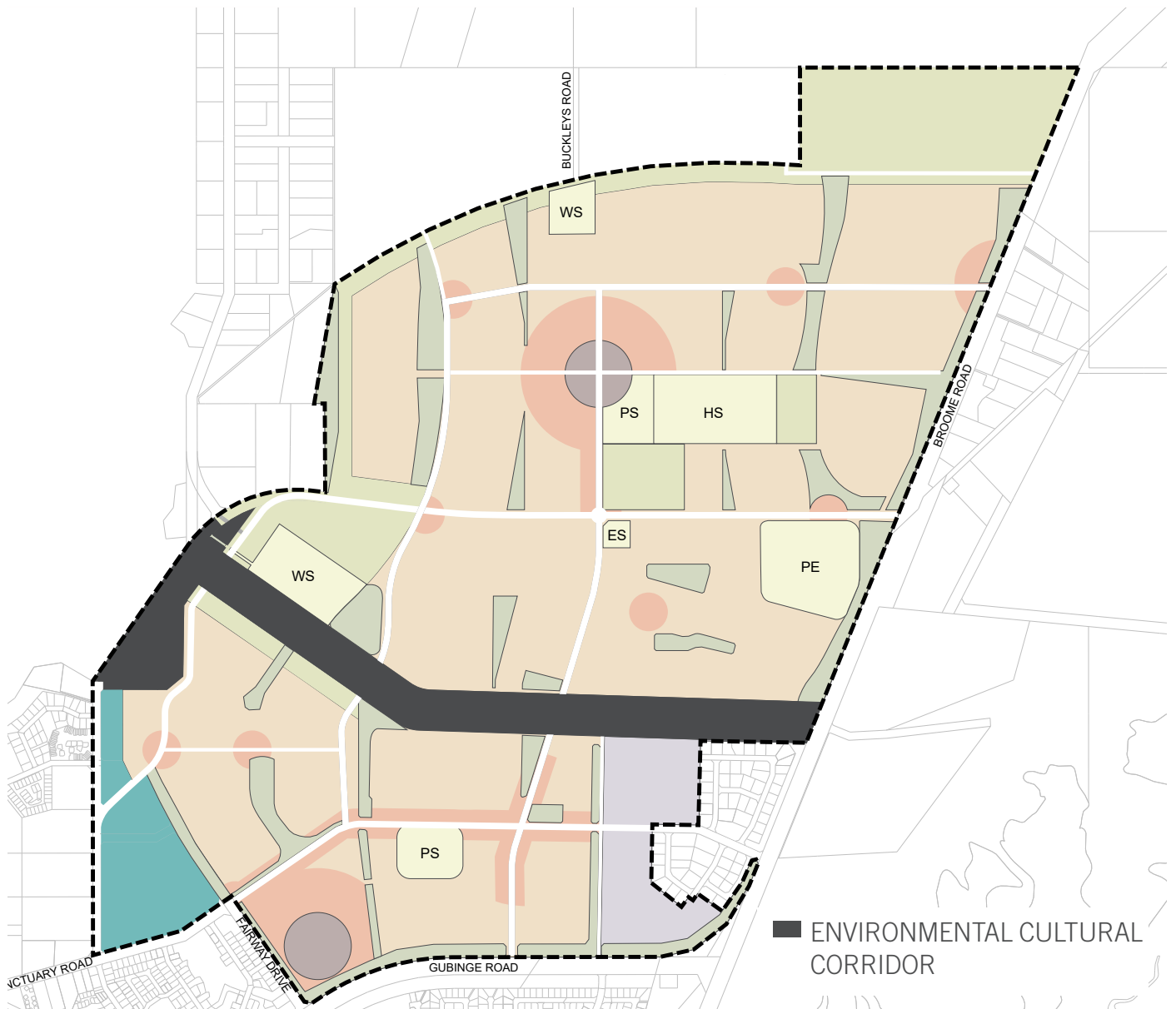
**Total Area** 699.5902ha

Deductions:

PS (x2)	8ha
HS	10ha
AS	15ha
HP	1ha
WC	7.6890ha
PP	1ha
ECC	40.95ha
Commercial (incl retail)	15,000sqm
Industrial	22.3691ha
<b>Total Deductions</b>	<b>107.5081ha</b>

Gross subdividable area	592.0821
Required 10% POS 59.	20821ha
<b>Actual POS provided</b>	<b>91.2ha (15.4%)</b>
(incl approx 21ha (3%) drainage)	

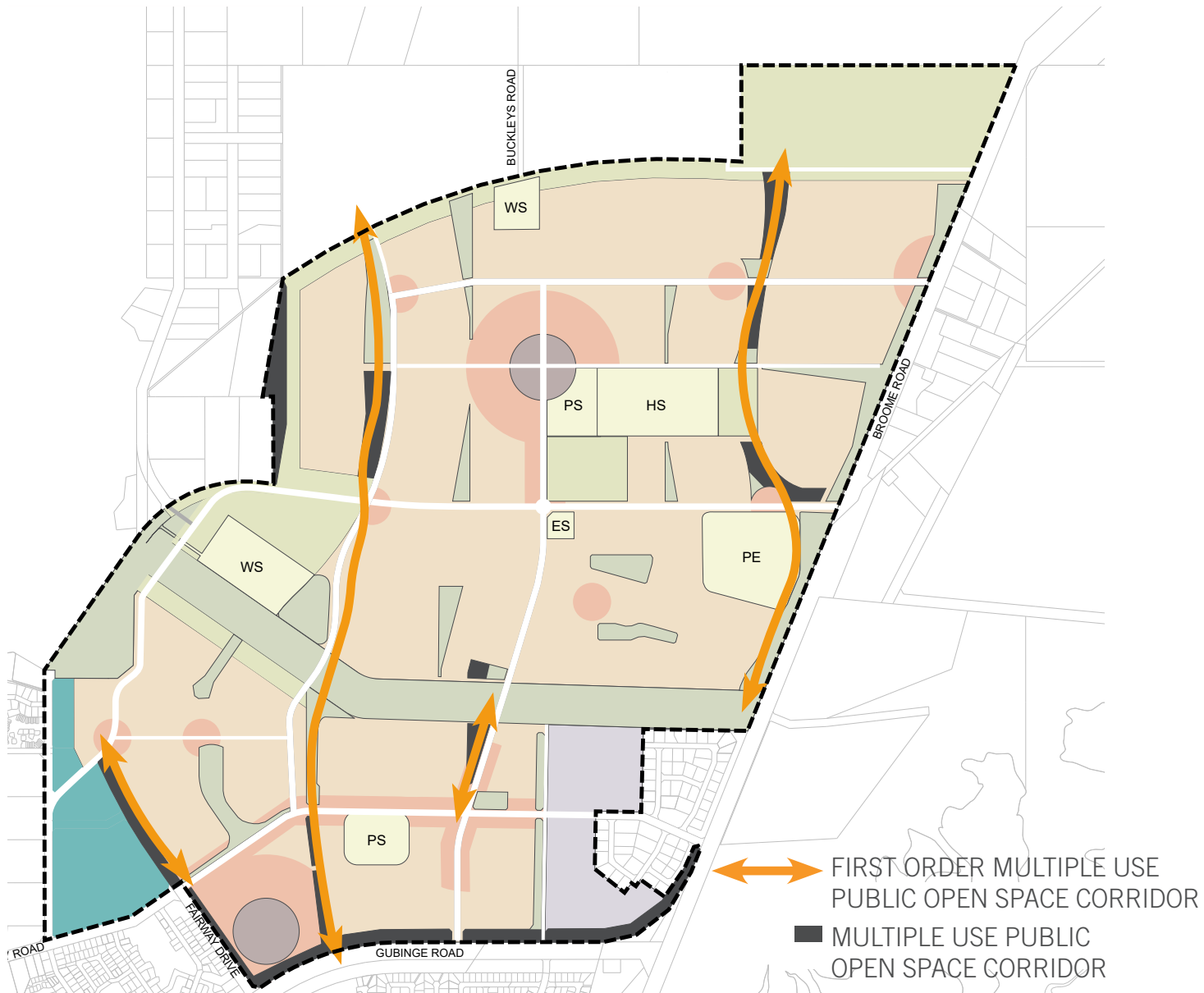
## 4.1.1 ENVIRONMENTAL CULTURAL CORRIDORS



### ENVIRONMENTAL CULTURAL CORRIDORS

A key outcome of the plan is the identification of a 150m wide environmental cultural corridor (ECC) running east-west across the site. The ECC provides a naturally vegetated corridor linking the proposed A-Class reserve adjacent to the dunal system in the west to the mangroves of Roebuck Bay. The ECC is intended to provide a habitat for flora and fauna and to provide an important cultural and community connection to 'country'. Consistent with Scheme requirements the ECC will also accommodate a low key path network to enable appropriate and managed access, as well as accommodating 'creek style' drainage swales and facilitating the movement of cooling breezes through the development area.

## 4.1.2 MULTIPLE USE PUBLIC OPEN SPACE CORRIDORS



### MULTIPLE USE PUBLIC OPEN SPACE CORRIDORS

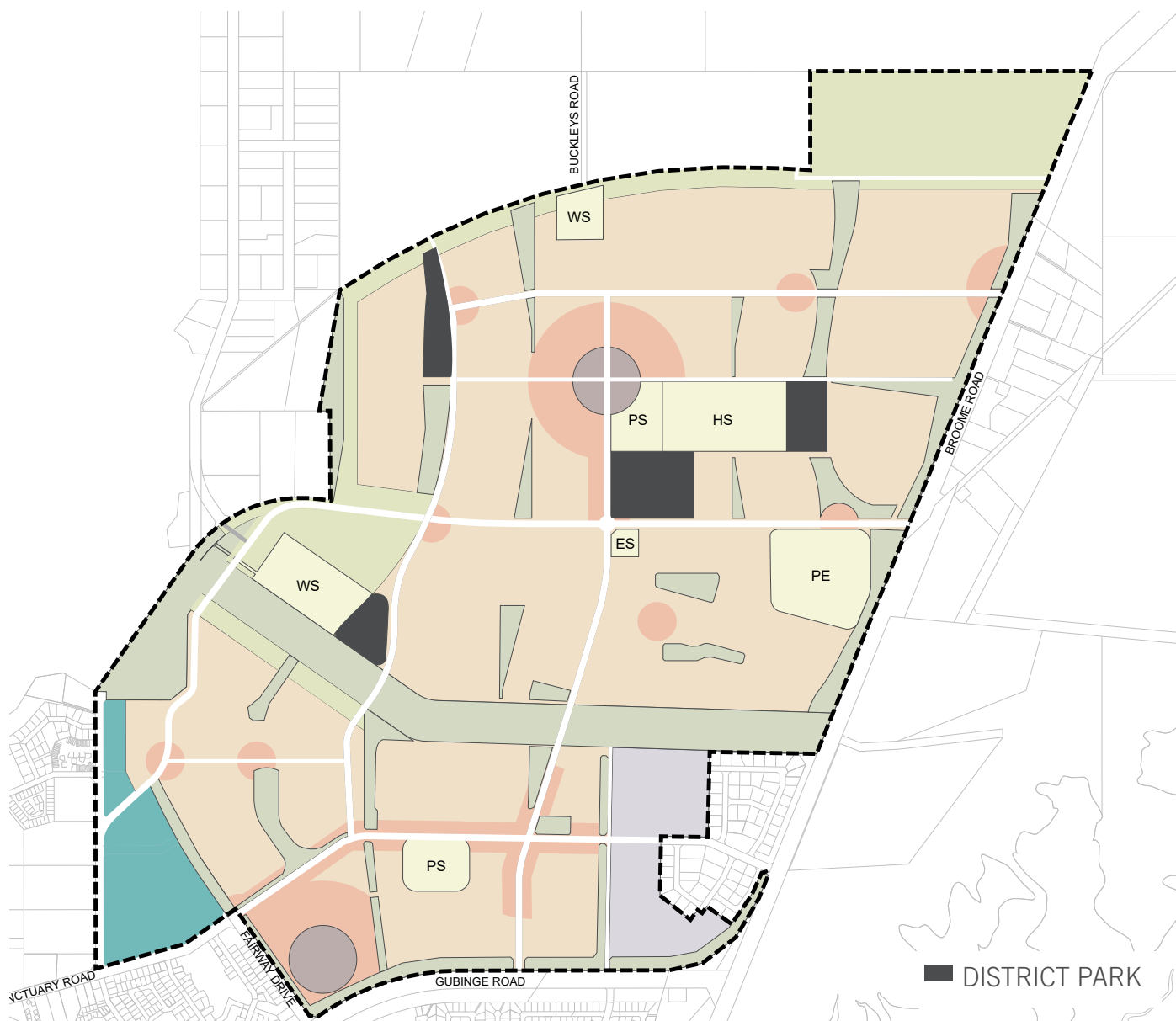
Two first order multiple-use corridors traverse north-south through the site providing green linkages from the Environmental Cultural Corridor to the proposed C-Class reserve on the northern boundary of the site.

Additional open space corridors in the form of vegetated buffers are also provided along Broome Road and the local road leading to the waste management facility.

All of the multiple-use corridors will comprise a combination of natural vegetation, drainage swales, useable parks and paths.



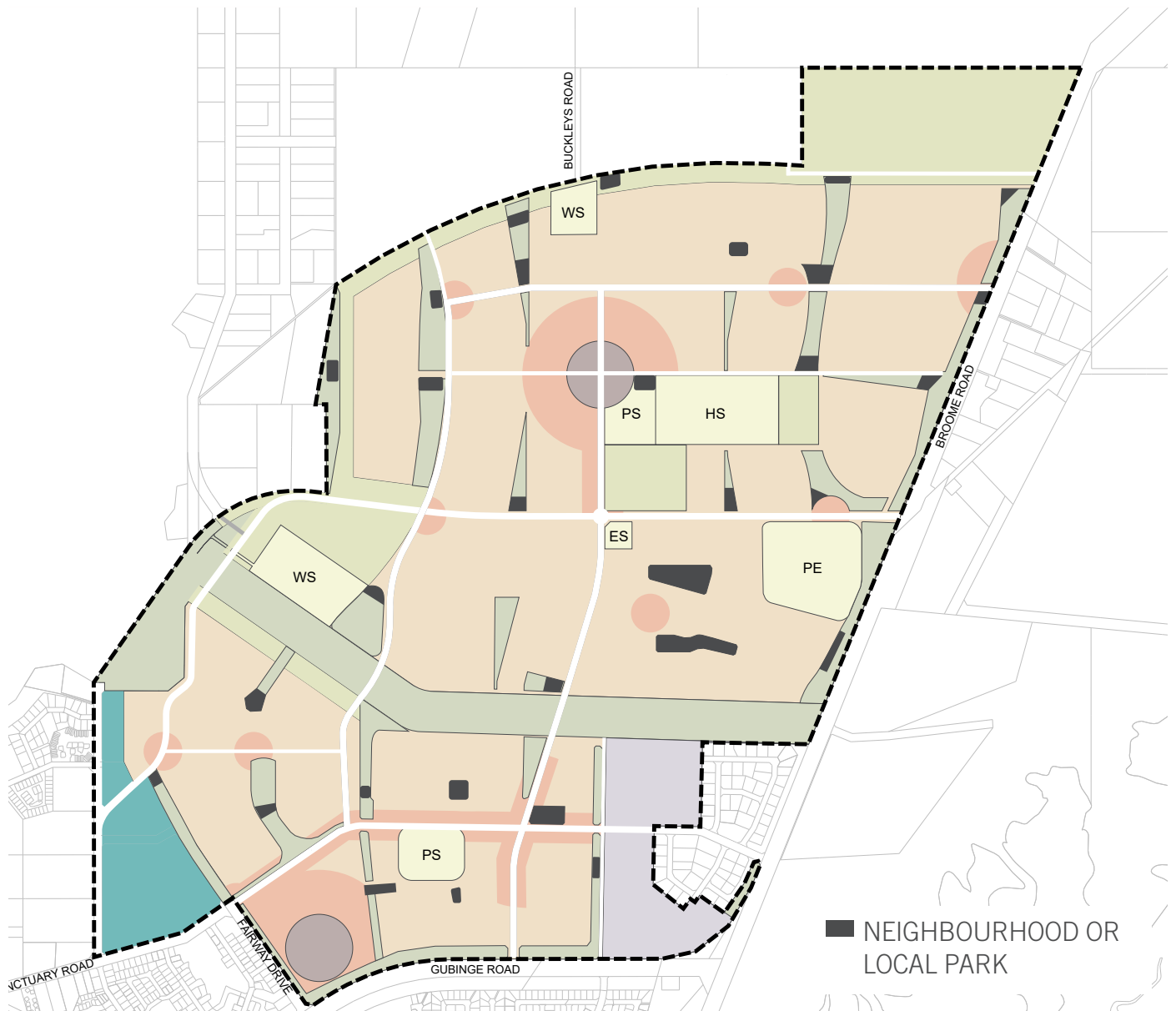
## 4.1.3 DISTRICT PARKS



### DISTRICT PARKS

Four district level parks are distributed throughout the Structure Plan area ensuring that most dwellings are within 1km of a district park. The future treatment of these spaces is to be fit for purpose, meaning that they may remain as bushland or be landscaped (or a combination of the two) or be developed for playing fields or similar should the demand for sporting facilities of this kind arise.

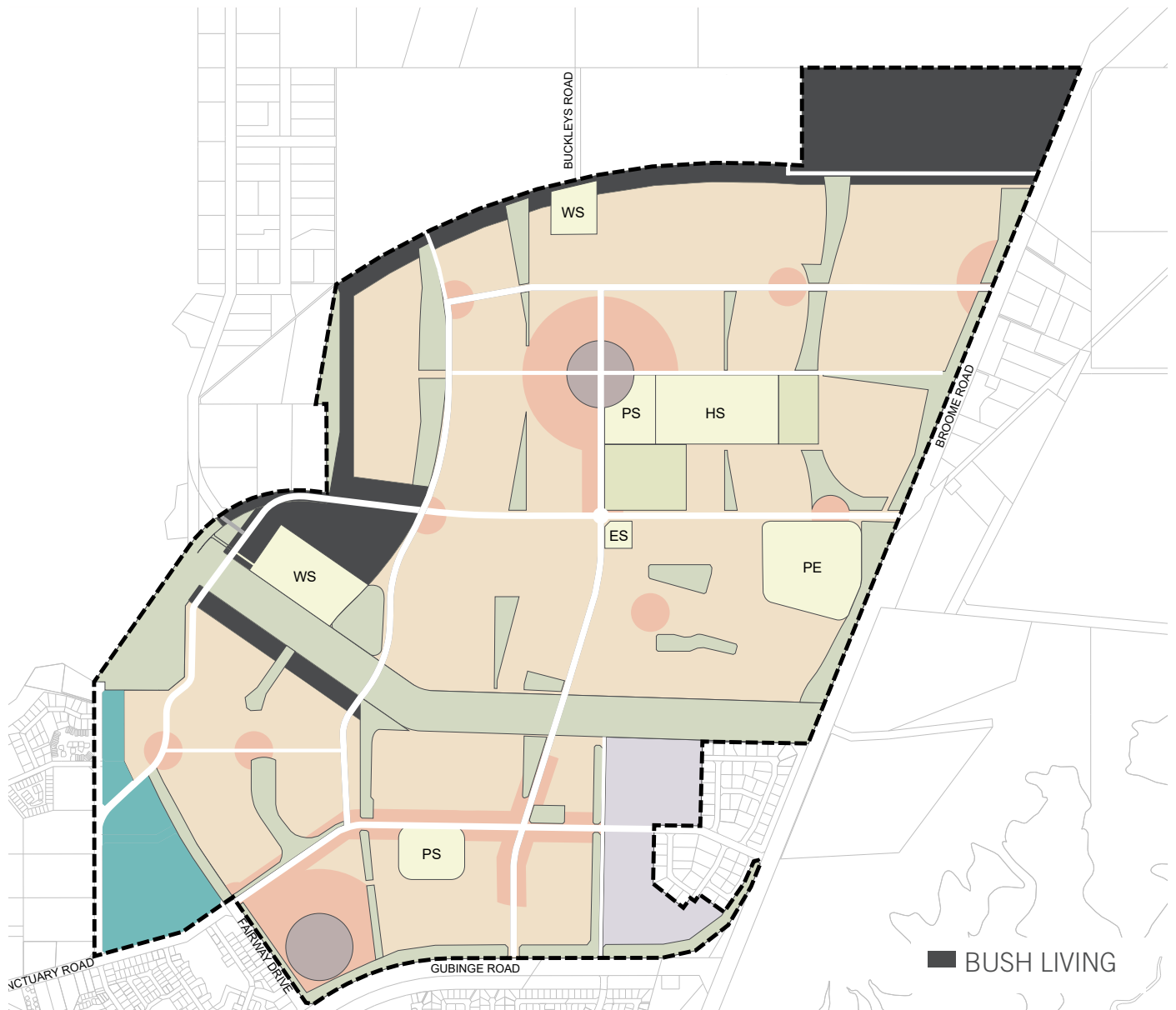
## 4.1.4 NEIGHBOURHOOD AND LOCAL PARKS



### NEIGHBOURHOOD AND LOCAL PARKS

The park distribution ensures most dwellings are within 400m of neighbourhood parks and 300m of local parks consistent with the Local Planning Policy for the Provision and Development of Open Space Reserves Managed by the Shire of Broome. The specific location and size of these parks will need to be determined through the detailed planning undertaken for Local Structure Plans. Open space will be provided in accordance with the requirements of Liveable Neighbourhoods on a staged basis as development progresses.

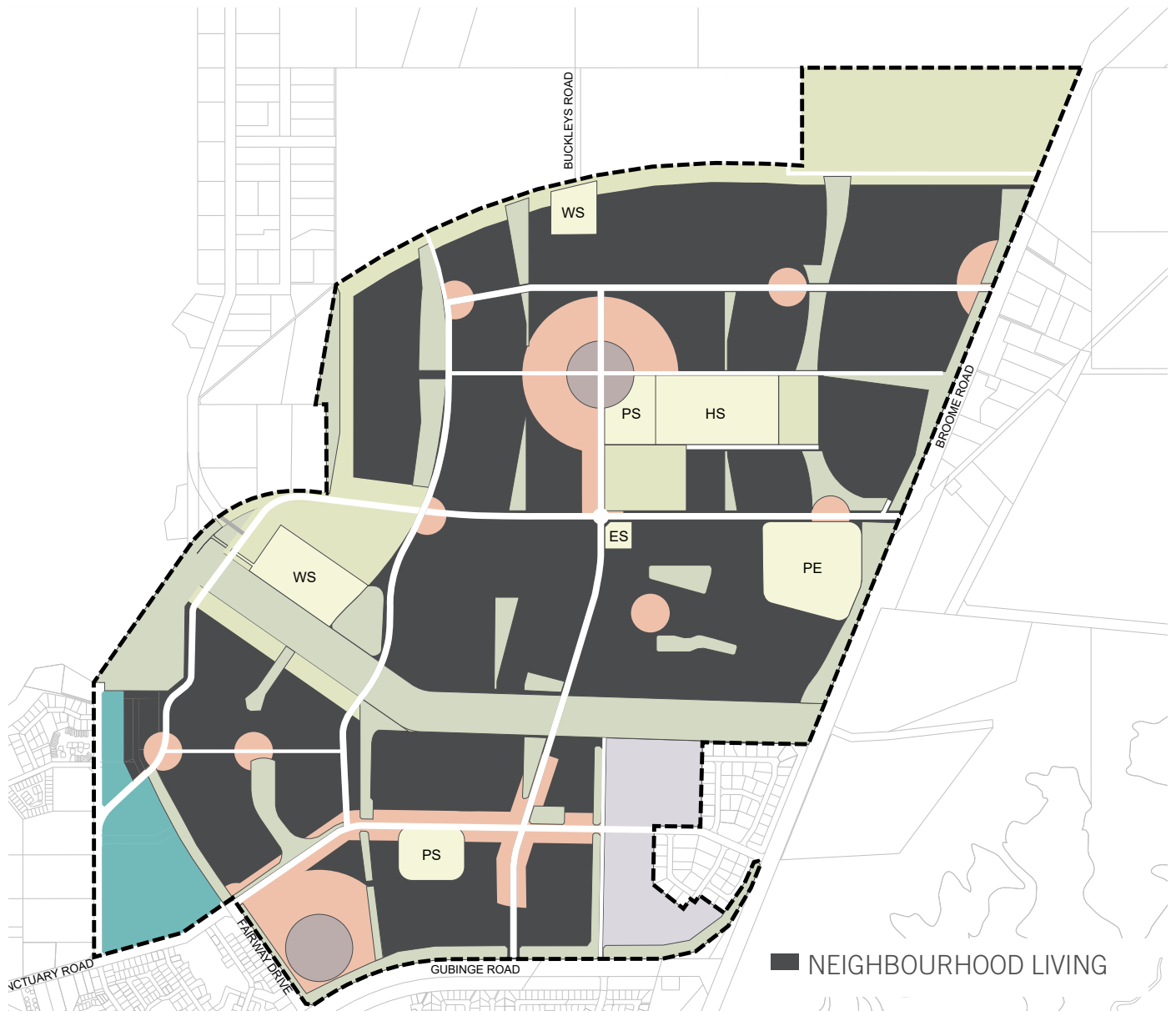
## 4.2 BUSH LIVING



### BUSH LIVING

Areas for Bush Living are located on the periphery of the site. Bush Living areas provide a buffer to adjoining reserves from urban development and a transition of urban intensity to adjacent semi-rural development. The lower density development of this transect zone will enable greater vegetation protection and minimise traffic volumes, both of which contribute to a reduction of impacts to adjacent areas. The size of Bush Living lots will be determined relative to their function and location as part of the preparation and approval of Local Structure Plans.

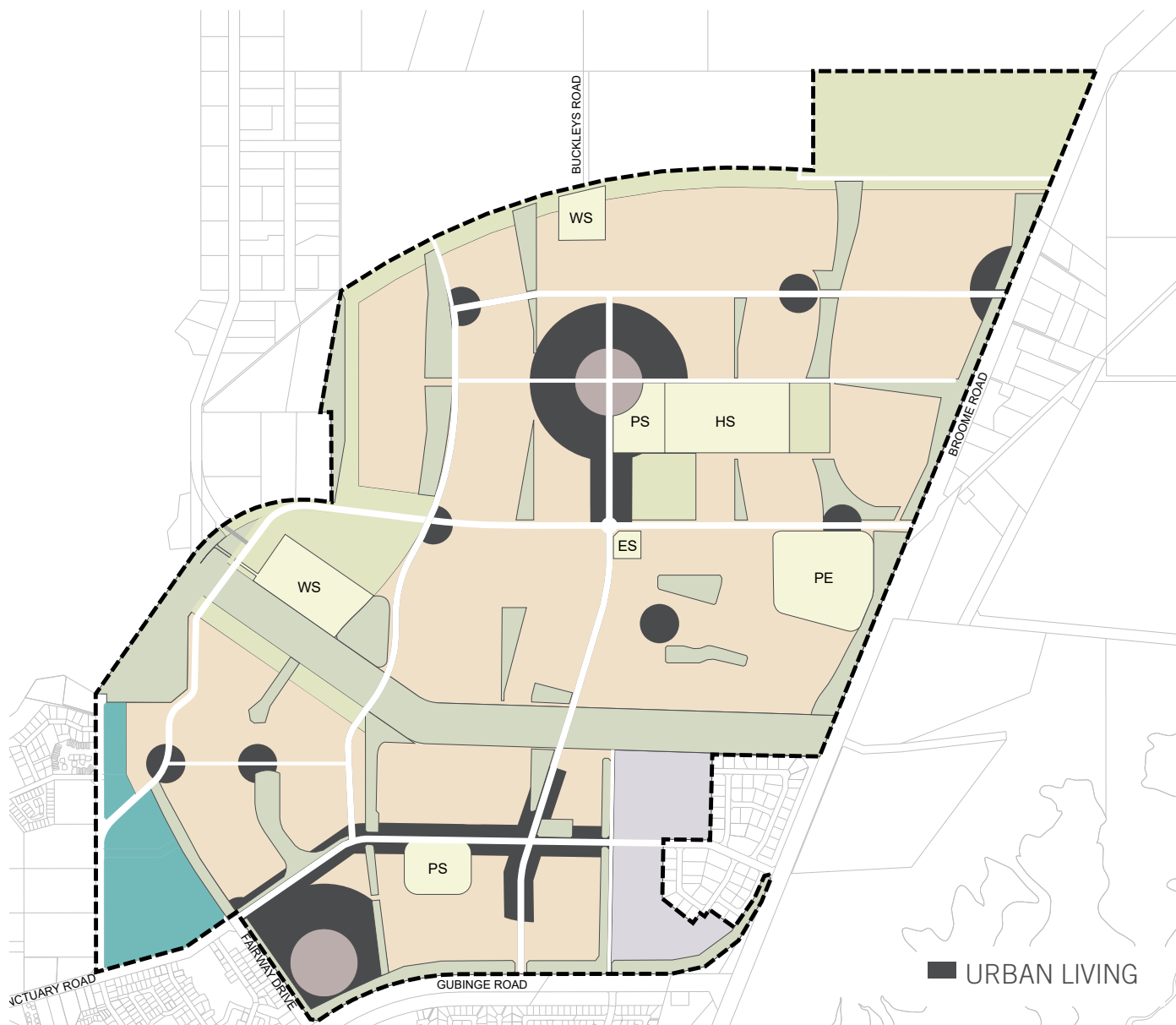
## 4.3 NEIGHBOURHOOD LIVING



### NEIGHBOURHOOD LIVING

The most significant component of site area available for urban development has been identified for Neighbourhood Living. This transect zone equates to what is more traditionally understood to be a “suburban” style of development. These areas will offer a range of low-medium density house sizes, set in an open space network of multiple-use corridors and parklands. Development will aspire to the character of the traditional neighbourhoods of “Old Broome”, particularly in terms of lot sizes and the intensity of development and the character of streets and buildings.

## 4.4 URBAN LIVING

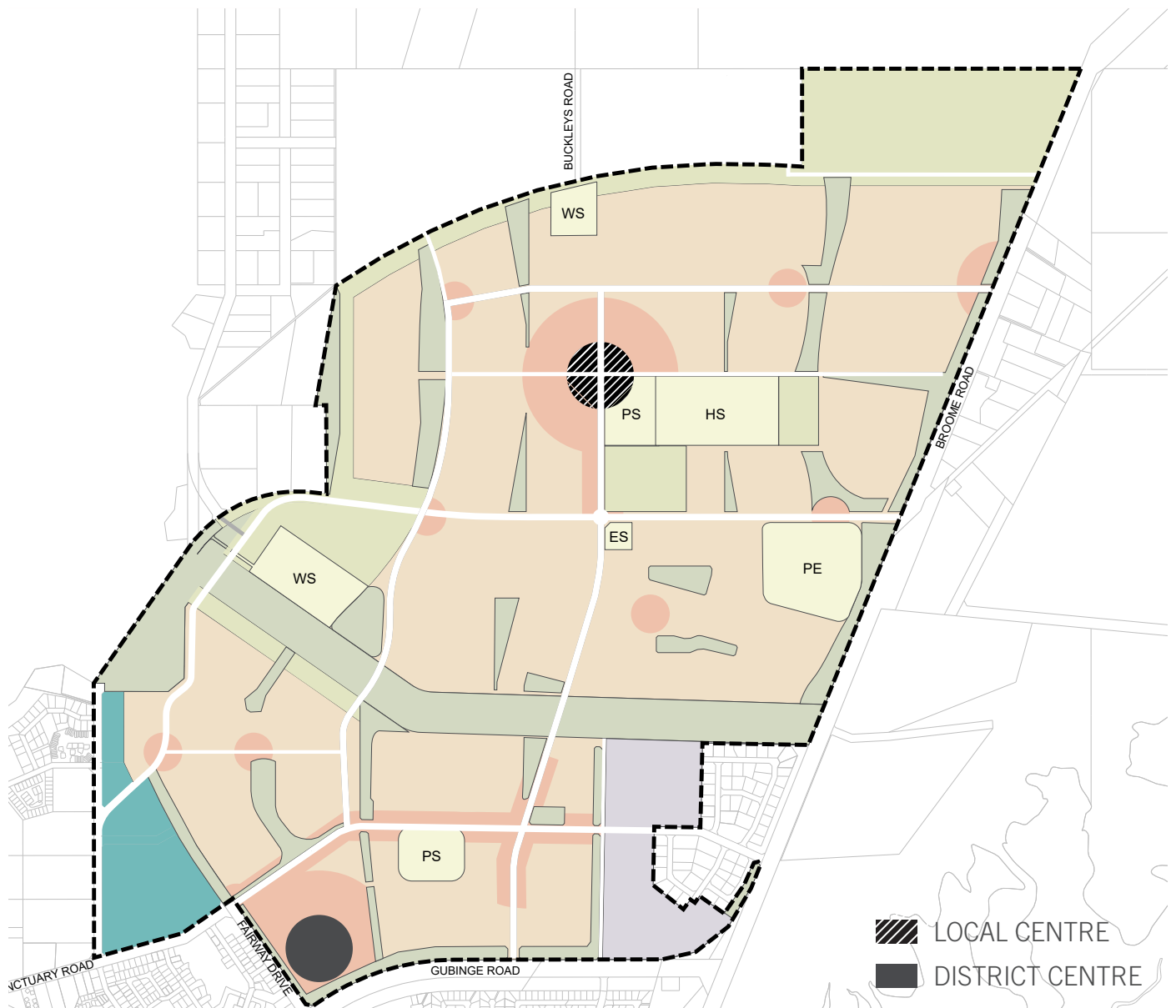


### URBAN LIVING

As the plan above demonstrates, medium density Urban Living is located around the two proposed Local Centres and at the heart of the 400 metre walkable catchments that define the site.

A key aim of the Urban Living transect zone is to maximise the number of households located within walking distance of shops and other commercial and community services. Urban Living is also identified around the various neighbourhood nodes throughout the site (which may be parks, community buildings or even bus stops) to maximise the number of households with access to these amenities. For similar reasons Urban Living is also designated on the two key movement corridors and opposite schools to reduce the number of crossovers to these streets.

## 4.5 CENTRE



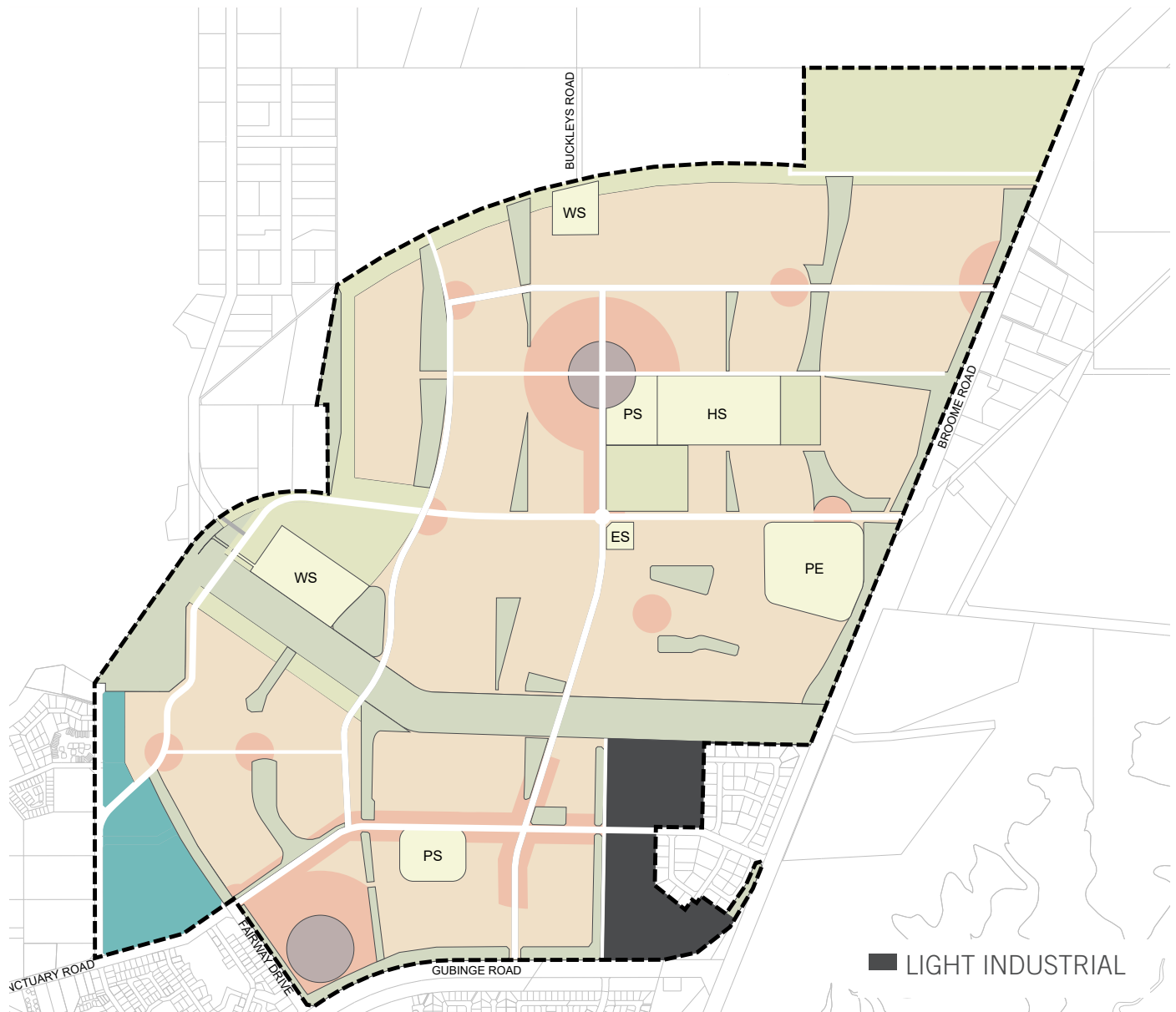
### CENTRE

In accordance with the recommendations of the Local Commercial Strategy (2017) the DSP identifies both a Local and District Centre within the development. The centres are located on the intersection of major roads within the development to capture passing trade, whilst being highly accessible to surrounding neighbourhoods for walking and cycling trips.

The Local Commercial Strategy anticipates the ultimate development potential for each centre (2051) as 2 x full-line supermarkets (2,500 – 4,500sqm) within the District Centre and 1 x full-line supermarket (2,500 – 4,500sqm) within the Local Centre, complemented by other specialty retail, food and business offerings.

The two centres also provide important focal points within the respective areas of the development for the provision of other commercial, community, cultural, recreation and residential land uses, and should be developed with a focus on the quality of the public realm and the end user experience.

## 4.6 INDUSTRIAL

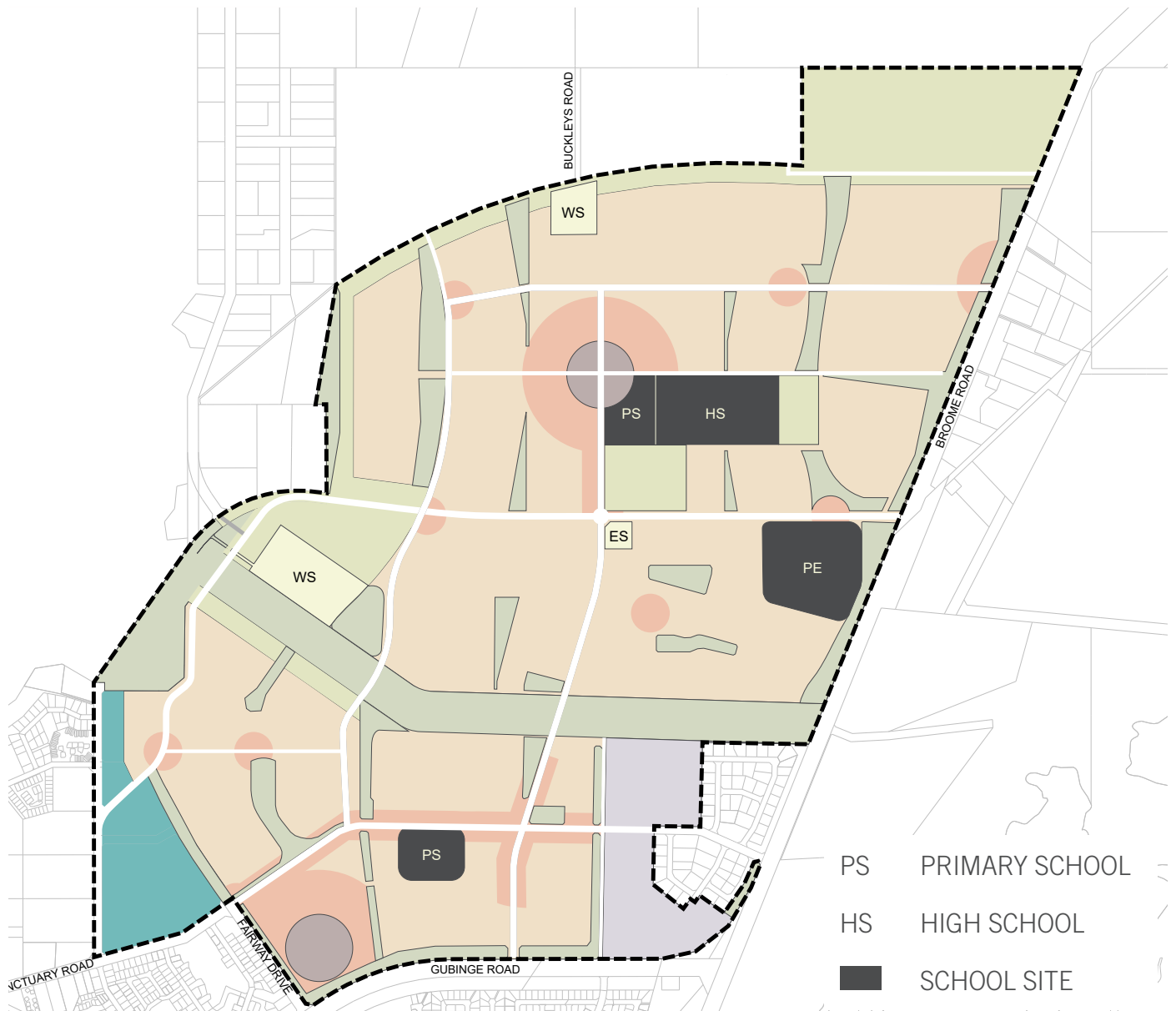


### INDUSTRIAL

The Structure Plan rationalises the extent of the existing Blue Haze Light Industrial Estate by allocating a further 27ha of light industrial land, separated from the proposed residential areas adjacent by a wide landscaped boulevard.

Detailed design of this precinct and the landscaped boulevard, addressing key issues of access and egress to and from Blue Haze, will be required at the Local Structure Plan stage.

## 4.7 SCHOOL SITES



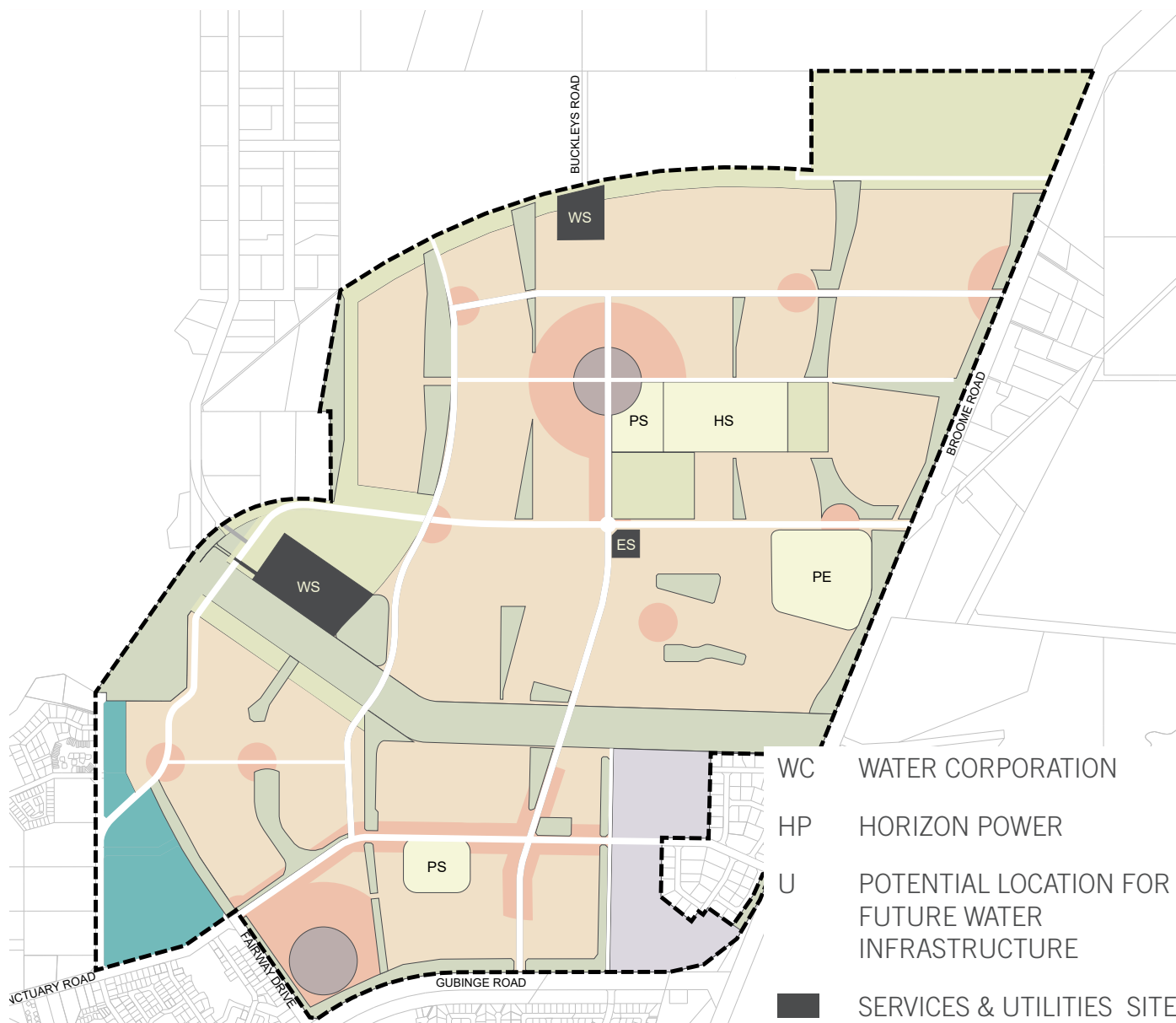
### SCHOOL SITES

As required by Liveable Neighbourhoods, the Plan identifies potential locations for two primary schools and a high school. The primary school in the south of the site has been located to enable its construction in the early stages of development.

One high school is provided adjacent to the northern primary school to service the northern parts of Broome. In response to the Anglican Schools Commissions' request for a future private school, a suitably sized site has been identified for future acquisition adjacent to its current landholding on Fairway Drive.



## 4.8 SERVICES AND UTILITIES



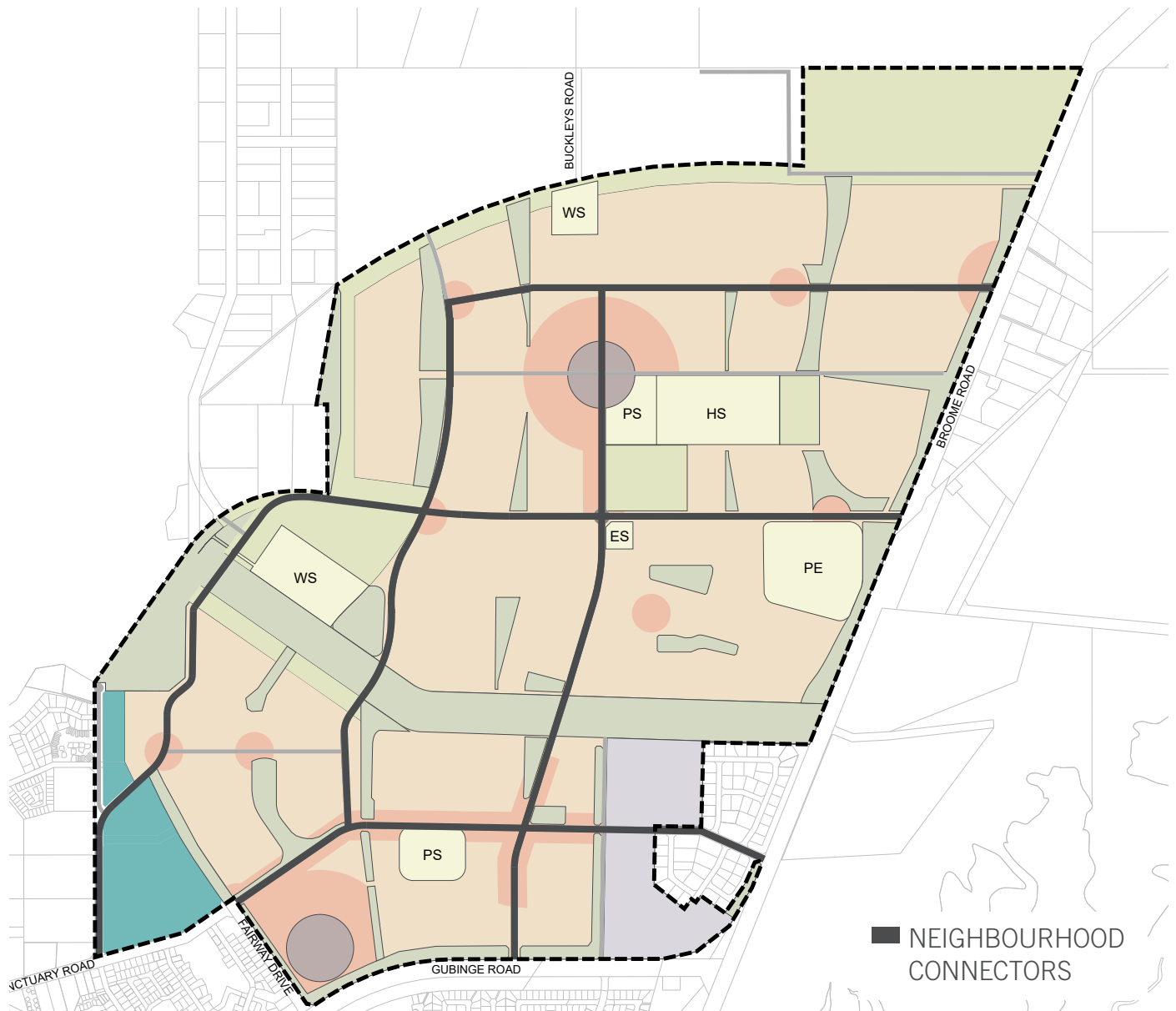
### SERVICES AND UTILITIES

The Water Corporation's existing water supply site has been expanded in accordance with its request and will incorporate a 30 metre high elevated tank. A secondary site has been identified, should this be required for a future wastewater recycling scheme.

In accordance with Horizon Power's requirements a 1ha site has been designated at the intersection of Magabala Road and Fairway Drive for the purpose of a zone substation.

Service authorities advise that both sites will be screened by vegetated buffers to minimise visual impacts to adjoining development.

## 4.9 ROAD NETWORK

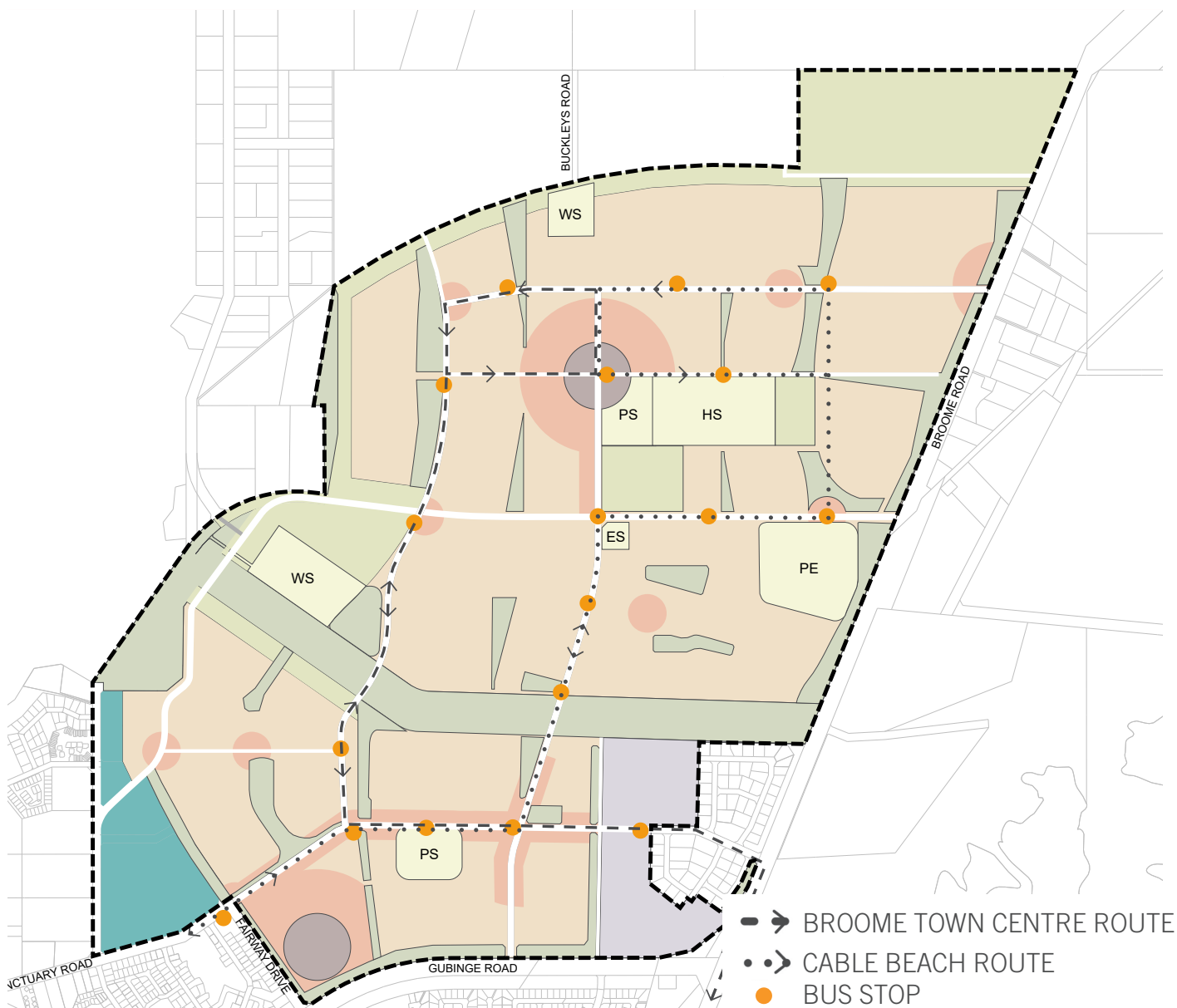


### ROAD NETWORK

The plan proposes a network of Neighbourhood Connectors providing connectivity throughout the site and linking the key destinations of Cable Beach via Sanctuary Drive, the Broome Town Centre via Gubinge and Broome Roads respectively and the future local centre in the north via Magabala Road.

The Neighbourhood Connectors are predominantly cardinally orientated to establish a framework for a cardinal grid of local streets within each of the neighbourhood cells. This project team's research indicates that this orientation will best facilitate the movement of cooling breezes throughout the development and will assist with solar control/shading of buildings. Details of the local street network are required to be resolved at the Local Structure Plan stage.

## 4.10 PUBLIC TRANSPORT

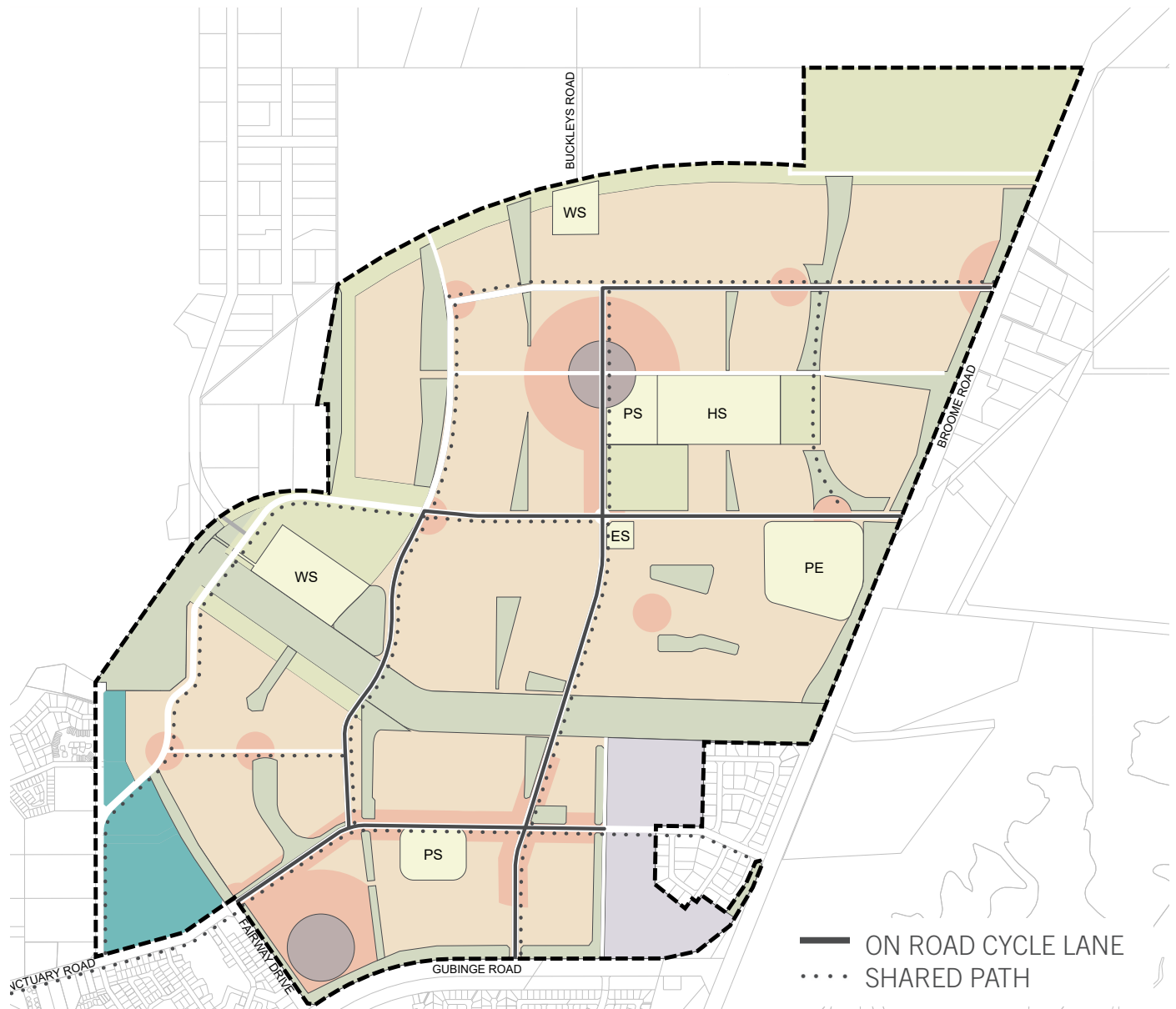


### PUBLIC TRANSPORT

The Transport Analysis that accompanies this report identifies that at least 1,500 internal and external trips per day are likely to be made by public transport when this becomes available. The District Structure Plan therefore identifies two separate public transport routes with connections to Cable Beach and the Broome Town Centre respectively.

Bus stops are proposed along the Neighbourhood Connectors, ensuring good walking access to the route from residential properties and the local centres.

## 4.11 PATH NETWORK



### PATH NETWORK

The Transport Analysis that accompanies this report identifies that at least 6,000 trips per day can be expected to be made by cycling and walking at full development. At the district level, shared paths and on-street cycle lanes have therefore been identified along the Neighbourhood Connectors and connecting externally to major destinations such as Cable Beach. Shared Paths are also depicted along multiple-use POS corridors and other key road connections. All major roads will have footpaths on both sides of the road and all local streets will have a footpath on at least one side of the street.

Additional shared paths, cycle lanes and footpaths will be identified in Local Structure Plans, particularly connecting through the environmental cultural corridor and other open space areas, to provide a comprehensive and integrated pedestrian and cycle network.

## 5.0 EXECUTIVE SUMMARIES OF TECHNICAL REPORTS

The full site of technical reports is provided as an appendix to this report. A summary of the key findings of each to these reports is provided below.

### 5.1 ENGINEERING, SERVICING AND TRANSPORT

#### 5.1.1 Site Characteristics

The topography of the site is generally flat, with a large percentage of the site between zero and 1% grade with a few pockets up to 2% grade. An area of the site in the north-west corner has a greater slope than the rest of the site and varies between 1% and 4% grades. A ridge line traverses the site in a south-west to north-east direction, with the western side grading to the base of the dunes and the eastern side grading to Dampier Creek. There are two main high points on the site which are at the approximate levels of RL 20.7 (south) and RL 19.1 (north). The lowest point in the site is in the north-west corner at RL 5.0.

##### 5.1.1.1 Soil Characteristics

A detailed Geotechnical investigation and desktop Hydro-geological study has been undertaken by Coffey Geotechnics which should be read in conjunction with this report. The investigation covered the total site and some 27 backhoe pits were investigated as well as a number of following head permeability tests. The results from the field investigation and laboratory testing, the soil over the site can be summarised as:

- The soil is typical Pindan Sand and is classified as a Silty Clayey Sand, fine to medium coarse, dense, and red to brown and weakly cemented. The materials were consistent to the full depth of the excavation of 2.5m.

- The soil contains 16% to 26% of fines most likely silt or clay material less than 75 microns. The fines are generally of low plasticity.
- Soil permeability varies over the site, however the Coffey report recommends a design value of  $K = 10^{-06}$  m/sec which is approximately 0.1m/day.
- The plastic index of the Pindan soil varies from 4.5 to 13.9.
- The CBR readings vary from 4 to 30 and the Coffey report recommends a Soaked CBR of 4 for the sub grade.
- The site has been given a Class “S” classification in the Coffey report under AS2870-1996 Residential Slabs and Footings Code. The definition of a Class “S” site is a “slightly reactive clay site with only slight ground movement from moisture changes”.
- The area is considered to have a low to medium risk of Acid Sulphate Soils (ASS) as outlined in the GHD Acid Sulphate Soil Desktop Investigation April 2009.

Geo-environmental testing of the soil from the project area was carried out by Coffey Geotechnics in accordance with Australian Standards AS 4482.1-2005 Guide to the Sampling and Investigation of Potentially Contaminated Soil (Standard Australia 2005). Part of the testing was carried out on a potentially contaminated site which is covered in the environmental report. Three (3) soil samples were taken in Lots 304 and 3150 and tested for total Nitrogen and total Phosphorus resulting in concentrations of Total Nitrogen at 130-230 mg N/kg and Total Phosphorus at 13-27 mg/kg.

### 5.1.1.2 Climate and Flooding

The climate in Broome is characterised by a wet summer season (December to March) and dry winter seasons (April to November). The major rainfall occurs during the wet summer season, with occasional storms during the summer. Tropical cyclones can be experienced during the months from November to April, but are most common in January and February (Bureau of Meteorology, 2009).

The median rainfall is 602.4mm on an average of 35 days per year; however this varies considerably from year to year. Over 75% of the average rainfall from January to March is associated with thunderstorms, tropical lows and cyclones. These systems can produce high intensity rain events over very short periods and a high proportion of the rainfall can occur in a few days. The evaporation rate is high and in November, the average rate is 9.5mm/ day.

There is no information in regard to flood levels for the site; however, there is evidence (Shire photo) of areas to the north-west of the site in the Waterfall and Lullfitz Drive special rural area, as being flood prone.

The eastern boundary of the site borders Broome Highway, which is affected by tidal levels. Tidal levels also affect the existing “Lake Broome” drainage basin at the intersection of Broome Highway and Gubinge Road. Broome is subject to significant tide changes, with the highest recorded tide being 10.76m above Chart Datum (post 1/1/09) or RL 5.24m AHD.

### 5.1.1.3 Groundwater

Broome is reliant on groundwater for its water supply which is sourced from the ‘Broome Sandstone’ superficial aquifer which is the most significant aquifer in the Broome region. The

Broome Groundwater area is divided into a number of sub areas including the Broome Townsite and Cable Beach sub areas. The Broome North development area is located over the Cable Beach sub area.

Coffey Geotechnics undertook a desktop assessment of the groundwater levels in the development area and assessed the Average Annual Maximum Groundwater Level (AAMGL) to be approximately RL 2.5m AHD with a maximum recurrence interval of 2 years. The groundwater level peaked at approximately 1.5m above “normal” levels at the end of the wet season peak in 1997 following the major cyclone event in September of the same year. On this basis the Maximum Probable Groundwater Level (MPGL) is estimated to be 2.0m higher at RL 4.5m AHD.

## 5.1.2 District Water Management Strategy

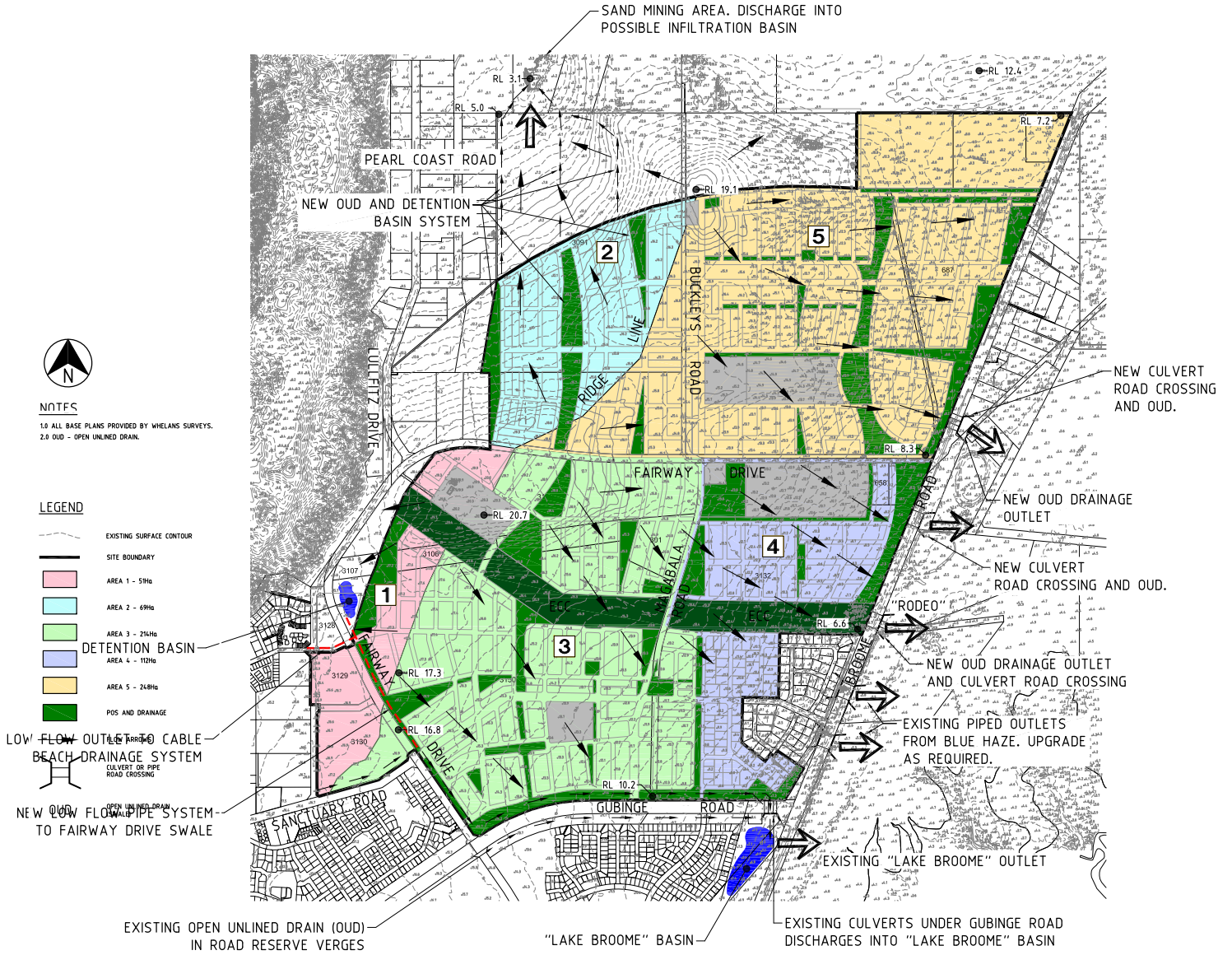
In accordance with the requirements of Better Urban Water Management (Western Australian Planning Commission, 2008) a District Water Management Strategy has been prepared for the project. The key principles and strategies are summarised below:

### 5.1.2.1 Principles

The key principles of integrated urban water management are:

- Minimise total water use in the Development Area;
- Protect infrastructure and assets from inundation and flooding;
- Manage groundwater levels to protect infrastructure and assets; and
- Protect environmental values of receiving water bodies.

Indicative Drainage Catchment Plan. Source: SKM



### 5.1.2.2 Design and Management Objectives

The overall intention of the District Water Management Strategy is to achieve the sustainable management of all aspects of the water cycle within the development and that potable water use should be as efficient as possible. Specifically the objectives for integrated urban water management for the development are:

- Minimise total water use in Broome North. The Western Australian State water plan (Government of Western Australia, 2007) sets a target of reducing unrestricted annual water consumption to 100 kL/person, including an aspirational target to achieve not more than 40 – 60 kL/person/year scheme water use.
- The developer will investigate with the relevant authorities to substitute drinking quality water with fit-for-purpose water for non-drinking water uses. The State water strategy (Government of Western Australia, 2003) sets a target of 20% reuse by 2012. The development could potentially aim to reduce the use of scheme/potable water by providing an alternative fit for purpose water supply for non-drinking use.
- Potable water use outside of buildings should be limited and as efficient as possible.
- Encourage the installation of 5 Star Plus provisions for all new fittings.
- The use of native plants is to be promoted, with native species constituting a minimum of 30-35% of total public areas and gardens.

#### 5.1.2.2.1 Water quantity management

The post development annual discharge volumes and peak flows are to be maintained relative to pre-development conditions, unless otherwise established through determination of ecological water requirements for sensitive environments. To achieve the above principle the following criteria will be applied:

- Ecological protection - For the critical one year average recurrence interval event, the post development discharge volume and peak flow rates shall be maintained relative to pre - development conditions in all parts of the catchment. Where there are identified impacts on significant ecosystems, maintain or restore desirable environmental flows and/or hydrological cycles as specified by the Department of Water.
- Flood management - Manage the catchment runoff for up to the 1 in 100 year average recurrence interval event in the development area to pre - development peak flows, unless otherwise indicated in an approved strategy or as negotiated with the relevant drainage service provider.
- Protect infrastructure and assets from inundation and flooding - Urban development usually results in the removal of significant areas of vegetation and replacement of permeable areas with buildings, roads and paved areas. This results in increased volumes and flows of surface runoff, which has the potential to cause flooding and inundation.



#### 5.1.2.2.2 Water quality management

Maintain surface and groundwater quality at pre-development levels (winter concentrations) and if possible, improve the quality of water leaving the development area to maintain and restore ecological systems in the sub catchment in which the development is located. To achieve the above principle the following criteria will be applied:

- If the pollutant outputs of development (measured or modelled concentrations) exceed catchment ambient conditions, the proponent shall use best endeavours to achieve water quality improvements in the development area or, alternatively, arrange equivalent water quality improvement offsets inside the catchment. If these conditions have not been determined, the development should meet relevant water quality guidelines stipulated in the National water quality management strategy (ANZECC and ARMCANZ, 2000).
- 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 (DoW, 2004-2007).
- Protect groundwater as a resource.

#### 5.1.2.2.3 Water quality modelling criteria

If it is proposed to use a water quality modelling tool to demonstrate compliance with design objectives, the following design modelling parameters are recommended. As compared to a development that does not actively manage stormwater quality, the water quality measures should achieve:

- At least 80 per cent reduction of total suspended solids;
- At least 60 per cent reduction of total phosphorus;
- At least 45 per cent reduction of total nitrogen; and
- At least 70 per cent reduction of gross pollutants.

Water quality modeling will be verified by site testing as proposed in the Local Water Management Strategy.

#### 5.1.2.2.4 Commitment to best management practice

In order to meet the design criteria of reductions in total phosphorus, total nitrogen, total suspended solids and gross pollutants as compared to developments in which water treatment is not undertaken, it is necessary to use a combination of best management practice strategies. In addition, best management practice strategies reduce risks of flooding on housing and infrastructure while maximising the potential for stormwater to be treated as a resource.

The hierarchy of best management practice principles is as follows:

- Implement controls at or near the source to prevent pollutants entering the system and/or treat stormwater.
- Install in-transit measures to treat stormwater and mitigate pollutants that have entered the conveyance system.
- Implement end-of-system controls to treat stormwater, addressing any remaining pollutants prior to discharging to receiving environments.
- Structural and non-structural best management practice strategies must be used in combination to achieve the required stormwater treatment outcomes. Recommended best management practices in increasing order of scale include:
  - » Residential lot scale:
    - On-site detention devices
    - Water-wise and nutrient-wise landscaping
    - Rainwater tanks for harvesting, detention and
    - Wastewater re-use
  - » Commercial/light industrial lot scale:
    - On-site detention
    - Water-wise and nutrient-wise landscaping
    - Contaminant management and sediment traps
    - Rainwater tanks for harvesting, detention and re-use
  - » Street scale:
    - Sediment traps
    - Conveyance bioretention systems (swales)
  - » Estate scale:
    - Detention (including water quality treatment) areas integrated within public open space, in accordance with the objectives and requirements of Elements 4 (Public parkland) and 5 (Urban water management) of Liveable Neighbourhoods Edition 4 (WAPC, 2007)
    - Non-structural best management practices such as interpretive signage, garden education programs, publishing a water-sensitive urban design web-page for the estate and inviting residents to engage with existing community catchment groups
  - » Area scale:
    - Non-structural best management practices such as; public education campaigns, support of local community catchment groups, installation of interpretive signage and web pages and the adoption of appropriate planning principles including local laws for on-site detention and retention.

The above practices may be limited by several factors, including: local soil and hydrological conditions, the depth and type of fill imported, public safety and public health standards, design life/reliability requirements, maintenance/management costs, legal authority and streetscape aesthetics. Advice should be sought from the local authority on the practices most appropriate for adoption within the development.

#### 5.1.2.2.5 Disease vector and nuisance insect management

To reduce health risks from mosquitoes, retention and detention treatments should be designed to ensure that between the months of November and May, detained immobile stormwater is fully discharged in a time period not exceeding 96 hours.

The Shire of Broome will not accept permanent water bodies in the drainage system. All detention basins are required to grade out and discharge over a period of up to 72 hours to prevent inhabitation by mosquito larvae to the satisfaction of the Shire of Broome on advice of the Department of Water and Department of Health.

### 5.1.3 Water and Sewerage

#### 5.1.3.1 Water

The Broome North development site currently has a traditional water supply system to existing lots within the development, such as the Blue Haze Industrial Area. The area contains a 3.4 Ha Water Corporation tank site on the western edge of the site off Fairway Drive.

Additional water for the Broome North development is calculated to be 3.3 GL per annum. Water Corporation has identified that sustainable yield of the existing town water source is 10.6 GL/annum. DOW (2008) indicates that the long term demand for Broome in 2030 is 9.4 GL/a, including system losses and tourist population.

The estimated total water demand for the town of Broome including the future Broome North development is 8.0 GL/annum. This total incorporates the 2009 production of 4.7 GL/annum and the future estimated water demand from the proposed development of around 3.3 GL/annum.

The existing water source is expected to be sufficient.

#### 5.1.3.2 Sewerage

The Broome North development site currently has three existing wastewater pumping stations that discharge to the south with treatment at the existing Broome South, Waste Water Treatment Plant (WWTP). Ultimately these flows will be pumped via the upgraded Broome North PS 6, Ocean Drive north to the proposed Broome North WWTP, at Crab Creek, scheduled for commissioning in approximately 2010. The future development of Broome North will initially also discharge to Broome North PS 6.

Water Corporation has already completed detailed sewer planning for the area in the southern part of the development area. Detailed planning will be required for the total Structure Plan area in addition to that already completed.

In summary;

- No additional water source is required
- An additional site (adjacent Buckley's Road) for water reservoir (or recycled water reservoir) will be required
- Up to three additional sewerage pump stations will be required for the Broome North project
- The new (WWTP) at Crab Creek will have sufficient capacity to handle the Broome North project.

#### 5.1.4 Effluent Reuse

Sinclair Knight Merz (SKM) has prepared a discussion paper on recycled wastewater as part of the investigations for the Broome North project. Recycled water has many applications that can be considered for the proposed development which are outlined in the paper. Key points are;

- Non-drinking uses (toilet flushing and garden watering) would require advanced treatment (e.g. MBR and disinfection) and duplication of the reticulation system.
- A dual reticulation scheme in Broome North would reduce the water demand and delay the expansion of the groundwater borefield.
- Costing and operational responsibilities for the scheme need to be established

#### 5.1.5 Power

Horizon Power have advanced planning for the new 'Bilingurr' Zone Substation to a point where a formal project has been set-up, a Project Manager has been appointed, a preferred substation site has been identified, land purchase is anticipated to occur soon, a preferred express 33kV cable route has been identified under the airport runway, conduits have already been installed under the runway in readiness for the express cables and procurement of the 33kV cables is expected to take place soon. Horizon Power has indicated that they are still on-schedule to meet an in-service date in December 2010.

A Master Plan of the HV distribution within Broome North based on the new 'Bilingurr' substation site has been prepared by SKM and included in this report providing an indication of switchgear locations, service corridors and likely land usage.

Various sustainability options are available that could be incorporated in the proposed development to provide environmental, social and economic benefits to the Broome community and stakeholders. Small scale grid connected Solar Photo Voltaic (PV) cells, solar hot water systems, building design and construction materials, and demand side management measures are understood to provide the best opportunities for residents of Broome to reduce green house gas emissions and use electricity in a more sustainable way.

### 5.1.6 Transport Planning

Sinclair Knight Merz has prepared a Transport Assessment on behalf of Development WA (then LandCorp) for the proposed Broome North development. Due to the scale of the site and long development timeline, the assessment has considered two scenarios:

- Interim: year 2031 with 2,000 residential lots, one primary school, one high school, extension to the Blue Haze industrial estate and partial development of one retail centre. This development area is expected to be bounded by Fairway Drive, Broome Highway and Gubinge Road.
- Ultimate: notionally year 2051 with full development extending northward to the existing waste transfer station. Full development will comprise 4,800 residential lots, two public primary schools, one public high school, an Anglican school, Blue Haze Light Industrial Estate and two town centres. The development is planned to be self-contained in relation to education and local shopping needs in the medium to long term. The site's planning has been underpinned by a series of transport objectives agreed with a number of community groups and government agencies at a four-day Planning Design Forum.

Traffic generation forecasts for a typical weekday for the interim and ultimate development scenarios are as follows:

- Interim: 4,626 internal, 12,468 external vehicle trips per day
- Ultimate: 16,249 internal, 20,667 external vehicle trips per day.

The site will be accessed in the interim via the following intersections:

- Broome Road/ Fairway Drive – priority controlled
- Broome Road/ Tanami Drive - priority controlled
- Gubinge Road/ Blue Haze access: priority controlled (right turn-in banned)
- Broome Road/ Magabala Road: priority controlled

The site will also be accessed via an easterly extension of Sanctuary Road.

Ultimately as the development extends north, a new access will be created on Broome Road approximately 900m north of the Fairway Drive and a separate access off Broome Highway for the waste management facility installed. At a stage between interim and ultimate development stages there will be a requirement for some of the site access points to be upgraded, this is in part due to the duplication of Gubinge Road and Broome Road (north of Gubinge Road). It is envisaged that this duplication (as outlined in the Broome Road Planning Study prepared by Western Infrastructure) will take place at some stage between 2031 and 2051.

Upgrading the intersections of Gubinge Road/ Magabala Road and Gubinge Road/ Fairway Drive/ Jigal Drive to traffic signals is likely to be triggered by the need to provide for safe pedestrian crossing of Gubinge Road, rather than on traffic capacity grounds.

In addition to the site access points, the development of Broome North is projected to notably impact the intersections of Broome Road/ Gubinge Road and Broome Road/ Sandpiper Avenue. It is forecast that the Broome Road/ Gubinge Road intersection can remain a priority controlled intersection well into the future. It is expected that the current configuration will remain suitable until such time as Gubinge Road and Broome Road north of Gubinge Road are duplicated to a four lane divided carriageway.

The intersection of Broome Road/ Sandpiper Avenue is forecast to require upgrading to a single lane roundabout control by interim development. Extending Jigal Drive south of Sandpiper Avenue through the airport would reduce the traffic volume through the Broome Road/ Sandpiper Avenue intersection and in this event further upgrade to this intersection may no longer be warranted.

The relocation of the airport and creation of a new arterial north-south route between Broome Road and Gubinge Road will greatly influence travel patterns. The timing of any such development is not yet known. However, if a new north-south road link through the airport is not created by 2051, it is apparent that Broome Road between Gubinge Road and Sandpiper Avenue will need to be duplicated (four lane divided road).

The intersection of Broome Road/ Frederick Street has been recently upgraded to roundabout control. It is expected that this intersection would be upgraded to a two-lane roundabout if/ when Broome Road (south of Gubinge Road) is duplicated.

In terms of sustainable transport, it is recommended that two bus services operate through Broome North – providing connections to cable Beach and Broome Town Centre.

A network of footpaths and cycling routes are planned throughout the Broome North development and integrating with existing infrastructure outside of the development site. A shared path linking Broome North to the Broome Town Centre, preferably along Broome Road, is recommended to encourage cycling as a travel mode.

#### 5.1.7 Other Utilities

The site contains existing gas and telecommunications assets that are to be maintained and protected. There are major Telstra fibre optic cables mainly to east side. The town's power is generated by gas which is piped through the centre of the site from north to south.

The site is not likely to be serviced by gas as reticulation to lots is not currently provided in Broome. Telecommunications legislations are currently undergoing changes that will likely see the role out of new policies mandating the provision of Fibre To The Premises (FTTP). Depending on the timing of development there may be a need to implement an interim strategy while legislation finalisation is underway.

## 5.2 ENVIRONMENT

The following is a summary derived from the various environmental technical reports prepared for the project:

### 5.2.1 Flora and Fauna

- No Environmentally Sensitive Areas (ESA) are situated within the study area;
- The vegetation types surveyed across the study area are known to be well represented locally and regionally within the Kimberley;
- Vegetation condition was considered range from Very Good to Completely Degraded;
- The study area is described as having a moderate flora species diversity with 95 taxa from 33 families;
- No Declared Rare or Priority flora species were recorded from the survey area;
- Fifteen weed species, including two Declared plants, were recorded from the survey area. Weed species were most dominant along tracks and roads, within and adjacent to the private properties, and amongst rubbish dumped within the study area;
- Part of the study area is located within the buffer zone of one 'Vulnerable' Threatened Ecological Community (TEC); 'vine thickets on the coastal sand dunes of Dampier Peninsula'. However, no TECs or PECs were identified as being present on the site during the field survey; and
- One fauna species of conservation significance was recorded in the study area. The Rainbow Bee-eater (*Merops ornatus*) is a Migratory and Marine species listed under the EPBC Act. The Rainbow Bee-eater is a common and widespread species and is unlikely to be significantly impacted by the proposed project;

### 5.2.2 Water and Drainage

- No wetlands or watercourses are located within the study area. Some of the treated, high rainfall event drainage will flow into Dampier Creek, which meets Roebuck Bay near the Broome North development area;
- A District Water Management Strategy and Local Water Management Plans will be submitted under Planning
- Roebuck Bay, an internationally significant wetland (Ramsar listed site) is located within 8 km of the study area. This Ramsar listed site will not be impacted by the proposed project; and
- The study area is not located within a Public Drinking Water Source Area (PDWSA);

### 5.2.3 Site Contamination

- A Preliminary Site Investigation for contaminated sites has been undertaken. Two potentially contaminated sites have been identified – being a disused poultry farm on Fairway Drive and a disused small scale abattoir at the northern end of the site. Both of these are in private ownership.
- A subsequent Soil Analysis Assessment was undertaken at the poultry farm by Stass Environmental in December 2009 for the landowner (Anglican Schools Commission). This concluded “that there is no evidence of any contamination of significance at this site.”
- The abattoir involved the processing of relatively small numbers of cattle and ceased operation over 25 years ago. Therefore this site does not indicate a pollution risk. When development of the subject site is proposed then any remediation required by law will be undertaken as required.

#### 5.2.4 Acid Sulfate Soils

- A desktop ASS investigation of the Broome North area, completed by GHD in May 2009, indicated a low ASS risk. However, land approximately 1 km south of the Site associated with Roebuck Bay, is classed as having a moderate to high risk of ASS occurring within 3 m of the natural soil surface level. To verify the risk of ASS occurring at Broome North, GHD undertook a sampling program targeting the areas most likely to contain ASS materials (if any).
- Based on these site observations and sampling results, it is considered that the risk of ASS occurrence at the Site is inherently low. Additionally, sampling within an adjacent, potentially high risk area in Dampier Creek, indicated the presence of ASS materials as negligible.
- Accordingly, it is considered that no further ASS investigations are required prior to earthworks being undertaken at the Site, on the assumption that the following are adhered to:
- Excavation works are limited to Pindan Soils; and
- Dewatering is not required.

#### 5.2.5 Aboriginal Heritage Considerations

- A desktop study indicated that the study area intersects the buffer zones of a number of Aboriginal Heritage sites which are protected under the Aboriginal Heritage Act (1972);
- Aboriginal heritage site investigations have been undertaken for the Broome North area and have indicated that there are no specific areas of heritage value within the proposed development area;
- Extensive consultation and negotiation with Aboriginal groups has provided an agreement on the location and size of areas to be retained as bushland corridors and reserves within the general Broome North area; and
- • Aboriginal heritage issues have been dealt with as a part of the Broome Global Negotiations.

#### 5.2.6 Approvals

- The proposal was discussed and all reports forwarded to staff from the Department of Environment, Water, Heritage and the Arts (DEWHA) and they have confirmed that formal referral under the Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act) is not required.
- The southern portion of the Broome North area, south of Fairway Drive, was rezoned under TPS Amendment No. 42. EPA advice on the Amendment, however, did not include an assessment of remnant vegetation of Declared Rare Flora. Recent flora and vegetation surveys of the area under Amendment No. 42 and this amendment have indicated that no Declared Rare Flora is present and that, based on an assessment of the 10 Clearing Principles, vegetation may be approved to be cleared.



### 5.3 LANDSCAPE MASTERPLAN: OPPORTUNITIES, DIRECTIONS AND STRATEGIES

The development of Broome, and more specifically the Broome North site, is challenging as it “...must navigate the boundary of cross cultural processes” (V. Margetts, 2008). The project team proposes to acknowledge this cultural connection along with the unique landscape condition within the open space planning by continuing the existing Broome lifestyle. This includes special consideration for the existing landform, adjacent ecosystem and climate. Recognising these factors will aid to intrinsically connect the project to ‘country’.

Key recommendations for the Broome North development include:

- Building capacity for the community by supporting local industry;
- Create spaces that promote growth and learning;
- Maintain connections and linkages through the landscape (flora, fauna and people);
- Provide cultural and community connections to ‘country’ through the inclusion of an Environmental Cultural Corridor;
- Protect and repair natural systems so traditional practices can take place alongside development;
- Minimise landform reshaping;
- Maximise vegetation retention on site;
- Inclusion of interpretation and public art within open space as part of an overall art strategy;
- Combine recreation, preservation, education/ interpretation and link urban/natural drainage systems through multi-use open space corridors; and

- Incorporating site specific solutions (such as the provision of shade amenity through consistent street tree planting along road and pedestrian connections).

Through consideration of the existing landscape, the local spatial order and cultural understanding, Broome North will aim to set a new benchmark for development in the North West Region.

## 5.4 COMMERCIAL ACTIVITY: IDEAS AND IMPLICATIONS

### 5.4.1 Local Commercial Strategy (2007)

Commercial planning for the original Broome North DSP had regard for the then current Local Commercial Strategy (2007). The independent assessment at that time concluded that “the significantly increased scale of the Broome North area relative to previous considerations requires a fresh look be taken at the provision of retail and commercial facilities to support the new community”.

This work was subsequently undertaken by the Shire and adopted in its Local Commercial Strategy 2017(LCS). The Strategy included a review of the 2007 recommendations, drawing on insights from local commercial enterprises, government and major facility operators, population trends and household and business expenditure data, to prepare recommendations for a new medium and long-term Commercial Land Strategy. The recommended strategic objectives for commercial land in Broome are:

1. Establish a sustainable mix, distribution and scale of additional retail and commercial uses to accommodate the projected floorspace demand to 2031 and 2051, whilst being mindful of the long-term uncertainty.
2. Maintain the integrity of ‘Chinatown – Town Centre’ as the primary commercial centre for Broome.
3. Identify modifications required to the established planning framework to deliver the recommendations of the Strategy.

The LCS notes WA Tomorrow forecasts for Broome, which predict a population of 21-25,000 by 2026. Trending forward this suggests a medium- term resident population to 2031 of between 19,000 and 28,000. Coupled with the larger service population (including regional residents and tourists) this suggests a total additional demand for around 31,000sqm of additional retail floorspace and 9,000sqm of additional office floorspace by 2031. The key implications of this growth for commercial and retail provision as it affects Broome North are as follows:

1. The capacity to support nearly 11,000sqm of additional Specialised Food, Grocery and Liquor Retail floorspace and 8,500sqm of additional Food Catering floorspace by 2031.
2. The capacity to support an additional 9,200sqm in commercial floorspace (equivalent to approximately 23,000sqm in additional land area) by 2031. By 2051, this will grow to nearly 21,500sqm in floorspace (or approximately 44,000sqm in land area).
3. The capacity to support one new full-line supermarket and one new half-line supermarket by 2031 when the population reaches a mean estimate of some 24,000 residents. This is in addition to the existing (2017) supermarket provision.
4. By 2051, there may be demand for three new full-line supermarkets when the population is expected to have exceeded 32,000 residents. This is in addition to the existing (2017) supermarket provision.

FIGURE 18:  
2031 PROPOSED COMMERCIAL CENTRES



FIGURE 19:  
2051 PROPOSED COMMERCIAL CENTRES



Source: Local Commercial Strategy 2017

5. There will be sufficient demand for a new district centre, possibly by 2031, to accommodate demand for a supermarket, speciality food, liquor and food catering into a single site. While there is a sufficient quantum of vacant land to support future (projected) demand, the location and suitability of much of this land is less than ideal, consequently, a new District Centre more ideally located (as per Broome North (South) is recommended.
6. Based on the forecast supermarket floorspace demand, it was concluded Broome North (and the wider catchment) can support one District Centre and one Local Centre.
7. The land designated as the local centre within the Warranyjarri Estate is not sufficient to accommodate a district centre and may be too close to the location proposed for the future district centre to be commercially sustainable. Further consideration is needed on appropriate, alternative land uses for this site. Amendment No. 2 identifies the land for residential purposes.
8. In consideration of the existing and future urban neighbourhoods located north of Broome Airport, and the location principles for new centres, it was concluded that a future district centre should be located centrally to the neighbourhoods of Broome North, Cable Beach, Roebuck and Roebuck West, at the intersection of major roads. The recommended location is depicted at Plan No.1 of Amendment No. 2 to the DSP.

Table 14 of the LCS (extract included) details the anticipated scale, locational and guiding design principles for the district and local centres proposed at Broome North which are depicted in the DSP Amendment.

EXTRACT FROM TABLE 14: PROPOSED COMMERCIAL LAND HIERARCHY  
(Source: Local Commercial Strategy 2017)

	District Centre	Local Centre
<b>Scale</b>		
2031	<p><b>Broome North (South)</b></p> <ul style="list-style-type: none"> <li>1 full-line supermarket (2,500m<sup>2</sup> –4,500m<sup>2</sup>)</li> <li>other food, grocery + liquor</li> <li>food catering</li> <li>apparel, homewares + leisure</li> <li>retail services</li> <li>local professional and service businesses</li> </ul>	<p><b>Broome North (North)</b></p> <ul style="list-style-type: none"> <li>1 half-line supermarket (1,500m<sup>2</sup>)</li> <li>other food, grocery + liquor</li> <li>food catering</li> <li>local professional and service businesses Seaview</li> <li>tourist related retail</li> </ul>
2051	<p><b>All</b></p> <ul style="list-style-type: none"> <li>other food, grocery + liquor</li> <li>food catering</li> <li>apparel, homewares + leisure</li> <li>retail services</li> </ul> <p><b>Broome North (South)</b></p> <ul style="list-style-type: none"> <li>1 full-line supermarket (2,500m<sup>2</sup> –4,500m<sup>2</sup>) (expansion of 2031 District Centre to comprise 2 x full-line supermarkets)</li> </ul>	<p><b>Broome North (North)</b></p> <ul style="list-style-type: none"> <li>1 full-line supermarket (2,500m<sup>2</sup> –4,500m<sup>2</sup>) (expansion of 2031 half-line supermarket)</li> <li>other food, grocery + liquor</li> <li>food catering</li> <li>local professional and service businesses</li> </ul>
<b>Distribution and Design (refer to mapping and note future centre locations are conceptual only and subject to detailed planning and design)</b>		
Location principles for new centres	<p>Located on the intersection of major roads to capture passing trade (vehicle based). Future centre location to be determined in consideration of future urban and population growth and vehicle based traffic generation, i.e. urban and population growth will occur north of Gubinge Road in association with the development of Broome North.</p> <p>Refer to the Guiding Design Principles outlined below, particularly in relation to accessibility to, and to service, a wider catchment/number of neighbourhoods.</p>	
Guiding Design Principles	<ol style="list-style-type: none"> <li>Centres are highly accessible.</li> <li>Centres do not have adverse impacts on adjoining residential areas.</li> <li>Ensure a mix of commercial and residential development.</li> <li>Provides for activity and accessibility at the street level.</li> <li>Supports the provision of public transport and pedestrian links.</li> <li>Provide for a wide range of different types of residential accommodation, including high density residential, to meet the diverse needs of the community.</li> </ol>	<ol style="list-style-type: none"> <li>Easily accessible to immediate neighbourhoods.</li> <li>Centres do not have adverse impacts on adjoining residential areas.</li> <li>Encourage high quality, pedestrian friendly, street orientated development.</li> <li>Provide a focus for medium density housing.</li> <li>Design and landscaping of development provide a high standard of safety, convenience and amenity.</li> <li>Design contributes towards a sense of place and community.</li> </ol>

#### 5.4.2 Blue Haze Light Industrial Estate

The Blue Haze industrial estate will be expanded to accommodate the service industry to support the needs of the resident Broome population. Industry which supports the larger development and primary resource sectors would be catered for in other locations outside the Broome North Area. The demand for additional service industrial will require the developed Blue Haze precinct to double in size.

Blue Haze may also provide opportunities for a limited amount of showroom retail to act as a buffer along streets connecting Blue Haze to the Broome North residential area.

#### 5.4.3 Employment Self Sufficiency

The employment self sufficiency for the original DSP report was produced based on the final lot yield generated from the Broome North District Structure Plan. The assessment has not been amended as part of the Amendment No.2 update.

Employment opportunities in Broome North are calculated in the adjacent table. It highlights that Broome North provides opportunities for up to 37% of its resident labour force.

Employment opportunities are relatively diverse with opportunities for 12% in industrial areas, opportunities for 10% in home based businesses and 3% for education employment.

The remaining opportunities are located in a range of existing and planned employment generating land uses within close proximity to the Broome North community.

Figure 1 - Demand Drivers

Dwellings	4,800
Persons/dwelling	2.6

Population	12,480
Resident labourforce (%)	60%
Resident labourforce (persons)	7,488

Figure 2 - Employment Opportunities

Employment Category	Floorspace (sqm)	Floorspace/employee (sqm)	Employees	Employment Self Sufficiency
Retail villages	7,500	25	300	4%
Large Format Retail	1,500	25	60	1%
Office (inc Medical/Community)	7,500	15	500	7%
Tourism	2,000	35	57	1%
<b>Commercial employment</b>	<b>18,500</b>	<b>20</b>	<b>917</b>	<b>12%</b>
<b>Industrial employment</b>	<b>90,000</b>	<b>100</b>	<b>900</b>	<b>12%</b>

Employment category	% of dwellings	Home based business	Employees/business	Employees	Employment Self Sufficiency
<b>Home Based employment</b>	<b>10%</b>	<b>480</b>	<b>1.5</b>	<b>720</b>	<b>10%</b>

Employment category	Number	Employees	Employment Self Sufficiency
Primary schools	2	40	
Secondary schools	1	80	
Private schools	1	100	
<b>Education employment</b>	<b>4</b>	<b>220</b>	<b>3%</b>

<b>Total Employment Opportunities</b>	<b>2,777</b>	<b>37%</b>
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## 5.5 BROOME NORTH HOUSING REPORT

The Broome North Housing Report evaluates the context and history of the housing market in Broome, its local conditions and site constraints. It sets out an approach to urban design and housing principles for Broome North to enable a climatically responsive housing that will enable residents to enjoy Broome's unique environment. The report works at macro and micro scales to provide an understanding of the site, Broome's history and the natural environment of the Broome peninsula and to develop unique responses to place, climate and culture. Our approach has been to learn from the past to make appropriate and informed decisions regarding the future development and innovation of Broome North.

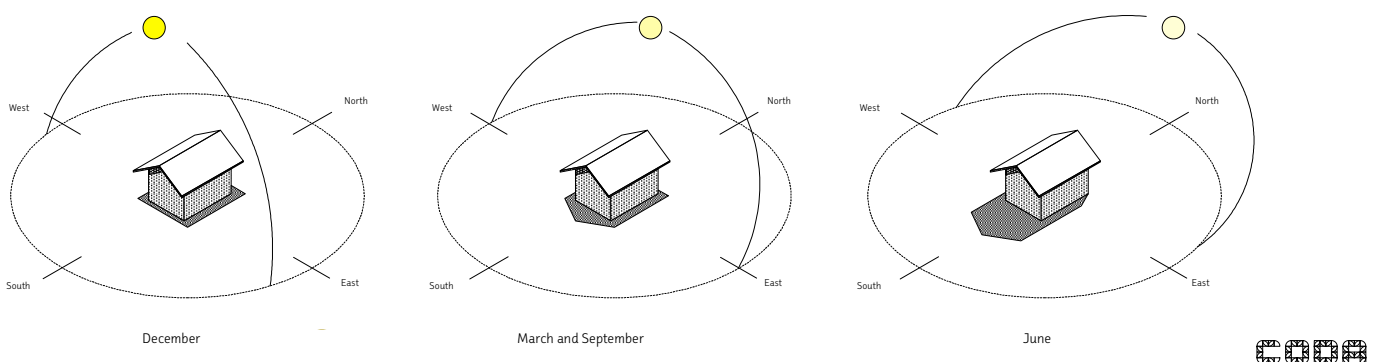
The two most important factors in housing and subdivision design in Broome are access to breeze and shade and both of these have implications for the street orientation, road width and lot layouts.

### 5.5.1 Shade

The first is shade and how to keep the walls of a house in shade as much as possible throughout the day. As Broome is above the Tropic of Capricorn, buildings get sunshine from the south in the wet season and hence shade is required from ALL angles!

In order to enable standard eaves projections for effective shading, the ideal lot orientation should be cardinal and laid out in a grid. Walls that are not aligned to a cardinal grid direction are difficult to shade since it is challenging to protect walls and external openings from slanting sun angles at certain times of the year, particularly from the hot western sun. Orientating the lots in a cardinal direction has been shown to reduce solar gains through all wall areas, as set out by Richard Aynsley B.Arch (Hons I, MS (Arch Eng, PhD) in his 'Assessment of Climate Responsive Design' for Thuringowa City Council in Queensland.

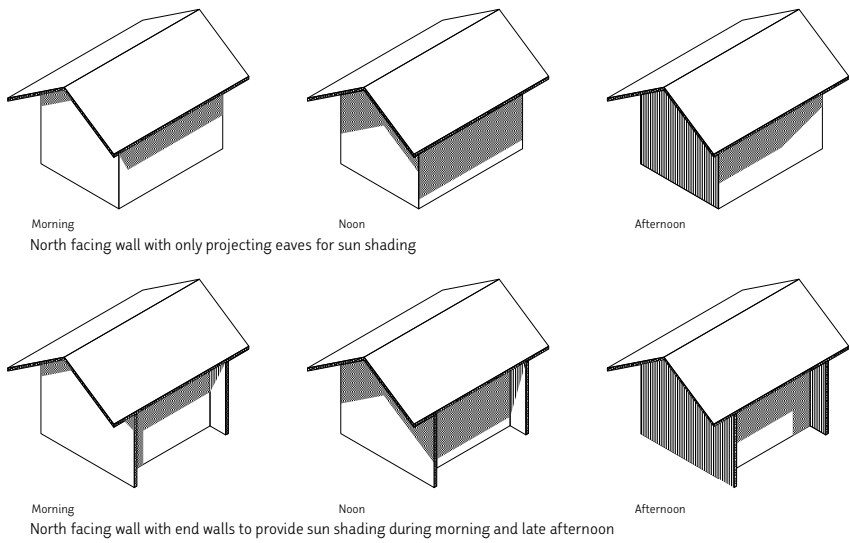
Sun angles at midday at different times of the year



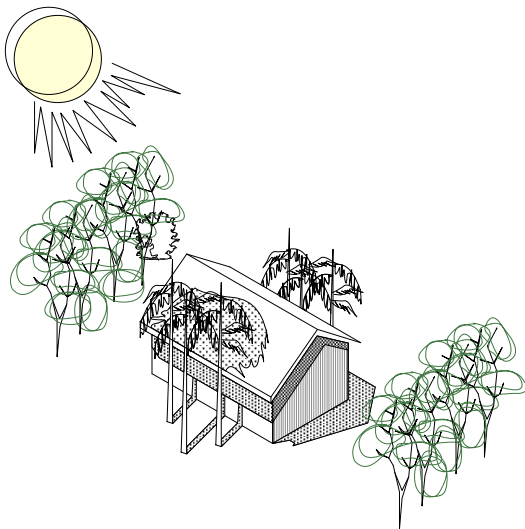


Heat gain analysis has shown that the optimum rectangular plan shape for a house in the hot humid tropics is 1 to 1.7 (Olgay, 1992) with the long walls orientated to the north and south. In the middle of the day, the sun is high in the sky, so with the cardinal grid effective shading to the north and south can be provided using simple wide eaves overhangs. The western and eastern sun creates the most problems, as it is low (rising and setting) and this early or late sun is the factor that heats up the home. Secondary screen walls or landscaping can be used to provide shading for these walls.

Alignment of eaves to minimize solar gain



Effective shading techniques



Tall shade trees close to the North and South of the house provide shade at midday without obstructing breezes.  
Lower trees and bushes to the East and West set further back from the house provide shade in the morning and afternoon when the sun is low in the sky.

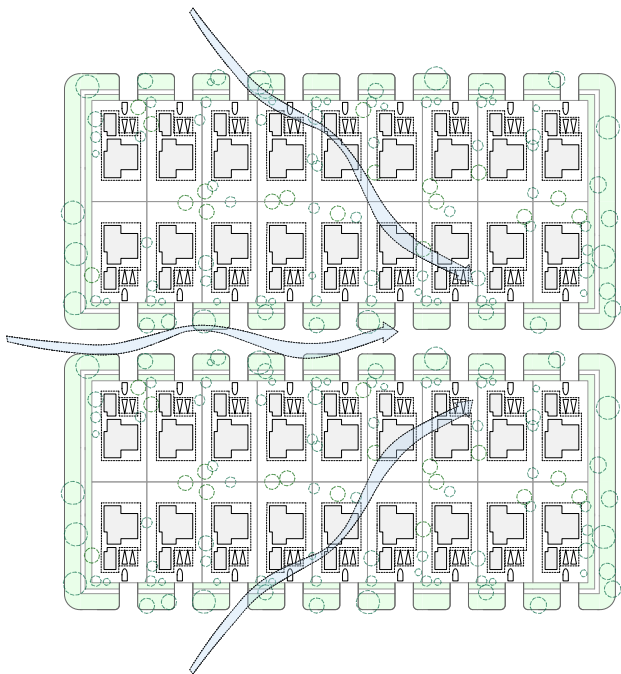


### 5.5.2 Breeze

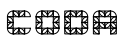
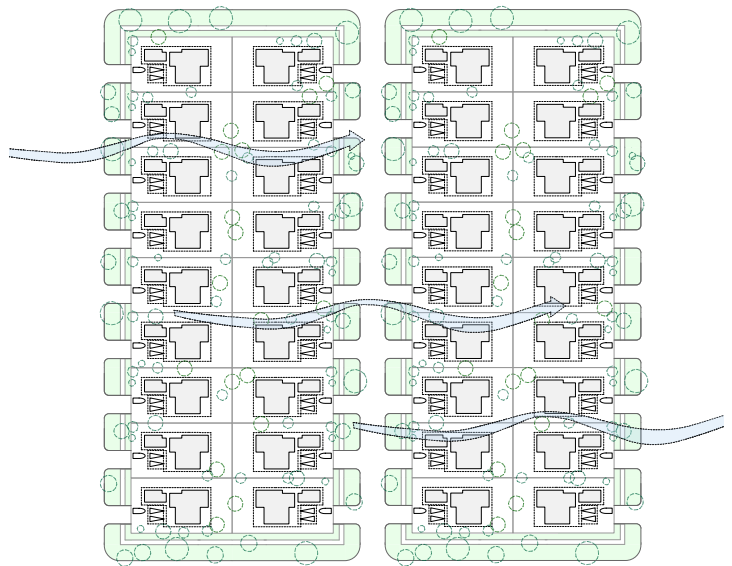
Designing to capture breezes is less predictable but our research began by establishing the prevailing wind direction. Data collected since 1939 by the Bureau of Meteorology (BOM) at Broome Airport shows that a south-easterly wind regime exists for much of the year. However afternoon sea breezes arrive from the north-west to south-west during the warmest months. In order to understand how this is affected over the site we purchased six weather stations and located them throughout the site and the Broome urban area. Data will be collected and monitored over the next year in order to obtain ongoing site-specific data of the local climate.

Following an in-depth study of the science of climatology from specialists across Australasia and based on the BOM data that the prevailing cooling winds come from the north-west/west/south-west, we identify the need for major roads to run North/South and the majority of lots East/West. This will allow improved ventilation over the subdivision as a whole since breezes are only moving through two lots before gaining speed via the street network. Conversely with North/South lots the westerly breezes must pass through multiple lots across the development.

Breeze Path North - South Lots



Breeze Path East - West Lots



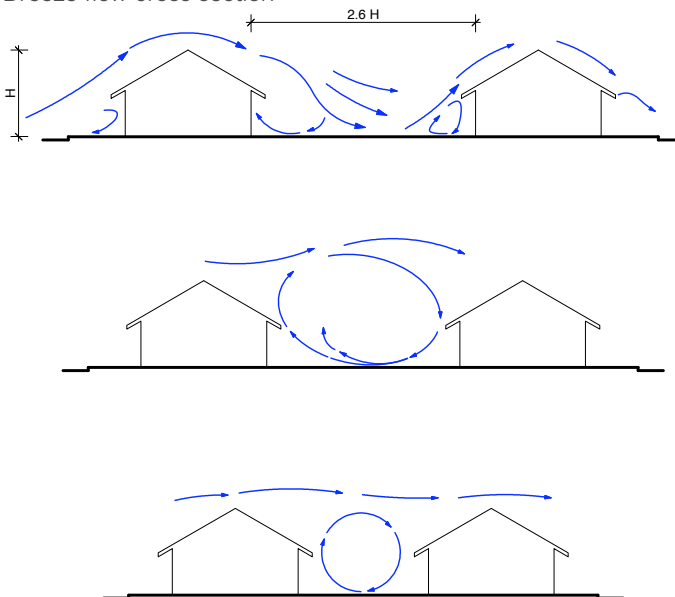
In addition we suggest that effective breeze paths of at least 15% of lot frontages be mandated on the southern side of all East/West lots to further assist breeze speeds to be maintained across the street blocks. As part of our research we also reviewed various studies in wind tunnels and CFD (Computation Fluid Dynamics) studies that found for wind speeds to be maintained across a 'rough' surface (such as a landscape of houses) a minimum distance is required between breeze obstacles. A rough (but surprisingly accurate) calculation is  $2.6 \times H$ , where H is the height of the obstacle. In the case of a single house, this is about 5-6m to the top of ridge line. It follows that a gap of some 13-15 metres between obstacles is required. A normal neighbourhood street will achieve this however the rear setbacks on East/West lots is critical to achieve a reduction in "skimming effect" where the wind simply hits the first obstacle, rises and skims across a series of closely spaced obstacles, reducing the potential for cross ventilation.

Studies by Lee et al (1980) also show that variety and staggering of the objects will reduce the skimming effect of the breezes over a group of similar sized houses. As such we suggest that the blocks include a variety of lot sizes. Where lots are narrower than 15m we suggest that the lots run North/South allowing the additional benefit of one house providing western shade to the neighbouring house. With lots less than 12m, lots should be zero lot bringing economies of scale by reducing the numbers of sidewalls.

Issues of lot drainage, topography, landscape and vegetation also play an important urban role and our entire Broome North team have worked together to deliver integration between each of these factors.

Our climatic principles extend to the detail of the built form of the houses in order to ensure that the designs not only respond to the seasonal variations of the local Broome climate but also are affordable, diverse, adaptable, 'Broome-style' and sustainable. Building details such the inclusion of breezeways, recesses, openings, louvres, overhangs, limiting thermal mass and increasing insulation are considered as well as the integration of natural shading and types of boundary fencing. Our report seeks to ensure that the air conditioning, insulation, water usage, energy use and solar power are all environmentally sustainable and the key criteria have been set out in the Development WA (then LandCorp) Broome North Design Guidelines to assist future home owners and builders.

Breeze flow cross section



The BN Housing report illustrates twelve house typologies that set out ways in which climatically responsive housing suitable for the Broome Climate, culture and situation can be designed. These housing types are suggestions people may chose to consider - they have been designed with an eye to the future - allowing for some inherent elasticity in how the rooms could be used. It is acknowledged over time with increased urbanisation some further refinement on the understanding of the movement of breezes will evolve and this will inform future planning. However, based on the best practice evidence collected, the above directions provide the primary consideration for the street alignment setback requirements and critical design elements to provide future residents of Broome with living spaces that celebrate the unique Broome lifestyle.

## 5.6 SOCIAL CONTEXT AND SOCIAL DIRECTIONS: DEVELOPING A COMMUNITY AND WELLBEING FRAMEWORK FOR BROOME NORTH

Broome North is a major project which will effectively double the population in Broome. This makes it incumbent on Development WA (then LandCorp) and all major stakeholders to ensure the full range of impacts associated with this substantial increase in population are understood and well planned for. Development WA (then LandCorp) engaged Creating Communities Australia to undertake a thorough community consultation and engagement process and develop a framework for community development, activation and wellbeing in Broome North.

### 5.6.1 Consultation and Engagement

The consultation and engagement process involved the establishment of a Community Reference Group and extensive meetings with key stakeholders in Broome. The process was designed to ensure that a wide range of views were inputted into the planning process.

Broome is a mixture of built form, relationships, land ownership, land form, ideologies, cultures and ethnic groups. The social fabric of Broome comprises of a range of social groups and networks that co-exist but rarely merge to create anything of significance.

In conversations with the people of Broome the following key points emerged:

- The defining characteristics of Broome are its climate, environment, multiculturalism, outdoor lifestyle, tourism and social connections;
- The physical environment is very important and a key driver behinds peoples choice to live or visit Broome; and
- The image of Broome's character and spirit defines it as a place and should be reflected in Broome North. However it was hard for people to enunciate what they thought the character and spirit of Broome was, rather they knew what it was not.

From the consultation and engagement two challenges have emerged for the development of Broome North:

1. How do we ensure the character and spirit of Broome is evident in every aspect of both the physical dimensions and the social fabric? and
2. How do we integrate Broome North with existing Broome to reinforce the social fabric rather than create an isolated place?

### 5.6.2 Community and Wellbeing Framework

To ensure the character and spirit of Broome is represented in Broome North as an integrated community within Broome, two key focus areas for the Broome North Community and Wellbeing Framework have been identified: neighbourhood construct and community construct. Each key focus area has specific objectives and implementation mechanisms making up the community and wellbeing framework for Broome North.

### **Key Focus Area 1: Neighbourhood Construct**

The neighbourhood construct involves developing Broome North as a neighbourhood of Broome. It is about connections to services and facilities, the natural environment, outdoor lifestyle and the design and construction of all aspects of Broome North with a focus on people.

### **Key Focus Area 2: Community Construct**

The community construct involves developing Broome North as a vibrant community which becomes an extension of Broome; maintaining and strengthening its character, spirit and social fabric.

## **5.7 BUSHFIRE MANAGEMENT PLAN**

Amendment No. 2 to the DSP is accompanied by a Bushfire Management Plan (BMP) to satisfy the requirements of State Planning Policy 3.7 Planning in Bushfire-Prone Areas in accordance with Guidelines for Planning in Bushfire Prone Areas. A summary of the key outcomes of the assessment is provided below.

The DSP area comprises mostly undeveloped scrub land that generally rises gently in level from east to west. A portion of the southern section of the subject site is currently developed into residential and light industrial zones.

Land to the immediate south and west of the subject site is mostly developed. However, there is a possibility of bushfire threatening the site from undeveloped areas in these directions. To the east the subject site is bounded by Broome Road and mostly developed sites on the east side of the road. Further east are saline wetlands. To the north of the subject site are large areas of scrub vegetation where there is potential for a landscape type bushfire.

The subject site is assessed as having low, moderate and extreme Bushfire Hazard Levels (BHLs) with the predominant undeveloped areas exhibiting an extreme BHL.

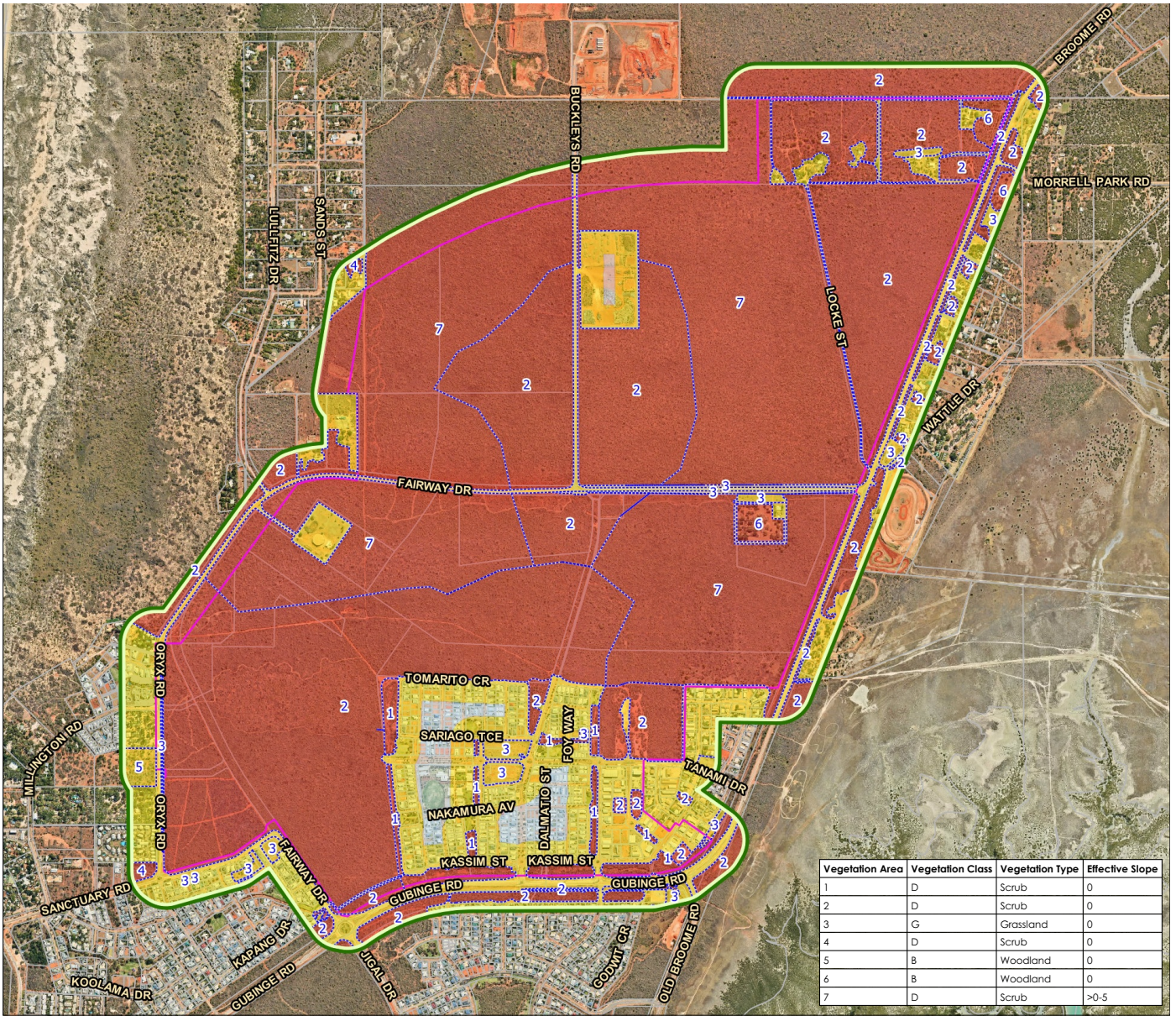
A variety of residential lot sizes are proposed within the DSP area ranging in R-Code classifications from R2 (minimum 5,000sqm) to R60 (minimum 120sqm). Larger lots will allow for the retention of native vegetation on the lots. Smaller lots will generally be cleared of vegetation during the subdivision stage or prior to construction on those lots.

Onsite vegetation can be managed to achieve a BAL-29 rating or less for future lots or buildings within the development. Some separation may be required, for these future lots or buildings, from vegetation external to the subject site to achieve a BAL-29 rating. This could be in the form of perimeter roads or managed public open space.

Where revegetation or ongoing maintenance of existing vegetation is proposed within public open spaces, drainage reserves or public purpose lots these areas are to be managed to comply with the requirements of the BMP. Strategic design of roads and/or lot layout may be necessary to achieve compliance between environmental requirements and bushfire protection criteria.

Future roads are to provide safe access and egress to two different destinations. As sealed public roads, they will be available to all residents and the public at all times and under all weather conditions.

A reticulated water supply is available to the subject site and hydrants will be installed in locations as required by the relevant authorities.



Disclaimer and Limitation: This map has been prepared for bushfire management planning purposes only. All depicted areas, contours and any dimensions shown are subject to survey. Bushfire Phone Planning does not guarantee that this map is without flaw of any kind and disclaims all liability for any errors, loss or other consequence which may arise from relying on any information depicted.

### District Development Plan Bushfire Hazard Level Map

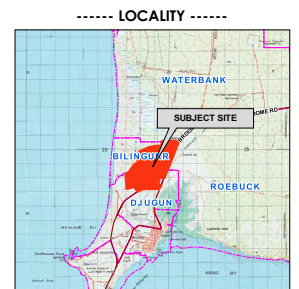
BROOME NORTH DEVELOPMENT  
BILINGURR  
SHIRE OF BROOME

----- LEGEND -----

- Vegetation Outline
- Subject Site
- 150m Assessment Area
- Cadastre
- Bushfire Hazard Levels**
- Extreme
- Moderate
- Low

0 250 500 750 1000

Metres



AERIAL IMAGERY: Landgate/SLIP



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# Appendix 1 - Planning Report

# Appendix 2 - Planning Design Forum Summary Documents

# **Appendix 3 - Engineering and Servicing Report and Addendum**

# Appendix 4 - Traffic Assessment and Addendum

# **Appendix 5 - District Water Management Strategy and Addendum**

# Appendix 6 - Environmental Reports

# Appendix 7 - Landscape Report

# Appendix 8 - Commercial Analysis



# Appendix 9 - Housing Report

# Appendix 10 - Social Directions Paper

# Appendix 11 - Social Context Paper

# Appendix 12 - Bushfire Management Plan