

1 PLANNING BACKGROUND

1.1 INTRODUCTION AND PURPOSE

The purpose of this LSP is to guide and facilitate the urbanisation of Lot 50 Cockram Street and Lot 119 Sparkman Road, Mundijong. This LSP has been prepared in accordance with:

- section 5.18.2 of the Shire of Serpentine Jarrahdale's Town Planning Scheme No. 2; and
- the Western Australian Planning Commission's newly released 'Structure Plan Preparation Guidelines' (August 2012)

This LSP proposes the development of the land for predominantly residential purposes generally to a density of between R10 to R40. The LSP provides for a primary school as designated in the Mundijong Whitby DSP.

1.1.1 LOCATION

The subject land is Lot 50 Cockram Street and Lot 119 Sparkman Road, Mundijong.

The subject land is located within the Perth Metropolitan South East corridor, within the municipality of the Shire of Serpentine Jarrahdale (the Shire). The land is situated approximately one kilometre west of the Mundijong townsite and 40 kilometres south east of the Perth Central Area and is accessible via the South Western Highway, Mundijong Road, and the Kwinana Freeway (refer **Figure 1** – Regional Context Plan). The subject land is bounded by Sparkman Road to the north, Adams Street to the east, Mundijong Road to the south, and the road reserve for the future extension of Tonkin Highway to the west. Refer **Figure 2** – Location Plan.

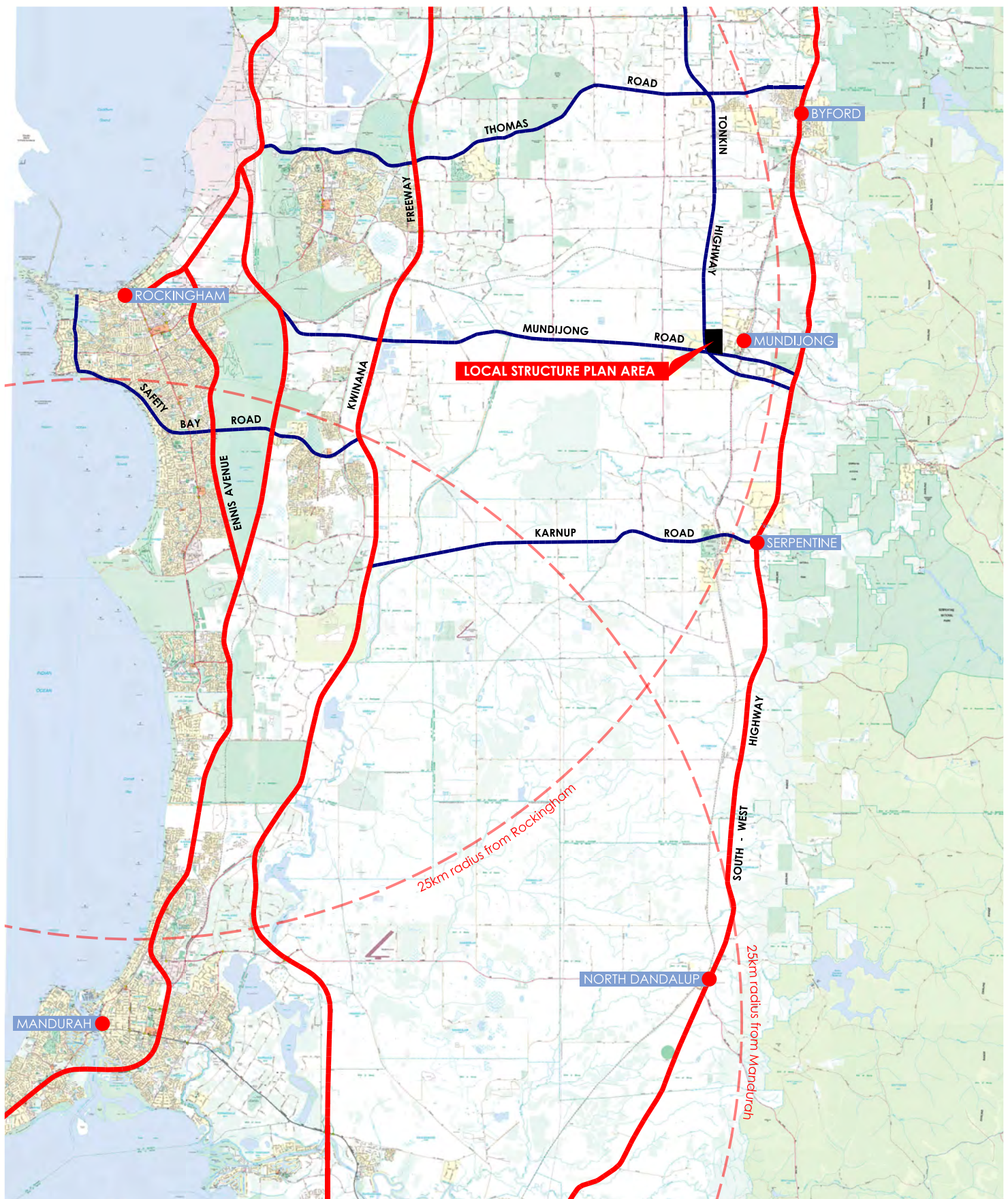
1.1.2 AREA AND LAND USE

The subject land comprises an area of approximately 56.6 hectares. The land is currently used for grazing and similar agricultural activities. There are some existing sheds and a house on Lot 119. The land is mostly cleared, with an existing stand of trees in the north-west of Lot 50 planted by the previous owner. Advice from PGV environmental consultants indicates that these trees are not native to this locality and are therefore not significant and do not require retention. Refer **Figure 3** – Aerial Photograph.

Given the close proximity of the site to the Mundijong townsite and within the Mundijong-Whitby Urban area, the site is strategically placed to accommodate urban development.

1.1.3 LEGAL DESCRIPTION AND OWNERSHIP

The following is the legal title and ownership details for the land of the LSP. Certificates of Title are attached at **Appendix 2**.



LEGEND	
	LOCAL STRUCTURE PLAN AREA
	MAJOR REGIONAL ROADS
	OTHER KEY REGIONAL ROADS

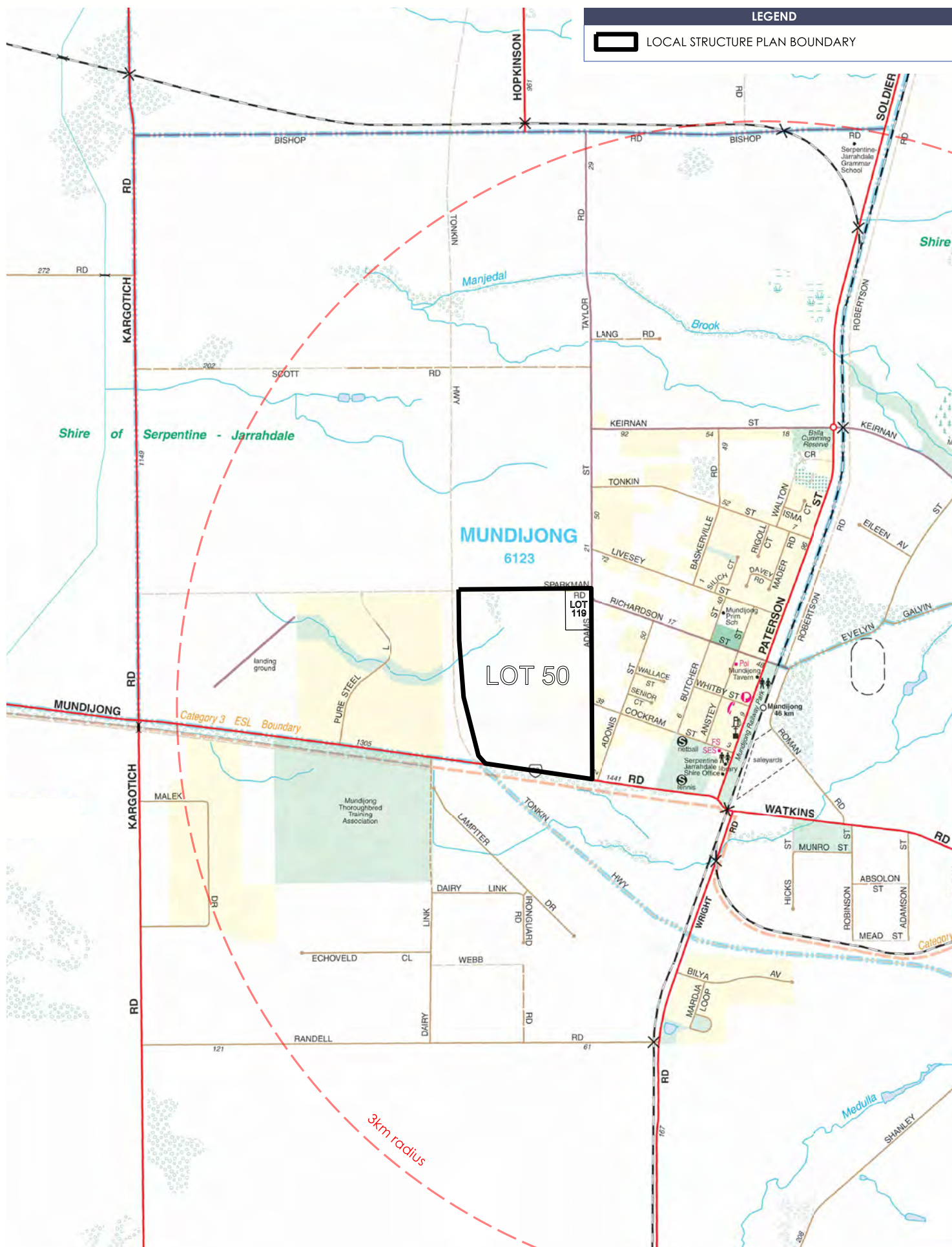
REGIONAL CONTEXT PLAN

Lot 50 Cockram Street &
Lot 119 Adams Street, Mundijong
A Peet Limited Project

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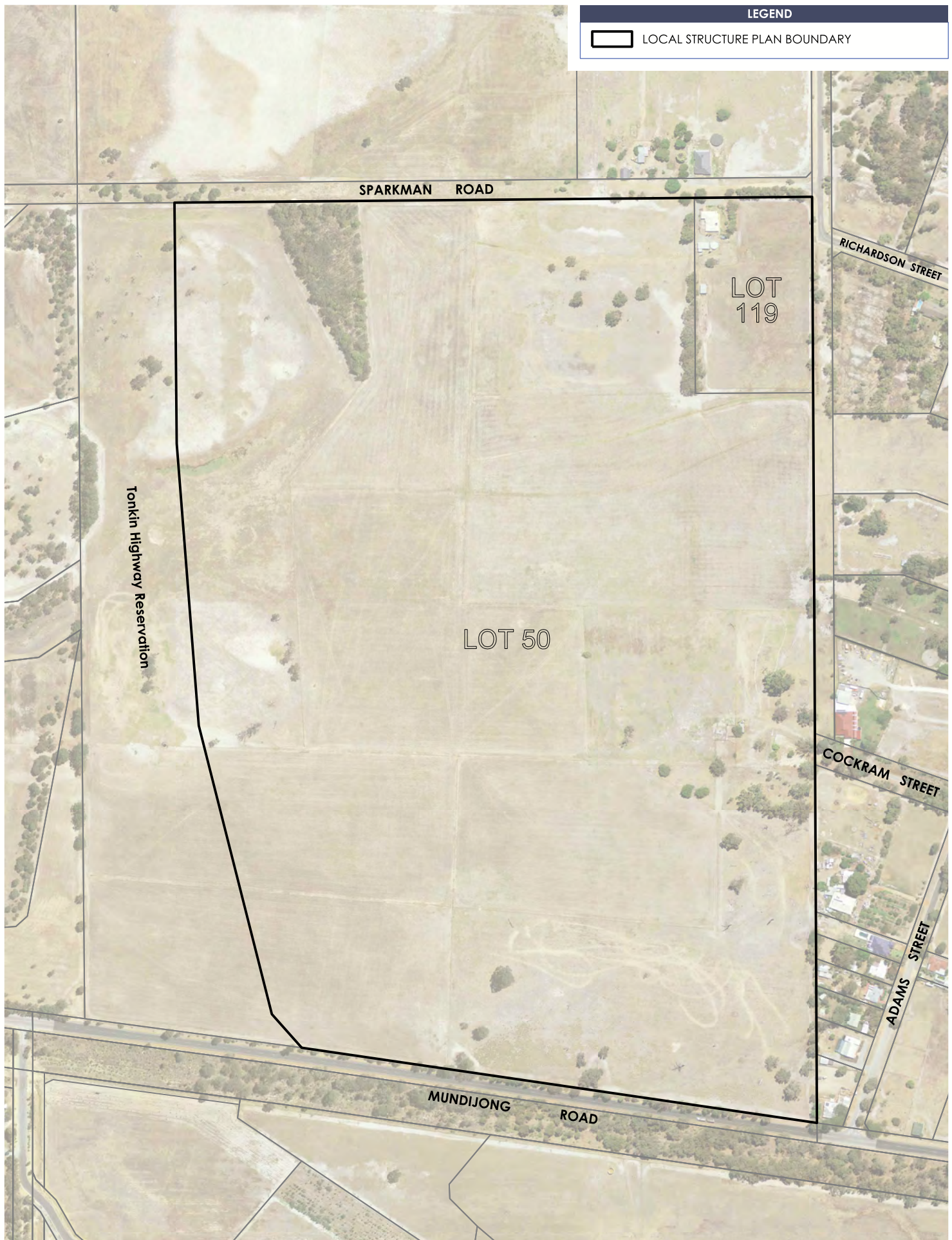


LOCATION PLAN

Lot 50 Cockram Street &
Lot 119 Adams Street, Mundijong
A Peet Limited Project

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LEGEND

LOCAL STRUCTURE PLAN BOUNDARY

AERIAL PHOTOGRAPH

Lot 50 Cockram Street &
 Lot 119 Adams Street, Mundijong

A Peet Limited Project

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TAYLOR BURNELL BARNETT

figure 03

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TABLE 2: LEGAL DESCRIPTION

Lot Address	Land Owner	Volume	Folio	Diagram/Plan	Area
Lot 50 Cockram Street, Mundijong	Peet No 88 Pty Ltd	2752	408	67194	54.2113 ha
Lot 119 Sparkman Road, Mundijong	Ramsay MacDonald Lightbody	723	99	226156	2.4283 ha

1.2 PLANNING FRAMEWORK

1.2.1 ZONING AND RESERVATIONS

METROPOLITAN REGION SCHEME

The subject land is zoned 'Urban' under the Metropolitan Region Scheme (MRS). The land to the north, east and southeast of the site is also zoned Urban. Abutting the site to the west is a 'Primary Regional Roads' reservation for the future Tonkin Highway extension. Refer **Figure 4 – Metropolitan Region Scheme Zoning**.

SHIRE OF SERPENTINE JARRAHDAL TOWN PLANNING SCHEME NO 2

The land is zoned 'Urban Development' under the Shire of Serpentine Jarrahdale Town Planning Scheme No. 2 (TPS 2); refer **Figure 5 – Shire of Serpentine-Jarrahdale Town Planning Scheme No. 2 Zoning**. It is located within Development Area 1 – Mundijong (DA 1), and development must adhere to the DA 1 Provisions within the Scheme Text. As stated in the Scheme, the purpose of the Urban Development zone is:

"to provide for the orderly planning of large areas of land in a locally integrated manner and within a regional context, whilst retaining flexibility to review planning with changing circumstances."

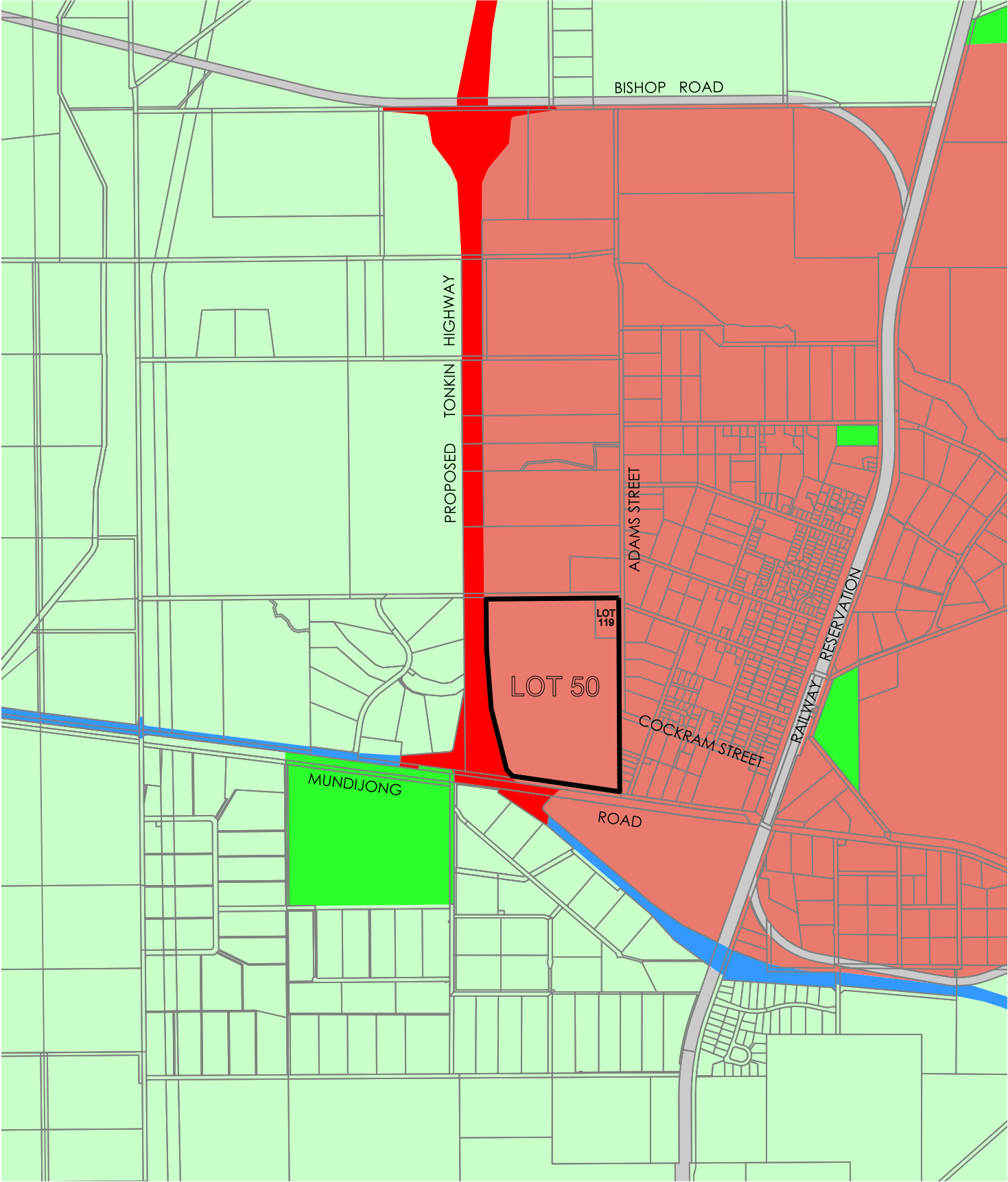
TPS 2 requires any Local Structure Plans over DA1 to be consistent with the provisions of the District Structure Plan. This LSP proposes to designate land for residential use with accompanying public open space, a primary school and roads consistent with the purpose and intent of the 'Development' zone, as well as the Mundijong-Whitby District Structure Plan.


1.2.2 REGIONAL AND SUB-REGIONAL STRUCTURE PLAN

In August 2011 the Shire adopted the Mundijong-Whitby District Structure Plan (DSP) (refer **Figure 6 – Mundijong-Whitby District Structure Plan**). This document aims to provide guidance to the structure, vision and objectives identified for the planning and development of the Mundijong-Whitby area, as well as guiding the preparation of more detailed Local Structure Plans.

There are a number of district level issues dealt with by the DSP, including:

- Biodiversity;
- Landscape Protection;
- Water Resources;
- Urban Form;



LEGEND		
RESERVED LANDS		
	PARKS AND RECREATION	
	RAILWAY	
ROADS		
	PRIMARY REGIONAL ROAD	
	OTHER REGIONAL ROAD	
ZONES		
	URBAN	
	RURAL	
	LOCAL STRUCTURE PLAN BOUNDARY	

METROPOLITAN REGION SCHEME ZONING

Lot 50 Cockram Street &
Lot 119 Adams Street, Mundijong

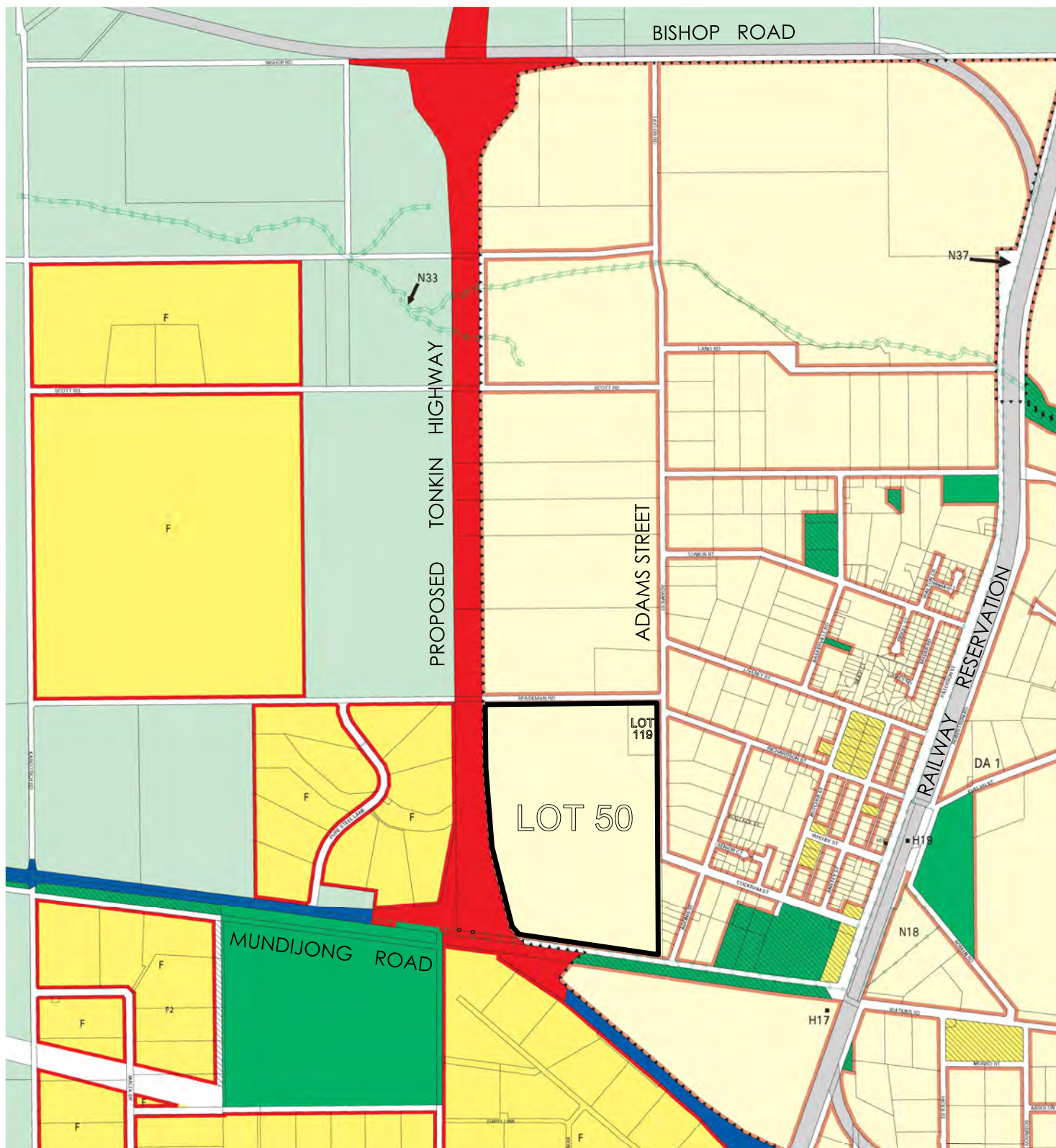
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LEGEND

METROPOLITAN REGION SCHEME RESERVES

- PARKS AND RECREATION
- RAILWAY
- PRIMARY REGIONAL ROAD
- OTHER REGIONAL ROAD

LOCAL SCHEME RESERVES

- DRAINAGE PURPOSES
- LOCAL ROAD
- PUBLIC OPEN SPACE

ZONES

- URBAN DEVELOPMENT
- CONSERVATION
- FARMLET
- RURAL

OTHER

- DEVELOPMENT AREA
(SEE SCHEME TEXT)
- AREA OF NATURAL BEAUTY
(SEE SCHEME TEXT)

LEGEND

- LOCAL STRUCTURE PLAN BOUNDARY

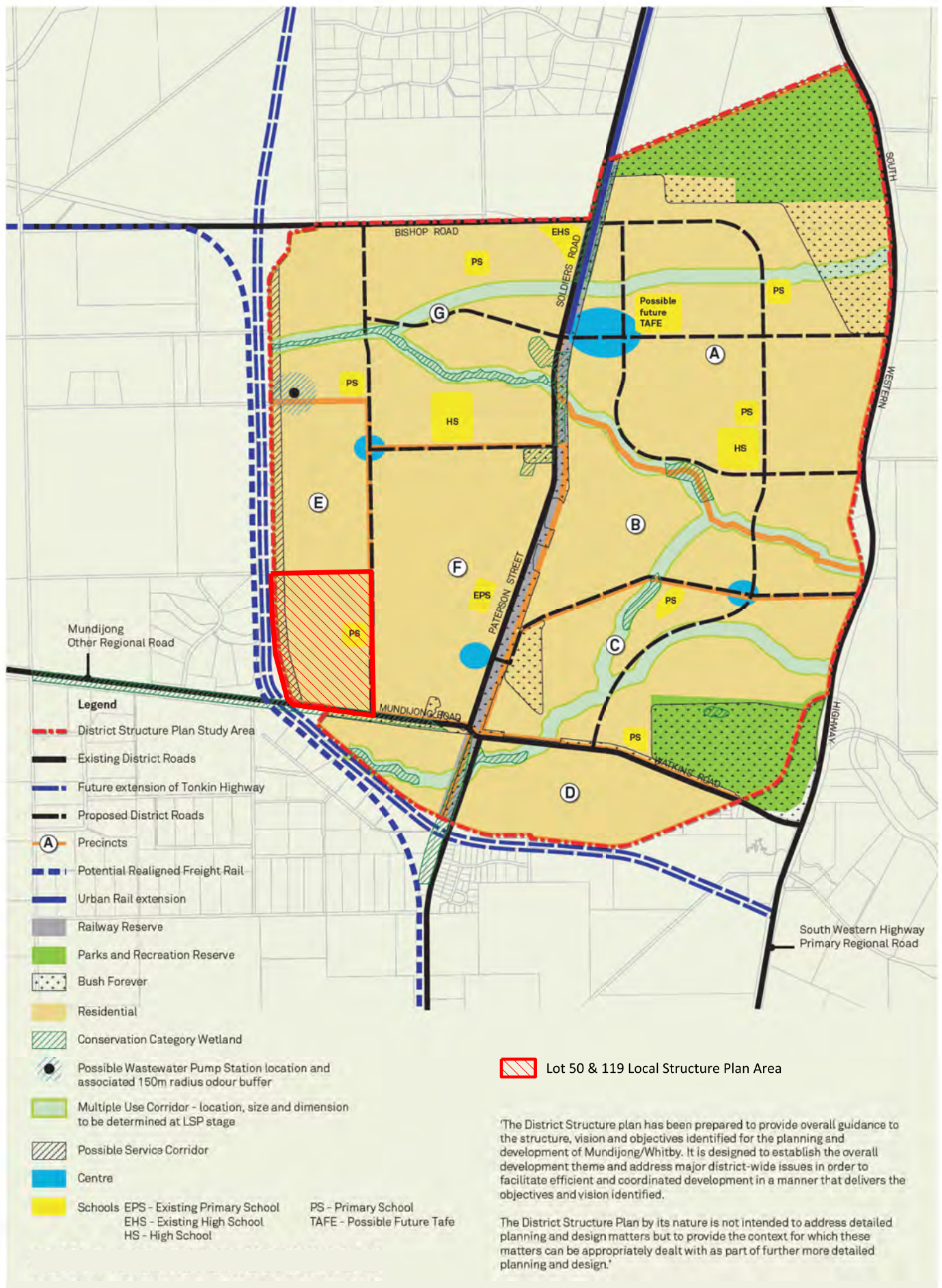
SHIRE OF SERPENTINE-JARRAHDAL TOWN PLANNING SCHEME No.2 ZONING

Lot 50 Cockram Street &
Lot 119 Adams Street, Mundijong
A Peet Limited Project

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MUNDIJONG-WHITBY DISTRICT STRUCTURE PLAN

Lot 50 Cockram Street &
Lot 119 Adams Street, Mundijong

A Peet Limited Project

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- Movement Networks;
- Climate-responsive Design and Energy;
- Economic Prosperity; and
- Community Wellbeing.

Local Structure Plans are to be prepared in accordance with the precincts defined in the DSP. As stated in the Shire's Local Planning Policy No 29 – Mundijong-Whitby Planning Framework (LPP 29), local structure plans prepared for any area geographically smaller than the sub-precincts defined in the DSP will not be supported by Council unless specifically resolved otherwise.

The DSP originally comprised seven precincts selected based on various criteria intended to enable efficient and coordinated development to be progressed. Following the adoption of the Shire's LPP 29, a proposal to modify the DSP precinct boundaries was submitted to the Shire to separate Precinct E (within which the subject site is located) and Precinct G into two sub-precincts each based on land ownership, existing roads and land use for the purposes of LSP preparation. At the Shire's Ordinary Council Meeting on 27 August 2012, Council adopted the updated LPP 29, incorporating the new sub-precincts, thus allowing for the preparation of a structure plan over only Precinct E2, being the subject land.

Clause 7.5 of the Mundijong-Whitby DSP considers 11 matters to be addressed within a Local Structure Plan for Precinct E. **Table 4** demonstrates how the LSP addresses these statutory requirements.

TABLE 4: LSP COMPLIANCE WITH STATUTORY REQUIREMENTS FOR PRECINCT E OF THE MUNDIJONG-WHITBY DSP

Matters to be addressed in LSP	LSP section/comment
Matters outlined in the Shire of Serpentine-Jarrahdale Town Planning Scheme Number 2, Clause 5.18.2.4.	The LSP has been prepared in accordance with Clause 5.18.2.4 of the Scheme (Details to be included in a Structure Plan).
Matters outlined in the Shire of Serpentine-Jarrahdale Town Planning Scheme Number 2, Schedule 15.	The LSP area is contained within DA1 and is prepared in accordance with the relevant provisions listed in Schedule 15 of the Scheme.
Matters outlined in the Shire of Serpentine-Jarrahdale Local Planning Policy No. 29 (LPP 29 Mundijong-Whitby Planning Framework).	Detailed in section 1.2.2 of the LSP report continued below.
The identification of two sites for the purposes of public primary schools generally in the location indicated in the DSP. The final location of the primary school sites within a LSP shall be determined in accordance with Liveable Neighbourhoods Element 8.	Precinct E2 of the DSP contains one of the two public primary schools required for the entire Precinct E. Its location as depicted on Plan 1 on the eastern boundary of the precinct is in accordance with the location identified in the DSP.
POS shall be provided in accordance with clause 6.3 of the DSP and relevant policy.	POS is provided in accordance with clause 6.3 of the DSP and relevant policy including Element 4 of Liveable Neighbourhoods.
LSPs should establish objectives for built form and any design guidelines that are required to be established, typically as Local Planning Policies or Centre Plans that are required prior to applications for subdivision and/or subdivision. These should be cognisant of sections 8.8 and 8.9 of the Enquire by Design Report and should reflect the structure described in Explanatory Part 2, chapter 6, clause 6.2.2 (5) of the Mundijong-Whitby DSP.	Section 6.2 of Part 1 includes Residential Design Codes variations intended to guide the acceptable built form outcome.

Matters to be addressed in LSP	LSP section/comment
Landscape design guidelines shall be provided as part of any LSP. These shall address matters to be adopted to implement both public and private landscaping that reflects the historic landscape character of Mundijong/Whitby and should reflect the structure described in Explanatory Part 2, chapter 6, clause 6.2.2 (5) of the Mundijong-Whitby DSP.	Section 3.4 of the LSP details landscaping design guidelines for the structure plan area.
LSPs should confirm the extent of the proposed service corridor to the east of Tonkin Highway and pump station site. The pump station site will need to be set aside for future acquisition by WaterCorp.	Plan 1 identifies the proposed service corridor at 60m wide.
Noise mitigation measures are required under appropriate policy requirements including SPP 5.4 are to be addressed at LSP stage.	Detailed in section 2.6.1.
The LSPs are to acknowledge and allow for appropriate interface to Bush Forever sites.	The southern entrance road is located within Bush Forever Site No. 360 (Mundijong and Watkins Roads Bushland, Mundijong/Peel Estate). The road is located through an area of Completely Degraded vegetation.
Such other information as may reasonably be required by the Council or the WAPC.	The LSP has been prepared and information has been provided in accordance with the WAPC Structure Plan Guidelines. Any additional information as may reasonably be required by the Council or WAPC may be provided at request.

1.2.3 SURROUNDING LOCAL STRUCTURE PLANNING

Local Structure Plans for adjoining land to the north and further to the east of the subject land have provided further context for the LSP design.

The Local Structure Plans for nearby land respect the development framework established in the DSP. The Whitby Local Structure Plan for land north-east of the subject land and east of the railway line was adopted by the Shire at the Ordinary Council Meeting held on 9 July 2012. Refer **Figure 7** – Whitby Structure Plan.

The Shire has recently considered a proposed local structure plan for the adjoining land to the north owned by Qube and Investa JV. Refer **Figure 8** – Proposed Mundijong Structure Plan. The proposed Mundijong Structure Plan of the subject land shows one neighbourhood connector road extending south towards Lot 50, as well as two other local access streets. The current proposed LSP shows neighbourhood connector road continuing through the subject site, bringing traffic from the northern site through to the primary school to be located within the subject site.

The Shire of Serpentine Jarrahdale has recently released a draft District Structure Plan for the West Mundijong Industrial Area located to the west of the subject land on the opposite side of Tonkin Highway. The West Mundijong Industrial Area is bounded by Mundijong Road to the south, Tonkin Highway Road reserve to the east, Railway Reserve (freight rail) to the north and Kargotich Road to the west. The draft District Structure Plan proposes predominantly light industrial land use along the Tonkin Highway.

Community Design Principles

- The LSP is intended as a guide for future urban development with the objective of generally identifying appropriate locations for housing types and densities whilst permitting flexibility to ensure the delivery of a diverse range of lot sizes.
- The neighbourhood structure should be sufficiently robust to facilitate diversity of land use (mix use development) which is flexible and adaptable to change.

Activity Centre Principles

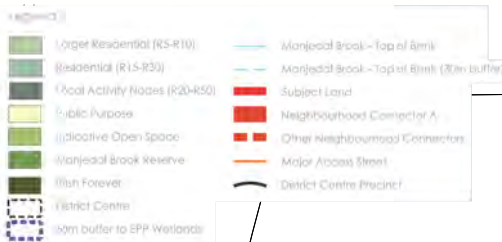
- The District Centre precinct is the identified activity centre and is envisaged to be a highly functional mixed use precinct comprising transit facilities, district and local retailing, mixed use development (including residential) within a high quality public domain.
- The District Centre will be subject to the preparation of a Activity Centres Structure Plan to determine design content including allocation of uses, final design layout, community and civic uses, retail floor space, transit provision, parking and general development standards, in accordance with WAPC policy.
- The District Centre precinct offers the opportunity for development in accordance with main street principles.
- The District Centre precinct is reliant on the adjacent rail crossing as depicted in the DSP and LSP, and is subject to change in commercial floor space area should this not be provided.
- Local activity nodes are identified on the LSP where mixed use development comprising residential, retail and/or civic uses will be permitted, subject to the preparation and approval of a Detailed Area Plan.

Housing Diversity (Lot Layout) Principles

Final residential densities will be determined at subdivision application stage; however will generally comply with the lot sizes and densities as identified on the LSP.

- Larger Residential Lots (indicative density: R5-R10) 1000m² - 2500m²
- Residential Lots (indicative density: R15-R30) 250m² - 700m²
- Local Activity Node Lots (indicative density: R20-R50) 150m² - 500m²

Residential Density Plans (RDP) are to be prepared, allocating density codes for individual lots subject of a subdivision application. Approved subdivision applications which identify residential coding generally consistent with the principles outlined in the LSP shall be deemed to be an approved modification to the LSP.



source | Roberts Day Group

WHITBY LOCAL STRUCTURE PLAN

Lot 50 Cockram Street &
Lot 119 Adams Street, Mundijong

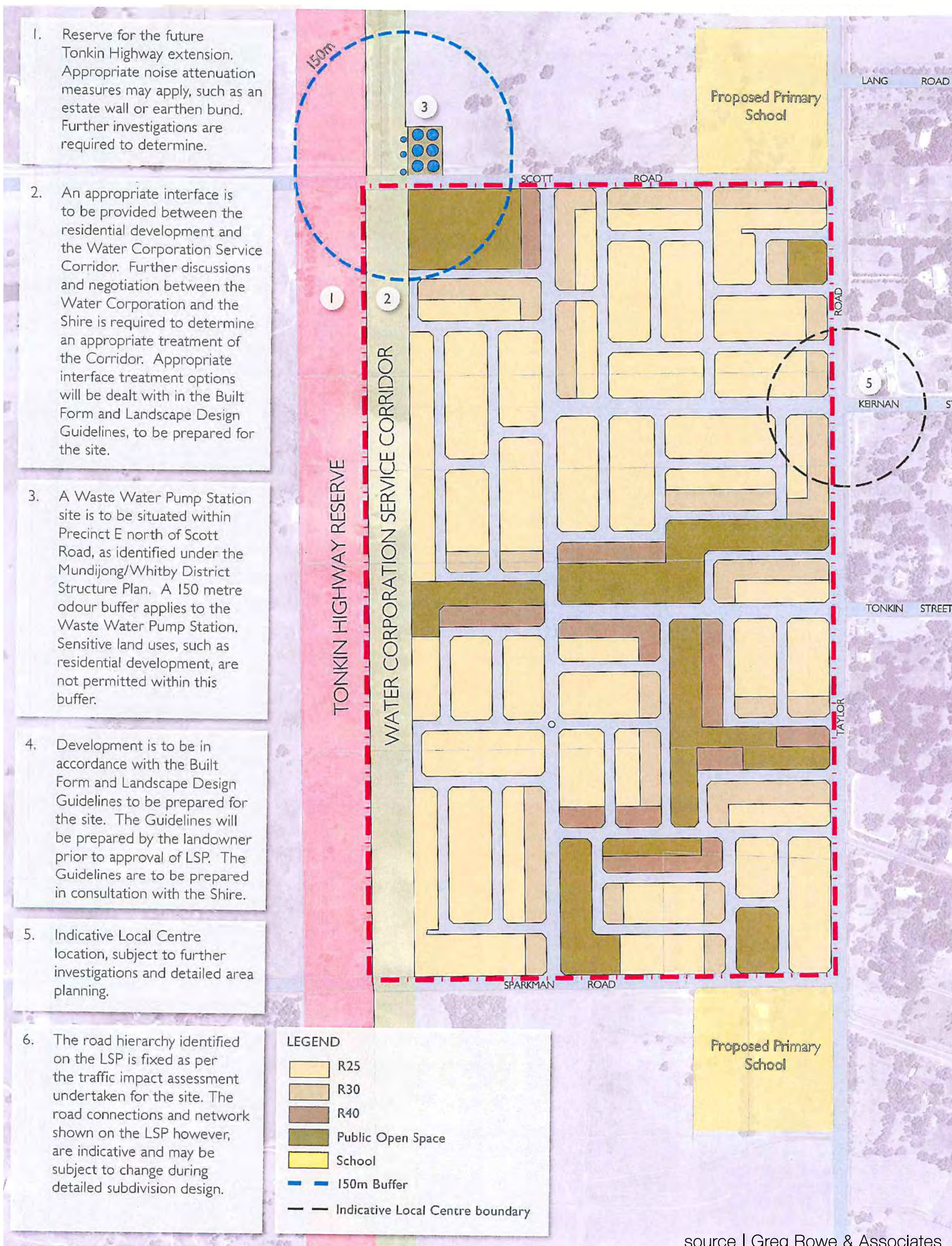
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source | Greg Rowe & Associates

PROPOSED MUNDIJONG LOCAL STRUCTURE PLAN

Lot 50 Cockram Street &
Lot 119 Adams Street, Mundijong

A Peet Limited Project

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1.3 PLANNING STRATEGIES

1.3.1 DIRECTIONS 2031 AND BEYOND

Directions 2031 and Beyond is Western Australia's high level spatial framework and strategic plan. The document provides a vision for future growth of the metropolitan Perth and Peel region. The aim of the plan is to achieve a connected city pattern of growth by promoting a better balance between greenfields and infill development. Infill and consolidation is promoted in existing 'Urban' zoned land, and the plan sets a density target of 15 dwellings per gross 'Urban' zoned hectare of land in new development areas and encourages more intensive development closer to Activity Centres.

The subject land is located within the Directions 2031 south-east sub-region. It is identified by Directions 2031 that 35,000 additional dwellings are required in the south-east sub-region in order to accommodate the projected population of 228,000 in this region by 2031. This growth is to be achieved through a combination of infill and greenfields development. The residential development proposed within the LSP will contribute to reaching the dwelling target for the wider south-east sub-region.

1.3.2 OUTER METROPOLITAN PERTH AND PEEL SUB-REGIONAL STRATEGY

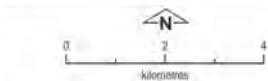
The subject land is included in the draft Outer Metropolitan Perth and Peel Sub-Regional Strategy (OMPPSRS). Located in the south-east sub-region, the sub-regional strategy has been prepared to assist State and local government authorities in delivering the objectives of Directions 2031. The document will also aid in linking State and local government strategic planning to guide the preparation and review of structure plans and local planning strategies. The OMPPSRS classifies the subject land 'Urban Zone Undeveloped'.

Potential dwelling yields provided in this document have been calculated using a range between the 'business as usual' scenario of achieving 10 dwellings per gross urban zoned hectare, and the 'connected city' scenario of achieving 15 dwellings per gross urban hectare in greenfields development. Using this method an estimated dwelling yield of 62,400 under the 'business as usual' scenario, and 86,700 under the 'connected city' scenario have been calculated for the south-east sub-region.

The planned urban growth areas listed in the OMPPSRS have been identified in Byford, Southern River/Forrestdale, Mundijong and the Armadale Redevelopment Authority Area (refer **Figure 9** – Outer Metropolitan Perth and Peel Sub-Regional Strategy). In relation to Mundijong, the OMPPSRS states the following:

"The town of Mundijong is experiencing significant development pressure. Structure planning for the area is underway and has identified capacity to accommodate 30,000 residents over the long term. It is expected that development in Mundijong will follow Byford and is therefore, considered a medium and long term growth opportunity for beyond 2031."

Additional to this, development of the Mundijong Urban Village is underway, facilitated through the District Structure Plan and subsequent local structure planning.



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Mapping & GeoSpatial Data Branch
Department of Planning, WA
On behalf of:
Western Australian Planning Commission
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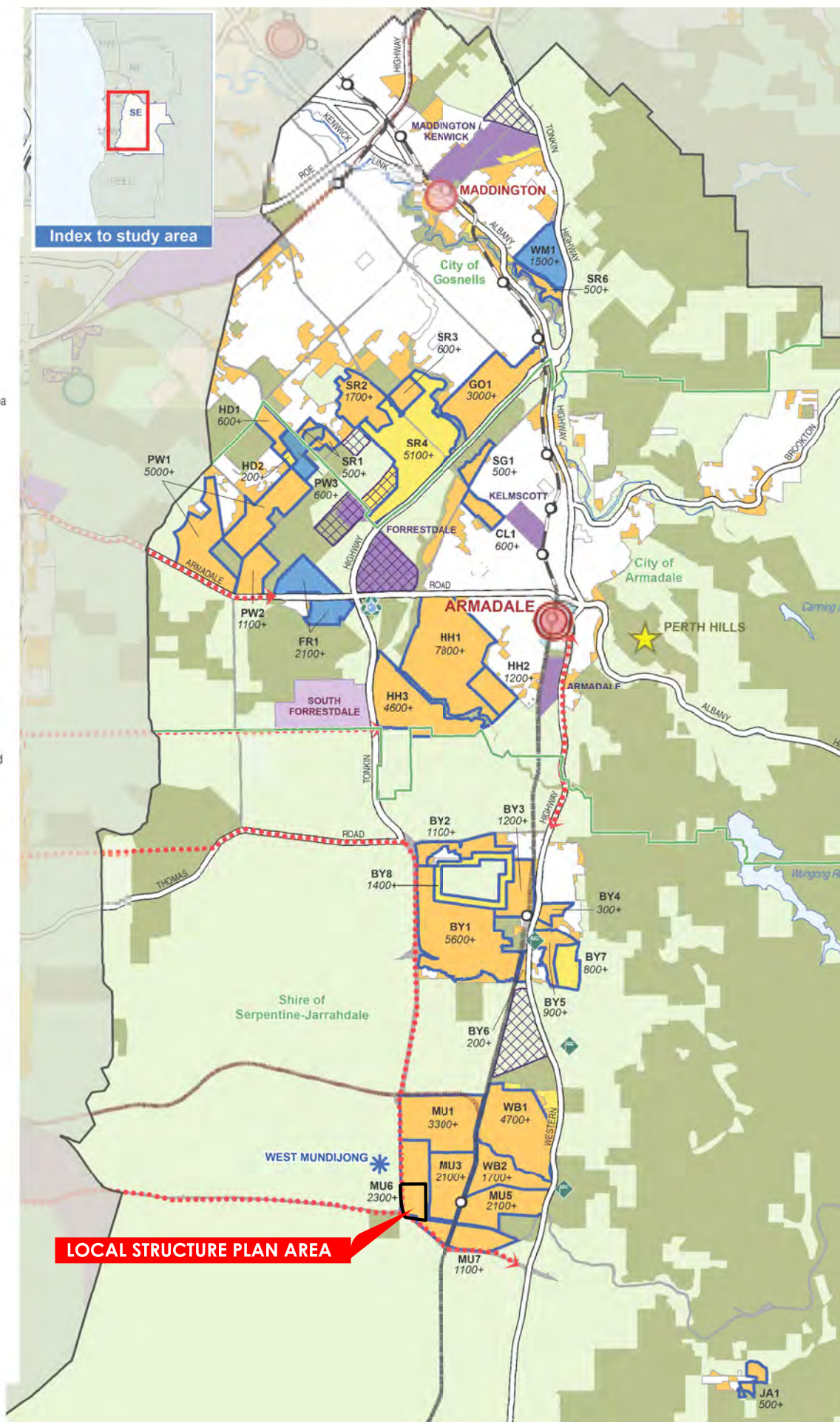
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Fig47_SouthEastSubRegionSpatialFrameworkMap.mxd

Base information supplied by:
Western Australian Land Information Authority
LI 430-2009-4
Railways supplied by:
Geopoint Solutions Pty Ltd

Note:
Map is based on Region Scheme zones and
does not include redevelopment authority areas

Legend

- existing industrial centre
- priority industrial site - subject to investigation
- 2009 draft industrial land strategy area
- existing developed area
- central city area
- road or rail reservation
- region scheme reserves
- rural
- waterways
- urban expansion area 2011-2015
- urban zoned undeveloped
- urban deferred zoned undeveloped
- area identifier
- connected city scenario dwelling yield
- strategic metropolitan centre
- secondary centre
- specialised centre
- metropolitan attractor
- planned intermodal freight terminal
- major water storage / reservoir
- proposed water recycling plant
- existing passenger railway station
- existing metropolitan railway
- existing freight railway
- existing regional railway
- major roads
- road upgrading (MRWA)
- strategic road planning
- local government boundary
- sub-region boundary



OUTER METROPOLITAN PERTH AND PEEL SUB REGIONAL STRATEGY

Lot 50 Cockram Street &
Lot 119 Adams Street, Mundijong
A Peet Limited Project

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1.4 POLICIES

1.4.1 SPP 5.4 ROAD AND RAIL TRANSPORT NOISE AND FREIGHT CONSIDERATIONS IN LAND USE PLANNING

The land to the west of the subject site is reserved under the MRS for the future extension of Tonkin Highway. SPP 5.4 – Road and Rail Transport Noise and Freight Considerations in Land Use will require consideration in context with the proposed development abutting the reserve. The Policy addresses transport noise from major transport corridors, including primary freight routes, and its impact on nearby noise-sensitive land uses, such as residential.

SPP 5.4 identifies Mundijong Road as a Primary Freight route, however it is anticipated that the future Tonkin Highway connection to South West Highway will carry the majority of freight traffic, thus lessening the noise impact resultant from traffic travelling along Mundijong Road. Currently the Tonkin Highway only extends as far south as Thomas Road in Byford.

It is also expected that noise will be somewhat mitigated by the proposed 60 metre wide service corridor (Water Corporation) on the western boundary of the subject land which will provide a buffer for noise and vibrations occurring from the traffic expected on Tonkin Highway. An acoustic assessment will be undertaken by the proponent or others if required as part of the future planning process for subdivision.

1.4.2 STATE PLANNING POLICY 3.6 - DEVELOPMENT CONTRIBUTIONS FOR INFRASTRUCTURE

Development contributions for the provision of public infrastructure and facilities within the site will be as per SPP 3.6, which sets out the principles and considerations that apply to development contributions for the provision of infrastructure in new and established urban areas.

PROPOSED SCHEME AMENDMENT 167 – REVISED SCHEME PROVISIONS FOR DEVELOPMENT CONTRIBUTION PLANS

The Shire's proposed Amendment 167 – Revised Scheme Provisions for Development Contribution Plans intends to update the Scheme to include new provisions based on the model provisions contained within SPP 3.6. The Scheme applies to developer contributions for the standard infrastructure items set out in Appendix 1 of SPP 3.6. Development Contribution Plans are to be prepared in accordance with the provisions of SPP 3.6 and the provisions of clause 10 of the Scheme, and are to be prepared for each development contribution area.

The following items are examples of infrastructure that may be included in the DCP:

- Adams Street upgrade
- Mundijong Road upgrade
- The extension of trunk services that will service the wider DSP area (e.g. HV power, wastewater pump stations and pressure mains, water mains, gas and telecommunications infrastructure), where these are not funded by the service provider's capital works budget
- District-scale post-development water quality monitoring
- Any infrastructure and associated land that is identified in accordance with SPP 3.6

The above list is not exhaustive and items to be included within any DCP will be subject to a separate planning, assessment and approvals process. The above shall have no binding effect and is indicative only.

1.4.3 LOCAL PLANNING POLICIES

A collection of Local Planning Policies (LPPs) have been prepared by the Shire of Serpentine Jarrahdale, and many of these have influenced the preparation of this LSP. The following LPPs have been considered and where relevant will be implemented through further detailed design at subdivision and detailed area planning stages:

- LPP 4 Revegetation Policy
- LPP 6 Water Sensitive Design
- LPP 8 Landscape Protection
- LPP 22 Water Sensitive Urban Design
- LPP 24 Designing Out Crime (Draft)
 - A completed Schedule 1 (Designing Out Crime Toolbox) of LPP24 is included at **Appendix 3**.
- LPP 26 Biodiversity Planning
- LPP 27 Stakeholder Engagement in Land Use Planning
- LPP 29 Mundijong-Whitby Planning Framework
- LPP 43 Hazards and Natural Disasters
- LPP 57 Housing Diversity
- LPP 60 Public Open Space
- LPP 61 Local Structure Plan
- LPP 62 Urban Water Management (Draft)
- LPP 63 Integrated Transport and Land Use Planning (Draft)
- LPP 68 Sustainability Assessment

2 SITE CONDITIONS AND ENVIRONMENT

2.1 BIODIVERSITY AND NATURAL AREA ASSETS

The site contains limited environmental assets due to the historical clearing for agricultural purposes and the current use of pasture crops and grazing. All native vegetation has been cleared from the site with the exception of isolated trees over pasture. The isolated native trees provide environmental value and vision amenity to the otherwise flat landscape. The isolated exotic tree species have limited environmental value but do provide some visual amenity.

The soils and groundwater characteristics within the site pose some limitations however these limitations can be mitigated and/or managed and are not considered being serious constraints to the future development of the site.

- Drainage and stormwater management will be required to control run-off from roads, car parking areas, roofs of buildings and lawn/landscape areas.
- The Bassendean soil units B2 and B6 have a high occurrence of phosphorous export (70% and 90% respectively) and the Pinjarra P1b has a low risk of occurrence (5%).
- The Bassendean Dune System is subject to a high risk (35% occurrence) of wind erosion, due to lack of structure of the deep, grey, non-vegetated sands which provide little resistance to wind when stripped of vegetation. In comparison, the Pinjarra land unit has a low risk (5% occurrence) wind erosion.

2.1.1 VEGETATION AND FLORA

A Level 2 Flora and Vegetation survey was conducted by PGV Environmental across the site in October 2011 and findings are detailed in the PGV Environmental Report (see **Appendix 4**).

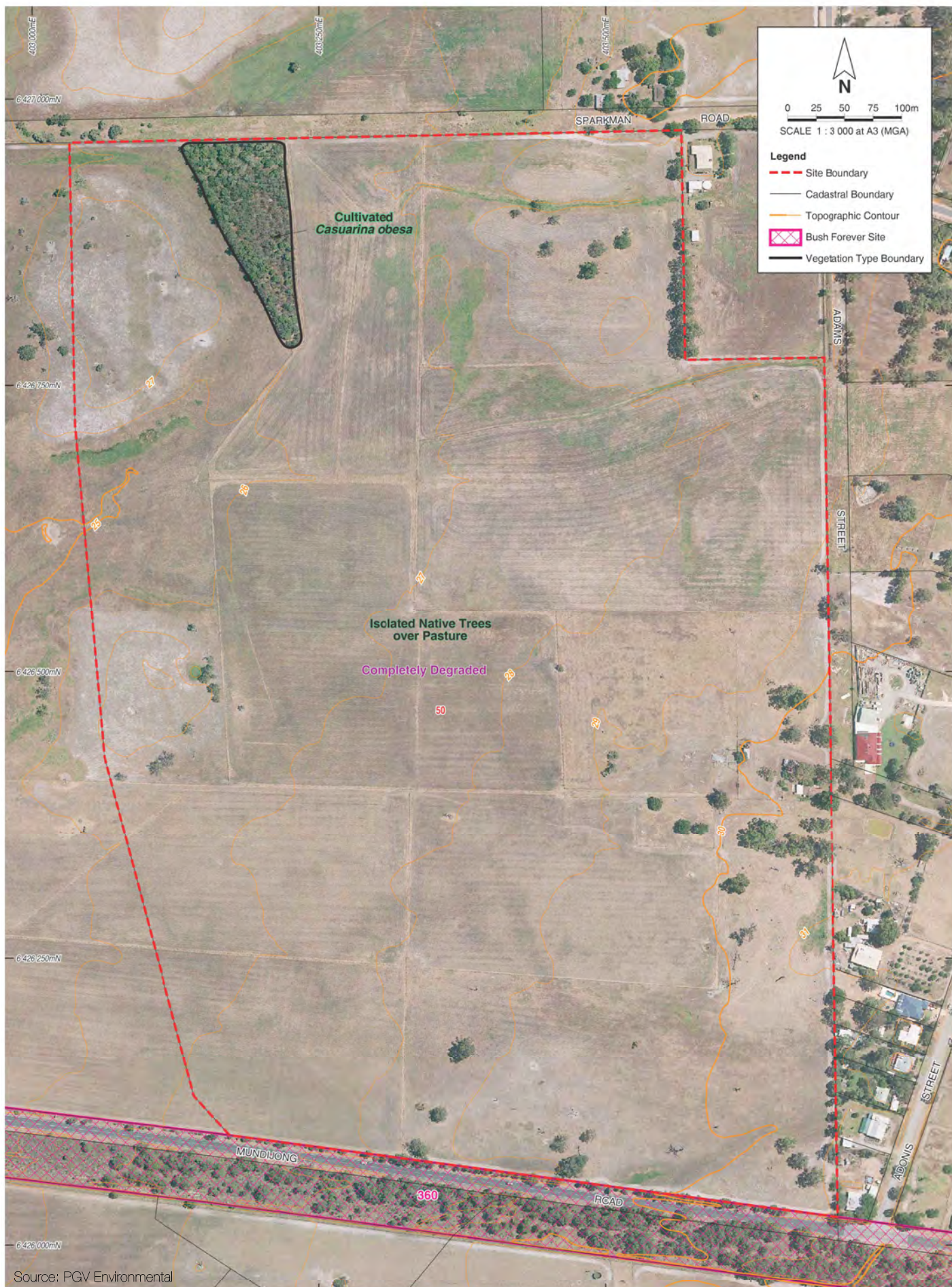
The site has been historically cleared for agricultural uses and is in a Completely Degraded condition. The site does not contain any remnant intact vegetation, significant flora species, Threatened Ecological Communities or Priority Ecological Communities (refer **Figure 10 – Vegetation Types and Condition**).

There are some mature native trees across the site of the following species that have some environmental value:

- *Corymbia calophylla* (Marri);
- *Kingia australis*; and
- *Eucalyptus rudis* (Flooded Gum).

The location of these trees is identified by a red cross in **Figure 10 - Vegetation Types and Condition**.

The majority of the site is covered by annual pasture and weed species. There are a number of cultivated Eucalyptus species including *Eucalyptus camaldulensis* (River Red Gum) and *Eucalyptus sideroxylon* (Ironbark) located around the boundary of the site. A small stand of *Casuarina obesa* with limited environmental value has been planted in the northern part of the site.



VEGETATION TYPES AND CONDITION

Lot 50 Cockram Street &
Lot 119 Adams Street, Mundijong
A Peet Limited Project

0m 50 100m

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d: 29 Oct 2012
p: 08/039/029

figure
10

Mature trees to be retained or transplanted will be identified and marked appropriately prior to commencement of any pre-construction activities.

Five mature *Kingia australis* over pasture are located in the northern and southern end of the site. Where possible these will be retained or salvaged and replanted in POS.

No management practises are required for significant flora or TECs/PECs as there were none found on the site.

2.1.2 FAUNA

A Level 1 Fauna survey was conducted by Terrestrial Ecosystems across the site in September 2011 (see Appendix 2 of **Appendix 4**)

Two fauna habitat types were identified on the site of limited environmental value to avifauna:

- Isolated native trees; and
- *Casuarina obesa* stand in the northern part of the site.

The conservation significant species that could potentially be seen on the site are the Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*), Baudin's Black Cockatoo (*Calyptorhynchus baudinii*) and the Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*). The three species of Black Cockatoo may infrequently forage and roost on the isolated mature Marri trees in the paddock. There is no evidence of the Black Cockatoo's nesting on the site.

The isolated trees that should be retained where possible for fauna habitat are identified in yellow on **Figure 10 – Vegetation Types and Condition**.

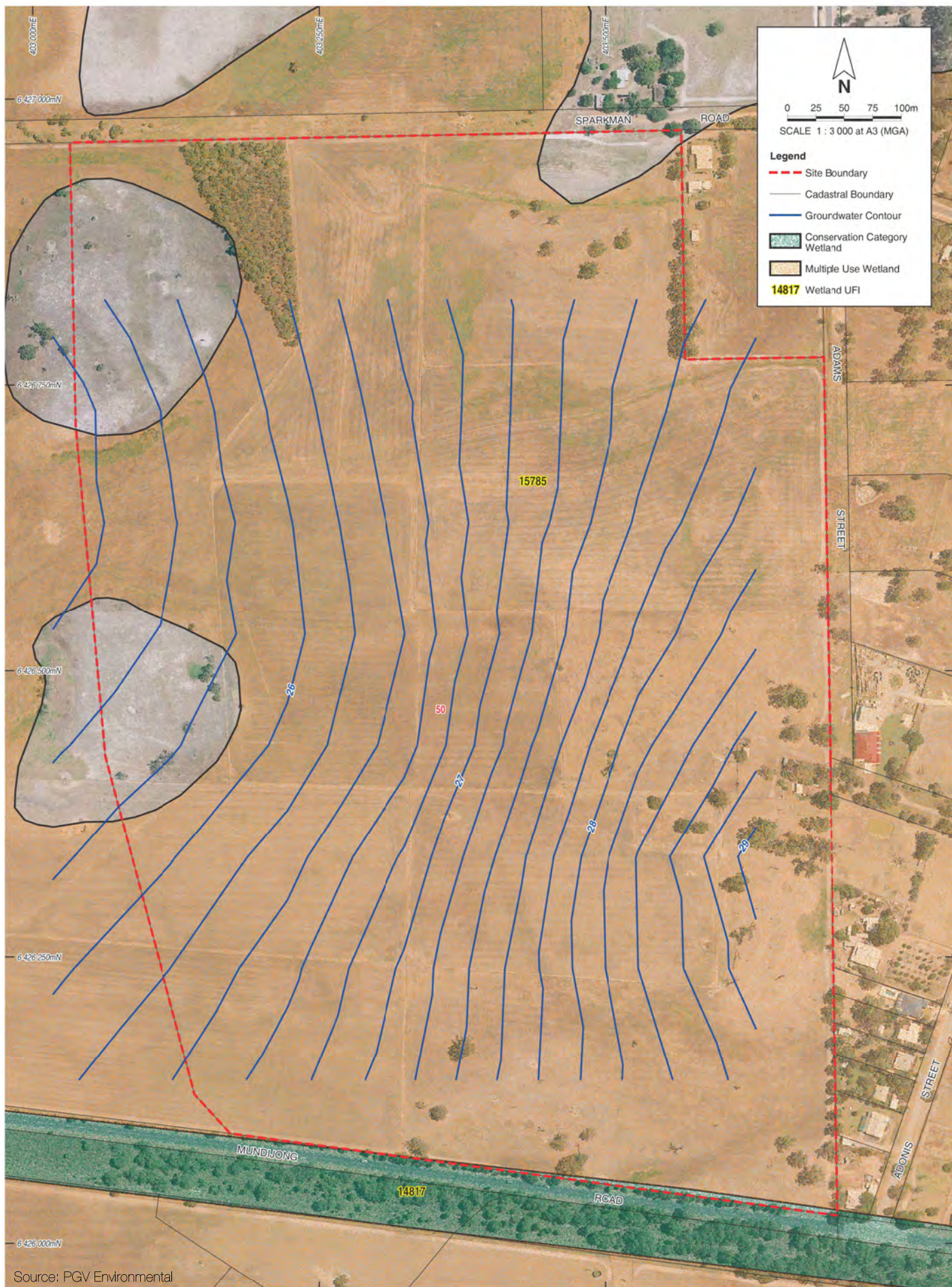
2.1.3 WETLANDS

A significant portion of the site is shown in the DEC *Geomorphic Wetlands of the Swan Coastal Plain* dataset as being a Multiple Use wetland. Multiple Use wetlands are described as having few environmental attributes and have no statutory and limited policy protection. The wetland on the site fits this definition as a cleared paddock (refer **Figure 11 – Hydrology**).

The *Geomorphic Wetlands of the Swan Coastal Plain* dataset shows a Conservation Category wetland in the Mundijong Road reserve. The road reserve north of Mundijong Road adjacent to the site is very narrow and contains scattered trees over a weedy understorey. As such this part of the road reserve does not exhibit any significant wetland values. The vegetation in the road reserve south of Mundijong Road is wider and in better condition and exhibits wetland values representative of a Conservation Category wetland.

2.1.4 STRUCTURE PLAN RESPONSE TO ENVIRONMENTAL ASSETS AND CONSTRAINTS

Within the LSP, the environmental values of the subject site have been considered as a part of the design process through a variety of mechanisms. These include the retention of the environmental values, provision of public open space locations and road alignments to accommodate specific values and/or provide for the protection and management of these values. The most significant spatial considerations within the LSP used to address the different environmental values include:



HYDROLOGY

Lot 50 Cockram Street &
Lot 119 Adams Street, Mundijong
A Peet Limited Project

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d: 29 Oct 2012
p: 08/03/030

figure
11

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- Location of the southern entrance road in Bush Forever No. 360 through an area of Completely Degraded vegetation;
- Location of public open space to accommodate stands of paddock trees wherever possible, to provide post development opportunities for Black Cockatoos to roost and forage and to enhance the view amenity of a largely flat landscape;
- Translocation of mature trees where possible into POS; and
- Provision of larger lots along the western boundary adjacent to the future Tonkin Highway reserve.

Refer **Figure 12** – Environmental Assets.

2.2 LANDFORM AND SOILS

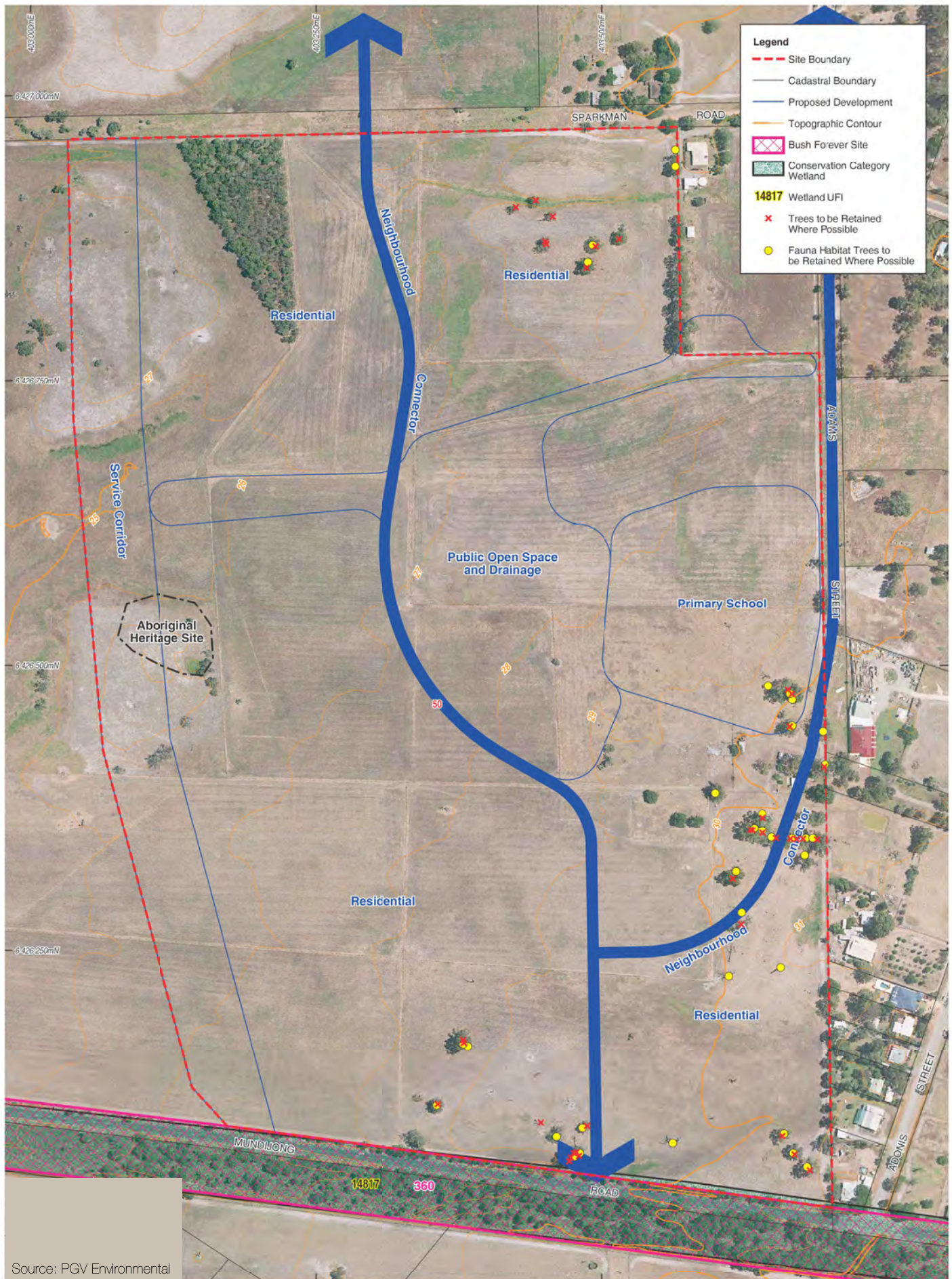
The site is located on the Swan Coastal Plain largely within the Bassendean Dune with the south east corner within the Pinjarra Plain. The site gently slopes from east to west with elevations ranging from approximately 31m AHD to 26m AHD. Refer **Figure 13** – Current Land Use and Topography.

The Bassendean soils within the site are very low relief and range from deep bleach grey sands sometimes with a pale yellow B horizon or a weak iron-organic hardpan at depths greater than 2m have tendency to become waterlogged during the winter months. The Pinjarra Plain soils are low in relief with deep acidic mottled yellow duplex (or “effective duplex”) soils comprising moderately deep pale sand to sandy loam over clay. These soils often become waterlogged during the winter season. Refer **Figure 14** – Geology and Soils.

A preliminary ASS investigation will be undertaken as part of the subdivision planning process to determine if ASS is present within the site.

To minimise potential for soil erosion to occur the following management measures are proposed:

- Ground disturbing activities will be kept to a minimum and carried out ‘as required’ (in stages) immediately prior to lots being released for sale as part of a ‘staged’ development of the site;
- Landscaping/stabilising/dust suppression of areas where ground disturbance has occurred will be scheduled to occur immediately after clearing/and or infrastructure construction has been completed; and
- Clearing activities have the potential to add clay ‘fines’ into the drainage channel creating turbid water downstream (drainage channel) and the installation of temporary drop-out basins to capture and aid in the settling of clay fines will be considered.



ENVIRONMENTAL ASSETS

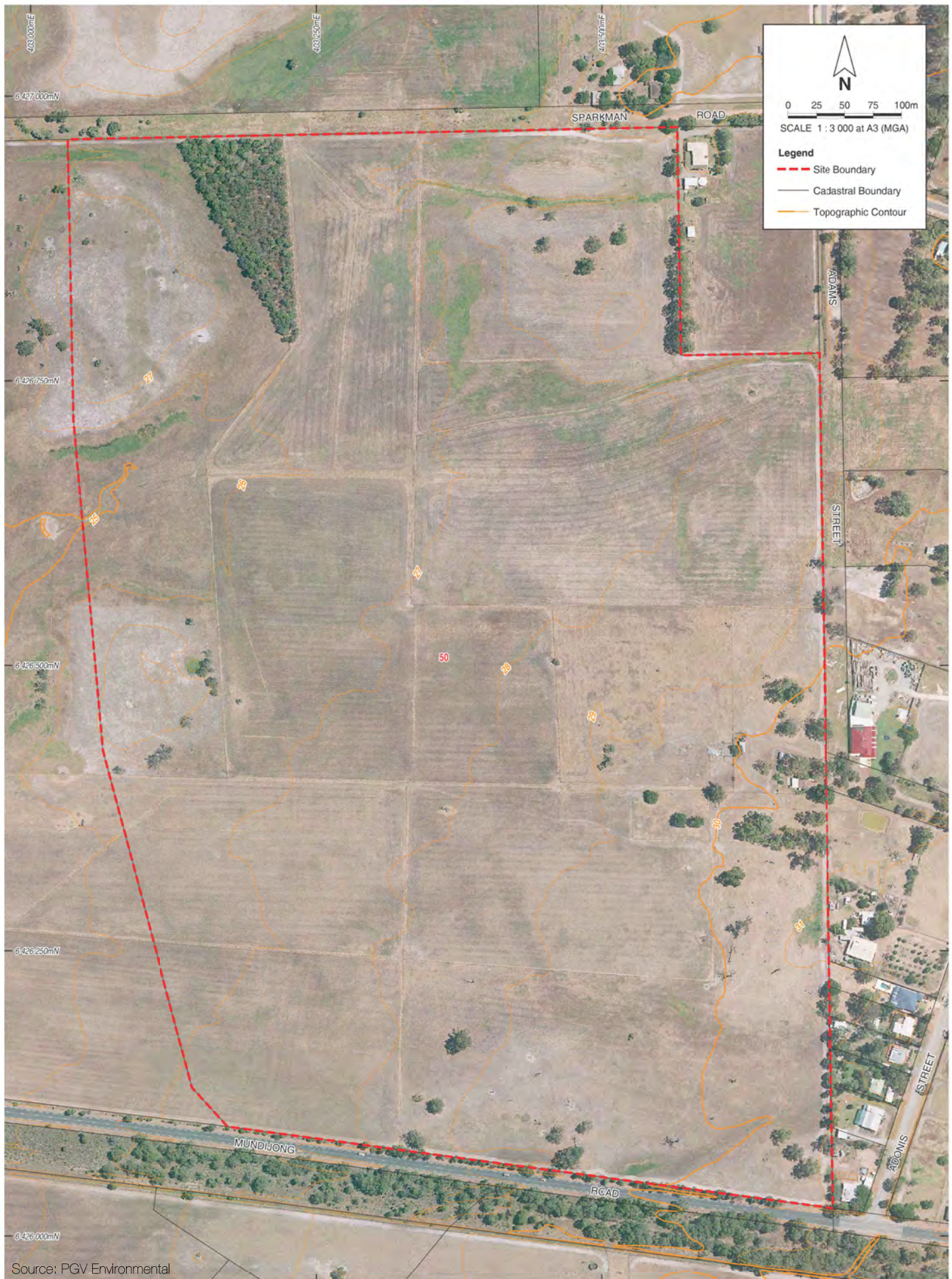
Lot 50 Cockram Street &
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12



CURRENT LAND USE AND TOPOGRAPHY

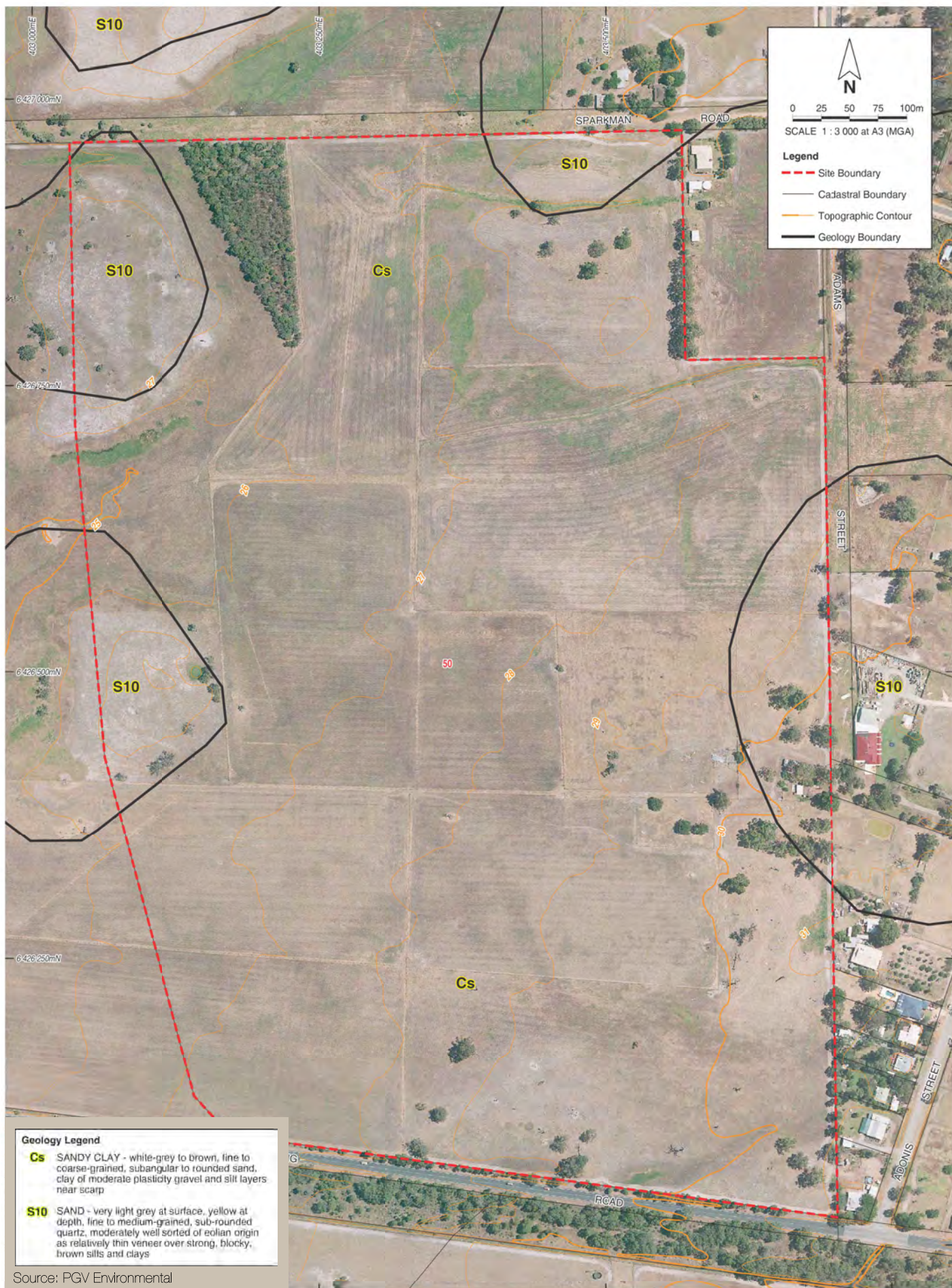
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GEOLOGY AND SOILS

Lot 50 Cockram Street &
Lot 119 Adams Street, Mundijong
A Peet Limited Project

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p: 08/039/033

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14

2.3 GROUNDWATER AND SURFACE WATER

Site-specific groundwater monitoring was carried out by Brown Geotechnical & Environmental and Emerson Stewart between September 2008 and August 2011 to obtain information on pre-development groundwater levels and water quality across the LSP area. The monitoring showed that groundwater levels were at their highest in September 2009, when depth to groundwater ranged from at-surface to 700mm below natural surface. Groundwater across this area tends to perch on the underlying clayey soils, causing large fluctuations of up to 2.5m between high and low groundwater levels. In areas of the site where the depth to the underlying clay materials is low, typical peak groundwater levels are very shallow (within 100mm of existing surface). Parts of the site with greater depth of sand over the underlying clays have a slightly larger natural separation between existing surface and peak groundwater levels (up to 800mm).

Surface runoff from the site is via overland flow from east to west, following the natural topography. There are some very shallow farm drains (approx 0.2 - 0.5m deep) across the site, which direct stormwater runoff towards the western side of the site. The main flow path through the site becomes more pronounced near the site's western border, and the existing waterway discharges to a Water Corporation main drain at Kargotich Road, approximately 1.5km west of the site. The Mundijong-Whitby DWMS (GHD, 2010) identified two flow paths which take runoff from upstream catchments east of Adams Street through the site. The DWMS estimated the combined flow through the Precinct E2 site from upstream catchments to be approximately 12m³/s under pre-development conditions (for the critical 100yr ARI event).

A Local Water Management Strategy (LWMS) has been prepared by Wave International to support the LSP. Groundwater quality will be protected by the use of Water Sensitive Urban Design principles as outlined in the LWMS.

To ensure nutrient rich runoff (and other potential sources of contamination) does not directly enter the drainage channel the following management measures are proposed:

- In the vicinity of watercourses construct purpose built 'detention' basins that have the ability to trap sediments and nutrients. These basins will not be allowed to discharge directly to watercourses;
- Lawn areas (that require fertiliser, pesticide and/or herbicide application) will be minimised in areas of POS adjacent to watercourses; and
- During the subdivision of the site, the local community/new landowners will be provided with informative literature describing preventative methods they can implement themselves (i.e. reducing nutrient run-off) to reduce adverse impacts on the environment.

2.4 BUSHFIRE HAZARD

The site is predominantly cleared and is not situated within close proximity to any bushland with the exception of the narrow reserve to the south of the site and Mundijong Road. Mundijong Road acts as a separation zone between the site and the reserve. A fire break will be maintained around the boundary of the landholding and around each stage of subdivision as the development progresses.

2.5 HERITAGE

A search of the Department of Indigenous Affairs Register of Aboriginal Sites revealed that there are no previously recorded ethnographic sites on the site.

Ethnoscience undertook an Aboriginal Heritage Assessment of the site in 2011/2012 (refer **Appendix 5**). The assessment included a desktop search and ethnographic and archaeological field surveys. A separate report has been prepared to detail the findings of the assessment.

In summary, no ethnographic sites were reported on the land during the ethnographic survey which involved representatives of Bilya and Winjan Aboriginal Corporation who have long-standing associations with the region.

A recently recorded artefact scatter (MJ-06) is partially located on Lot 50 and partially within the adjacent service corridor. MJ-06 is a small, medium-density, open quartz artefact scatter situated on a Bassendean sand dune above seasonally inundated wetlands. The site represents either the by-products of task specific activities or a short term or infrequently used occupation site. However, MJ-06 is assessed as currently being of low archaeological significance.

The consultants from the Bilya and Winjan Aboriginal Corporation groups were of the view that Site MJ-06 — the artefact scatter identified on Lot 50 during the archaeological survey — was of low cultural significance and did not oppose Peet Limited applying for Section 18 consent for the site.

Following discussions with the Department of Indigenous Affairs (DIA) it was decided that before the site's scientific, cultural and heritage significance could be fully assessed and management strategies determined further investigation was required. Specifically, the DIA was keen to determine the nature and importance of any artefactual material that might be located in the subsurface of MJ-06. Such information would play a significant part in determining MJ-06's significance, particularly if any stratified and dateable deposits were located. In order to address the questions raised by the DIA, test excavations of MJ-06 are being undertaken within the conditions layout in the excavation licence obtained by the archaeological team.

This work still in progress with the assistance of members from two regionally based Aboriginal organisations, the Bilya Noongar Organisation and the Winjan Aboriginal Corporation.

A fair amount of subsurface archaeological material was recovered from MJ-06 in spits between 50cm-80cm deep and further bulk excavation was undertaken in early 2013. However, the assessment of the significance of the material recovered and therefore of the site, will be only be determined following its detailed analysis.

Once this is done, appropriate management strategies can be devised following further consultation with the Aboriginal community, Peet Mundijong Syndicate Limited, the DIA and the determination of the Aboriginal Cultural Material Community. Based on what is currently known, it is probable that the Community will determine that MJ-06 is an Aboriginal site as defined by Section 5(a) of the Act. However, it is also possible that Peet could obtain Ministerial consent, with or without the conditions (e.g., further archaeological investigations), under Section 18 to use the land or a portion of it on which the site is located. It is unlikely that MJ-06 and its management will have anything other than a localised impact on the LSP and therefore planning processes ought to continue as normal.

2.6 CONTEXT AND OTHER LAND USE CONSTRAINTS

The existing site is best described as flat to gently undulating and exhibits minimal change in ground elevation with the low point being at approximately 26m AHD in the north western corner, rising evenly to approximately 31m AHD in the south eastern corner.

The existing site's former land use as a grazing/pastoral property has resulted in all but a very small percentage of the existing vegetation being cleared. The occasional remnant tree remains, which have been supplemented with occasional introduced tree plantings which could have been acting as windbreaks to paddocks and/or for spatial definition around sheds and other farming infrastructure. Fruit trees indicate a possible small orchard previously existed on part of the site. No understorey vegetation exists at all with the exception of pasture grasses.

2.6.1 NOISE

The proposed Tonkin Highway extension and possible re-alignment of the Kwinana Freight Rail Line (west of Tonkin Highway) are adjacent to the western boundary of the LSP area. Noise emissions from the highway and rail line may have some impacts on those lots adjacent to the Tonkin Highway road reserve.

Noise emissions from any railway line and road would need comply with the requirements of State Planning Policy 5.4 *"Road and Rail Transport Noise and Freight Considerations In Land Use Planning"*. Under SPP 5.4, noise received at any residence would need to comply with the "Noise Limits", these being:

- EXTERNAL
 - LAeq(day) of 60 dB(A); and
 - LAeq(night) of 55 dB(A).

As this is a new rail infrastructure in the vicinity of a future extension to Tonkin Highway and proposed noise-sensitive land uses, it is noted that under the policy "in these instances, the infrastructure provider and developer are both responsible for ensuring that the objectives of this policy are achieved, and a mutually beneficial noise management plan, including individual responsibilities, should be negotiated between the parties." Thus under SPP 5.4 all parties should enter into discussions/negotiations to obtain the optimum outcome. The final civil designs for the development and the transport infrastructure are required inputs for acoustic models to determine the level of impact. Consideration will be given at further detailed stages of planning to explore the merits and potential construction of a noise amelioration barrier to mitigate emissions.

2.6.2 DUST, NOISE AND VIBRATION (CONSTRUCTION) MANAGEMENT

A Construction Environmental Management Plan will be prepared as part of the subdivision process. The CEMP will address the preconstruction and construction phases of the project and will provide guidance to the Proponent/Contractors on the following issues:

- Vegetation Clearing Protocols;
- Vegetation Management;
- Weed Management;
- Dust Management;
- Noise and Vibration Management;
- Fuel Storage;
- Waste Management;
- Hours of Operation; and
- Implementation and Monitoring.

3 LAND USE AND SUBDIVISION REQUIREMENTS

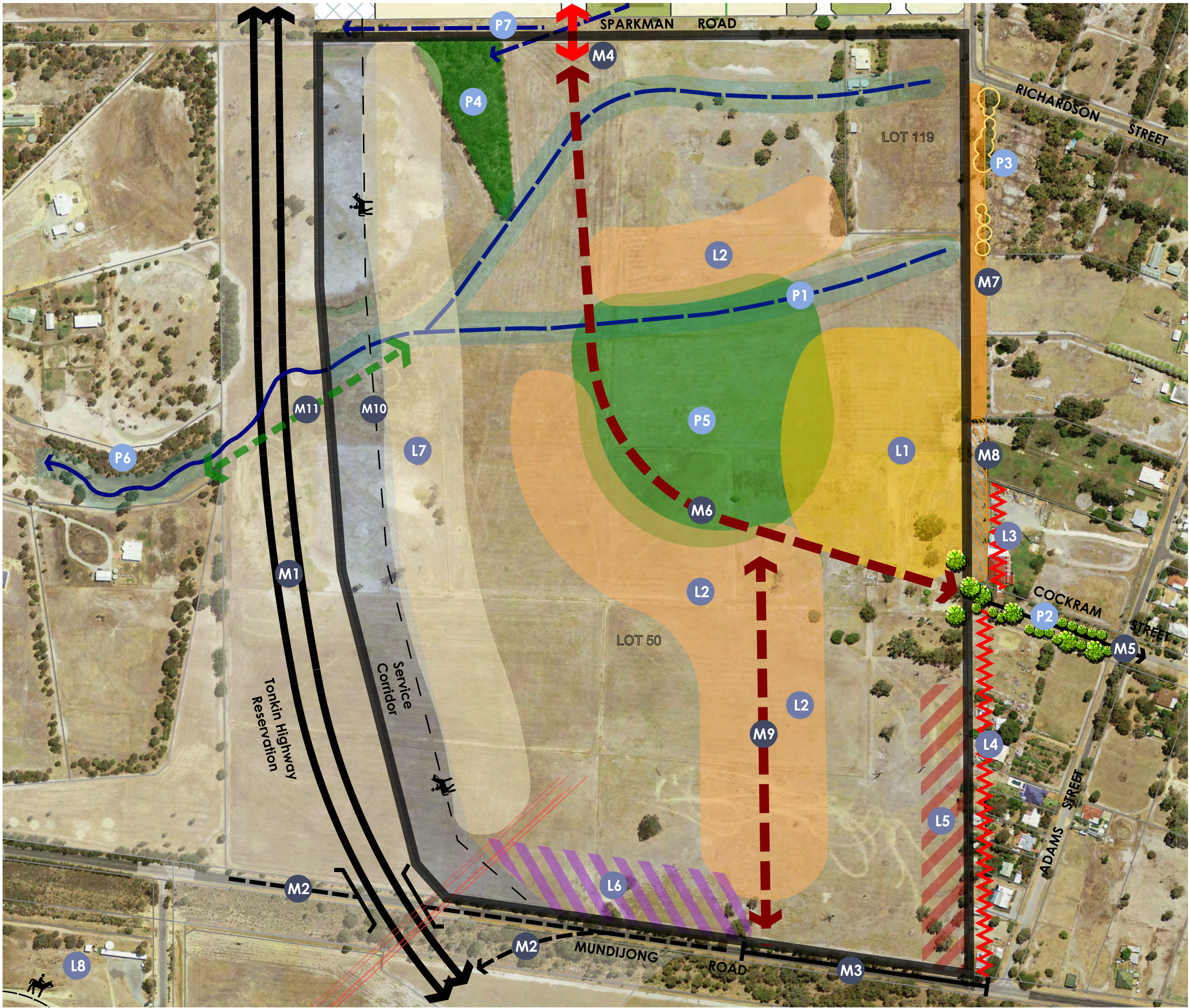
3.1 DESIGN OBJECTIVES

There are a number of fundamental design principles that underpin the proposed LSP, as summarised below:

- Respect for the inherent features/attributes of the land and its location.
- A sound rationale for the development, including its context within the wider Mundijong locality, to ensure that the future development is fully integrated with the existing and proposed surrounding development. Particular consideration has been given to the existing residential area south of Mundijong Road, existing residential area and Town Centre east of Taylor Road, proposed Qube and Investor JV LSP to the north and future Tonkin Highway to the west.
- A sensitive and innovative stormwater management approach to conveyance, treatment and storage in an urban context.
- To achieve a distinct identity and sense of place for future residents of the area.
- To facilitate a diversity of built form in terms of housing typologies, affordability and sustainability.
- To optimise passive solar orientation of lots as far as practicable, taking into account constraints such as existing road alignments, drainage patterns, topography and trees.
- Configuration of street blocks to develop an efficient and legible layout that promotes walkability and reduces private motor vehicle journeys.
- To ensure that the Estate completes and builds upon the arterial road network identified in the Mundijong Whitby DSP.
- Creation of a network of attractive and well-utilised public open space areas with a prominent focus on a central Public Open Space.
- Creation of a dynamic Community/Public Open Space hub at the heart of the estate, incorporating a viable combination of uses that include recreation and education.
- To establish an environment that provides a variety of active and passive recreational facilities that specifically seek to promote the mental and physical health and well-being of future residents.

3.1.1 OPPORTUNITIES AND CONSTRAINTS

Site analysis opportunities and constraints are provided diagrammatically in **Figure 15 – Opportunities and Constraints**.



MOVEMENT	
M1	Future Tonkin Highway Alignment.
M2	Connection of Mundijong Road to Tonkin Highway to be determined.
M3	Connection to Mundijong Road may be limited to long-term available interface.
M4	Location of proposed Neighbourhood Connector road.
M5	Cockram Street to: <ul style="list-style-type: none">• Town Centre• Recreation Centre and Town Oval.
M6	Connection of Cockram Street with northern Neighbourhood Connector to be considered.
M7	Unmade road reserve.
M8	Consider relocating road reserve to control estate equally on both sides of road.
M9	Control the quality of key entry road by relocating it away from the edge of site.
M10	Possible bridal path in Service Corridor.
M11	Possible short-medium term opportunity to connect with existing linear park.
LANDUSE	
L1	Location of Primary School adjacent to Adams Street.
L2	Medium-density housing adjacent to open space and main entrance.
L3	Poor interface with existing building.
L4	Rear lot boundary-interface issue.
L5	New development should back-on to existing properties.
L6	Interface between landuse and road will change if Mundijong Road realigned.
L7	Consideration for 'horse lots' along service corridor, with access to a bridal trail.
L8	Horse training track in close proximity to estate.
PUBLIC OPEN SPACE	
P1	Existing drainage line (following east to west). Possible inclusion of drainage lines into linear park elements.
P2	Existing large trees provide attractive public realm transition to development area.
P3	Minimal existing tree amenity in Adams Road reserve; barren landscape to be addressed.
P4	Investigate integration of tree copse into a feature parkland.
P5	Consider major park central to residents.
P6	Linear park through rural residential estate; existing drainage channel.
P7	Notthern landowner considering putting drainage through Peet land or piped in Sparkman Road.

OPPORTUNITIES AND CONSTRAINTS
Lot 50 Cockram Street & Lot 119 Adams Street, Mundijong
A Peet Limited Project

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3.2 LAND USE

Development proposed within the LSP is primarily residential, and provides a range of housing choices through the provision of low and medium density single lots, as well as potential for grouped housing sites. Lots situated in close proximity to high amenity areas such as public open space are identified as being suitable for medium density residential development and have been provided for accordingly.

The provision of Public Open Space (POS) is distributed throughout the site to provide accessibility to residents and responds to the existing drainage lines present in the area. The layout of POS comprises a mixture of linear parks, smaller areas of POS, and a large park central to residents. The major park is to be co-located with the primary school site.

The proposed primary school is to be located on a 3.5022 hectare site, bounded by three roads. The co-location of this site with the shared POS will provide sporting and recreational facilities to the school as well as the surrounding community.

Refer **Figure 16** – Draft Masterplan.



NOTES

- 1 INTEGRATION WITH FUTURE RESIDENTIAL AREA

2 CONSIDERATION FOR LARGER 'SPECIAL RESIDENTIAL' LOTS ADJACENT TO SERVICE CORRIDOR

3 DIVERSITY OF MEDIUM DENSITY LOCATED NEAR LANDSCAPED AMENITY

4 LINEAR OPEN SPACE NETWORK WITH INTEGRATED DRAINAGE

5 CENTRALLY LOCATED PRIMARY SCHOOL CO-LOCATED WITH SHARED OVAL
- 6 LARGE, CENTRAL PARK CREATED AS A FOCUS FOR COMMUNITY LIFE

7 SPECIAL WIDE STREET LINKING COCKRAM STREET TO PRIMARY SCHOOL AND CENTRAL PARK

8 EXISTING TREES TO BE RETAINED IN PARKS AND STREETS WHERE POSSIBLE

9 WIDE MEANDERING ENTRANCE ROAD LEADING TO CENTRAL PARK

10 LONG-TERM REALIGNMENT OF MUNDIJONG ROAD

LEGEND

- LOCAL STRUCTURE PLAN BOUNDARY

RESIDENTIAL R10

RESIDENTIAL R25

RESIDENTIAL R30

RESIDENTIAL R40
- PRIMARY SCHOOL

PUBLIC OPEN SPACE

DRAFT MASTERPLAN
Lot 50 Cockram Street & Lot 119 Adams Street, Mundijong
A Peet Ltd Project

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3.3 OPEN SPACE

3.3.1 PUBLIC OPEN SPACE

The provisions of Liveable Neighbourhoods require a range of site responsive urban parkland in order to address the district, neighbourhood and local needs of residents, and should be a mixture of unrestricted and restricted open space. The POS provided throughout the subject land is a mix of a number of smaller POS areas, drainage corridors and a major centrally located park adjacent to the primary school site. The POS layout allows access for all residents in the area, encouraging the usage of these spaces by the community. The central POS co-located with the primary school will provide a shared sized oval, providing active recreational facilities for students of the school and the wider community and provide a central focal point for the community. Refer **Figure 17** – Public Open Space Plan.

The POS is made up of restricted and unrestricted open space, providing drainage basins based on the 1 year, 5 year and 100 year storm event, combined with the provision of drainage channels. Drainage channels through the site will be developed as natural swales, or 'living streams', through the use of planting and grasses, and walled or contoured banks. Native sedges and rushes are proposed to assist with nutrient stripping and midge and mosquito control. Boulders or low walls will act as minor barriers to control the flow of storm water through the living stream. The proposed drainage swales will be unfenced and landscaped in accordance with Liveable Neighbourhoods to allow for informal active and passive recreational uses.

An indicative calculation of the POS intended in the current LSP is provided in the Public Open Space Schedule overleaf (refer **Table 5**).

It is estimated the current LSP will provide a total of 10.9% POS, exceeding the 10% POS required by Liveable Neighbourhoods. This will be subject to detailed design at subdivision stage, which will meet the 10% requirement. The Landscape Strategy (refer **Appendix 6**) identifies various facilities and treatments of the POS areas. This design is provided as a guide and will be further informed by detailed site planning, engineering design and discussions with the Shire at subdivision stage. The calculated POS provision does not include any POS that may potentially be provided within adjoining Lot 119, as it is recognised that the landowner is not required to develop the land. All POS and drainage indicated on this lot is indicative only, based on the assumption of this lot being self sufficient. Likewise, Lot 50 is completely self sufficient in terms of POS provision and accommodating all necessary drainage functions.

PUBLIC OPEN SPACE TABLE	
PUBLIC OPEN SPACE SITE	SIZE (ha)
1	0.0733
2	0.0672
3	0.0490
4	0.7154
5	0.0486
6	0.0887
7	0.1264
8	4.3908
9	0.1437
10	0.4663
11	0.2100

LEGEND

LOCAL STRUCTURE PLAN BOUNDARY

PUBLIC OPEN SPACE



PUBLIC OPEN SPACE PLAN

Lot 50 Cockram Street & Lot 119 Adams Street, Mundijong

A Peet Ltd Project



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TABLE 5: PUBLIC OPEN SPACE SCHEDULE

PUBLIC OPEN SPACE SCHEDULE		
Gross Site Area - Excluding Existing Roads (ha)		54.2113
Deductions		
Service Corridor	5.2422	
Primary School	3.5022	
Drainage Basins (1:1)	0.5900	
Surplus Restricted Public Open Space	0.7855	
Total Deductions	10.1199	
Gross Subdivisible Area		44.0914
Required Public Open Space (10%)		4.4091
Public Open Space Requirements		
Unrestricted public open space – minimum 80%	3.5273	
Restricted public open space – maximum 20%	0.8818	
Total		4.4091
PUBLIC OPEN SPACE PROVISION		
Unrestricted Public Open Space		
Formalised POS	3.8964	
Total Unrestricted Public Open Space		3.8964
Restricted Public Open Space		
Drainage Basins (Between 1:1 & 1:5)	0.8600	
Linear Swales (1:5)	0.8230	
Total Credited Restricted Public Open Space		0.8975
Total Credited Public Open Space		4.7939
Percentage of Public Open Space Provided (Unrestricted and Restricted POS Contribution)		10.9%
POS Oversupply		0.3848

- All areas are in hectares.

3.4 LANDSCAPING

3.4.1 FOCAL POINTS AND VIEWS

Given the site's gentle undulation as outlined previously, there are no strong views or vistas from vantage points located within the site.

The important focal points and views to be considered, retained and reinforced through the urban and landscape design process relate to the dominant landform features surrounding the site, of which there are two distinctive features, being:

1. The Darling Scarp; and
2. Swan Coastal Plain.

The entire subject land is located on the low lying, gently undulating Swan Coastal Plain. The nature of the landscape of the Swan Coastal Plain in the immediate vicinity is largely unvegetated, with a predominant rural character. Views are dominated by the Darling Scarp to the east.

The Darling Scarp is the most dominant physical feature and the retention of views from the subject site onto the Scarp will be critical in ensuring a rural character with green values can be promoted to enhance the built environment.

The views and vistas to the Scarp will typically occur through the creation and reinforcement of long vistas along east west aligned roads and public open space links within the proposed development. These views and vistas should be reinforced and/or framed through the consideration of tree placement.

3.4.2 RECREATION CONNECTIONS

There are no existing recreation connections around the existing site. The site is located at the end of Cockram Street and therefore is within 500m walking distance to the existing Mundijong Sporting Oval.

The installation of a dual use path along Cockram Street to the existing town centre and sporting oval would create a strong recreation connection to the proposed open space areas within the Development Plan.

3.4.3 SIGNIFICANT TREES

The extensive pasture/grazing activity during the site's previous land uses has resulted in little to no remnant vegetation remaining on the site and as such significant trees that could be retained within the development are few and far between. There are the occasional examples of endemic and exotic trees which could be incorporated into the urban design and/or public open space to provide instant amenity as follows:

Towards to southern boundary of the site, a group of approximately six (6) *Corymbia calophylla* (Marri) exist which could be incorporated into an entry statement of Mundijong Road. It is planned that these trees be retained in a widened verge on the major boulevard running north south in the Development Plan. Also within close proximity to this stand of Marri trees are three (3) *Kingia australis* (Bullanock) which if unable to be incorporated in the urban design are able to be relocated to POS.

At the current Cockram Street cul-de-sac end of the site on the eastern boundary a number of introduced trees exist which appear to have been related to the previous farming operations of the site. A group of *Eucalyptus camaldulensis* (Northern River Red Gum) are the main species in this location which are suitable for retention in POS only due to the propensity of this species to unpredictably drop large limbs. If retained in POS, these it should be ensured that these trees are retained in garden beds away from POS infrastructure such as playgrounds or bench seats.

In addition to the Northern River Red Gum's a variety of exotic trees exist which could possibly be relocated into POS areas, including the following species:

- One (1) *Citrus limon* (Lemon Tree)
- One (1) *Liquidambar styraciflua* (American Sweetgum)
- One (1) *Caesalpinia ferrea* (Leopard Tree)
- Two (2) *Erythrina indica* (Coral Tree)
- One (1) *Pinus radiata* (Monterey Pine)

Towards the northern boundary of the site, adjacent to Sparkman Road, another group of approximately five (5) *Corymbia calophylla* exist which could be incorporated into the urban design if possible. A further four (4) *Kingia australis* are also present in this location and are suitable for transplant into POS areas.

In the north western corner of the site, a large triangular grove of *Casuarina obesa* (Swamp She-Oak) have been planted in regularly defined rows. The density of planting and the locally wet depression that these trees are located in results in no opportunity or value for incorporation of these specimens in a worthwhile urban design or POS outcome and their removal is recommended.

In the north eastern corner of the site, a north south oriented row of *Eucalyptus* plantings exist as a windbreak, which sit just in the adjacent landowners property, but are planned to be retained in the development as part of the road layout in this area.

3.4.4 LANDSCAPE DESIGN

LANDSCAPING VISION

The landscape strategy behind public open space development is to provide a readily useable, aesthetic and liveable environment to potential residents. Landscaped open space areas shall incorporate features and facilities to both encourage residential growth and to provide public, aesthetic and site character building amenities to residents. Landscape works shall contain and maximise both aesthetic and functional uses where possible.

Part of the successful delivery of aesthetic and functional POS areas will be the retention of the site's existing significant trees where possible in accordance with proposed Civil Engineering design levels. The retention of existing significant trees will assist in establishing the site's Sense of Place, which will be reinforced through the landscape materials palette.

LANDSCAPING THEME

It is proposed that close attention to detail will be provided in the landscape detailing and materials selection to ensure the development comprises a palette that is relevant to its locality while creating a quality open space environment.

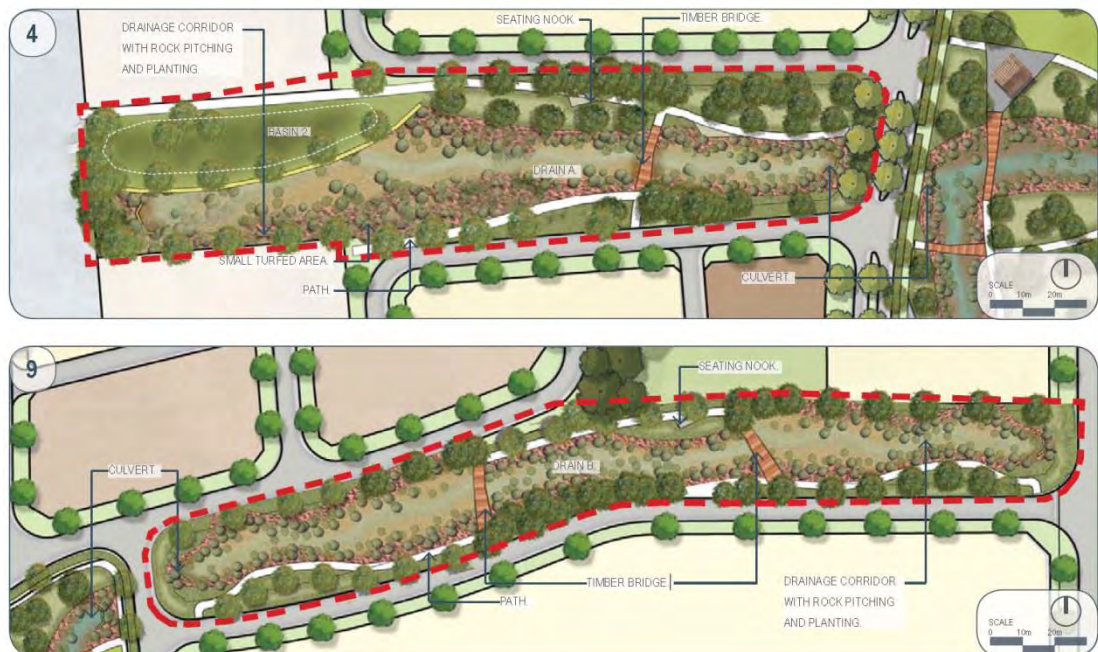
The inclusion and use of some the following detailing is proposed to achieve this outcome within the project area:

- Paving styles and colours will be chosen to create visual interest, assist in differentiation between area uses and provide hard-wearing surfaces of varying textures.
- Wall detailing through the use of local stone features and laterite coloured limestone retaining where required.
- Durable street furniture of a style and colour palette to co-ordinate with the overall POS design.
- Tree and shrub planting palettes that are aesthetically pleasing while responding to the surrounding natural environment, incorporating water sensitive design species while creating view shafts to develop community value.

LANDSCAPE MASTERPLAN

MULTIPLE USE CORRIDORS

Three major Public Open Space [POS 4, 8 & 9] areas have been designated to include the site's overland drainage paths whilst also designed to accept major and minor stormwater drainage events in an attractive landscape setting. Ranging in size between 6,769 square metres and 4.3 hectares, these open space areas will contain the swales and overland flow path that will be created, contoured and stabilised where necessary to provide a multiple use - drainage / landscaped response. This will be critical to establishing an immediate informal active and passive recreation opportunity as the centrepiece to the development area. Indicative concepts for POS 4 and POS 9 are shown below.



To facilitate multiple uses, it is proposed 1:1 year and 1:10 year stormwater events will be contained within landscaped drainage channels within the POS and the 1:100 year stormwater event contained within the adjacent drainage basins. The drainage channels will typically be planted with side slopes no greater than 1:3 or grassed areas with maximum side slopes of 1:6 grade to allow for ongoing maintenance activities and safe egress in the event of a large stormwater event. Occasional small walls no greater than 900mm in height could exist to provide definition to the drainage channels.

All outlet structures into POS areas will incorporate stabilised water entry points, smooth and even grading of contours and mass planting of suitable native water tolerant tree and shrub species for maintenance minimisation.

All associated landscape infrastructure such as picnic shelters, playgrounds, footpaths and the like will be constructed above the 1:10 year stormwater flood levels. The 1:10 year stormwater levels will not exceed 900mm deep in POS areas and similarly the 1:100 year stormwater flood levels will not exceed 1100mm deep when full.

Pedestrian crossings over the drainage channels will be incorporated into the overall footpath network which will be constructed of all metal subframe with timber or composite decking products as agreed with the Shire. Balustrading will be provided where the fall heights exceed the requirements of the Building Code of Australia (typically 900mm in height).

There is currently limited to no remnant native vegetation on a large portion of the multiple use POS area proposed within the development area. The existing vegetation over the site has been highly modified through previous farming and land use practices. Several large existing trees are to be retained adjacent to the north-eastern MUC and will remain elevated above any drainage basins to ensure their long term health and viability. These trees (and any other retained vegetation through the site) will have remedial pruning undertaken to ensure accordance with the requirements of fire management techniques.

Edge treatment to the swales will include planted garden beds with mowing kerbs and / or hard edge treatments as a maintenance edge between adjoining turf areas within the open space. Hard edge interfaces will include either one of the following:

- Limestone retaining wall
- Concrete mowing kerb
- Informal granite rockwork

The MUC areas shall incorporate dual use and pedestrian path systems with built in vehicular crossing and access points for maintenance purposes. Dual use and pedestrian paths shall provide smooth and easy access to all features of the open space and link accordingly into residential and other areas adjacent as part of a greenbelt system across the development. Disability access will be given a high priority and will be designed in accordance with relevant Australian Standards.

LARGE PARKS

One large Public Open Space will be developed as part of the development plan. It will be positioned central to the development and co-located to a proposed Primary School incorporating a shared playing field. This POS will be approximately 4.3 hectares in size and shall incorporate dual use and pedestrian path systems with built in vehicular crossing and access points for landscape maintenance purposes. Dual use and pedestrian systems shall provide smooth and easy access to all features of the open space and link accordingly into residential and other areas adjacent. Disability access will be given a high priority in all large parks and will be designed in accordance with relevant Australian Standards where practicable.

The large park will be a parkland area which will offer a range of recreation and community facilities. This area will provide both informal active and passive recreation functions. The parkland shall consist of open grassed spaces bounded and defined by both feature avenue trees and native tree groupings. The western boundary will be defined by a swale with drifts of native plantings and a three row avenue of street trees running up the central boulevard.

Shrub plantings are planned to strategic areas to provide spatial definition and colour where required. Shrub planting shall primarily consist of lower growing species to enable clear vision and security through passive surveillance. It is proposed that the shrubs will consist of native species, with consideration and adherence to Waterwise principles.

Access to the large central POS shall be via the path system running along the east-west tending MUC as well as four additional pathways leading from the central boulevard spine across the swale. These entrances will incorporate gateway features principally situated along the axes of side streets. Through the development of manicured landscaped areas and its associated facilities will be the provision for picnic settings and informal gathering spaces. One of these gathering spaces will be located adjacent to the formal playing field. A shelter will allow surveillance over both the playing field and the informal recreation area to the other side. Play equipment and BBQ facilities will be considered to enable a variety of use.

A main playground with feature shelter is intended to be located adjacent to the north south aligned boulevard road through the development but with strong views and vistas across the open space and from the proposed road network to draw users into the space. Shelters, seating, BBQ's and shade trees will position this as the predominant passive and community activation space within the POS. Positioning of all facilities within the large park will maximise available views towards the Darling Range wherever possible.

The large park will be required to accept some stormwater runoff from the surrounding development area in a multi-use drainage channel as outlined in the Multiple Use Corridor section of **Appendix 6**. An indicative concept for the large central park is shown above.



POCKET PARKS

A series of eight (8) smaller to medium sized POS areas, ranging in size from approximately 486sqm up to 2106sqm will also be provided within the development. (POS areas 1-3, 5-7 and 10. These parks will incorporate elements of the items outlined previously, with the exception of larger informal recreation / kickabout areas and communal features such as BBQ's. The five (5) smallest POS areas will act as a transition from the smaller lot densities to large lifestyle sized lots and consist of feature paths, turf with tree and amenity shrub planting. These Pocket Parks are not designed to accept any stormwater drainage. Their path systems will link to the adjoining residential streets to provide access as necessary. Avenues of trees and minimal shrub planting are preferred. Species will be a mix of native and exotic tree species and native groundcovers that are Waterwise.

The three (3) largest of these parks will typically consist of a central built feature such as a picnic shelter or playground only. The Pocket Park adjacent to the end of Cockram Street will retain a group of existing trees. The elements proposed for this POS will be positioned around these plantings to maximise shade and amenity values whilst considering the tree species habit outlined previously in this report.

An indicative concept for the pocket parks is shown opposite.



STREETSCAPES

Streetscapes throughout the development shall incorporate a variety of treatments in response to the road hierarchy system. In all cases landscape works shall incorporate tree planting in accordance with accepted traffic standards on the standard street tree alignment in relation to the service utility corridor. Treatments may include soft works such as street trees, hedge planting and groundcovers.

Final tree species are yet to be decided; however an indicative street tree plan has been included in **Appendix 6** to this report and primarily consist of Australian native and West Australian native species. Following discussion with the Shire, the indicative species list will be reviewed and updated at the detailed landscape design stage to include locally native shrubs and groundcovers and a majority of native tree species.

The timing of installation will be to occur at the completion of civil engineering works, prior to the construction of homes. It is envisioned street trees will be allocated at one per lot for standard lots and three per lot for corner blocks. Trees will be placed typically centre of lot and / or a minimum of 8m from any boundary to allow for driveway crossovers and in accordance with the corridor provided by utility service providers, being 2.7m from lot boundary.

The retention of existing significant trees to the Mundijong Road boundary and the main boulevard running from that road will enhance the project's landscape theme. The trees will serve an important visual buffer and amenity function in reinforcing the rural character of Mundijong. Within the entrance from Mundijong Road the road reserve has been increased to allow for the proposed retained trees to be accommodated within a wide verge to allow suitable width for long term tree health and maintenance minimisation.

IRRIGATION STRATEGY

In general terms the project is committed to undertaking water sensitive design with minimal impact on good quality groundwater sources and preserving water quality.

It is anticipated that irrigation water will be provided through a series of deep aquifer groundwater bores constructed across the open space areas. The flow rate of the production bores will determine the number of bores required, however, it is envisaged that up to three deep aquifer bores will be required for this development. The use of large droplet format sprinklers within turf areas and subsurface drip line irrigation within garden beds will assist in reducing evaporation and aid water conservation.

All irrigation shall be installed to the local authorities' standard specifications and industry best practice. Maintenance minimisation processes will apply in all circumstances. Controllers shall be keyed and accessed in accordance with the local authorities standards. Irrigation shall be designed to incorporate stations that can be terminated as agreed upon planting establishment and maintenance handover to the Council in accordance with relevant policies.

LANDSCAPE MAINTENANCE

The industry accepted standard Developer funded and managed landscape and irrigation maintenance period is typically two (2) summers as outlined in Liveable Neighbourhoods. Following this period, the landscape and irrigation maintenance will be handed over to the Serpentine Jarrahdale Shire to manage, unless otherwise negotiated.

Typically the first year is an establishment period, followed by a second year of consolidation. Irrigation requirements are to be scheduled to be wound back during this period to a point of almost self sufficiency at the time of handover to the Council.

As part of the ongoing approval process, every public open space landscape and irrigation design will be submitted to and approved by the Serpentine Jarrahdale Shire for Development Application prior to construction commencing.

The Landscape Design will incorporate recreation and environmental requirements, whilst focusing on maintenance minimisation principles and techniques. The developer is committed to working with the local authority to deliver outcomes in this process to reflect best practice throughout the development.

3.5 RESIDENTIAL

Low and medium density residential development is proposed for the LSP land, ranging from R20 to R60. Higher densities are located within close proximity to high amenity areas including public open space and adjacent the primary school site and neighbourhood connectors (proximity to transport connections).

Early assessment of the LSP suggests an indicative lot yield in the range of 670 to 810 lots, equating to approximately 14.8 to 17.8 dwellings per gross hectare across the site. Actual yields will be determined at subdivision design stage.

The proposed densities will facilitate subdivision to create lots with a range of sizes. Based on the Indicative Masterplan, an indicative only breakup of the lot range is shown below.

Density Coding	Number of lots as %age of total lots	Average lot size
R20	3.5%	1620m ²
R25	65.3%	550m ²
R30	14.9%	340m ²
R40	15.57%	270m ²

Grouped Housing sites	Lot Size (approximate)
Site 1	2100m ²
Site 2	1900m ²

3.6 MOVEMENT NETWORK

The traffic and transport impacts of developing Lot 50 and Lot 119 have been considered by Riley Consulting, and are detailed in the Structure Plan Traffic Report attached as **Appendix 7**.

3.6.1 PROPOSED ROAD NETWORK AND STAGING

The development of Lots 50 and 119 is anticipated to generate a total of 4,256 trips per day. Assuming that direct access is taken to Mundijong Road and developments to the north are not connected, **Figure 18 – Forecast Traffic Flows** shows the forecast traffic movements. **Table 6** shows the anticipated road network impacts.

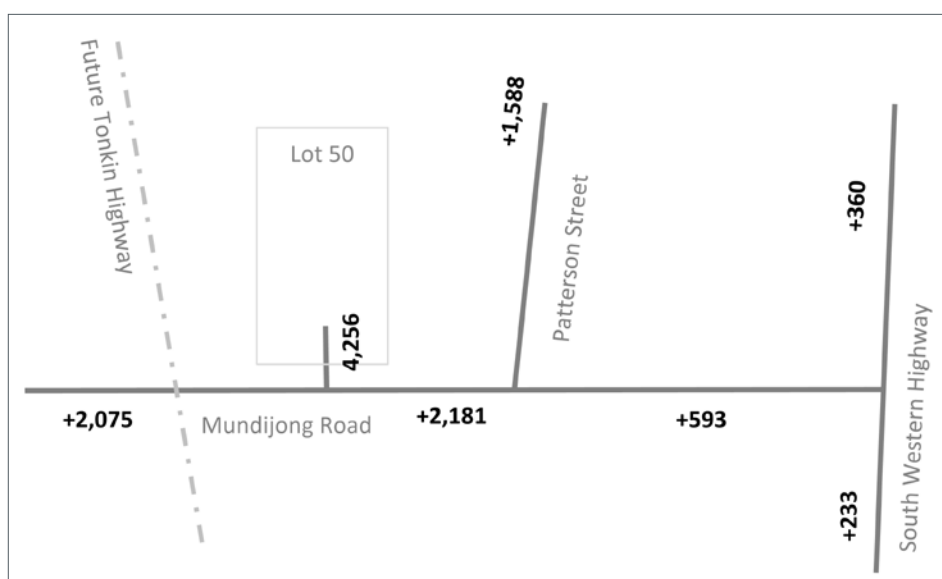


Figure 18 – Forecast Traffic Flows

TABLE 6: LOTS 50 & 119 TRAFFIC VOLUMES AND LEVELS OF SERVICE (LOS)

Road	Type	Lot 50	Forecast	LoS
Mundijong Road west of Paterson Street	1	2,181	5,461	C
Mundijong Road east of Tonkin	1	2,075	4,865	C
Mundijong Road east of Baldivis Road	1	1,343	4,133	B
Watkins Road	1	593	2,993	B
South Western Highway north	1	360	9,470	D
Paterson Street	1	1,588	3,788	B
Soldiers Road	1	1,588	3,788	B
Lot 50 Access Road	1	4,256	4,256	B
Taylor Road	1	0	500	A
Adams Street	1	0	500	A

ACCESS

The subject land is presently accessed from Mundijong Road. It has a frontage to the unmade roads of Adams Street and Sparkman Road to the north. It is possible to develop the subject land in isolation with access taken purely from Mundijong Road to the south. In the longer term, the development would become part of Mundijong and will accommodate the neighbourhood connector of Adams Street/Taylor Road.

Access to streets other than Mundijong Road will be created as new streets are planned in accordance with *Liveable Neighbourhoods*.

As discussed, access to the subject land will be taken directly to Mundijong Road and in the first years of development would operate as a priority controlled intersection. In the longer term, traffic associated with developments to the north will pass through the LSP area and affect the operation of the proposed intersection with Mundijong Road.

Figure 19 shows the suggested road hierarchy for the LSP, involving a combination of laneways, access streets and neighbourhood connectors.

NEIGHBOURHOOD CONNECTORS

Roads shown as neighbourhood connectors in **Figure 19** provide the primary access to the structure plan area. Daily traffic flows on these roads are well within the 7,000vpd recommended. These streets can be provided with a standard 7.2m carriageway, which is suited to bus movements. A footpath on both sides of the street is required, although one side may be designated as a shared use path. At intersections, median islands of 2.0m width would be desirable to provide safer pedestrian crossing points and to highlight the intersection. A residual verge width of 4.1m will occur where such medians are provided.

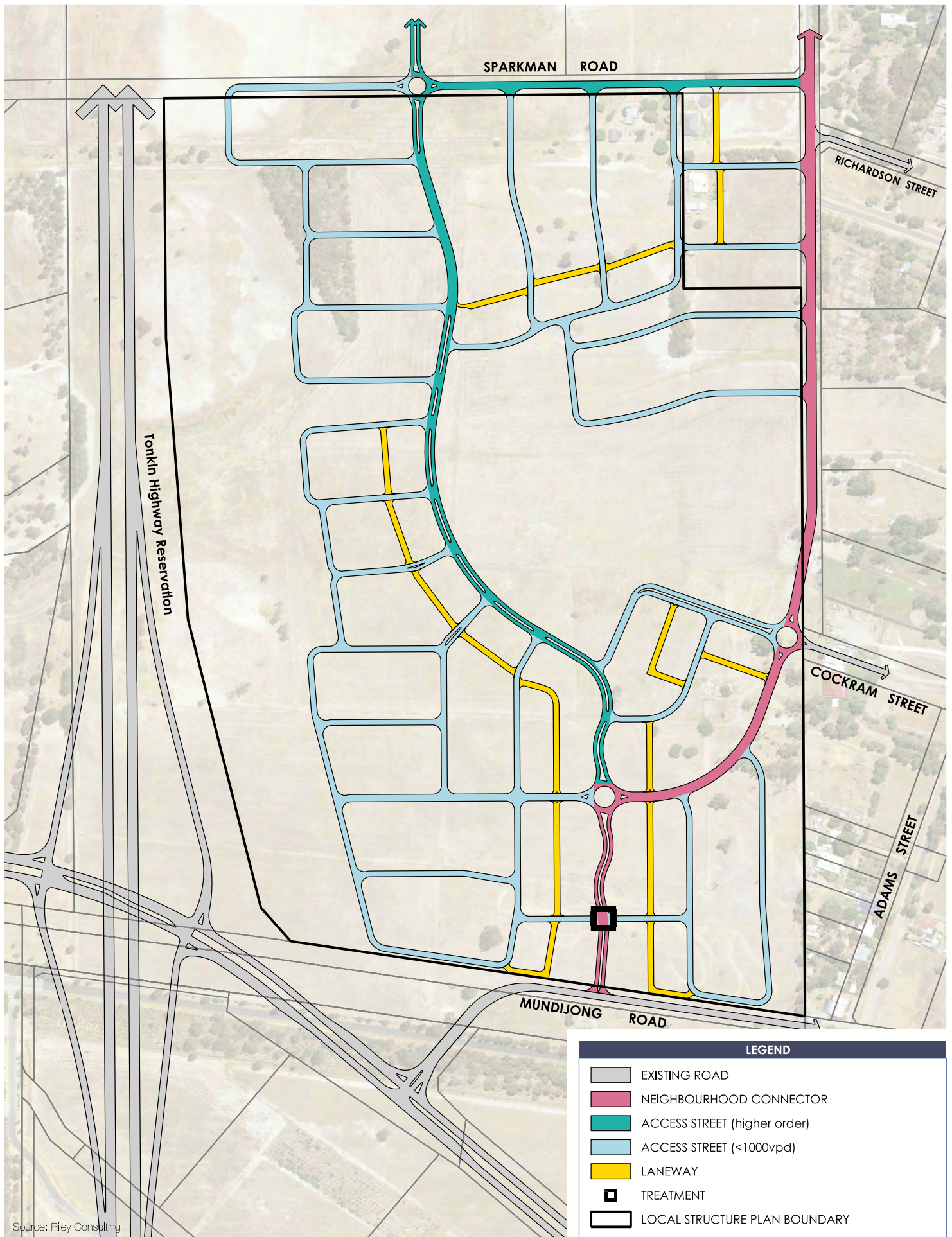
ACCESS STREETS

Access streets are the main residential streets within the development and provide direct lot access. A typical access street would be provided with a 6.0m to 7.0m carriageway depending on the bus routes and Local Government requirements. It is recommended however, that the minimum carriageway width be provided to encourage a slower speed environment. Unfortunately, many streets with 7.0m+ carriageways and low density lots frequently experience traffic speeds well in excess of the posted 50kph limit. A reduced carriageway width will assist in achieving a more appropriate 40kph typical travel speed.

HIGH ORDER ACCESS STREETS

Access streets carrying between 1,000vpd to 3,000vpd are considered to be higher order access streets and a slightly wider road reservation is suitable. *Liveable Neighbourhoods* suggests that these streets would be considered as “typical residential streets” and a carriageway width of 7.0m within a 15.4m to 16.0m road reservation is appropriate. However, the 7.0m wide carriageway is not supported in residential areas as it will tend to encourage a higher traffic speed. A 6.0m carriageway is preferred to encourage a 40kph target speed. A wide carriageway is only recommended where buses or large vehicles are expected.

In higher density areas, the provision of parking embayment's is a preferred treatment rather than an increased carriageway width.



Source: Riley Consulting

ROAD HIERARCHY

Lot 50 Cockram Street &
Lot 119 Adams Street, Mundijong
A Peet Limited Project

0m 20 40 60m

s: 1:5000@A4
d: 15 Oct 2012
p: 08/039/027

figure
19

It should be noted that from a road network capacity basis, a 6.0m wide carriageway could accommodate two-way traffic flows up to 1,100 vehicles per hour (indicatively 11,000vpd), but as a residential street should be restricted to less than 3,000vpd to maintain appropriate residential amenity. A wider carriageway is not required from a traffic movement perspective.

LOT 50 ACCESS ROAD

Primary access to the LSP area and development to the north will be taken via the Lot 50 access road. Daily traffic volumes on this link are shown to be in the order of 8,000 to 9,000vpd approaching Mundijong Road will determine if four lanes would actually be required. It should also be noted that the higher volume using the Lot 50 access road could be reduced by traffic redistributing to Adonis Street. Modelling indicates that this is not a desirable route for LSP traffic accessing Mundijong Road, but would be attractive to development further north. To date, the planning team has not sought raise the capacity of Adonis Street for access to Mundijong Road.

ADAMS STREET/TAYLOR ROAD

Adams Street is currently provided with a 20 metre road reservation. In isolation, the LSP is highly unlikely to increase traffic movements on Adams Street/Taylor Road until the development connects to Adams Street. This connection will be progressively upgraded as adjacent land is developed.

The current sealed width of Taylor Road/Adams Street is about 6 metres (approximately) and may require additional width to cater for significant increases in traffic demand.

3.6.2 WALKING AND CYCLING NETWORK

The structure plan provides for a primary school which is within a pleasant walking distance for the majority of households. Adjacent to the school and on identified walking routes, it is desirable to provide a footpath to both sides of the street. Current planning guidelines suggest that all streets should be provided with a footpath where ever possible. Where traffic flows exceed 1,000 vehicles per day, a footpath to both sides of the road should be provided.

The Shire has recently made revisions to its *Local Area Bicycle and Shared Path Plan (July 2012)*, which focuses on providing linkages to services such as schools and business centres, whilst ensuring the safety of pedestrians. This is reflected in the proposed walking and cycling network for Precinct E2, as cycling would be safe on the majority of local streets where traffic flows are less than 1,000vpd. On the neighbourhood connector shared paths should be provided to provide a safe alternative to on-road cycling. A principle shared path is indicated in the district structure plan adjacent to the future Tonkin Highway. It is desirable to provide linkages to this path, although the future service corridor may preclude such access.

3.6.3 PUBLIC TRANSPORT AND STAGING

Armadale is about 21 kilometres to the north of Mundijong, where the metro rail line service to the CBD currently terminates. There is discussion of the service being extended to Byford, however this is a very long term proposal. The Perth – Mandurah line can be accessed at Wellard, Rockingham and Safety Bay. These stations are probably closer than Armadale to the north and have been developed as park and ride stations. It can be expected that commuters to Perth will be split 60/40 to the Perth – Mandurah line.

There are two bus services passing through the locality, routes 252 and 253. The services connect to Armadale railway station. The district station plan sets out to provide a bus route along Taylor Road/Adams Street that would terminate to the north side of Mundijong Road.

3.7 WATER MANAGEMENT

3.7.1 DISTRICT WATER MANAGEMENT STRATEGY

The subject land falls within the area covered by the Mundijong Whitby District Structure Plan District Water Management Strategy, which was prepared by GHD (2010). The DWMS addresses broad-scale stormwater management measures over an 1800ha area which extends from the future Tonkin Highway reserve to South Western Highway.

3.7.2 LOCAL WATER MANAGEMENT STRATEGY

A Local Water Management Strategy has been prepared by Wave International to further define surface water and groundwater management design concepts at Lot 50 Cockram Street & Lot 119 Sparkman Road (refer **Appendix 8**). The LWMS outlines the design criteria and objectives for stormwater management, groundwater management, water quality management, water conservation & sustainability measures and requirements for additional work as planning and design for the site progresses.

3.7.3 DISTRICT STORMWATER MANAGEMENT

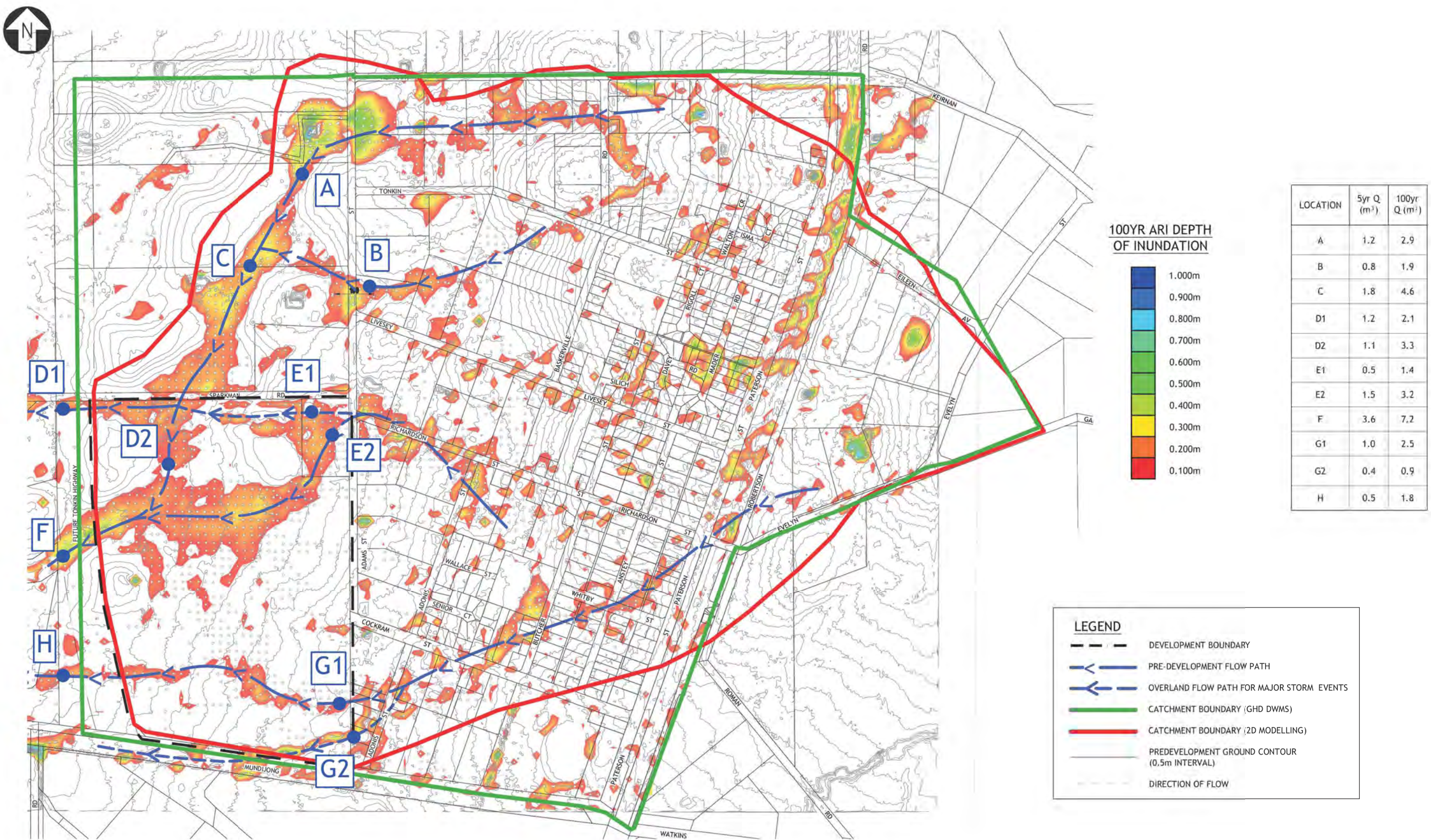
Surface runoff from a 390ha catchment discharges through Lot 50 Cockram Street and Lot 7 Adams Street. Due to the relatively flat nature of the site and very shallow existing drains, there is significant interaction between flow paths throughout the catchment which makes the calculation of pre-development flow rates particularly complex.

A 2-dimensional surface water model was developed using XP Storm's 2D module, which has the ability to model floodplains and areas with poorly-defined flow paths with greater accuracy than a traditional 1-dimensional model. The model was developed to clarify pre-development flow rates from the overall catchment and to better delineate the flow paths through the catchment, as the existing drains are very shallow and not well defined.

The modelling showed that a total flow rate of $7.9\text{m}^3/\text{s}$ enters Lot 50 & Lot 119 from catchments to the east in the critical 100yr ARI storm event, and the design of the open drains through the multiple use corridors will be designed to accommodate this inflow. The pre-development modelling also showed that a peak flow rates of $2.3\text{m}^3/\text{s}$ is generated by surface runoff from Lot 50 & Lot 119 in a 100yr ARI storm event.

Figure 20 shows the pre-development surface contours (taken from the Department of Water's LiDAR dataset), the extent of the upstream surface water catchment, and also shows the main flow paths and overflow locations between adjacent flow paths.

To ensure that downstream landholdings are not adversely impacted by development in upstream catchments, each development must ensure that peak post-development flow rates generated by runoff from the development area do not exceed pre-development levels. This is achieved through the use of detention storage areas spread throughout the development. Off-line storage areas will be provided within public open space to attenuate peak flows, and will discharge to open swale drains through the multiple use corridors. **Figure 21** shows the approximate locations and sizes of the detention basins required to attenuate post-development flows.



Source: WAVE International

PRE-DEVELOPMENT FLOW PATHS

Lot 50 Cockram Street & Lot 119 Adams Street, Mundijong

A Peet Limited Project

0m 50 100 150m
 S: 1:10000@A3
 d: 22 Mar 2013
 p: 08/039/025A

figure
20

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Source: WAVE International

3.7.4 LOCAL STORMWATER MANAGEMENT

Road runoff from events up to 1yr ARI will be directed into the bioretention swales in POS areas for on-site retention. Residential lots are expected to retain runoff from roof and hardstand areas in soakwells within the lot.

Inflows from the upstream catchment to the east of Precinct E2 have been allowed for in the design of the open drainage swales through Precinct E2.

JDA Consultant Hydrologists has prepared an LWMS to address water management for Precinct E1 (immediately north of Precinct E2), which proposes to discharge flow from the Precinct E1 LSP area along the Sparkman Road reserve, without discharging into Precinct E2. This flow would be piped for up to the 5yr ARI event, and conveyed by overland flow for major storm events.

Runoff within Precinct E2 will be managed by collecting road runoff in a piped drainage network, which will discharge to flood storage basins in the POS areas. These basins will act to attenuate the runoff to predevelopment levels and will discharge to the open drains which replicate, as closely as practicable, the predevelopment flow paths through POS corridors.

3.7.5 GROUNDWATER MANAGEMENT

Groundwater flows from east to west across the region, generally following the topography. The Perth Groundwater Atlas (DoW, online) shows a snapshot of groundwater levels as measured in May 2003 (which are an indication of low groundwater levels); showing groundwater levels at the site ranging from 27mAHD in the east to 23mAHD in the west.

Groundwater across this area tends to perch on the underlying clayey soils, causing large fluctuations of up to 2.5m between high and low groundwater levels. In areas of the site where the depth to the underlying clay materials is low, typical peak groundwater levels are very shallow (within 100mm of existing surface). Parts of the site with a greater depth of sand over the underlying clays have a slightly larger natural separation between existing surface and peak groundwater levels (up to 800mm). A comparison of the pre-development monitoring data to nearby long-term DoW monitoring bores showed that the maximum measured water levels measured in September 2009 were close to the long-term (25 year) average maximum levels. Using the long-term DoW data, the site groundwater levels have been calibrated to estimate a typical winter perched water level (refer **Appendix 8**). A combination of imported sand fill and subsoil drainage will be used in the design of the development to ensure adequate separation between finished lot levels and perched water levels, and to alleviate the perching of infiltrated rainwater on the impermeable clay soils and ferricrete across the site. Finished lot levels are to be a minimum of 1.5m above subsoil drainage inverts, or 1.8m above the underlying clay surface – whichever is higher. Minimum subsoil drainage levels will be dictated by several factors – the level of the clay and ferricrete material present across the site; the invert level of the open drainage swales and subsoil outfall locations; and in the upstream reaches of the subsoil drainage network the invert levels will be governed by minimum pipe grades.

The perched groundwater that is intercepted by subsoil drains during winter months will be treated in bioretention swales at the drainage outfalls, which will be located in POS areas and will be designed with appropriate soil media and plant species to retain and treat the discharge from subsoil drains.

3.7.6 NON-POTABLE WATER SUPPLY

An important part of water sustainability is fit-for-purpose water use, or the use of alternative water sources for applications where drinking-quality water is not necessary (e.g. toilet flushing, garden watering).

The State Water Plan (Government of Western Australia, 2007) identified a potable water consumption target of 40-60 kL/person/year. This target can only be achieved if all outdoor water use is supplied by non-potable sources, and the widespread implementation of non-potable water schemes is most successful when installed with the construction of subdivision works. A non-potable water supply (third pipe) system would allow the use of alternative water sources throughout the development and would greatly reduce consumption of potable water.

The widespread implementation of non-potable water schemes is most successful when installed with the construction of subdivision works. A reticulated non-potable water supply (third pipe) system would allow the use of alternative water sources throughout the development and would greatly reduce consumption of potable water.

The Shire of Serpentine Jarrahdale is investigating potential alternative water sources that could be used for a third-pipe scheme throughout the greater Mundijong area. The developer will continue to liaise with the Shire as the development process continues, with a view to implementing a reticulated third-pipe system should an alternative water source be available at the time of development.

Public open space is expected to be irrigated using groundwater from the superficial aquifer. The site falls within the Serpentine Groundwater Area, and the Byford 3 Groundwater Subarea. According to the Department of Water (September 2012), there is water available in the superficial aquifer, and a groundwater licence application is currently being assessed by the DoW with the licence expected to be issued in March 2013.

The groundwater licence application is for approximately 44 kL/yr, to irrigate 5.6 ha of POS and streetscapes. The primary school site has not been included in the application, and DET will be responsible to secure a groundwater allocation for the primary school area. When the groundwater licence is approved, exploratory drilling will be undertaken to determine the possible yield in the proposed bore locations.

3.8 EDUCATION FACILITIES

3.8.1 PRIMARY SCHOOL SITE

Education requirements have been guided by relevant policy and the requirements of the Department of Education (DoE). The provision of primary school sites in urban areas provides a vital social value to the area, with primary schools being recognised for their role as place making elements. There is one Primary School Site proposed within the LSP area, representing one of the eight primary school sites identified as necessary within the Mundijong-Whitby DSP area. This primary school site is 3.5022 hectares in size and will service Precinct E of the DSP area, which includes the LSP area to the north of the subject LSP. The primary school site is to be co-located with the major park in the centre of the LSP, hosting active recreational and sporting facilities for the community and school students.

Development Control Policy 2.4 – School Sites states that one primary school site is required for between 1,500 and 1,800 housing units. It is also stated in the policy the importance of primary school sites being located close to a local distributor road to ensure ease of access by vehicles and proximity to public transport routes. The co-location of the primary school site with public open space allows for facility sharing.

Element 8 of Liveable Neighbourhoods (LN) provides a guide to facilitate the responsive design of school sites in new subdivision areas. It is noted that it is important to consider the provision of school sites during the sub-regional and district structure planning stages and in consultation with both government and non-government education providers. It is reiterated in LN that primary schools be located on a neighbourhood connector with good accessibility for walking, cycling and public transport together with vehicular access. LN states that one primary school is required per 1,500 housing units. Shared ovals with local government and school sites are encouraged to improve land efficiency, and allow the provision of smaller school sites, as is the case with the proposed primary school site within the subject area. There is a requirement of a minimum 3.5 hectare site for a primary school in cases of co-location with adjoining public open space.

A meeting was held with Richard Bloor at the Department of Education on 26 July 2012 to discuss the proposed primary school site. Mr Bloor confirmed that the location and configuration of the primary school and the co-located oval were suitable. It was also indicated during this meeting that as the expected lot yield of approximately 557 does not meet the housing unit requirement for a primary school, compensation will be received for the development of the primary school site from surrounding landowners and the DoE. The expected lot yield of 557 contributes to development of approximately one third of the 1,500 dwelling units required for the development of a primary school, and Lot 50 is therefore required to contribute one third of the school site, being approximately 1.1 hectares. The remaining 2.4 hectares shall be contributed by surrounding landowners via the Department of Education.

It is of note that there is an existing Mundijong primary school to the east of the subject site, with a student enrolment of 175 students. The Mundijong Primary School is currently at capacity in terms of student accommodation, thus confirming the timely requirement for an additional primary school in Mundijong. It has been advised by the DoE that transportables may be added to the Mundijong Primary School to meet excess demand in the interim, depending on the size and accessibility of the space available. There is an existing Serpentine Jarrahdale Grammar School private K-Yr12 school located north-east of the subject site servicing a large portion of the Mundijong existing community.

3.9 ACTIVITY CENTRES AND EMPLOYMENT

3.9.1 NEIGHBOURHOOD CENTRE

Precinct E of the Mundijong-Whitby DSP contains portion of a local neighbourhood centre which will provide for the convenience needs of the local community. The location of this neighbourhood centre is within Sub-Precinct E1 to the north of the LSP area, and is outside the responsibility of the subject LSP. Future residents within the LSP area (Sub-Precinct E2) will be able to access the neighbourhood centre via Adams Street on the eastern boundary of the LSP land, which provides a direct connection through to Sub-Precinct E1 to the north.

3.10 INFRASTRUCTURE COORDINATION, SERVICING AND STAGING

3.10.1 STORMWATER MANAGEMENT

Lot runoff will be managed through the use of soakwell systems to retain and infiltrate roof runoff within individual lots. Subsoil drainage will be installed within road reserves to promote infiltration and improve the efficiency of soakwells. Future lot owners may also opt to install rainwater tanks, which will also act to retain lot runoff on-site.

A conventional piped network will be designed to manage road runoff, with 'leaky' side entry/gully pits located to suit appropriate spread rates and pit spacings. The level of service for the side entry/gully pits and the pipe network will be dependent on the road hierarchy. Road runoff from minor storm events (up to 1 year ARI) will be retained and treated within bioretention systems in public open space areas to ensure water quality objectives are met.

To ensure that downstream landholdings are not adversely impacted by development in upstream catchments, each development must ensure that peak post-development flow rates generated by runoff from the development area do not exceed pre-development levels. This is achieved through the use of detention storage areas spread throughout the development. Off-line storage areas will be provided within public open space to attenuate peak flows, and will discharge to open swale drains through the multiple use corridors.

3.10.2 WATER SUPPLY

The main water supply to Mundijong is currently supplied off the Serpentine Trunk Main on Summerfield Road 5.5km to the south of Mundijong Road. This water main consists of pipes of 150mm and 300mm diameter and Water Corporation is in the process of upgrading the 150mm diameter pipes to 400mm diameter pipes.

The long term water supply proposed for Mundijong would be a supply from the north along Soldier Road from the Byford gravity tank. This proposed water distribution pipeline would vary in size from 500 to 900mm diameter. Sections of the mains will be installed to allow for staging as development occurs to the north of Mundijong, but this would need to be supplied off the current network and works will be developer funded.

Water Corporation is currently undertaking a review of the water planning in Mundijong and it is expected that the review will be completed by November 2012.

However in the interim, the water supply for Lot 50 Cockram Street can be obtained from the water main at the corner of Paterson Street and Mundijong Road. It is expected that a 250mm diameter main will be laid from Paterson Street to the site.

The proposed water infrastructure requirements for Lot 50 Cockram Street are shown on drawing 2681-01-SK-01 of the Infrastructure Servicing Report (refer **Appendix 9**).

3.10.3 WASTEWATER

The Water Corporation has a long term plan to construct a permanent Type 1000 sewer pump station (Mundijong A) at Scott Road to service the whole of Mundijong. The discharge from Mundijong A will be at East Rockingham Waste Water Treatment Plant via a pressure main along the service corridor and Mundijong Road. Initially a temporary pump station will be built in Scott Road and pump northwards to an existing pump station in Byford with an approximately 20 l/s capacity available.

The availability of this 20 l/s capacity for Mundijong will be subject to ongoing monitoring and will only be available on a staged basis and will be dependent on the progressive upgrades of Byford pump station.

Water Corporation is currently undertaking a review of the sewer planning in Mundijong and it is expected that the review will be completed by November 2012.

To service Lot 50 Cockram Street, a temporary Type 40 sewer pump station can be constructed near Sparkman Road and discharge via a pressure main to the proposed temporary pump station at Scott Road.

The proposed sewer infrastructure requirements for Lot 50 Cockram Street are shown on drawing 2681-01-SK-01 of the Infrastructure Servicing Report (refer **Appendix 9**).

3.10.4 POWER SUPPLY AND TELECOMMUNICATIONS

The existing Western Power distribution infrastructure in the vicinity of Lot 50 Cockram Street comprises of several three phase 22kV high voltage (HV) aerial feeder lines (BYF 524) from Byford Zone Substation along Taylor Road and Adams Street.

There is currently some spare capacity on the BYF 524 feeder but the actual spare capacity is not known and confirmation from Western Power will be required. This capacity is available on a first-come first-served basis.

Western Power has plans to construct a major Zone Substation along Gossage Road in Oldbury in 2025. If the supply capacity is required before 2025 Western Power will charge the developer for the full capital costs.

Western Power's Feasibility Study for Mundijong estimates that the Headworks charges will amount to approximately \$2,500 to \$3,000 per lot for the initial phase of development. Headworks refer to distribution network reinforcements outside the subdivision that are necessary in order to provide power capacity to the subdivision. All headworks extensions, removal, moving or upgrades to the network will be fully funded by the developer.

The WAPC and Western Power will most likely stipulate that the existing HV and LV aerials adjacent to the subdivision are to be undergrounded and any existing consumers affected must have their consumer mains reconnected to the underground network.

It is envisaged that the Lot 50 Cockram Street development will fall under the ambit of the National Broadband Network (NBN) which requires developers to install an approved pipe and pit system as part of the development.

Network infrastructure will be installed subsequently by NBN appointed contractors at no cost to the developers.

3.10.5 GAS SUPPLY

As there are currently no ATCO gas headworks infrastructure in the vicinity of the subject site, the provision of natural gas will require the construction of a headworks high pressure gas main from Nettleton Road, Byford.

3.11 DEVELOPER CONTRIBUTIONS AND ARRANGEMENTS

The Shire is currently preparing a Development Contribution Arrangement for the Mundijong-Whitby Development Contribution Area, inclusive of the LSP area. The timing for the completion of this Plan is not known at this stage. In the interim, it is understood a Developer Contribution Agreement, similar to that prepared for Byford, will be negotiated between the developer and the Shire.

Developer Contribution arrangements will include both 'traditional' infrastructure and 'community' infrastructure, through statutory processes and in accordance with State Planning Policy 3.6 Development Contributions for Infrastructure.

4 CONCLUSION

This structure plan has been prepared following a detailed and considered analysis of the opportunities and constraints within the subject site.

The LSP provides a guiding framework for subdivision and development. It serves to coordinate the provision of land use, services and infrastructure. The proposed land uses and subdivision design are compliant with the MRS, the Shire's TPS 2, the Mundijong-Whitby DSP, and have been prepared in accordance with the principles of Liveable Neighbourhoods.

From the research and analysis undertaken on the land use capabilities of the subject site, it is evident that the site is suitable for development for urban purposes, with the provision of sufficient POS. The site is accessible from the existing road network and servicing requirements within the site such as roads, drainage and utilities have been adequately addressed.