# Structure Plan

## Lot 51 Tunbridge Street, Margaret River

**September 2015**


**Prepared by:**

LB PLANNING
TOWN PLANNING | URBAN DESIGN | LAND DEVELOPMENT CONSULTING

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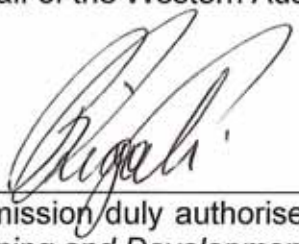
This structure plan is prepared under the provisions of the Shire of Augusta-Margaret River Local Planning Scheme No.1

IT IS CERTIFIED THAT THIS STRUCTURE PLAN WAS APPROVED BY RESOLUTION OF THE WESTERN AUSTRALIAN PLANNING COMMISSION ON: 12 October 2016

Signed for and on behalf of the Western Australian Planning Commission



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

Witness

12 October 2016

Date

Date of Expiry: 12 October 2026

DISCLAIMER:

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Table of amendments

| Amendment No. | Summary of the Amendment | Amendment type | Date approved by Commission |
|---|---|---|---|
| | | | |
| | | | |

# EXECUTIVE SUMMARY

This Structure Plan has been prepared to guide the subdivision and development of land contained within Lot 51 Tunbridge Street, Margaret River.

The Structure Plan area comprises 1.3394 hectares and is located approximately 250m north-west of the Margaret River main street, within the Shire of Augusta – Margaret River.

The landowner (CVJ Pty Ltd) purchased the property in 2014 and seeks to subdivide the land in order to facilitate residential and mixed used development, as envisaged by the Shire's Local Planning Strategy.

The Structure Plan has been prepared in conjunction with a proposed scheme amendment to rezone the land from "Residential R15" to "Future Development" zone pursuant to the Shire of Augusta - Margaret River Local Planning Scheme No 1.

The consultant project team involved with the preparation of this Structure Plan included the following:

- LB Planning - Urban Design and Town Planning;
- CVJ Pty Ltd - Project Management;
- MPM Development Consultants - Civil Engineering & Stormwater Strategy;
- SW Environmental – Flora & Fauna Value Assessment;
- Jonathan Riley - Traffic and Transport Assessment; and
- RUIC Fire - Bushfire Management.

The proposed Structure Plan outlines the planned urban layout for the land and identifies intended land use areas, residential density and other development provisions to guide and control future land use. It has been prepared in accordance with the relevant planning framework and will provide appropriate guidance to future subdivision and development assessment of the land.

It is estimated the proposal will realise between 25-30 residential dwellings on the site with a potential mixed use land use component closer to the Tunbridge Street interface.

Although not limited to, formulation of the proposed Structure Plan considers the following:

- Awareness of the surrounding established residential area, site topography and natural features;
- Central movement corridor to ensure land efficiency and minimise impact on established adjoining residential lots;
- Strategic location of infrastructure to ensure sensitive storm water management and future pedestrian access opportunities;
- Proximity to the town centre and its relationship to Tunbridge Street;

- Implementation of specific building design guidelines at the subdivision stage (via an approved Local Development Plan) to inform envisaged housing design/built form outcomes and assist building approval assessment;
- Development cell placement & design to support site appropriate housing on future lots of appropriate size and orientation;
- Flora and fauna values; and
- Fire risk mitigation.

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## PART ONE - IMPLEMENTATION



## PART TWO - IMPLEMENTATION

## LIST OF PLANS



## PART THREE - APPENDICES

# Part One

## IMPLEMENTATION

# 1 STRUCTURE PLAN AREA

This Structure Plan shall apply to Lot 51 Tunbridge Street, Margaret River, being the land contained within the inner edge of the broken black line shown on the Structure Plan Map (**Plan 1**).

For the purposes of this report it is referred to as the *Structure Plan.*

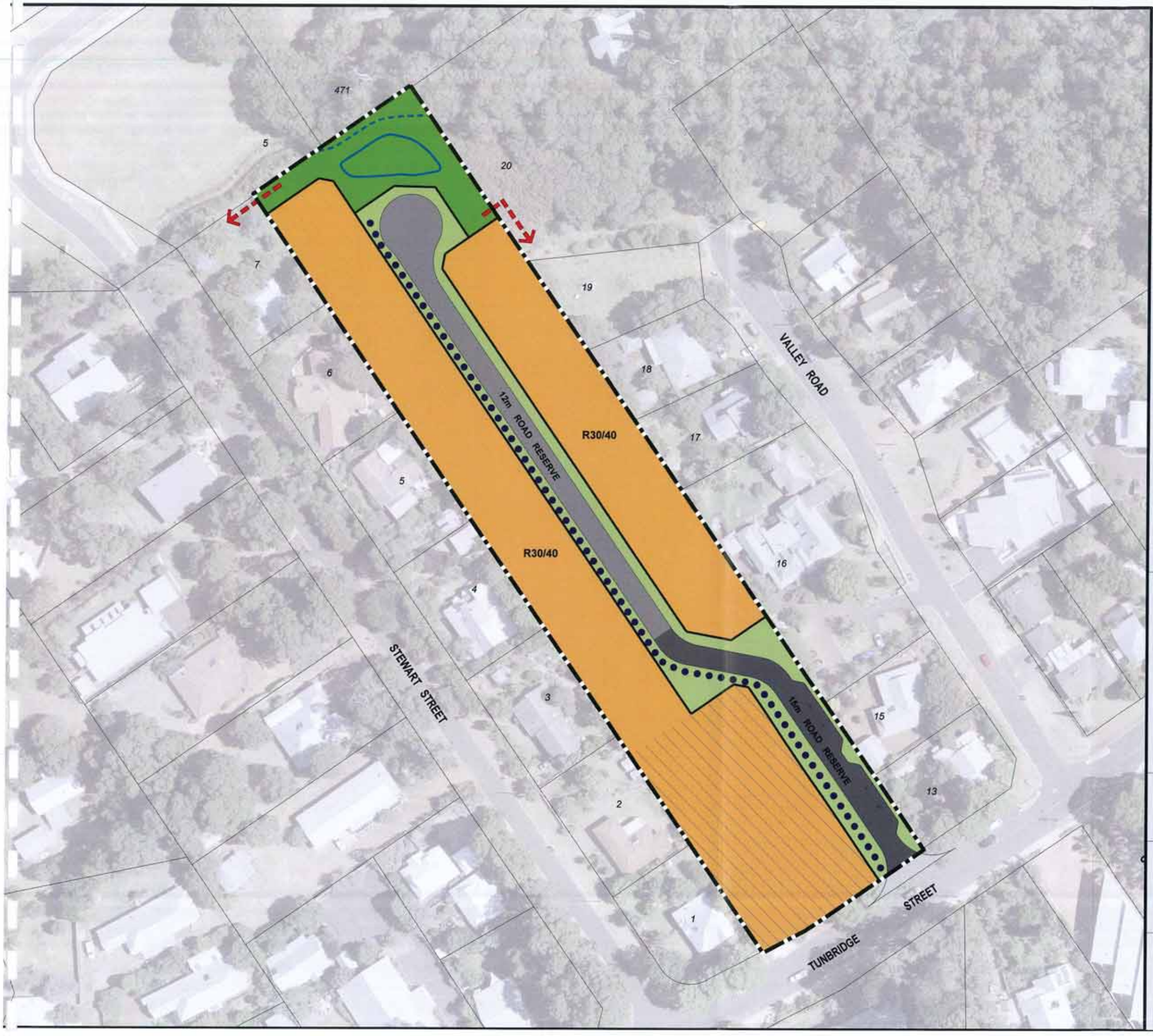
# 2 STRUCTURE PLAN CONTENT

This Structure Plan report comprises three parts being:

- **Part One (Implementation)** – This section contains the Structure Plan Map including requirements to be applied when assessing subdivision and development applications within the Structure Plan Area.
- **Part Two (Explanatory Section)** – This section provides an explanation of the Structure Plan including planning background, site conditions, constraints, land use and design philosophy. Part Two is to be used as a reference guide to interpret and justify the implementation of Part One.
- **Part Three (Appendices)** –Incorporates all specialist consultants reports used to inform and prepare the Structure Plan.

# 3 OPERATION

This Structure Plan commences operation on the date it is approved by the Western Australian Planning Commission and is valid for a period of ten years from such time. Due regard to its intent and specific provisions shall be given when considering future subdivision and development of the land.




**LEGEND**

- STRUCTURE PLAN BOUNDARY
- R30/40 LOTS
- MIXED USE POTENTIAL
- POS / DRAINAGE
- DRAINAGE LINE
- POTENTIAL PEDESTRIAN LINK
- INDICATIVE DRAINAGE BASIN
- FOOTPATH
- ACCESS STREET (15m ROAD RESERVE)
- SPECIAL STREET (12m ROAD RESERVE)

| | | |
|---|---|---|
| **CLIENT** | : | *CVJ PTY LTD* |
| **SCALE** | : | *1:1,000 @ A3* |
| **DATE** | : | *26 November 2015* |
| **PLAN No** | : | *51 Tnbrge-1-002.dgn* |
| **REVISION** | : | *C* |
| **PLANNER** | : | *SLB* |
| **DRAWN** | : | *BL* |

**NOTES**

Base data supplied by Dataman Geomatics / Landgate
Areas and dimensions shown are subject to final survey calculations.
All carriageways are shown for illustrative purposes only and are subject to detailed engineering design.
Datum: GDA94 zone 50

0 10 20 30 40
metres

# PLAN 1
# STRUCTURE PLAN
Lot 51 Tunbridge Street MARGARET RIVER

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# Part Two

## EXPLANATORY SECTION

# 1 PLANNING BACKGROUND

In June 2013 the estimated resident population of the Shire of Augusta – Margaret River was 13,168 people. Current population forecasts suggest that by 2026 the population will be somewhere between 15, 000 and 19,000 people.

As its principal centre and from a planning perspective, the Margaret River Townsite must be prepared to account for this predicted growth and as a guide its Local Planning Strategy (LPS) provides a medium to long-term planning strategy. While the LPS specifically sets out strategies for land use and development over the next 15 years, it can also be used to determine the appropriateness of future local planning scheme amendments.

Lot 51 Tunbridge Street, Margaret River (the site) is identified by the LPS within a Development Investigation Area M13 (DIA M13) which provides for infill development at a density of R30/40 with mixed use potential, subject to rezoning and structure planning.

Following a decision at its Meeting of 24 September 2014, to provide 'in principle' support to such rezoning of the land, the Council also requested the applicant to undertake/investigate certain actions as part of a formal structure plan and scheme amendment proposal.

Accordingly the landowner has done so and in association with this proposal, has also submitted formal request to amend the Scheme by rezoning the land from 'Residential R15' to 'Future Development' zone in the form of proposed Scheme Amendment No 42. The proposed scheme amendment refers to these actions and should therefore be read in conjunction with this Structure Plan proposal.

This report and has generally been prepared in accordance with the "Draft Structure Plan Framework" pursuant to *The Planning and Development (Local Planning Scheme) Regulations 2015*. It provides a local design response to the site and will guide future subdivision and the sustainable urban development of the land.

The Structure Plan is also informed by a number of technical investigations (i.e. traffic, environmental, civil and bushfire) prepared by an appointed consultant project team. A summary of each investigation is included within this section, with complete copies provided in Part Three (Appendices Section).

# 2 LAND DESCRIPTION

## 2.1 Site Details

The subject land is located within the Margaret River Townsite and at the time of writing this report is zoned "Residential R15" by the Scheme. As mentioned above, it is proposed to rezone the land to Future Development' zone by way of Scheme Amendment No 42.

It is approximately 250m north-west of the Margaret River main street and is bounded by residential zoned land on its west, east and northern boundaries **(refer Plan 2)**.

The land enjoys direct frontage to Tunbridge Street and is within walking distance to shops, café's, offices and other town centre related land uses. Public community facilities such as the Margaret River Community Resource Centre, Hospital and Public Library are also in close proximity.

The site comprises a total area of 1.3394ha and accommodates an existing dwelling, shed and water tank. The topography generally slopes to the north towards a small creek line that traverses the very north east corner of the property **(refer Plan 3)**.

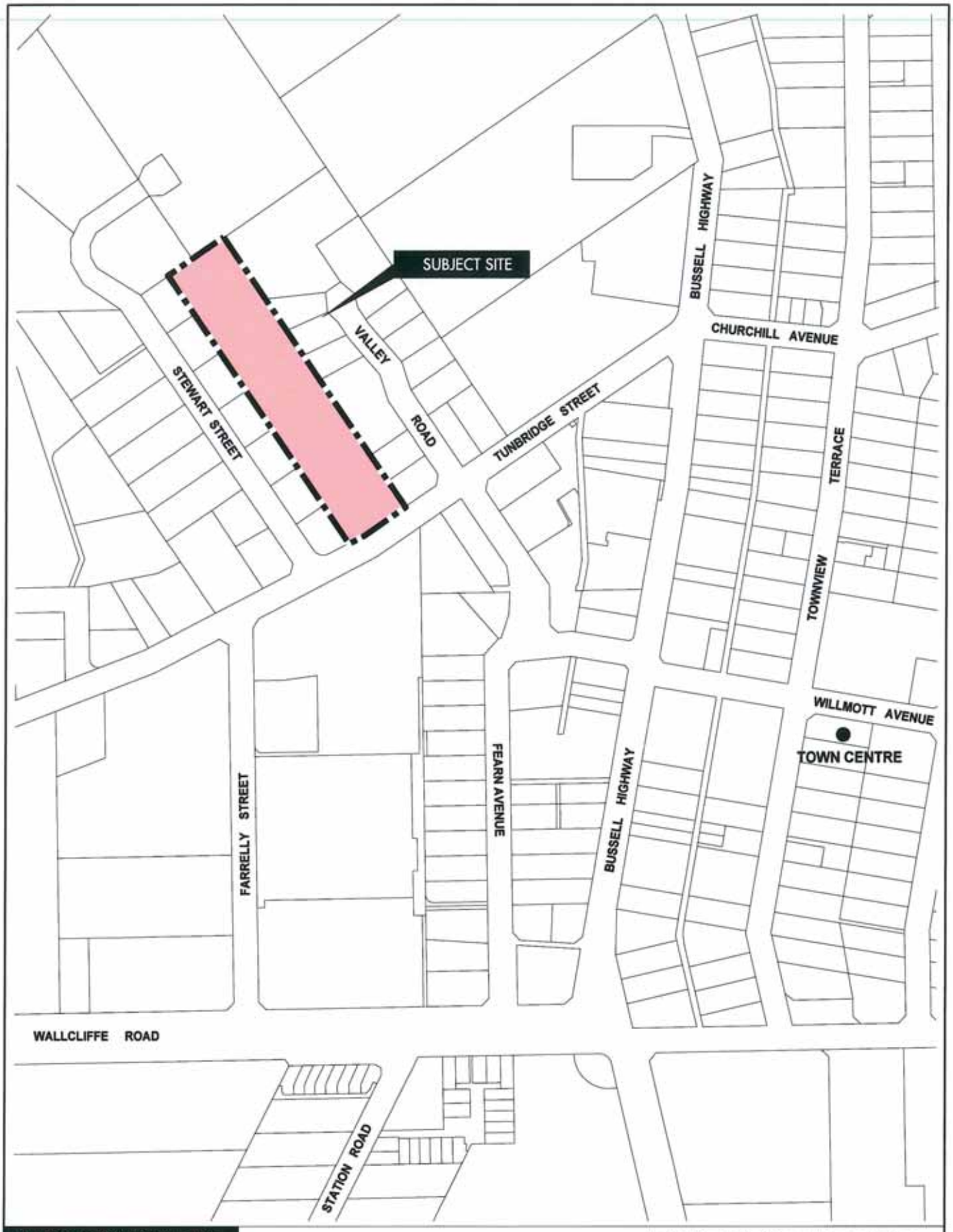
Most of the site is either parkland cleared or consists of planted exotic ornamental or fruit trees. A fruit orchard (0.3 ha) has been planted immediately north of the dwelling. Vegetation in front of and around the dwelling is exotic and includes palms, conifers and eastern states gum trees. The only native vegetation remaining on site includes five large Peppermints (*Agonis flexuosa*) and some mixed Peppermint and Marri (*Corymbia calophylla*) regrowth along the creek line (0.05 ha). Ground cover over the site is heavily weed infested with dense Kikuyu and herbaceous weeds.

A topographical feature survey of the site has been completed which indicates a gentle slope, with contours varying from 87m AHD to RL 66m AHD falling from Tunbridge Street in the south to the northern property boundary.

The site also includes a crossfall between the west and east boundaries varying from just over 1.0m along the northern boundary to a 4.0m differential through the centre of the site.

## 2.2 Legal Description and Ownership

The subject land is described as Lot 51 Tunbridge Street, Margaret River on Deposited Plan 203023 Volume 1976 Folio 752. The registered proprietor is CVJ Pty Ltd.




## PLAN 2: LOCATION PLAN

Lot 51 Tunbridge Street, Margaret River

| | | |
|---|---|---|
| CLIENT | : | CVJ PTY LTD |
| SCALE | : | 1:4,000 @ A4 |
| DATE | : | 17 September 2015 |
| PLAN No | : | 51 Tunbridge locn.dgn |
| REVISION | : | A |
| PLANNER | : | SLB |
| DRAWN | : | BL |

LEGEND

SUBJECT SITE

0 40 80 120 160

metres

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ABN 65 115 274 128


## PLAN 3: AERIAL PLAN

Lot 51 Tunbridge Street, Margaret River

| | | |
|---|---|---|
| **CLIENT** | : | *CVJ PTY LTD* |
| **SCALE** | : | *1:1,500 @ A4* |
| **DATE** | : | *17 September 2015* |
| **PLAN No** | : | *51 Tunbridge AP.dgn* |
| **REVISION** | : | *A* |
| **PLANNER** | : | *SLB* |
| **DRAWN** | : | *BL* |

**LEGEND**

*SUBJECT SITE*

0 15 30 45 60
metres

N

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# 3 PLANNING FRAMEWORK

## 3.1 Shire of Augusta – Margaret River Local Planning Scheme No.1

The site is zoned 'Residential R15' by the Shire of Augusta – Margaret Local Planning Scheme No 1 (the Scheme).

It is proposed via Amendment No. 42 to the Scheme, that the site be rezoned to 'Future Development' zone thus requiring the preparation of a Structure Plan.

Clause 4.2.7 of the Scheme (outlined below) sets out the purpose and objectives of the Future Development Zone:

*"Purpose of the Future Development Zone:*

*To provide for additional sustainable urban development within and around existing settlements within the Scheme area.*

*Objectives of the Future Development Zone:*

*(a)To designate land considered to be generally suitable for future urban development and to prevent such land being used or developed in a manner which could prejudice its possible future use for planned urban development;*

*(b) To provide for the sustainable development of land in an orderly manner with appropriate levels of physical infrastructure and human services;*

*(c) To require, as a pre-requisite to the local government's support for subdivision proposals and approval to development for urban purposes, the preparation and approval by the local government together with endorsement by the Western Australian Planning Commission of a Structure Plan in accordance with the provisions of Part 6 of the Scheme; and*

*(d) To guide and control the development so as to achieve compact urban areas linked by open space, natural areas and functional open space consistent with the objectives"*

The Scheme also states in Clause 4.2.9 (a) that:

*"Prior to the local government granting approval to any development or supporting any proposal for the subdivision of land within the Future Development Zone, other than the erection of a single dwelling or minor changes in the use of land, a Structure Plan shall be prepared and approved pursuant to the provisions of Part 6."*

In the context of this proposal, Part 6 of the Scheme specifically refers to preparation of Structure Plans and the subsequent adoption and approval process by the Council and Western Australian Planning Commission (WAPC). This Structure Plan has been prepared to fulfil these requirements and those necessary to support the proposed rezoning of the land itself.

The proposed Structure Plan identifies specific land use, residential density codes, and other development provisions to guide and control the area development. This Structure Plan has been prepared under the provisions of the Scheme and following public advertising and formal assessment, will be adopted by the Shire of Augusta Margaret River and endorsed by the WAPC. The Structure Plan comprises an implementation section (Part One) and explanatory section (Part Two) consistent with the WAPC Draft Structure Plan Framework.

## 3.2 Residential Design Codes of Western Australia

State Planning Policy No. 3.1 Residential Design Codes (the Codes) provides the basis for control of residential development through Western Australia.

The Codes are adopted by the Scheme and therefore unless otherwise provided by the Scheme, all future residential development of the subject land shall be in accordance with the provisions of the Codes as it relates to the density code applied to specific portions of the site.

## 3.3 Margaret River Townsite Strategy

The Margaret River Townsite Strategy was adopted by Council in 2008 and includes the site within "Precinct Three – Town Centre" where it is identified for mixed use (residential and commercial) development to support the town centre.

The Strategy also makes reference to the area being suitable for an increase in residential density. The proposed Structure Plan is consistent with the intent of the Strategy and its vision for potential mixed use development.

## 3.4 Local Planning Strategy

The Local Planning Strategy (LPS) was endorsed in 2011 and it identifies the site within Development Investigation Area (DIA M13) with specific reference to "mixed use" and residential densities of "R30/R40" **(refer Plan 4)**.

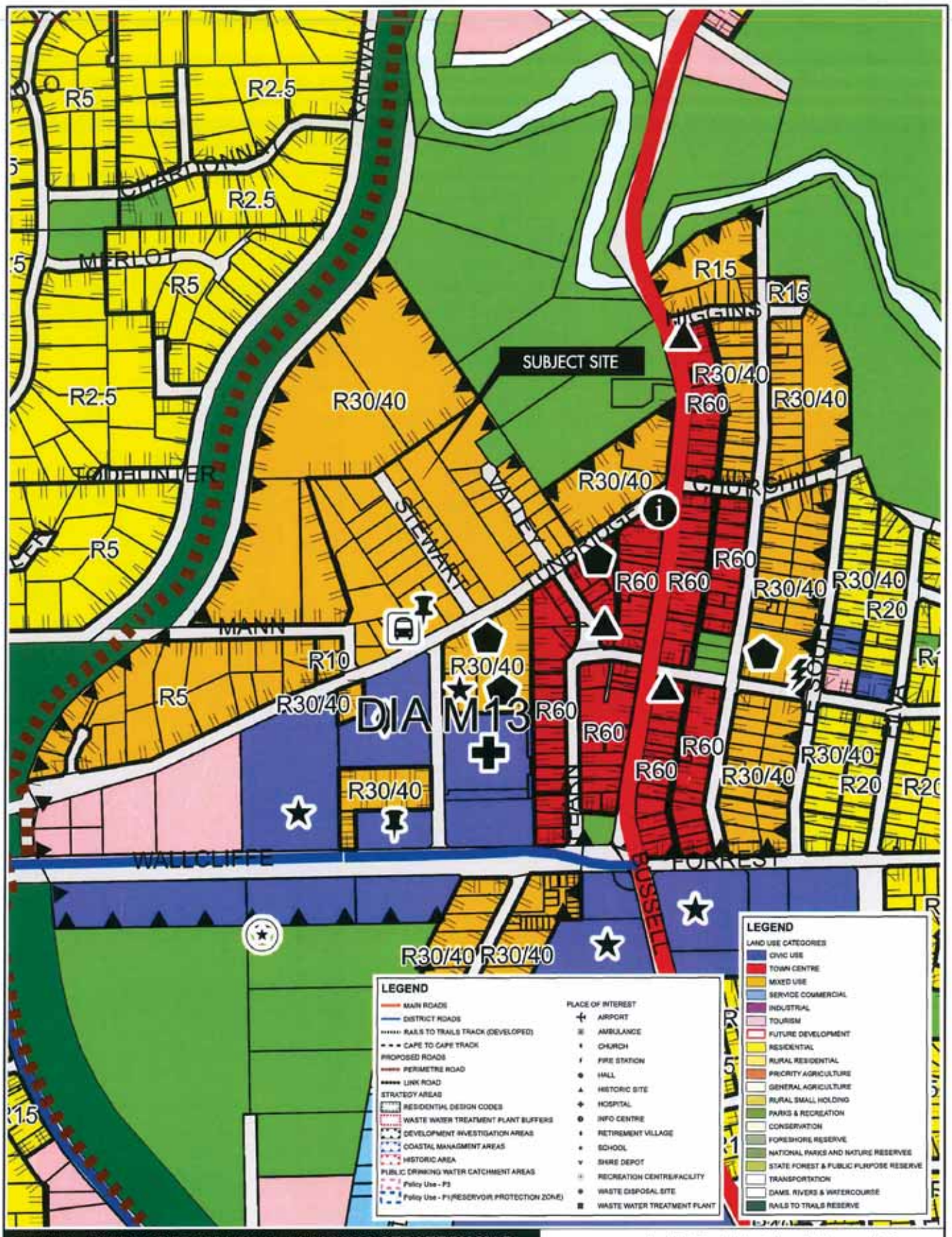
The LPS also specifies that potential for a density increase within DIA M13 is subject to an overall structure plan/scheme amendment being carried out to examine servicing and urban design/streetscape issues in respect of the area.

Neighbouring properties within nearby Stewart Street and Valley Road are also identified within DIA M13 for infill development, subject to an overall Structure Plan. However the LPS also refers to the alternative option of preparing individual Structure Plans for each street, to examine servicing and urban design/streetscape outcomes. This is on the basis that an overall plan may not be possible to formulate for the whole DIA and as part of a single scheme amendment process in the short term, due to issues associated with multiple ownership and differing land owner points of view.

Conversely, unlike the adjoining properties, Lot 51 Tunbridge is a largely undeveloped Greenfield site under single ownership and its ability to be considered as part of a stand-alone Structure Plan in order to facilitate future residential planning objectives provided by the LPS in the short term is the logical way forward. However, in order to confirm whether a more holistic proposal could realistically be considered at this juncture, the landowner consulted with the key adjoining landowners to gauge the level of interest. In summary a lack of consolidated support to participate in the Scheme Amendment/Structure Plan process was revealed. Shire staff acknowledge this outcome and moving forward, accept this structure plan proposal in respect of Lot 51 Tunbridge Street only.

The site is a significant land parcel that can achieve a cohesive, well planned stand-alone development that is able to align itself with any further infill development that may prevail in the surrounding locality. It enjoys direct access and frontage to Tunbridge Street and a site specific Structure Plan can independently address the various planning considerations such as access, streetscape, location of development cells, mixed use development; the public realm, servicing/drainage and building design principles to name a few.

The proposed Structure Plan and envisaged infill development concept is fully supported by the LPS and its objectives for the site.




**PLAN 4 - EXTRACT FROM LOCAL PLANNING STRATEGY MAP**

Lot 51 Tunbridge Street, Margaret River

| | | |
|---|---|---|
| **CLIENT** | : | *CVJ PTY LTD* |
| **SCALE** | : | *1:7,500 @ A4* |
| **DATE** | : | *17 September 2015* |
| **PLAN No** | : | *51 Tunbridge LPS.dgn* |
| **REVISION** | : | *A* |
| **PLANNER** | : | *SLB* |
| **DRAWN** | : | *BL* |

0 75 150 225 300
metres

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## 3.5 Draft Structure Plan Framework

Schedule 2, Part 4, clause 15(1) and Part 5 clause 30(1) of the *Planning and Development (Local Planning Schemes) Regulations 2015* (the Regulations) requires a structure plan to be prepared in a manner and form approved by the WAPC.

The above clauses apply to all planning schemes in Western Australia as deemed provisions and set out the information required to be included in a structure plan. The Draft Structure Plan Framework document (September 2015) constitutes the manner and form for the preparation of structure plans under Schedule 2, Part 4, clause 16(1)(a) and activity centre plans under Part 5, clause 32(1)(a), as well as outlining procedural issues associated with structure plans. The Structure Plan Preparation Guidelines (2012) are replaced by this framework.

Accordingly this Structure Plan has been prepared in line with Draft Structure Plan Framework.

At the time of writing this report it is understood that the Draft framework will be reviewed six months after coming into operation (March 2016), to ensure it is functioning effectively.

## 3.6 Liveable Neighbourhoods

*Liveable Neighbourhoods* is WAPC operational policy to inform the design and assessment of structure plans and subdivision proposals, in metropolitan and country areas on green field or infill development sites.

It is intended that Structure Plans be prepared in line with the framework provided under *Liveable Neighbourhoods*. However where a structure plan is a requirement of a Local Planning scheme (as in this case) it must be prepared in accordance with scheme provisions.

Furthermore and as stated above, the Regulations also require structure plans to be prepared in accordance with the new Structure Plan Framework.

In association with the above, *Liveable Neighbourhoods* provides sound principles and guidance to structure plan design.

Accordingly this proposal broadly considers *Liveable Neighbourhood* objectives including the design of walkable neighbourhoods; mixed uses, active streets; energy efficient design and variety of lot sizes and housing types.

# 4 SITE CONDITIONS AND CONSTRAINTS

## 4.1 Flora and Fauna

To inform and guide the preparation of the Structure Plan, SW Environmental carried out an assessment to review the flora and fauna values of the site and identify any environmental issues to be further considered as part of the proposal.

In summary the site was found in a Completely Degraded condition (Keighery 1994) and native vegetation limited to only five Peppermints (*Agonis flexuosa*) with some mixed regrowth near the drainage line. Though spring surveys were not conducted it was considered unlikely that the site would support any threatened flora or ecological communities.

Evidence of Western Ringtail Possum was observed (scat and one drey) though the loss of 0.12 ha of habitat proposed (five trees and regrowth in the drainage line) is not considered likely to be significant. It was considered the proposed development is unlikely to result in a notable impact on any flora, fauna or threatened ecological communities nor should it require follow up biodiversity surveys.

A complete copy of the environmental investigation report prepared by SW Environmental is contained within Part Three (Appendices Section).

## 4.2 Geology

As stated in the Servicing Report contained in Part Three, a preliminary geotechnical investigation has not been completed for the site. However, based on the geological mapping and local knowledge, the site conditions are to likely consist topsoil covered laterite sand/silt to depths of 1.5 to 2.0m over reddish clay.

This general profile was also visible evident during a site inspection in April 2015, at a neighbouring property during an earthworks operation.

Subject to geotechnical confirmation by way of investigation it is unlikely that a pure sand will not be present on the development site, therefore site classification in accordance with AS2870 will likely be 'S' or 'M'.

Further development of the Structure Plan will require the investigation of subsurface conditions by way of a geotechnical investigation. This investigation and subsequent report will provide guidance on the requirements for future building development across the Structure Plan area. This may involve the ability for future buildings to be placed directly onto the existing soil types or the earth working of the site with additional clean sand fill material to improve the soil classification in accordance with AS2870 and reduce the subsequent building development requirement.

Based upon the existence of existing residential properties adjoining the Structure Plan Area, it is unlikely subsurface geotechnical conditions will restrict development of the site.

## 4.3 Groundwater and Surface Water

The Servicing Report also concludes that while groundwater monitoring has not been undertaken across the site, given the slope and the extensive excavation observed within an adjoining property, groundwater is not envisaged to require management.

The existing drain and dam in the north east corner of the site indicate that surface water presently flows through the area and it is likely the dam will be creating elevated groundwater levels in this north east corner. The removal of the permanent water retention dam as part of the stormwater strategy will reduce the ground water levels through this area.

In respect of surface water there are no Geomorphic Wetlands recorded for this area and the main surface water features are the dam (currently unused) located in the north east corner of the site and the stormwater drain which enters the site on the northern boundary and exits in the north east corner.

While the existing drainage line provides an urban drainage function, it also forms a type of winter creek following a rainfall event. The drainage line has been previously reconstructed upstream and realigned across the site. Reconstruction work has involved drain profile reshaping and rock lining to assist with scour protection. The drainage line within the site appears to have been realigned to permit the construction of a storage dam that is presently used as a reticulation supply dam.

As part of the proposal it is intended to re-align the existing drain and construct a new bioretention basin to manage future stormwater from the development. This will allow the existing drain to function as it presently occurs and allow the development to manage stormwater prior to discharge to the drain. Such works will be carried out at the time of subdivision, in accordance with an approved Urban Water Management Plan and Environmental Management Plan to ensure appropriate treatment of the realigned drainage line is implemented to the satisfaction of the Shire and Department of Water.

Further details regarding stormwater management are outlined in the Servicing and Stormwater Strategy Report prepared by MPM contained in Part Three of this document.

In relation to flood risk, the existing drainage line on the property caters for upstream urban stormwater flows and is therefore subject to potential flood inundation during extreme storm events. As part of its investigation, MPM conducted a review of the available 1 in 100 year recurrence interval flood levels for the area and it concluded that the site is clear, above any flood event of the Margaret River.

Further details, including flood mapping is provided by the Servicing and Stormwater Management Strategy Report.

## 4.4 Bushfire Hazard

During formulation of this Structure Plan a qualified fire management consultant (RUIC Fire) was engaged by the landowner to prepare a Bushfire Management Plan (BMP) to support the proposed Structure Plan. A full copy of the BMP is contained within Part Three of this document.

Strategic assessment of the site and surrounding area was completed in accordance with Planning for Bushfire Protection Guidelines 2nd Edition (FESA, 2010) and it was found that the subject land has *an overall Low Bushfire Hazard Rating*. It was therefore concluded that the Bushfire Hazard is not prohibitive of development.

A risk assessment was also completed in accordance with ISO31000:2009 and COAG's National Inquiry on Bushfire Mitigation and Management (2004). Consequently, it was concluded the bushfire related risk is not prohibitive of development on the site, subject to implementation of the treatments detailed in the BMP.

The proposed Structure Plan design considers the performance criteria of Planning for Bushfire Protection Guidelines 2nd Edition (FESA, 2010) with due regard for draft Planning for Bushfire Risk Management Appendices (May, 2014). Future development of the site will be subject to compliance with the requirements of the approved BMP.

The required bushfire planning design requirements proposed by the BMP are summarised as:

- Cul-de-sac head to be constructed to ensure appropriate fire service turning circle, inclusive of 21m diameter head;
- Future dwellings to be constructed in accordance with AS3959;
- All dwellings shall be located to ensure a rating of BAL-29 or less;
- A reticulated hydrant system be provided to ensure permanent water supply for firefighting efforts; and
- The subject lots shall have a Section 70A Notice on Title to ensure landowners are aware of the approved BMP requirements.

In summary the Bushfire Hazard rating, bushfire related risk level and BAL rating applicable to the proposed development cells are not prohibitive of development and the proposed Structure Plan satisfies all Elements and Performance Principles of SPP3.7

## 4.5 Heritage

There are no known registered European or Aboriginal Heritage places identified on the subject land.

## 4.6 Acid Sulphate Soil (ASS)

The current ASS mapping on the Landgate website, indicates that the site is within one distinct area of ASS mapping. Most of the development area lies within an area of moderate to low risk of ASS occurring within 3m of the natural soil surface, with the northern boundary portion being within an area of moderate to high risk of ASS occurring within 3m of the natural soil surface.

Accordingly, it is proposed as a condition on the Structure Plan that at the time of subdivision, the subdivider undertake investigations into ASS and include mitigation measures through the preparation of an ASS Management Plan to the satisfaction of the Department of Environment and Regulation (DER) and the Shire of Augusta-Margaret River.

## 4.7 Contamination

A review of the WA Atlas into potential contamination of land in July 2015 noted that the development site is not recorded as contaminated land.

No visual evidence exists on the property, as at July 2015, of illegal dumping or potential areas of contamination.

# 5 STRUCTURE PLAN

The proposed Structure Plan will provide planning direction to guide and control the proposed development of the site for future urban infill development. The Structure Pan is a flexible means of assessing land capability and long term opportunities for future development of the site in context with the strategic planning vision for the locality and its surrounds.

This Structure Plan will also provide a useful tool for assessing future subdivision and development proposals in respect of the land.

Finally, this Structure Plan identifies an urban pattern that will be used to guide future subdivision of the site. In this regard the Structure Plan only shows the proposed development cells and intended densities, as the eventual subdivision design will be confirmed as part of a formal subdivision application to be determined by the WAPC.

## 5.1 Design Layout

The Structure Plan has been designed with consideration to various planning principles, including *Liveable Neighbourhoods* objectives. It seeks to achieve a vision whereby the ultimate urban form of the site is able to provide a functional and sustainable residential component in context with the existing locality and its planned evolution as an urban infill development precinct.

The primary planning considerations and objectives that have been applied to formulate the plan and its design philosophy are as follows:

- Consideration to solar access and ability to apply suitable lot dimensions at the subdivision stage;
- The option of providing future pedestrian links to adjoining land by way of providing public reserved land at the northern end of the site;
- Site topography and ability to manage stormwater in a sensitive and appropriate manner;
- Review flora and fauna values of the site and confirm any potential impacts;
- Establish a central movement corridor to ensure land efficiency and minimise impact on established adjoining residential lots;
- Provision of adequate road reserve widths to accommodate services, infrastructure, footpaths and car parking whilst ensuring safe and efficient vehicle/pedestrian movements;
- Confirm appropriate intersection treatment and sightlines to Tunbridge street can be achieved;
- Encourage pedestrian movement via a proposed internal footpath and activation of the Tunbridge Street interface;
- Acknowledge the sites close proximity to the town centre and various civic and community services nearby;

- Apply specific Design Guidelines via a Local Development Plan (LDP) to encourage sustainable development principles and housing type that recognises the sites existing topography by "treading lightly";
- Ensure appropriate measures are established to mitigate fire risk;
- Identify mixed use potential in close proximity to the Tunbridge Street interface; and
- Intent to apply more detailed planning as part of the above mentioned LDP in respect of the potential 'Mixed Use' component. Further detailed planning in this regard will ensure built form and other urban design elements such as parking, access and setbacks will be properly considered at the development stage.

## 5.2 Access and Movement

The development proposes a simple, single intersection with Tunbridge Street and the provision of a cul-de-sac road internal of the development.

Construction of the intersection and cul-de-sac shall be to the Shire of Augusta-Margaret River Standards and current applicable Australian standards, including Austroads design guidelines and the IPWEA Local Government Guidelines for Subdivisional Development.

A Traffic Impact Assessment based on the proposed Structure Plan has been undertaken by a qualified Traffic Engineer (Riley Consulting) and fully copy of the traffic statement report is contained within Part Three of this document.

In summary its findings conclude the following:

- The location of proposed access to Tunbridge Street is in accordance with current intersection spacing guidelines set out in *Liveable Neighbourhoods* and provides appropriate visibility with low traffic impact levels;
- The proposed development is considered to generate 240 vehicle movements per day based on permanent residential occupation. Overall the proposed development can be expected to increase local traffic by 232 movements per day. During peak periods the site may generate up to 24 vehicle movements;
- The level of generated traffic is considered to be moderate in terms of its traffic impact and requires the provision of a traffic statement under WAPC guidelines. Assessment of the forecast traffic demands results in no material impact under the *WAPC Transport Assessment Guidelines for Developments*;
- A new cul de sac off Tunbridge Street provides access to the subject site. The location of the access to Tunbridge Street accords with current intersection spacing guidelines set out in *Liveable Neighbourhoods*. Appropriate visibility is provided at the location of access to Tunbridge Street and the low traffic demands will result in excellent Levels of Service;
- The subject site is well located to access the town site and the generated traffic is unlikely to have any adverse impact to the local road network. Suitable pedestrian and cycle access is currently provided;

- Based on the forecast traffic movements the lowest order of street is appropriate for the subject site. A 5.5 metre wide road pavement would be acceptable;
- The location of the proposed access road to Tunbridge Street conforms to the requirements of *Liveable Neighbourhoods* in regard to intersection spacing requirements. The proposed access is approximately 50 metres west of Valley Road and over 70 metres from Stewart Street;
- Parking is provided on individual lots. Visitor parking can be accommodated on the internal street to the subject site; and
- With up to 24 vehicle movements expected during the peak period, the access will operate with no significant delays. Austroads advice indicates that with a peak hour flow on Tunbridge Street of approximately 350 vehicles (10% of the daily flow), uninterrupted flow conditions will prevail. Under these circumstances Austroads advises that no further assessment is warranted.

In relation to the proposed road reserve widths, it is proposed to provide a 15m wide reserve from the Tunbridge Street intersection into the site whereby the reserve width is later reduced to 12m.

In this regard, *Liveable Neighbourhoods* indicates that a 14.2m wide road reservation (Access Street D) accounts for residential areas with less than 1000 vehicle movements per day (vpd). It also provides consideration to 'Special Streets' between 10 – 14m wide with a 5.5m wide carriageway, up to 1000 vpd.

As confirmed by Riley Consulting, the estimated traffic volumes resulting from the proposal is expected to be 240 vpd which is well below the traffic threshold for both the 'Access D' and 'Special Street' categories as per *Liveable Neighbourhoods.*

MPM also confirms both proposed15m and 12m wide road reserves are sufficient to accommodate required utilities to service proposed future development of the site

In light of the above, the proposed road reserve widths as shown on the Structure Plan are deemed sufficient from a traffic movement perspective and combined with a 5.5m wide carriageway, will still have adequate area for the provision of utility services and the proposed footpath.

## 5.3 Proposed Land Use

The proposed land use identified within the Structure Plan Area is primarily "residential" consistent with the R30 and R40 residential density codes. The residential component is identified on the Structure Plan as a dual code being R30/40. The dual coding provides flexibility particularly in relation to the general site requirements prescribed by the Codes.

The ability to consider mixed use development is also identified on the Structure Plan and this component has been strategically located closer to Tunbridge Street and is serviced by the wider 15m wide road reserve. This will provide on street car parking opportunities and ability to consider internal or laneway access, subject to more detailed planning at the subdivision/development stage via implementation of a Local Development Plan (LDP).

The Codes define mixed use as follows:

*"Buildings that contain commercial and other non-residential uses in conjunction with residential dwellings in a multiple dwelling configuration."*

At this preliminary stage it is not known whether 'mixed use' type development will be proposed therefore such potential is identified by the Structure Plan for consideration at the time of subdivision and development.

It is estimated that identified residential land within the Structure Plan area will produce an approximate yield between 25 - 30 residential lots. The actual yield will however be confirmed at the time of subdivision following further detailed planning.

## 5.4 Public Open Space

The area shown on the Structure plan as POS is for drainage purposes and will accommodate a bio-retention basin. The area required for the basin to account for 1:5 year rainfall is estimated at 300m$^2$.

In accordance with WAPC policy, it is required for a subdivider to provide up to 10% of its gross subdivisible area as POS, in this case 1339.5m$^2$. However in this instance and given the site's size, narrow configuration and proximity to the town centre, it is proposed to account for any POS requirement, by way of cash in lieu payment instead.

It should also be noted that while the proposed location of POS is mainly influenced by site topography and preliminary drainage design, it also provides opportunity for pedestrian connectivity with adjoining lots, in particular Lot 471 to the north and Lot 20 to the east. Such links are important as they could provide access to other areas of public open space and beyond into the future.

## 5.5 Local Development Planning

It is proposed to prepare and implement a Local Development Plan (LDP) at the time of subdivision, for the Structure Plan Area. Such requirement is proposed to be inserted as a specific provision in Schedule 11 of the Scheme text, as it relates to the subject Structure Plan Area (SPA 29) to which the subject land is incorprated.

It is intended the LDP incorporate specific guidelines to ensure all homes/buildings are built to a high standard whilst encouraging a variety of housing styles which are in harmony with the streetscape. The LDP will also guard against inappropriate development that may not be suitable for the site.

Due to the sites' sloping topography and also considering the amenity and long term development potential of adjoining land, the landowner will endeavour to progress development with a view to 'treading lightly' on the existing topography. If it is decided that retaining walls are necessary, it is envisaged that a range of options will be explored at the development stage. If possible it is also intended to utilise locally available materials for soil retention with stabilisation of batters to be undertaken in a consistent and aesthetic manner creating a development that fits the land not forces change upon it.

Accordingly, the LDP will try and avoid the creation of dominating retaining walls throughout the site and alternatively (via thoughtful building design) work with the site's natural topography.

Although not limited to the LDP will generally focus on the following:

- Site and building orientation;
- Streetscape;
- Housing types & architectural style;

- Vehicle access; and
- Slope & topography.

In addition to the above consideration of the sustainability provisions of Council's Local Planning Policy 24 for R40 development will also be considered as part of the LDP preparation.

# 6 INFRASTRUCTURE SERVICES

A detailed servicing and stormwater strategy report has been prepared for the Structure Plan area by MPM. A full copy of the report is contained in Part Three (Appendices Section).

Key aspects of current service scenario (including stormwater management) outlined in the technical report can be summarised as follows.

## 6.1 Stormwater Management

Following pre-lodgement consultation with the both the Department of Water and Shire staff, it was confirmed that requirement for an Urban Water Management Plan or Local Water Management Strategy at this stage of the planning process is not considered necessary. Alternatively a Storm Water Strategy has been prepared and is contained within the Servicing Report in Part Three of this document.

Based on a preliminary assessment of the sites geotechnical characteristics and the density of the proposed development, it is likely that the development will be required to install lot connection pits for future stormwater from the purchasers building development. Where possible a stormwater lot connection pit would be provided for a pair of lots, however the site grade may necessitate individual pits per lot.

The provision of the stormwater lot connection pits would be subject to the site 'not' being classified as 'A' under AS2870, by a subsequent geotechnical investigation and classification.

The proposed stormwater system for the road network would be suitably sized to accommodate the stormwater from future building development, However, it would be intended that each of the stormwater lot connection pits are fitted with a flow control on the pit outlet in order that the outflow rate is controlled to a predevelopment rate.

In accordance with the guidelines as provided by the DoW the development will undertake the retention of the 1 year ARI 1 hour storm event within the development area. It is proposed that this retention be undertaken within the bioretention basin to be located in the north east corner of the property within the identified POS reserve on the Structure Plan.

The bioretention basin will be provided with a low flow subsoil outlet, amended soil base and vegetated with suitable, locally sourced nutrient stripping vegetation in accordance with the Stormwater Biofiltration system, Adaption Guidelines by FAWB and Vegetation guidelines for stormwater biofilters in the south west of WA by Monash University. The bioretention area required has been calculated at 2.0% of the equivalent impervious area of 1.03ha equating to 205m2.

Detailed design at Urban Water Management Plan (UWMP) stage will resolve the exact layout of the bioretention basin.

The implementation of the bioretention garden, in conjunction with the management of the 5 year and 100 year AEP events will require the modification of the existing drain and dam that is located in the north east corner of the property. The Structure Plan recognises this requirement and as a condition requires the preparation and implementation of an Environmental Management Plan at the time of subdivision to address realignment of the drain to the satisfaction of the Department of Water (DoW) and the Shire of Augusta-Margaret River.

## 6.2 Water Supply

The subject land falls within an area currently licensed to the Water Corporation for water supply and any subdivision development of the land would require the connection to reticulated water.

The Water Corporations as-constructed record Esinet and current DBYD information indicates that there is a 100mm diameter water main in the northern Tunbridge Street road reserve.

Internally the development could be serviced by an extension of reticulation water mains from Tunbridge Street, installed at the developers cost providing each proposed lot with reticulated water. This would likely include a single 100mm diameter water main extending along the proposed road reserve to the cul-de-sac head.

## 6.3 Effluent Disposal

The subject land falls within an area licensed to the Water Corporation for the provision of sewer infrastructure and services.

A review of the Water Corporations as-constructed network Esinet and the latest DBYD information indicates that the property presently contains a Water Corporation Sewer Main that crosses the north east corner of the property.

The Structure Plan design accounts for the easement to remain in its current location however any adjustment of ground level undertaken by development will require the adjustment of the lids to the existing sewer chambers. Confirmation is presently being sought from Water Corporation regarding the installation of the drainage infrastructure within the sewer easement and above the sewer pipe. The sewer depth has been checked and is sufficient to service the entire development property.

The sewer reticulation internal of the development would include a central 150mm diameter pipe connection from the existing sewer on site to the proposed R40 lots fronting Tunbridge Street, providing each proposed lot with a connection to reticulated sewer.

## 6.4 Power

Pre-lodgement consultation with an experienced electrical power designer, based upon the existing infrastructure in the area, indicates the site will be able to be supplied with underground power. Internal of the development, a network of underground cables and lot connection domes will be required to be designed, supplied and installed by the developer.

Western Power are unable to provide any confirmation as to the adequacy of supply for the site until a subdivision application and design are lodged for Design Information Package. However, given the proximity of the site to the main street of Margaret River power supply is not considered to be a restriction to development.

## 6.5 Telecommunications

Having regard to the proximity of the land to established residential and commercial areas and their associated infrastructure, it is anticipated that the development of Lot 51 will have access to existing communications infrastructure.

Based upon the anticipated lot numbers the development will be required to design, supply and install a communications network for future cabling by the communications provider, under Telstra's guidelines.

Upon subdivision approval application will be made to Telstra with an approved internal communications design.

Please note that the provision of telecommunications services is not a condition of WAPC approval.

## 6.6 Gas

The Margaret River Townsite presently does not have a reticulated gas network.

# 7 CONCLUSION

The Structure Plan has been prepared in conjunction with proposed Scheme Amendment No.42 to rezone the land from "Residential R15" to "Future Development" zone pursuant to the Shire of Augusta - Margaret River Local Planning Scheme No 1.

The proposed Structure Plan outlines the planned urban layout for the land and identifies intended land use areas, residential density and indicative drainage areas. It has been prepared in accordance with the relevant planning framework and will provide appropriate guidance to future subdivision and development assessment of the land.

The Structure Plan has been prepared under the provisions of the Scheme and is required to be advertised prior to adoption by the Shire of Augusta – Margaret River and endorsement by the WAPC.

# Part Three
## APPENDICES

# Appendix A

## SERVICING AND STORMWATER STRATEGY REPORT

**Prepared by: MPM Development Consultants**

21 September 2015

# LOT 51 TUNBRIDGE STREET, MARGARET RIVER

# RESIDENTIAL DEVELOPMENT

# SERVICING REPORT AND STORMWATER STRATEGY

PREPARED FOR: CVJ PTY LTD

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# DOCUMENT CONTROL

**TITLE :** LOT 51 TUNBRIDGE STREET, MARGARET RIVER

**Author (s) :** Mr Craig Pippin

**Job No. :** 15017

**Client :** CVJ Pty Ltd

| Revision | Summary | Revised by | Approved by | Date |
|---|---|---|---|---|
| A | Issued for Client and LB Planning Review | | CP | |
| B | Minor Text Updates | CVJ | CP | 31/08/15 |
| C | Correction of Area and Volumes to 1 in 1 AEP event | CP | CP | 18/09/15 |

# Contents

# 1.0 Introduction

MPM Development Consultants were engaged by CVJ Pty Ltd to undertake the preparation of a servicing report for the residential development of Lot 51 Tunbridge Street, Margaret River.

The servicing report is based on the LB Planning Structure Plan, September 2015.

The report includes a summary and brief explanation of the site works, roadworks and servicing infrastructure requirements for conceptual development on the site.

The report also includes a stormwater management strategy intended to ensure the proposed structure plan considers and integrates the Better Urban Water Management Framework, produced by the WAPC and Department of Water (DoW).

The information contained herein has been provided to assist in the understanding of the potential engineering issues and constraints involved in the development of 51 Tunbridge Street, Margaret River. It is noted that the advice contained herein is general in nature, as MPM have not undertaken detailed engineering, environmental, geotechnical or other design work as part of this report. MPM have not undertaken detailed discussions with the local authority or servicing agencies, unless it is specifically noted within, where an issue was deemed to require additional clarification due to its affect on the potential for development.

# 2.0 Site

## 2.1 Location

The development site is located within the Margaret River townsite of the Shire of Augusta Margaret River. The current aerial photograph, courtesy of Landgate, is shown below as Figure 1 and a location plan as shown as Figure 2.

Figure 1 – Aerial Photography Courtesy of Landgate, July 2015

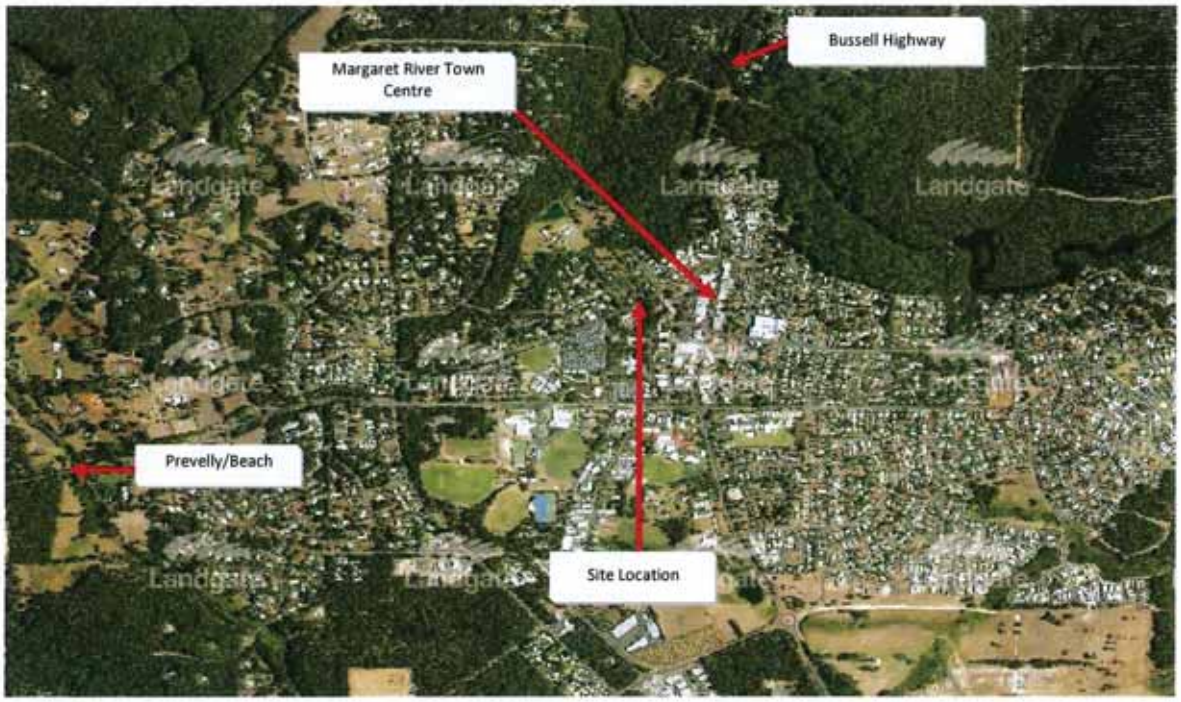


Figure 2 – Aerial Photography Courtesy of Landgate, July 2015

The site is located approximately 200m west of the Margaret River Townsite

## 2.2 Geology

The surface geology across the site is approximately described as being undifferentiated laterite and associated quartz sand with the potential for granite gneiss: mainly potassic, strongly to weakly foliated usually concordant; always present between basic ganite and course grained granulite. (Department of Mines and Petroleum, Busselton to Augusta, Geological Survey of Western Australia) See Figure 3 below.

A preliminary geotechnical investigation and report has not been completed for the site however based on the geological mapping and local knowledge, the site conditions likely consist of a topsoil covered laterite sand/silt to depths of 1.5 to 2.0m over reddish clay.

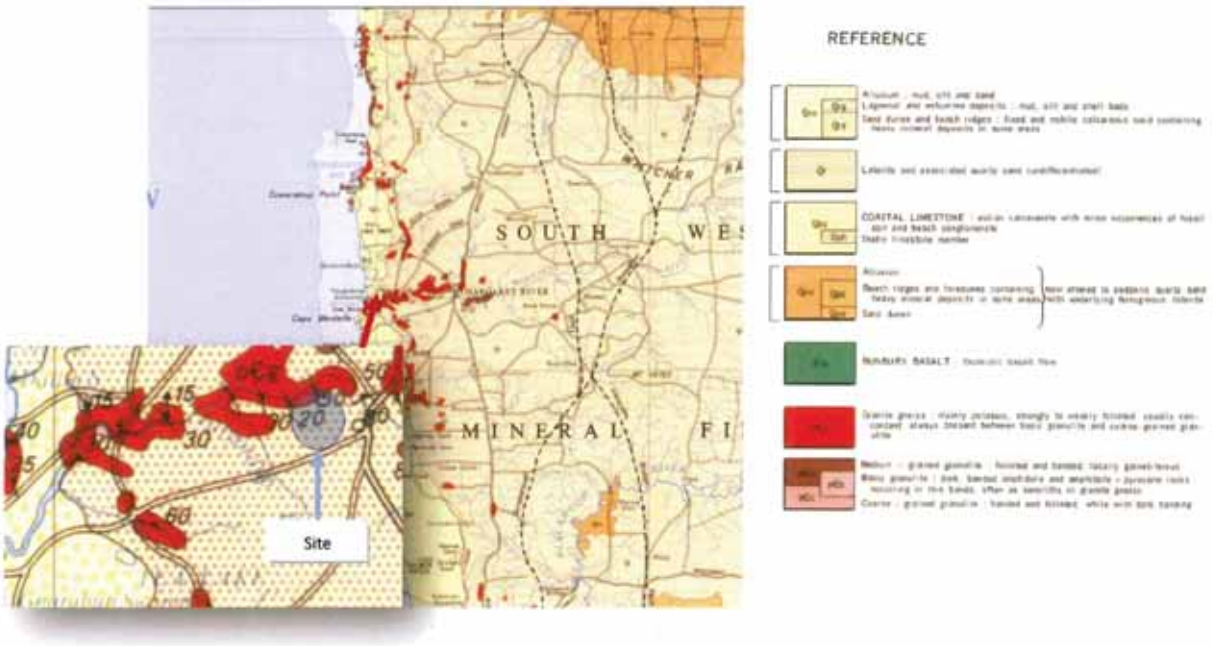


Figure 3 – Geological Information Supplied by Department of Mines and Petroleum

This general profile was also visible evident during a site inspection in April 2015, at a neighbouring property during earthworks operations.

Subject to geotechnical confirmation by way of investigation it is unlikely that a pure sand will not be present on the development site, therefore site classification is accordance with AS2870 will likely be 'S' or 'M'.

Further development of the Structure Plan will require the investigation of subsurface conditions by way of a geotechnical investigation. This investigation and subsequent report will provide guidance on the requirements for future building development across the Structure Plan area. This may involve the ability for future buildings to be placed directly onto the existing soil types or the earthworking of the site with additional clean sand fill material to improve the soil classification in accordance with AS2870 and reduce the subsequent building development requirement.

Based upon the existence of existing residential properties adjoining the Structure Plan area, it is unlikely subsurface geotechnical conditions will restrict development of the site.

## 2.3 Topography

A feature survey of the site has been completed. The survey indicates that the development site has a gentle slope, with contours varying from 87m AHD to RL 66m AHD falling from Tunbridge Street in the south to the northern property boundary.

The site also includes a crossfall between the west and east boundaries varying from just over 1.0m along the northern boundary to a 4.0m differential through the centre of the site.

Development on the site will need to be considerate of the existing topography. The adjoining residential properties have generally worked with the existing topography to minimise the use of extensive retaining walls. It is proposed that development of the site will maintain this philosophy.

## 2.4 Acid Sulphate Soil (ASS)

The current ASS mapping on the Landgate website, as per Figure 4 below, indicates that the Lot 51 development is within one distinct area of ASS mapping. Most of the development area lies within an area of moderate to low risk of ASS occurring within 3m of the natural soil surface, with the northern boundary portion being within an area of moderate to high risk of ASS occurring within 3m of the natural soil surface.

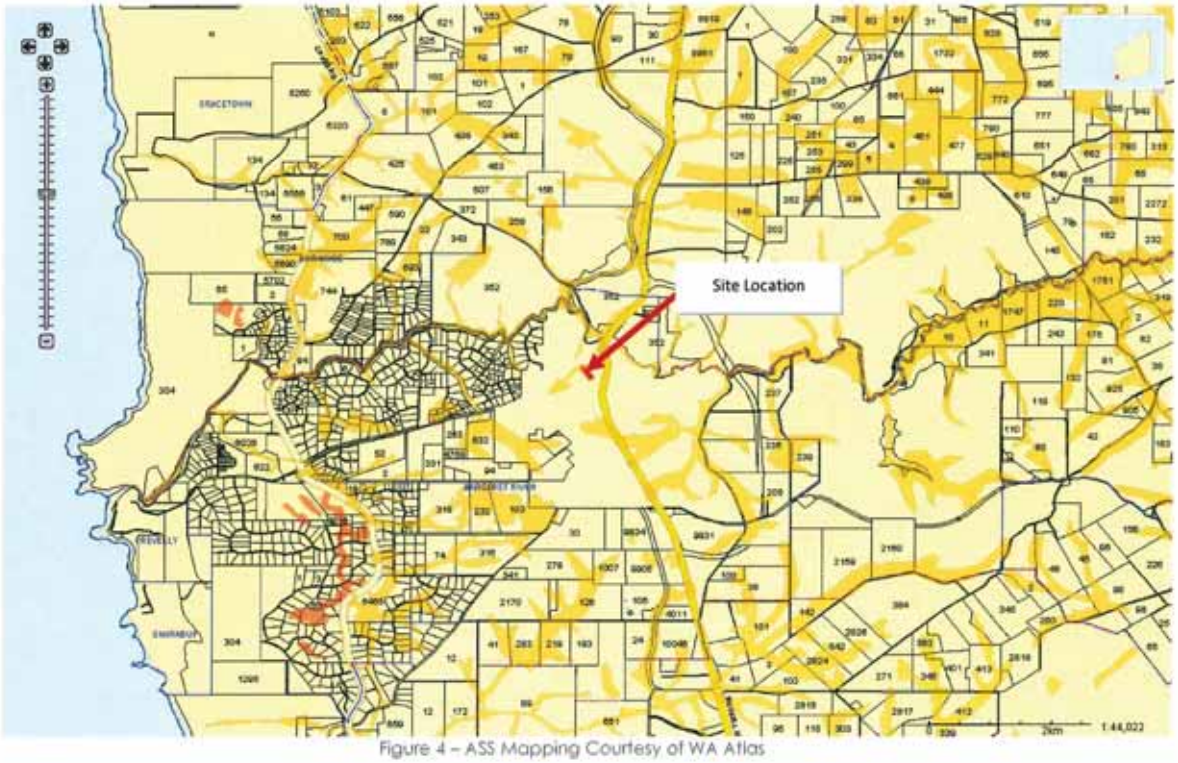


Figure 4 – ASS Mapping Courtesy of WA Atlas

## 2.5 Contamination

A review of the WA Atlas into potential contamination of land noted in July 2015 that the development site is not recorded as contaminated land.

No visual evidence exists on the property, as at July 2015, of illegal dumping or potential areas of contamination.

## 2.6 Flood Information

The development is bounded to the north by an open swale drain which forms a tributary of the Margaret River. The drain caters for upstream urban stormwater flows and is therefore subject to potential flood inundation during extreme storm events. A review of the available 1 in 100 year recurrence interval flood levels of both rivers was conducted with the Department of Water and Shire of Augusta Margaret River. A review of WA Atlas provided a flood plain development control area, refer Figure 5.

The Shire provided the flood mapping for the Margaret River, see below for Figure 6. Both plans indicate the site is clear, above any flood event of the Margaret River.

Further reference is made in Section 5.3.7 of the Stormwater Management Strategy section of this report.

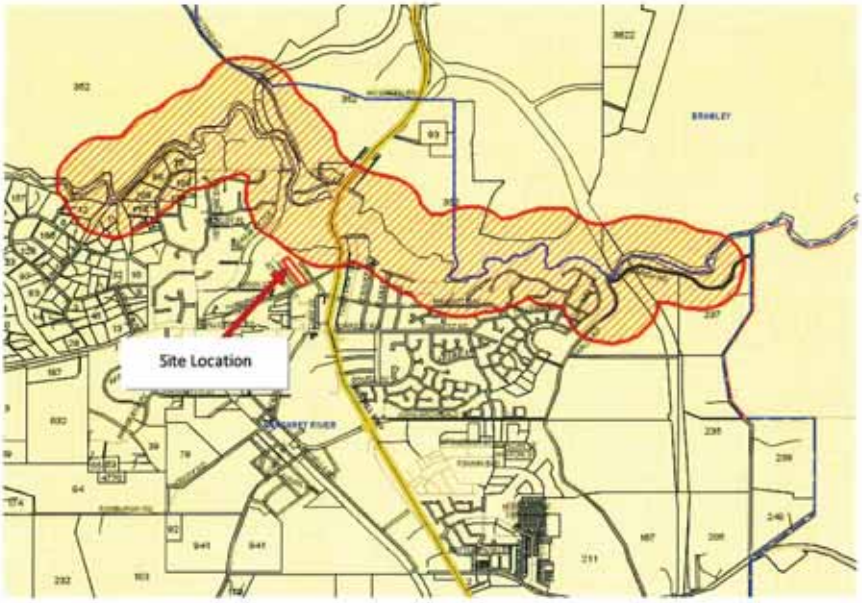


Figure 5 – 100 ARI plain flood development control area Courtesy of WA Atlas

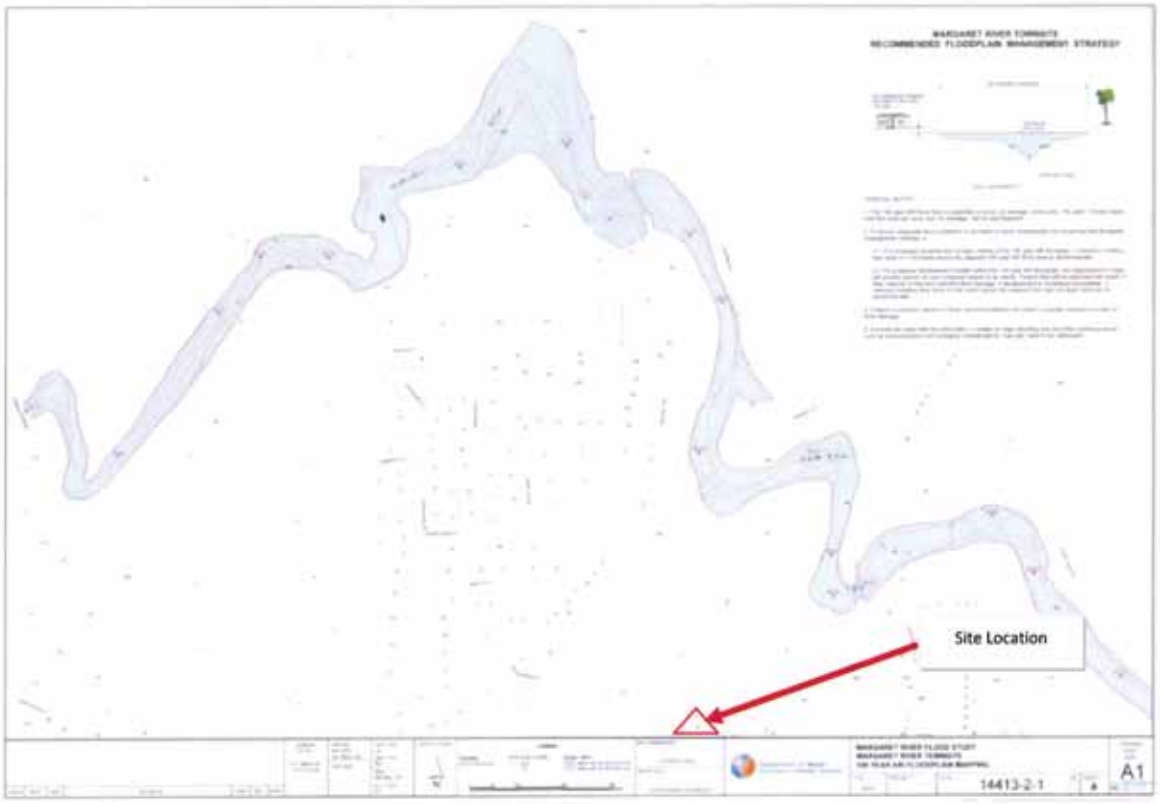


Figure 6 – 1:100 yr Flood Study. Courtesy of Department of Water

## 2.7 Groundwater

Groundwater monitoring has not been undertaken across the development site. However, given the slope throughout the site and the extensive excavation occurring within an adjoining property, groundwater is not envisaged to require management.

The existing drain and dam in the North East corner of the site indicate that surface water presently flows through the area and it is likely the dam will be creating elevated groundwater levels in this north east corner.

The removal of the permanent water retention dam as part of the stormwater strategy will reduce the ground water levels through this area.

However, it is proposed to install a single, shallow groundwater monitoring bore in this northern area to collect the 2015 winter peak groundwater level to ensure that any stormwater detention areas/basins are able to dry out within a few days after a storm event and have adequate separation from base to groundwater.

## 2.8 Surface Water

A thorough review of the existing surface water characteristics is included within the Stormwater Management Section of this report.

There is no Geomorphic Wetlands recorded for this area.

The main surface water features are the dam (currently unused) located in the north east corner of the site and the stormwater drain which enters the site on the northern boundary and exits in the north east corner.

## 2.9 Existing Building Infrastructure

The site contains an existing single residential building with associated outbuildings.

In order to facilitate the structure plan, these buildings will require removal and demolition.

# 3.0 Development Siteworks

## 3.1 Earthworks

It is intended that any development on the site will need to "tread lightly" with the existing topography to minimise its impact on the environment and its interface with its neighbours.

It would be proposed to cut, fill and retain the development site to achieve partially level building areas within each lot.

The earthworks proposed for the site are highly dependent on the geotechnical investigation of the subsurface material. However, as previously described, based upon the relatively close proximity of existing, neighbouring residential development the subsurface materials are highly unlikely to restrict the proposed development.

## 3.2 Retaining Walls

As described within the earthworks section of this report, the development needs to be 'tread lightly' on the existing topography.

It would be proposed to utilise a range of retaining wall options rather than the standard limestone blocks, utilising locally available materials for soil retention and the stabilisation of batters will be undertaken in a consistent and aesthetic manner creating a development that fits the land not forces change upon it.

Building design guidelines will be implemented to ensure that future building development does not create a development of mass walls, but the proposed buildings recognise the topography and designs are undertaken to fit the site.

## 3.3 Fencing

In addition to aesthetic or marketing requirements of the developer, fencing will be required to be undertaken to all lots abutting POS or preservation areas. The type of fence will be subject to approval by the Shire of Augusta Margaret River. Fencing may also be required to the drain and basins should the batter slope of the basins be steeper than 1 in 6, thus prevent public access.

# 4.0 Infrastructure

## 4.1 Roadworks

The site is well serviced with existing road frontage to Tunbridge Street.

Image 1 – Existing Tunbridge Street courtesy of Google Streetview

The development proposes a simple, single intersection with Tunbridge Street and the provision of a cul-de-sac road internally of the development.

Construction of the intersection and cul-de-sac shall be to the Shire of Augusta Margaret River Standards and current applicable Australian standards, including Austroads design guidelines and the IPWEA Local Government Guidelines for Subdivisional Development.

It is proposed to construct a 5.5m wide carriageway width in accordance with an Access Place definition under the WAPC's Liveable Neighbourhood guidelines and IPWA's Local Government Guideline's for Subdivision Development.

The roads will be single crossfall in order to accommodate some of the existing slope on the development site and longitudinal grades will be within the minimum and maximum guidelines for the Shire and the IPWEA guidelines.

Standard verge grades of 2.0% would be proposed and mountable kerb constructed on all roads with the exception of a portion of cul-de-sac head adjacent the proposed POS which will be barrier type to restrict vehicle access.

The proposed intersections with the existing Tunbridge will provide sufficient sight distance for entering and exiting vehicles. An adjustment to current roadside carparking controls on Tunbridge Street will be required.

A dual use path network that interconnects Tunbridge Street and the cul-de-sac head will be provided.

## 4.2 Water Reticulation

The subject land falls within an area currently licensed to the Water Corporation for water supply and any subdivision development of the land would require the connection to reticulated water.

The Water Corporations as-constructed record Esinet and current DBYD information indicates that there is a 100mm diameter water main in the northern Tunbridge Street road reserve.

Internally the development could be serviced by an extension of reticulation water mains from Tunbridge Street, installed at the developers cost providing each proposed lot with reticulated water. This would likely include a single 100mm diameter water main extending along the proposed road reserve to the cul-de-sac head. Confirmation of this servicing assessment has been requested from the Water Corporations planning section in Leederville.

Water headworks would be applicable to the development; however this would be subject to the number of lots proposed. The headwork's fees would not be payable to Water Corporation until clearance of WAPC conditions were requested.

## 4.3 Stormwater Drainage

Reference is made to Section5 of this report.

## 4.4 Sewer Reticulation

The subject land falls within an area licensed to the Water Corporation for the provision of sewer infrastructure and services.

A review of the Water Corporations as-constructed network Esinet and the latest DBYD information indicates that the property presently contains a Water Corporation Sewer Main that crosses the north east corner of the property, as per figure 7 below.

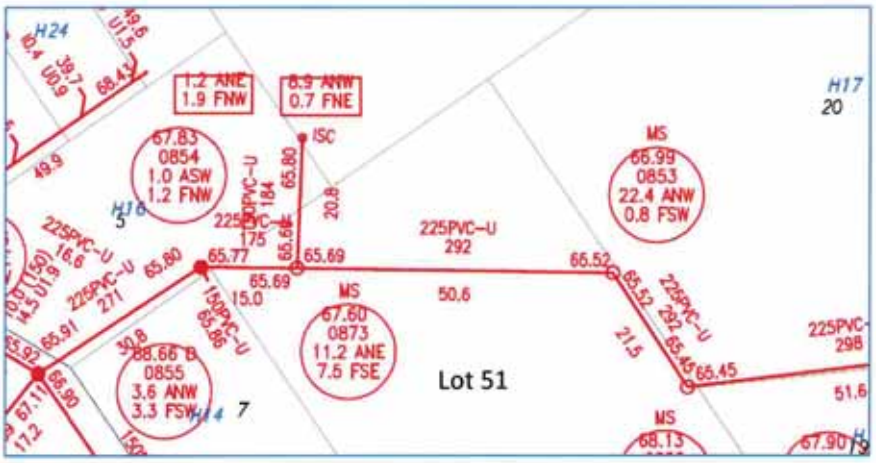


Figure 7 – Water Corporation DBYD information

The sewer depth has been checked and is sufficient to service the entire development property. Particularly, given the entire development site slopes to this North East Corner.

Confirmation is presently being sought from the Water Corporations Planning section that this sewer can accommodate the anticipated sewer effluent flow from the development site. Given the zoning of the property the sewer is likely to be correctly sized, in addition the Water Corporation sewer planning indicates the site to be developed as residential.

The development of the site will be required to preserve the inferred easement that protects the sewer main and is in the favour of Water Corporation for maintenance of the pipework. Any adjustment of ground level undertaken by development will require the adjustment of the lids to the existing sewer chambers. Confirmation is presently being sought from Water Corporation regarding the installation of the drainage infrastructure within the sewer easement and above the sewer pipe.

The sewer reticulation internally of the development would include a central 150mm diameter pipe connection from the existing sewer on site to the proposed R40 lots fronting Tunbridge Street, providing each proposed lot with a connection to reticulated sewer.

## 4.5 Power Reticulation

Initial discussions have been held with an experienced electrical power designer that indicate, based upon the existing infrastructure in the area that the site will be able to be supplied with underground power. Internally of the development a network of underground cables, and lot connection domes will be required to be designed, supplied and installed by the developer.

Existing overhead power exists within Tunbridge Street and would be reticulated within the central road reserve to each proposed lot.

Western Power are unable to provide any confirmation as to the adequacy of supply for the site until a subdivision application and design are lodged for Design Information Package. However, given the proximity of the site to the main street of Margaret River power supply is not considered to be a restriction to development.

## 4.6 Communications

Having regard to the proximity of the land to established residential and commercial areas and their associated infrastructure, it is anticipated that the development of Lot 51 will have access to existing communications infrastructure.

Based upon the anticipated lot numbers the development will be required to design, supply and install a communications network for future cabling by the communications provider, under Telstra's guidelines.

Upon subdivision approval application will be made to Telstra with an approved internal communications design.

Please note that the provision of telecommunications services is not a condition of WAPC approval.

## 4.7 Gas

The Margaret River Townsite presently does not have a reticulated gas network.

# 5.0 Stormwater Management Strategy

## 5.1 Design Criteria

| | |
|---|---|
| **Stormwater Management** | |
| Extreme Storm Events | • Ensure overland conveyance to pre-development outlet location<br>• Provide additional on site storage to maintain pre-development outflow rate<br>• Provision of earthworks to maintain minimum habitable floor levels 0.5m above the 100 year AEP flood event level. |
| Major Storm Events | • Provision of pit and pipe network designed to convey up to the 5 year ARI storm event.<br>• Ensure site storage capable of maintaining pre-developed outflow rate for storm events up to 5 year AEP. |
| Pollutant Treatment (Environmental Flows) | • Encourage implementation of WSUD to lot purchasers.<br>• Encourage low nitrogen and phosphorous use in POS area.<br>• Retain the 1 in 1 year 1 hour storm event on site.<br>• Implementation of WSUD treatment areas at 2.0% of impervious catchment. |
| **Water Quantity Management** | |
| Post-development annual discharge volume and peak flow be maintained relative to pre-development conditions, unless otherwise established through determination of ecological water requirements for sensitive environments. | • Ecological protection – For the critical 1-year AEP event, the post-development discharge volume and peak flow rates shall be maintained relative to predevelopment conditions in all parts of the catchment. Where there are identified impacts on significant ecosystems, maintain or restore desirable environmental flows and/or hydrological cycles as specified by the Department of Water.<br>• Flood management – Manage the catchment runoff for up to the 1-in-100-year AEP event within the development area to pre-development peak flows unless otherwise indicated in an approved water management strategy or as negotiated with the relevant drainage service provider. |

## 5.2 Pre-Development Environment

### 5.2.1 Current Land Use

The site is currently utilised as a single residential property. The site has been previously cleared of native vegetation and is utilised for residential purposes that includes fruit trees and unutilised paddock area.

Minor Vegetation regrowth has occurred within the degraded open drain that exists within the site but no significant vegetation area exists.

There is several isolated peppermint tress within the property and approximately 3 or 4 peppermint trees that exist near the property dam.

Photo 1 – Existing Trees on site

Photo 2 – Existing trees on site

### 5.2.2 Topography

The site is relatively undulating with a steady fall from Tunbridge Street to the north eastern property boundary corner.

Preliminary survey across the existing site indicates existing heights of RL 87.0m AHD to the Tunbridge Street reserve falling to RL 66.3 in AHD in the north east corner.

### 5.2.3 Climate

The area experiences a Mediterranean climate with warm dry summers and cool wet winters.

Monitoring at the Margaret River Bureau of Meteorology site indicates a mean average annual rainfall of 1129mm with the highest average monthly rainfalls occurring in June and July.

**Summary statistics for all years** Information about climate statistics

| Statistic | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean | 14.9 | 12.3 | 27.9 | 67.4 | 156.4 | 222.6 | 216.3 | 160.8 | 105.2 | 72.0 | 42.4 | 19.3 | 1129.2 |
| Lowest | 0.0 | 0.0 | 0.0 | 3.7 | 41.3 | 85.7 | 81.4 | 52.8 | 34.0 | 9.0 | 1.5 | 0.0 | 754.7 |
| 5th %ile | 0.7 | 0.2 | 1.4 | 13.2 | 71.9 | 105.8 | 128.7 | 93.8 | 47.5 | 24.9 | 9.1 | 1.1 | 858.9 |
| 10th %ile | 1.5 | 0.8 | 3.2 | 23.1 | 82.9 | 114.8 | 148.6 | 101.8 | 57.5 | 35.6 | 12.2 | 3.1 | 906.6 |
| Median | 8.2 | 8.0 | 19.8 | 61.5 | 144.4 | 216.4 | 218.5 | 155.2 | 102.4 | 60.8 | 39.1 | 15.4 | 1129.8 |
| 90th %ile | 37.7 | 31.0 | 56.4 | 118.7 | 246.1 | 329.4 | 292.4 | 229.1 | 162.9 | 120.6 | 82.3 | 40.0 | 1353.0 |
| 95th %ile | 48.3 | 45.8 | 81.2 | 135.1 | 260.2 | 349.9 | 309.3 | 255.4 | 176.3 | 150.1 | 88.7 | 51.4 | 1379.9 |
| Highest | 79.0 | 78.4 | 137.2 | 242.8 | 367.5 | 441.0 | 410.7 | 329.5 | 215.7 | 177.8 | 109.4 | 85.4 | 1590.8 |

Table 1 – Summary Statistics courtesy of Bureau of Meteorology

### 5.2.4 Surface Water Hydrology

The development site is characterised by its topography the gentle northerly facing slope falling to drainage line that forms an Urban Drainage function but forms a type of winter creek following a rain event.

The drainage line has been reconstructed upstream of the site and realigned. The reconstruction work has involved drain profile reshaping and rock lining to assist with scour protection.

The drainage line within the site appears to have been realigned to permit the construction of a storage dam that is presently used as a reticulation supply dam.

The existing dam and drain includes areas of minor vegetation regrowth to its southern side only.

The drain line forms the outlet point for all stormwater from the site but must be maintained in a separated state to permit the drain to perform the urban drainage conveyance function.

## 5.3 Pre-Development Environment

The stormwater management strategy for the development of Lot 51 Tunbridge Street, Margaret River is to be undertaken in accordance with the guidelines of the DoW through Water Sensitive Urban Design (WSUD) and the requirements of the Shire of Augusta Margaret River.

The Key components of the stormwater management strategy are:

- Provision of lot connection pits for homestead and roof stormwater collection.
- Collection and transfer of storm events up to 1 in 5 year ARI within a standard pit and pipe system within the road reserve.
- Treatment for the 1 in 1 year 1 hour storm event within biofiltration basin.
- Detention of the 5 year major storm event within a basin with outflow rate to equal the predevelopment flow rate.
- Detention of the 100 year extreme storm event within the basin, with the outflow rate set equal to the predevelopment flow rate.

### 5.3.1 Modelling

The stormwater modelling has been completed utilising the Rational Method, based on the relatively small scale of the development area. The development site exists as a single catchment and is modelled post development as a single catchment.

A critical design criterion for the rational method includes the runoff coefficients which are shown below in Table 2.

| LAND USE | RUN OFF COEFFICIENT | | |
|---|---|---|---|
| | 1 YEAR ARI | 5 YEAR ARI | 100 YEAR ARI |
| Predevelopment – Partly Treed | 0.1 | 0.1 | 0.1 |
| Residential (R10 to R30) | 0.3 | 0.4 | 0.4 |
| Residential (R40 to R60) | 0.6 | 0.7 | 0.75 |
| Road Reserve | 0.8 | 0.8 | 0.9 |
| POS | 0 | 0.1 | 0.1 |

Table 2 – Modelling Run off Coefficients

Multiple storm events have been modelled utilising the Rational Method as described in Australian Rainfall and Runoff (AR & R).

Rainfall intensities for the various storm events and storm durations are calculated and provided by the Bureau of Meteorology (BoM) computerised design IFD Data System (www.bom.gov.au).

In addition the Shire actively encourages the use of rain gardens as a WSUD alternative to detention and soakage, as part of the building development thereby also facilitating the treatment of stormwater prior to discharge to the subsurface material.

### 5.3.2 Predevelopment Flow

Predevelopment out flow rates have also been calculated based upon the Rational Method with the run off coefficient utilised as per Table 2 above.

The time of concentration was calculated utilising the Kinematic Wave Equation, with a Mannings 'n' of 0.5 representing light bush, some trees and pasture grass.

Based upon a 300m² Building Area and a remaining 1.36ha of vacant lot the following pre-development flows were identified:

- 5 year AEP Predevelopment Flow of 0.04m³/s
- 100 year AEP Predevelopment Flow of 0.095m³/s

## 5.4 Development Stormwater Management

### 5.4.1 Lot Level Stormwater

Based upon a preliminary assessment of the sites geotechnical characteristics and the density of the proposed development, it is likely that the development will be required to install lot connection pits for future stormwater from the purchasers building development.

Where possible a stormwater lot connection pit would be provided for a pair of lots, however the site grade may necessitate individual pits per lot.

The provision of the stormwater lot connection pits would be subject to the site 'not' being classified as 'A' under AS2870, by a subsequent geotechnical investigation and classification.

The proposed stormwater system for the road network would be suitably sized to accommodate the stormwater from future building development, However, it would be intended that each of the stormwater lot connection pits are fitted with a flow control on the pit outlet in order that the outflow rate is controlled to a predevelopment rate.

### 5.4.2 Environmental Flow (1 Year ARI)

In accordance with the guidelines as provided by the DoW the development will undertake the retention of the 1 year ARI 1 hour storm event within the development area, this equates to 95m³. It is proposed that this retention be undertaken within the Bioretention basin to be located in the north east corner of the property.

The environmental flow 1 year stormwater strategy is indicated in Figure 8 below.

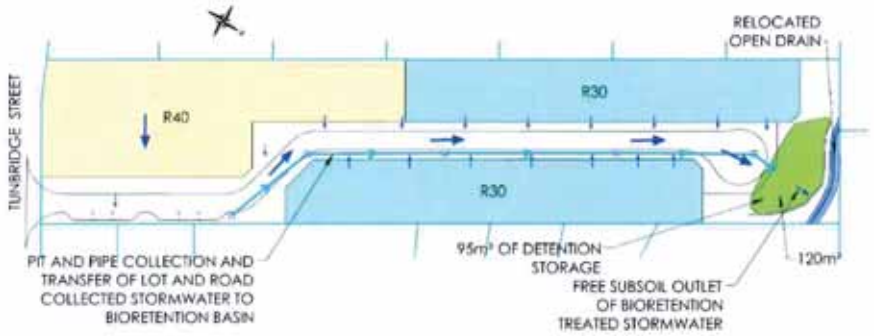


Figure 8 – 1 in 1 year sketch plan

The bioretention basin will be provided with a low flow subsoil outlet, amended soil base and vegetated with suitable, locally sourced nutrient stripping vegetation in accordance with the Stormwater Biofiltration system.

Adaption Guidelines by FAWB and Vegetation guidelines for stormwater biofilters in the south west of WA by Monash University.

The bioretention area required has been calculated at 2.0% of the equivalent impervious area of 0.59ha equating to 120m². Detailed design at Urban Water Management Plan (UWMP) stage will resolve the exact layout of the bioretention basin.

The implementation of the bioretention garden, in conjunction with the management of the 5 year and 100 year AEP events will require the modification of the existing drain and dam that is located in the North East corner of the property. At present, the dam is located in the North East corner and the drain to the southern side of the dam. Refer Pictures below.

Photo 3 – Dam

Photo 4 – Drain

The management of stormwater detention from the development proposes to re-align the drain to the North East corner and construct the new bioretention basin to the south of the drain. This will allow the existing drain to function as presently occurs and allow the development to manage stormwater prior to discharge to the drain.

Table 3 below provides a summary of the expected pollutant removal efficiencies for the proposed environmental flow WSUD option, as provided by the DoW's Stormwater Management Manual for WA.

| Parameter | Design Criteria via BUWM | Structural Controls Nutrient Output Reduction | |
|---|---|---|---|
| | | Vegetated Swales/Bioretention Systems | Detention/Retention Storages |
| Total Suspended Solids | 80% | 60-80% | 65-99% |
| Total Phosphorus | 60% | 30-50% | 40-80% |
| Total Nitrogen | 45% | 25-40% | 50-70% |
| Gross Pollutants | 70% | - | >90% |

Table 3 – BMP Water Quality Performance

### 5.4.3 Major Flows (5 Year AEP)

The development proposes a series of collection pits (either side entry pits or grated pits, depending on the Shires preference) and a pipe network for management of storm events up to and including the 1 in 5 year AEP storm.

The detailed design of the pit and pipe network will form part of UWMP stage of development and be submitted for approval with detailed design drawings to the Shire of Augusta Margaret River.

The conveyance and detention of the major stormwater event will occur as detailed in Figure 9 below.

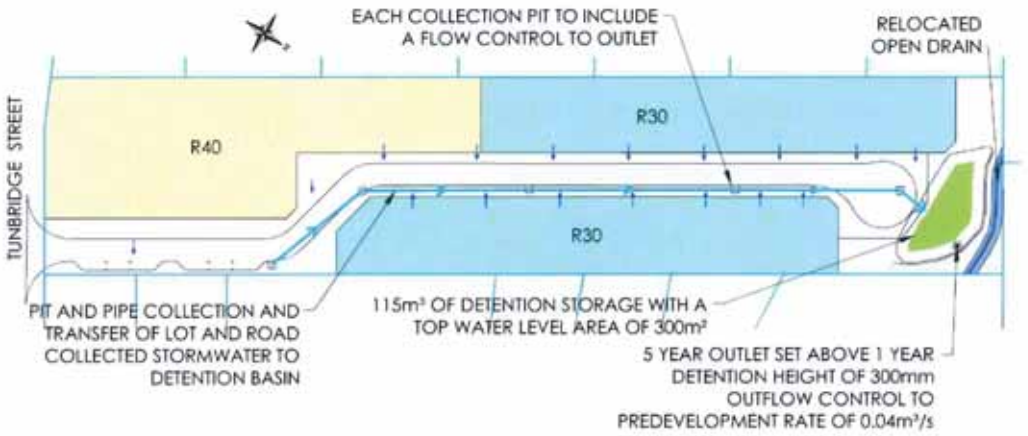


Figure 9 – 1 in 5 AEP event sketch

Based upon the rational method calculations, design indicates that with a predevelopment outflow of maximum of 0.04m³/s, a detention basin of 115m³ is required to detain the 5 year AEP storm event.

The detention basin would not be designed to remain permanently inundated, with a flow controlled outlet providing an outflow at the predevelopment flow rate and a network of subsoil pipes beneath the basin, ensuring the basin will drain over several days.

As per the note within the Environmental Stormwater Management Section the subsoil beneath the basin will free outlet at a minimum of 200mm above the existing invert of the realigned drain.

The detention basin would be located within the north east corner of the site, and as previously noted would be located south of the proposed relocated drain.

In order to prevent a change in catchment boundary through the implementation of the proposed intersection with Tunbridge Street, (A new intersection with Tunbridge will allow surface water from the Tunbridge Road Reserve to enter the development site and flow down the proposed cul-de-sac) it would be intended that the new intersection include the implementation of a ramp type kerb, thus preventing the existing surface water flow from Tunbridge from entering the development site. The stormwater from Tunbridge would remain within the Tunbridge carriageway, contained by the kerb and discharge at its current location.

In order to assist with the detention of the 1 in 5 year AEP event, each of the proposed road stormwater pits will be fitted with a controlled flow outlet. The controlled flow outlet will assist in reducing the velocity and quantity of stormwater in the pipework thus not only assisting in restricting outflow to predevelopment levels but reducing the scour and erosion potential of the stormwater at bottom of the relatively steep cul-de-sac. At detailed design stage the outlet flow rate from each pit would be set based upon the available storage of the pit and pipework, based upon peak flow not at the predevelopment rate. The predevelopment outflow rate will be controlled by the outlet pit prior to discharge to the existing drain.

### 5.4.4 Extreme Flows (100 Year ARI)

The development will include the central road reserve that will grade in accordance with the current natural surface profile of the land. It is intended to utilise the road reserve, in particular the road pavement, to convey the extreme 1 in 100 year event as generated by the development area and catchment, to the proposed detention basin.

The detailed design of the road pavement grades will occur as part of the UWMP stage of development and will include detailed earthwork designs indicating the minimum clearance of building floor levels being 0.3m above estimated 100 year ARI flood levels. This minimum clearance will also include estimated flood levels within the detention basin.

The conveyance and detention of the extreme 1 in 100 year ARI storm event will occur as detailed in conceptual sketch below.

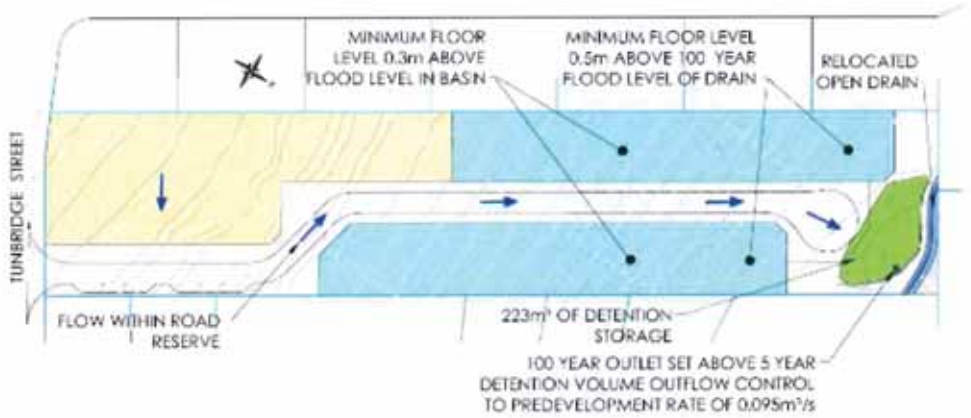


Figure 10 – 100 Year ARI

The localised batter slopes and design details of the detention area will be determined at UWMP stage of the development. The indicative volume for detention of the 100 year storm event, based upon the predevelopment outflow of a maximum of 0.095m³/s, is 223m³.

As per the other storm events the detention basin will only remain inundated for a few days post an extreme event due to the implementation of the subsoil network.

In regards to the regional flood management the site has been determined to be outside the flood impacts of the nearest river being the Margaret River. (Refer section 2.6)

The current 100 year AEP flood level within the existing drain in unknown and will be highly influenced by stormwater and urban drainage runoff upstream of the site. A minimum of 300mm separation is required to be confirmed between the Top Water Level (TWL) and finished floor level (FFL) of any building development. The existing drain includes a top of bank height on the development site of approximately 66.5 AHD.

Based upon aerial flown contours available through the Water Corporations system the neighbouring properties could be estimated to have FFL's of:

- Lot 7 (North West) 68.8m AHD
- Lot 20 (North) 68.0m AHD
- Lot 19 (North East) 69.0m AHD

Based upon this information, no anecdotal evidence at present that these properties have experienced flooding from the drain and the existing contours of the development site, it would be proposed to establish a minimum FFL for the development of 68.4m AHD. However, during the Scheme Amendment process and

subsequent detailed design it is hoped that additional technical design and/or anecdotal evidence my resolve that this FFL could be reduced or at least further clarified.

## References

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Monash University, 2014: Vegetation guidelines for stormwater biofilters in the South West of Western Australia.
Geological Survey of WA: Busselton and Augusta portions of sheets SI50.5&SI50.9
Water Corporation of WA: Esinet as-constructed system
Bureau of Meteorology: Website, rainfall records
Bureau of Meteorology: IFD calculation website
WA Atlas : _www2.landgate.wa.gov.au/bmvf/app/waatlas/

# Appendix B

## FLORA AND FAUNA VALUES ASSESSMENT

**Prepared by: SW Environmental**

SW environmental
po box 1037 dunsborough wa 6281 P 0437 700 917
admin@swenvironmental.com.au

28 July 2015

Stan Lawrence-Brown
Director
LB Planning
stan@lbplanning.com.au

Dear Stan,

**RE: (SW042) Proposed Scheme Amendment and Local Structure Plan - Lot 51 Tunbridge Street, Margaret River: Flora and Fauna values**

It is understood that a Scheme Amendment and Local Structure Plan is proposed for the above-mentioned property, (herein referred to as 'the site'). This letter provides a brief appraisal of the flora and fauna values of the site and identifies whether additional flora or fauna surveys are likely to be required to support any planning applications.

Detailed methods and results are provided as an attachment.

In summary the site is in a Completely Degraded condition (Keighery 1994). Native vegetation is limited to only five Peppermints (*Agonis flexuosa*) with some mixed regrowth near the drainage line. Though spring surveys were not conducted it is considered unlikely that the site would support any threatened flora or ecological communities. Evidence of Western Ringtail Possum was observed (scat and one drey) though the loss of 0.12 ha of habitat proposed (five trees and regrowth in the drainage line) is not likely to be significant.

The proposed development is not likely to result in a notable impact on any flora, fauna or threatened ecological communities nor should it require follow up biodiversity surveys. Recommendations are provided in Attachment 1.

Yours sincerely,

Shane Priddle,

Principal Consultant
SW environmental
po box 1037 | dunsborough wa 6281
**M** +61 (0)437 700 917
www.swenvironmental.com.au

Attachments

Attachment 1 Methods and results

Attachment 2 Site photos

Attachment 3 Database search

# Attachment 1 Methods and results

### Background and scope

The 1.4 ha site is located at Lot 51 Tunbridge Street, Margaret River. A house is positioned at the front (southern end) of the block. The block slopes down to the northwest to a small drainage line in the northern corner of the Lot.

The scope of work involved:

- A site reconnaissance
- A statement confirming the condition of native vegetation at the site (after the Keighery Condition scale, 1994)
- Quantification and mapping of native vegetation to be removed based on the concept designs provided on 14.07.2015
- A statement on whether there are likely to be impacts on threatened flora or fauna.
- Advice on the requirement for further additional environmental (flora and fauna) surveys

### Methods

A site reconnaissance was conducted on 15/07/2015 by Shane Priddle. This involved a walk over the entire site to identify native vegetation and condition and to validate the aerial photo. Notes were made on other ecological features, evidence of fauna, presence or absence of drainage features, habitat trees, etc particularly where they may be utilised by the threatened species. Threatened species or ecological communities include flora, fauna or ecological communities listed under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) and *Wildlife Conservation Act 1950* (WC Act).

The Department of Parks and Wildlife (DPaW) also produces a list of priority species and communities that have not been assigned statutory protection under the WC Act, but are under consideration as 'Scheduled' taxa, and are in urgent need of further survey or regular monitoring, and although not currently threatened may become so in the future.

A Naturemap online database search was conducted for conservation significant flora and fauna within five kilometres of the site, provided in Appendix 3. This includes compiled threatened species records from DPaW, WA Museum and others. The Department of Environment's Protected Matters Search Tool for matters of National Environmental Significance (which lists matters under the EPBC Act) was not available at the time of writing this letter. Note, detailed assessment of the creek was not undertaken nor were spring flora surveys conducted though considering the condition of the vegetation on site, they are not likely to be required.

### Results

Native vegetation at the site is in a Completely Degraded condition (Keighery 1994). Most of the site is either parkland cleared or consists of planted exotic ornamental or fruit trees. A fruit orchard (0.3 ha) has been planted immediately north of the house. Vegetation in front of and around the house is exotic and includes among others, palms, conifers and eastern states gum trees. The only native vegetation remaining on site includes five large Peppermints (*Agonis flexuosa*) and some mixed Peppermint and Marri (*Corymbia calophylla*) regrowth along the drainage line (0.05 ha). Ground cover over the site was heavily weed infested with dense Kikuyu and herbaceous weeds.

The creek was running at the time of the survey. Although it is connected to a larger vegetation patch the understorey was mostly cleared with only regrowth Peppermints present within Lot 50. It appeared to be completely cleared in the adjacent in Lot 16 (to the west). Although spring flora surveys were not carried out or detailed assessment of the creek, the lack of intact understorey means it is unlikely to support threatened flora.

It is considered extremely unlikely that the upslope areas of the site would support any threatened flora or ecological due to its Completely Degraded condition.

The Completely Degraded condition of the site also means that the site generally doesn't contain habitat required for the persistence of most threatened fauna that may occur locally. Possible marginal habitat may occur for some species near the drainage line, including Water Rat (*Hydromys chrysogaster*) (Priority 4) and Southern Brown Bandicoot (*Isoodon obesulus*) (Priority 5). This however is a very small section on site (about 0.05 ha) and insignificant in the context of the broader vegetation available locally and the habitat requirements for these species. The drainage line was not inspected in detail for aquatic species though the adjacent area to the west (offsite) has been cleared and the small area of drainage line has been altered with little or no native wetland vegetation left in the understorey.

Evidence of Western Ringtail Possum (WRP) (*Pseudocheirus occidentalis*) (Endangered under the WC Act and Vulnerable under the EPBC Act) was found on site, with low densities of scats observed under several of the Peppermints (see Figure 1). A single drey was also observed. It is probable that WRP occur in the dense connected Peppermint woodland to the north of the site. The loss of five Peppermint paddock trees and small section of regrowth associated with the creek area (a total canopy area 0.12 ha) is not likely to be significant to WRP. No hollows or trees likely to develop hollows in the near term occur on site.

On this basis, the proposed development is not likely to have a notable impact any threatened species or communities nor are any follow up surveys likely to be required.

**Recommendations**

- A suitably licensed fauna specialist however should inspect the site prior to clearing to ensure that any Western Ringtail Possums located within the clearing envelope are relocated outside of the impact area if necessary.
- Planning of the development should ensure that the creek hydrology (the flow regime in particular) is maintained during and following the construction of the development.
- Construction associated with the drainage line should be carried out in summer when the water levels are low.
- Appropriate erosion and sediment controls (during construction) and stormwater management (to manage runoff post construction) should be implemented.

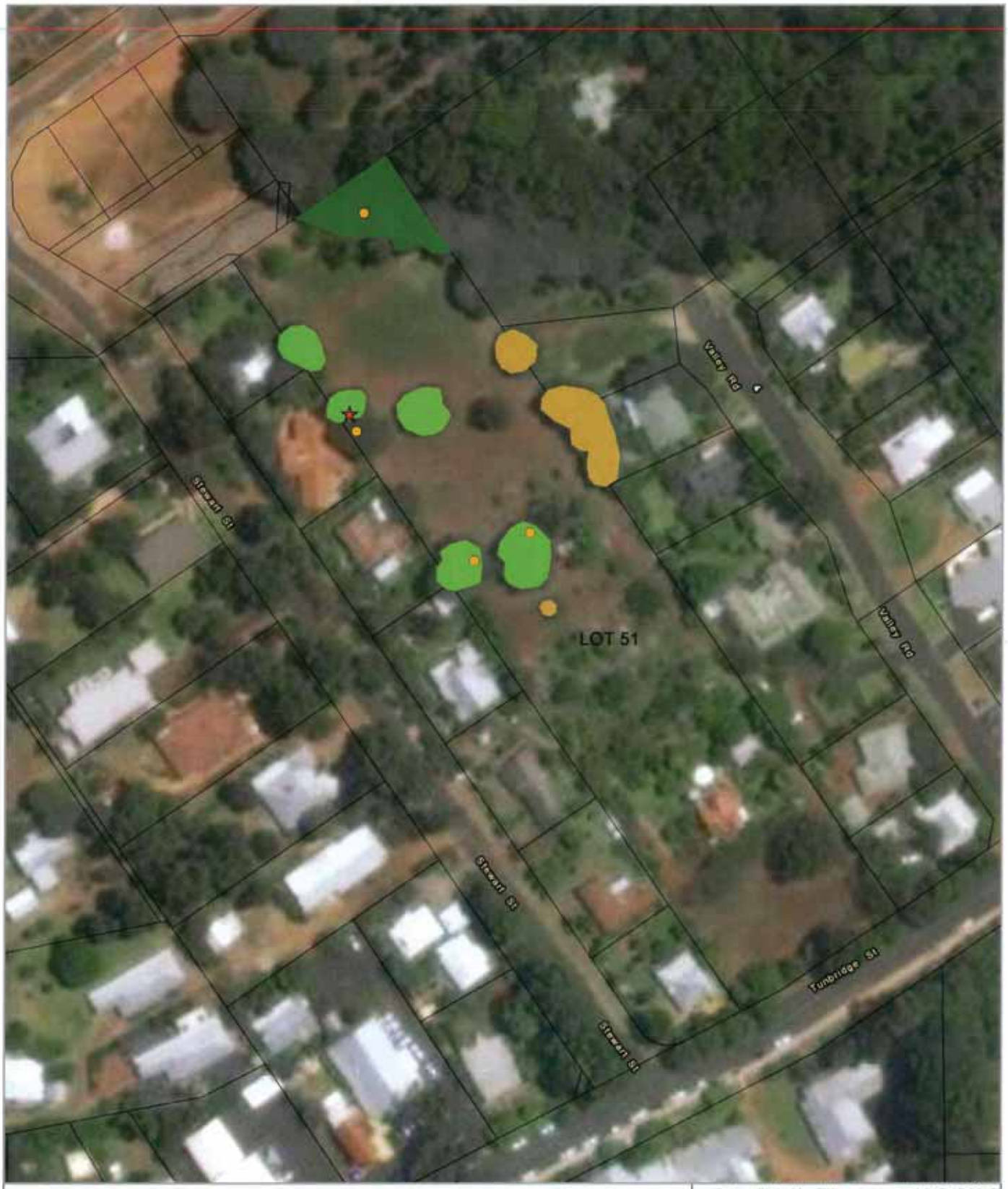



**FIGURE 1: FLORA AND FAUNA VALUES**

**Lot 51 Tunbridge Street, Margaret River**

- Drey
- Scat

Native vegetation

- Peppermint, 0.07 ha
- Cleared, 0.05 ha
- Mixed Peppermint and Marri, 0.05 ha

- Data collected by SW environmental ( 15.07.2015)
- Base map © Esri and its data suppliers.



0 10 20 40 Metres

A4 @1:1500
Author:
Ref: SW042

NORTH

SW environmental

## Attachment 2 Site photos

Photo 1 Looking east towards the cleared trees shown in Figure 1

Photo 2 Looking north over the clearing and towards the creekline in the background

Photo 3 The creekline in the north of the site

Photo 4 Looking west – note the Peppermint trees and cleared areas

Photo 5 The orchard and fruit trees

Photo 6 The front yard looking west

## Attachment 3 Database search

NatureMap
Mapping Western Australia's Biodiversity

# NatureMap Species Report

*Created By Shane Priddle on 16/07/2015*

**Conservation Status** Conservation Taxon (T, X, IA, S, P1-P5)
**Current Names Only** Yes
**Core Datasets Only** Yes
**Method** 'By Circle'
**Centre** 115°04' 24" E,33°57' 19" S
**Buffer** 5km

| | Name ID | Species Name | Naturalised | Conservation Code | [1]Endemic To Query Area |
|---|---|---|---|---|---|
| 1. | 3386 | *Acacia inops* | | P3 | |
| 2. | 41323 | *Actitis hypoleucos (Common Sandpiper)* | | IA | |
| 3. | 3706 | *Bossiaea disticha* | | P4 | |
| 4. | 13619 | *Caladenia excelsa* | | T | |
| 5. | 18037 | *Caladenia lodgeana* | | T | |
| 6. | 24731 | *Calyptorhynchus banksii subsp. naso (Forest Red-tailed Black-Cockatoo)* | | T | |
| 7. | 24733 | *Calyptorhynchus baudinii (Baudin's Cockatoo (long-billed black-cockatoo), Baudin's Cockatoo)* | | T | |
| 8. | 24734 | *Calyptorhynchus latirostris (Carnaby's Cockatoo (short-billed black-cockatoo), Carnaby's Cockatoo)* | | T | |
| 9. | 33940 | *Cherax tenuimanus (Margaret River Marron, Hairy Marron)* | | T | |
| 10. | 24092 | *Dasyurus geoffroii (Chuditch, Western Quoll)* | | T | |
| 11. | 25624 | *Falco peregrinus (Peregrine Falcon)* | | S | |
| 12. | 24475 | *Falco peregrinus subsp. macropus (Australian Peregrine Falcon)* | | S | |
| 13. | 1945 | *Franklandia triaristata (Lanoline Bush)* | | P4 | |
| 14. | 17744 | *Gahnia sclerioides* | | P4 | |
| 15. | 34026 | *Galaxiella munda (Western Mud Minnow)* | | T | |
| 16. | 20504 | *Gastrolobium formosum* | | P3 | |
| 17. | 34030 | *Geotria australis (Pouched Lamprey)* | | P1 | |
| 18. | 6868 | *Hemigenia rigida* | | P1 | |
| 19. | 24215 | *Hydromys chrysogaster (Water-rat)* | | P4 | |
| 20. | 25478 | *Isoodon obesulus (Southern Brown Bandicoot)* | | P5 | |
| 21. | 24153 | *Isoodon obesulus subsp. fusciventer (Quenda, Southern Brown Bandicoot)* | | P5 | |
| 22. | 24347 | *Ixobrychus flavicollis subsp. australis (Australian Black Bittern)* | | P1 | |
| 23. | 14631 | *Juncus melanthus* | | P2 | |
| 24. | 33980 | *Kawaniphila pachomai (cricket)* | | P1 | |
| 25. | 24133 | *Macropus irma (Western Brush Wallaby)* | | P4 | |
| 26. | 24168 | *Macrotis lagotis (Bilby, Dalgyte)* | | T | |
| 27. | 17693 | *Meeboldina thysanantha* | | P3 | |
| 28. | 24099 | *Phascogale tapoatafa subsp. tapoatafa (Southern Brush-tailed Phascogale, Wambenger)* | | T | |
| 29. | 24164 | *Potorous platyops (Broad-faced Potoroo)* | | X | |
| 30. | 24166 | *Pseudocheirus occidentalis (Western Ringtail Possum)* | | T | |
| 31. | 4179 | *Pultenaea pinifolia* | | P3 | |
| 32. | 24145 | *Setonix brachyurus (Quokka)* | | T | |
| 33. | 24855 | *Tyto novaehollandiae subsp. novaehollandiae (Masked Owl (southern subsp))* | | P3 | |

**Conservation Codes**
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

# Appendix C

## TRAFFIC STATEMENT

**Prepared by: Riley Consulting**

# CVJ PTY LTD
# LOT 51 TUNBRIDGE STREET, MARGARET RIVER

## RESIDENTIAL DEVELOPMENT
## TRAFFIC STATEMENT

August 2015

Riley Consulting

PO BOX Z5578

Perth WA 6831

0413 607 779 Mobile

| | | | |
|---|---|---|---|
| Issued on | 26 August 2015 | Amendments | Date |
| Version | V2 | Yield adjusted | |
| Reference | 840 | | |

**CONTENTS**

## 1. EXECUTIVE SUMMARY

1.1. Riley Consulting has been commissioned through LB Planning to consider the traffic and transport impacts of developing between 25 and 30 residential lots on Lot 51 Tunbridge Street, Margaret River. The key findings of the traffic review are:

1.2. The site is currently occupied by a single residential dwelling that can be expected to generate about 8 vehicle movements per day based on normal residential trip rates.

1.3. The proposed development is considered to generate 240 vehicle movements per day based on permanent residential occupation. Overall the proposed development can be expected to increase local traffic by 232 movements per day. During peak periods the site may generate up to 24 vehicle movements.

1.4. The level of generated traffic is considered to be moderate in terms of its traffic impact and requires the provision of a traffic statement under WAPC guidelines. Assessment of the forecast traffic demands results in no material impact under the *WAPC Transport Assessment Guidelines for Developments*.

1.5. A new cul de sac off Tunbridge Street provides access to the subject site. The location of the access to Tunbridge Street accords with current intersection spacing guidelines set out in *Liveable Neighbourhoods*. Appropriate visibility is provided at the location of access to Tunbridge Street and the low traffic demands will result in excellent Levels of Service.

1.6. The subject site is well located to access the town site and the generated traffic is unlikely to have any adverse impact to the local road network. Suitable pedestrian and cycle access is currently provided.

## 2. CHECKLIST

| Item | Comments/Proposals |
|---|---|
| **Proposed development** | |
| proposed land uses | Up to 30 residential lots |
| existing land uses | 1 private dwelling |
| context with surrounds | Residential area |
| **Vehicular access and parking** | Acceptable |
| access arrangements | New access road from Tunbridge Street |
| public, private, disabled parking set down / pick up | Parking on individual lots |
| **Service vehicles** | Garbage collection |
| access arrangements | On-street |
| rubbish collection and emergency vehicle access | On-street |
| **Hours of operation (non-residential only)** | Residential development |
| **Traffic volumes** | Low |
| daily or peak traffic volumes | Traffic increase 232vpd – 24 vehicles in peak. No material impact. |
| type of vehicles (eg cars, trucks) | Predominantly private cars |
| **Traffic management on frontage streets** | New cul de sac |
| **Public transport access** | Nil |
| nearest bus stops/train stations | N/A |
| pedestrian/cycle links to bus stops/train station | N/A |
| **Pedestrian access/facilities** | Good |
| existing pedestrian facilities within the development (if any) | None |
| proposed pedestrian facilities within development | Footpath to be provided |
| existing pedestrian facilities on surrounding roads | Footpaths provide to all streets. Very good walking environment. |
| proposals to improve pedestrian access | None external to subject site |
| **Cycle access/facilities** | Acceptable |
| existing cycle facilities within the development (if any) | None |
| proposed cycle facilities within development | N/A |
| existing cycle facilities on surrounding roads | None |
| proposals to improve cycle access | None as part of development |
| **Site specific issues** | None |
| **Safety issues** | None |

## 3. THE LOCAL ROAD NETWORK

3.1. The subject site is located at Lot 51 Tunbridge Street, Margaret River.

3.2. Tunbridge Street is a local distributor road linking Bussell Highway to Railway Terrace and thence Wallcliffe Road. It is a secondary connection to Wallcliffe Road and would be more commonly used by local traffic. It is constructed with a 9.5 metre pavement within a 20 metre road reservation.

3.3. Current traffic data is not available from the Shire of Augusta-Margaret River. Historical data from Main Roads shows 2,421 vehicles per day (vpd) to the east of Stuart Street recorded in 2006. A later traffic count undertaken for the 2012 modelling of the Margaret River bypass showed 3,040vpd, with the modelling showing little growth as a result of the Margaret River structure plan. It can be expected that Tunbridge Street would currently pass less than 3,500vpd.

3.4. Appendix A indicates that a daily flow of 3,500vpd would indicate Level of Service B on Tunbridge Street. Tunbridge Street would be considered as a neighbourhood connector under the Liveable Neighbourhoods hierarchy and it is desirable to limit daily volumes to less than 7,000 vehicles.

3.5. Figure 1 shows the shows the concept structure plan.

## 4. PROPOSED DEVELOPMENT

4.1. The development will subdivide the existing lot to provide between 25 and 30 individual lots, serviced by a new cul de sac from Tunbridge Street. For the purpose of assessment, 30 lots are assumed.

4.2. A single house presently occupies the site.

## 5. DAILY TRAFFIC VOLUMES AND VEHICLE TYPES

5.1. The site is currently occupied by a single dwelling. Reference to the RTA *Trip Generation* document indicates a trip rate of 8 trips per dwelling can be expected in the subject site location. The existing land uses would therefore be expected to generate about 8 vehicle movements per day. Due to the close proximity of Margaret River town site a lower actual traffic generation may occur.

5.2. The proposed development will provide up to 30 residential lots and using the RTA *Trip Generation* can be expected to generate (30 x 8) 240 vehicle movements per day. The close proximity of the site to local shops, cafes and shopping facilities may reduce the overall traffic generation of the subject site.

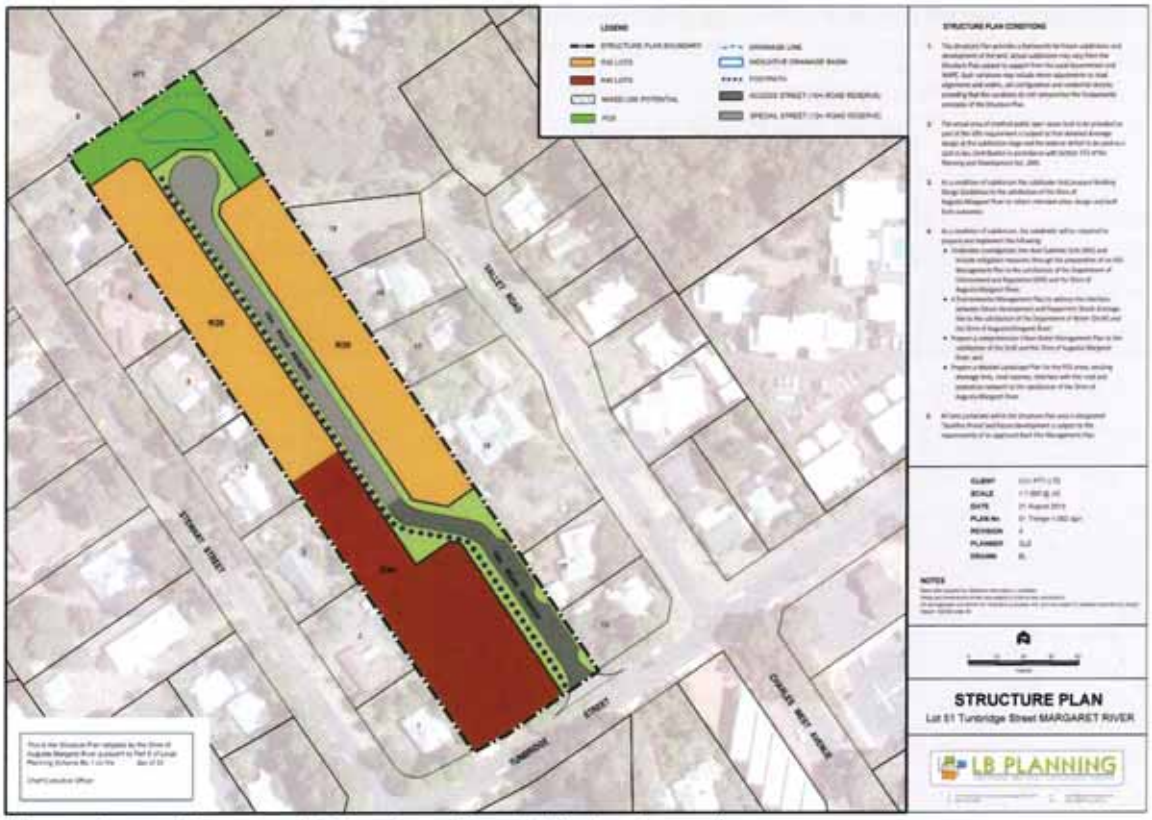



**Figure 1** **Proposed Structure Plan** (refer to planner)

5.3. Overall the proposed development could generate 240 vehicle movements per day. When compare to the existing expectations of traffic associated with the site (8 vehicle movements) the proposed development can be expected to increase local traffic movement by about 232 vehicle movements per day.

5.4. During the peak periods, 10% of the generated traffic could occur, or 24 vehicle movements.

5.5. Reference to the WAPC *Transport Assessment Guidelines for Developments* states that where a traffic increase as a result of a proposed development is less than 10% of current road capacity, it would not normally have any material impact.

5.6. Tunbridge Street would have capacity to pass up to 22,900vpd (refer Appendix A) before unacceptable Levels of Service occur (which is capacity). On this basis an increase of 232 vehicles per day would equate to less than 1% of the capacity. However, a more reflective method is to assess the increase in comparison to the desirable volumes indicated by *Liveable Neighbourhoods*.

5.7. Based on *Liveable Neighbourhoods* Tunbridge Street would be considered as a neighbourhood connector with a target maximum flow of 7,000vpd. An increase

of 232vpd would equate to 3.3% of the maximum desirable flow and thus would be deemed to have no material impact under the WAPC guidelines.

5.8. Based on the existing traffic flows of about 3,500vpd, the forecast increase equates to 6%. The forecast traffic increase would be considered to have no significant impact.

5.9. As a residential development, vehicles generated would be private cars. Service vehicle such as garbage trucks can be expected on a weekly basis and house removal vehicles can be expected on an occasional basis.

5.10. The traffic flows calculated are the maximum expectations of the site based on permanent residential occupation. Should lots be purchased for holiday use, the overall traffic generation of the site would be significantly less.

## 6. VEHICLE ACCESS AND PARKING

6.1. Access to the proposed lots will be made from a new cul de sac off Tunbridge Street. Figure 1 shows that some lots will front Tunbridge Street, but can be accessed from a rear laneway.

6.2. A 15 metre road reservation is proposed adjacent to Tunbridge Street reducing to 12 metres further north. Based on the forecast traffic movements the lowest order of street is appropriate for the subject site. A 5.5 metre wide road pavement would be acceptable. *Liveable Neighbourhoods* indicates that a 14.2 metre road reservation should be provided, although with the forecast traffic demands, a laneway of 6 metres would be deemed sufficient under *Liveable Neighbourhoods* guidelines. It is considered that a 12 metre road reservation is sufficient from a traffic movement perspective, but will require attention to utilities servicing. The reduced road reservation will have no impact to traffic movements.

6.3. The location of the proposed access road to Tunbridge Street conforms to the requirements of *Liveable Neighbourhoods* in regard to intersection spacing requirements. The proposed access is approximately 50 metres west of Valley Road and over 70 metres from Stewart Street.

6.4. Visibility to current requirements can be achieved along Tunbridge Street at the proposed site access. However, some alterations to existing car parking bays will be required.

6.5. With up to 24 vehicle movements expected during the peak period, the access will operate with no significant delays. Reference to Austroads advice (Refer Appendix B) indicates that with a peak hour flow on Tunbridge Street of

approximately 350 vehicles (10% of the daily flow), uninterrupted flow conditions will prevail. Under these circumstances Austroads advises that no further assessment is warranted.

6.6. Parking is provided on individual lots. Visitor parking can be accommodated on the internal street to the subject site.

## 7. PROVISION FOR SERVICE VEHICLES

7.1. Garbage collection will be provided to each lot from the proposed cul de sac. A turning head is provided at the northern end of the cul de sac.

## 8. HOURS OF OPERATION

8.1. As a residential development there are no defined hours of operation.

## 9. TRAFFIC MANAGEMENT OF FRONTAGE STREETS

9.1. Traffic generated by the proposed development will take access to a new access road and thence Tunbridge Street. Good visibility is provided along Tunbridge Street at the location of the proposed access.

9.2. No traffic management measures would be required as a result of the proposed development.

## 10. PUBLIC TRANSPORT ACCESS

10.1. The subject site is located approximately 250 metres from the main street of Margaret River and is not reliant on public transport.

10.2. Margaret River has no formal bus service, although South West coach lines do provide regular services to Busselton and Perth

## 11. PEDESTRIAN ACCESS

11.1. All adjacent roads are provided with footpaths. Tunbridge Street has a footpath to its southern side. The access road servicing the lots will be provided with a footpath to its western side.

11.2. The subject site is within easy walking distance to Margaret River town centre with its supermarket, cafes, restaurants and bars. The majority of facilities are within 300 metres.

11.3. Margaret River is considered to be a safe walking environment and the subject site has a walk score of 73. The walk score suggests that daily errands do not require a car. Most facilities within the town site are within a 20 minute walk.

## 12. CYCLE ACCESS

12.1. The proposed access road will cater for up to 200 vehicles per day and a safe cycling environment will exist on the internal access road.

12.2. There are few cycle lanes in the Margaret River locality, although local traffic demands and speeds are reasonable and on-street cycling is currently appropriate.

## 13. SITE SPECIFIC ISSUES

13.1. There are no site specific traffic issues that are raised through the assessment of the subject site.

## 14. SAFETY ISSUES

14.1. There are no road safety issues that are raised through the assessment of the subject site.

## APPENDIX A

### Levels of Service by Road Type

| LOS | Single Carriageway[1] | 2-Lane Boulevard[2] | Dual Carriageway (4-Lanes)[3] | Dual Carriageway (4-lane Clearway)[3] |
|---|---|---|---|---|
| A | 2,400vpd | 2,600vpd | 24,000vpd | 27,000vpd |
| B | 4,800vpd | 5,300vpd | 28,000vpd | 31,500vpd |
| C | 7,900vpd | 8,700vpd | 32,000vpd | 36,000vpd |
| D | 13,500vpd | 15,000vpd | 36,000vpd | 40,500vpd |
| E | 22,900vpd | 25,200vpd[4] | 40,000vpd | 45,000vpd |
| F | >22,900vpd | >25,200vpd[4] | >40,000vpd | >45,000vpd |

[1] Based on Table 3.9 Austroads - Guide to Traffic Engineering Practice Part 2

[2] Based on single carriageway +10% (supported by Table 3.1 Austroads - Guide to Traffic Engineering Practice Part 3) – Boulevard or division by medians.

[3] Based on RRR Table 3.5 - mid-block service flow rates (SF.) for urban arterial roads with interrupted flow. Using 60/40 peak split.

[4] Note James Street Guildford passes 28,000vpd.

## APPENDIX B
## AUSTROADS

### Table 4.1 — Intersection Capacity - Uninterrupted Flow Conditions

| Major Road Type[1] | Major Road Flow (vph)[2] | Minor Road Flow (vph)[3] |
|---|---|---|
| Two-lane | 400 | 250 |
| | 500 | 200 |
| | 650 | 100 |
| Four-lane | 1000 | 100 |
| | 1500 | 50 |
| | 2000 | 25 |

Notes:

1. Major road is through road (i.e. has priority).
2. Major road design volumes include through and turning movements.
3. Minor road design volumes include through and turning volumes.

# Appendix D

## BUSHFIRE MANAGEMENT PLAN

**Prepared by: RUIC Fire**

**T:** *1300 797 607* **E:** *admin@ruic.net.au*

# BUSHFIRE MANAGEMENT PLAN

**Site:** Tunbridge Stree, Margaret River

**Version:** 1.0

**RUIC Job:** 3702

RUIC FIRE

# Bushfire Management Plan

RUIC Fire is a trading name of
Rural Fire Risk Consultancy Pty Ltd
ABN: 48 151 451 713

## Disclaimer and Limitation

This report is prepared solely for **LB Planning** (the 'proponent') and is not for the benefit of any other person and may not be relied upon by any other person.

The mitigation strategies contained in this Bushfire Management Plan are considered to be prudent minimum standards only, based on the writer's experience as well as standards prescribed by relevant authorities. It is expressly stated that RUIC Fire and the writer do not guarantee that if such standards are complied with or if a property owner exercises prudence, that a building or property will not be damaged or that lives will not be lost in a bush fire.

Fire is an extremely unpredictable force of nature. Changing climatic factors (whether predictable or otherwise) either before or at the time of a fire can also significantly affect the nature of a fire and in a bushfire prone area it is not possible to completely guard against bushfire.

Further, the growth, planting or removal of vegetation; poor maintenance of any fire prevention measures; addition of structures not included in this report; or other activity can and will change the bushfire threat to all properties detailed in the report. Further, the achievement of the level of implementation of fire precautions will depend on the actions of the landowner or occupiers of the land, over which RUIC Fire has no control. If the proponent becomes concerned about changing factors then a new Fire Risk Management Plan should be requested.

To the maximum extent permitted by the law, RUIC Fire, its employees, officers, agents and the writer ("RUIC Fire") excludes all liability whatsoever for:

1. claim, damage, loss or injury to any property and any person caused by fire or as a result of fire or indeed howsoever caused;
2. errors or omissions in this report except where grossly negligent; and

the proponent expressly acknowledges that they have been made aware of this exclusion and that such exclusion of liability is reasonable in all the circumstances.

If despite the provisions of the above disclaimer RUIC Fire is found liable then RUIC Fire limits its liability to the lesser of the maximum extent permitted by the law and the proceeds paid out by RUIC Fire's professional or public liability insurance following the making of a successful claim against such insurer.

RUIC Fire accepts no liability or responsibility whatsoever for or in respect of any use or reliance upon this report and its supporting material by any third party.

This report is valid for a period of three years only from the date of its issue.

**Document Details**

| ITEM | DETAIL |
|---|---|
| Project Number | 3702 |
| Project Name | Lot 51 Tunbridge Street, Margaret River |
| Prepared by | Louisa Robertson and Greg Penney |
| Approved by | Greg Penney |
| Version | 1.0 |
| Date of Issue | 27th August 2015 |

Approval

Date: 27th August 2015

In signing the above, we declare the report is true and accurate to the best of our knowledge at the time of issue.

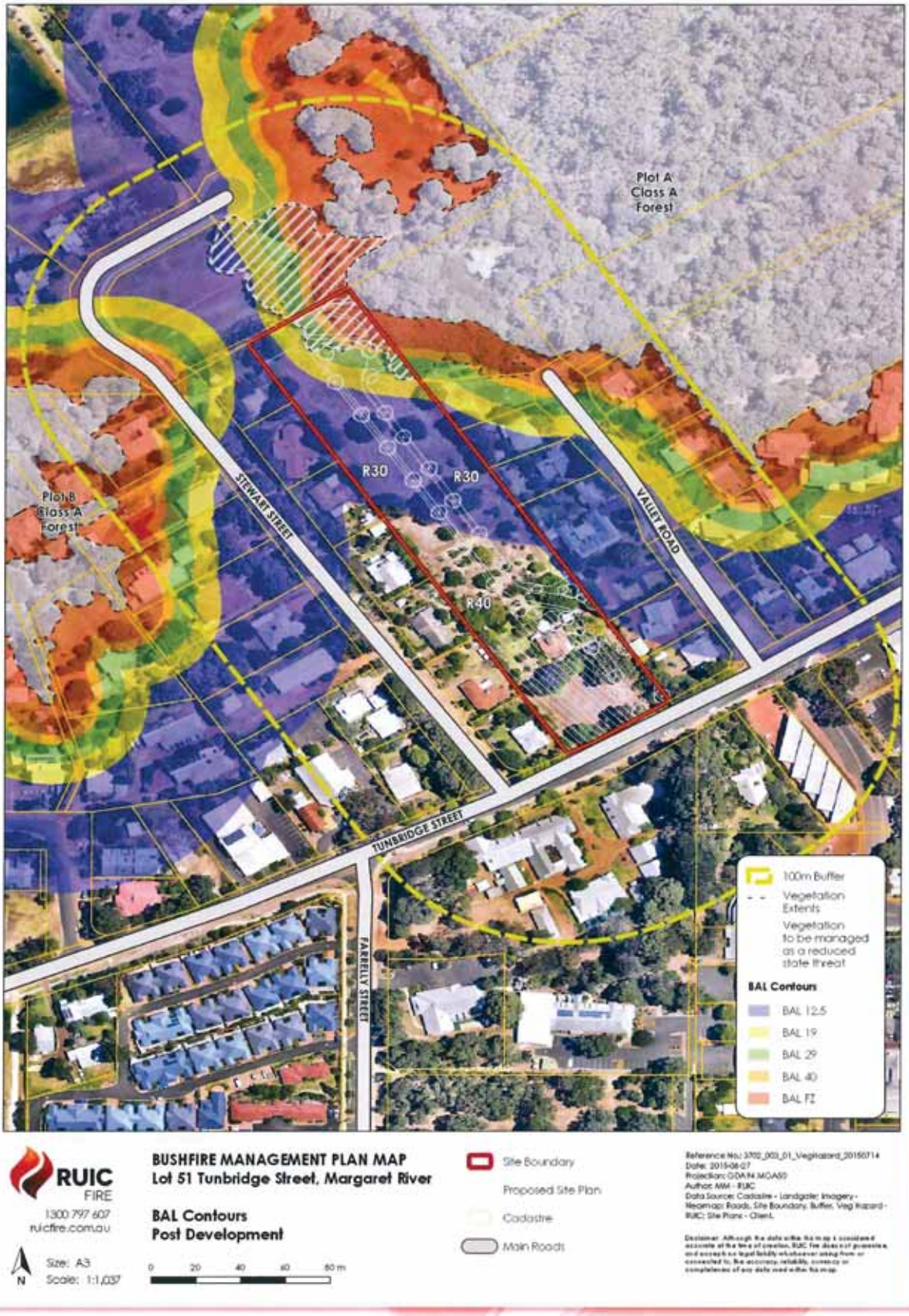



Figure i: Bushfire Management Strategies Map

# Contents

# 1.0 Introduction

## 1.1 Scope

The proponent engaged Rural Fire Risk Consultancy Pty Ltd (RUIC Fire) to prepare a site specific Bushfire Management Plan (BMP) in support of the subdivision (the development) of Lot 51 Tunbridge Street, Margaret River (the site).

## 1.2 Objectives

The objectives of the BMP are to:

i. Achieve consistency with objectives and policy measures of the current Planning for Bushfire Protection Guidelines 2nd Edition (PfBPG); draft SPP 3.7 Planning for Bushfire Risk Management (SPP3.7) and the Planning for Bushfire Risk Management Guidelines (SPP3.7 Guidelines), and any local planning scheme provisions relating to bushfire;
ii. Understand and document the extent of bushfire risk for the BMP area;
iii. Prepare bushfire risk management measures for bushfire management of all land subject of the Plan, with due regard for people, property, infrastructure and the environment;
iv. Nominate individuals and organisations responsible for fire management and associated works within the plan area (eg. local government for land vested in it and private property owners for freehold land); and
v. Define an assessment procedure which will evaluate the effectiveness and impact of proposed, as well as existing, bushfire risk management measures and strategies.

## 1.3 Document Review

In accordance with SPP3.7 Guidelines this Bushfire Management Plan is valid for a period of 3 years only from the date of issue. Planning Context

### 1.3.1 Existing Bushfire Management Plans

No existing Fire Management Plan exists for the proposed development.

### 1.3.2 Bushfire Prone Designation

Formal designation of an area as "Bushfire Prone" provides the legislative trigger to enforce all Class 1, 2, 3, and associated Class 10a buildings to be constructed in accordance with AS3959:2009 Construction of buildings in bushfire prone areas.

#### 1.3.2.1 Shire of Augusta Margaret River

The site is designated a "Bushfire Prone Area" by the Shire of Augusta Margaret River. In accordance with the Bushfire Prone zoning, all dwellings within 100m of a bushfire hazard must comply with construction requirements detailed in Australian Standard AS3959 "Construction of Buildings in Bushfire Prone Areas."

### 1.3.3 Section 70A Notice on Title

The development is subject to a S70A Notification on Title stating that this Bushfire Management Plan is applicable to the site and is to be complied with.

### 1.3.4 Summary

The site has been declared Bushfire Prone by the relevant authorities. AS3959 is therefore applicable to all future Class 1,2,3 and associated Class 10a buildings within the subject lot. This requirement subsequently facilitates development within 100m of vegetation having an Extreme Bushfire Hazard rating in accordance with Acceptable Solution A2.1 of draft SPP 3.7 Appendix 4.

## 1.4 Bushfire Context

The following documents are identified as being referenced to provide the performance criteria and technical specifications for this Bushfire Management Plan:


i. AMRSC (2013). LPS 1.
ii. AMRSC. (2013). Local Planning Policy 28 - Subdivision and Development in Bushfire Prone Areas. AMRS Planning.
iii. Ellis, S., Kanowski, P., & Whelan, R. (2004). National Inquiry on Bushfire Mitigation and Management. Council of Australian Governments.
iv. FESA. (2010). Planning for Bush Fire Protection Guidelines 2nd Edition Perth: Western Australian.
v. Standards Australia. (2009). AS 3959:2009 Construction of buildings in bushfire prone areas: SAI Global.
vi. Standards Australia. (2009). ISO AS 31000:2009 Risk management principles and guidelines: SAI Global.
vii. Standards Australia. (2013). HB89:2013 Risk management - Guidelines on risk assessment techniques. (Vol. HB 89:2013). Sydney: SAI Global.
viii. Standards Australia. (2013). HB 436:2013 Risk management guidelines - Companion to AS/NZS ISO 31000:2009 (Vol. HB436:2013). Sydney: SAI Global.
ix. WAPC. (2013). Planning Bulletin 111/2013 Planning for Bushfire. Western Australian Planning Commission.
x. WAPC. (2014a.) Draft State Planning Policy 3.7 Planning for Bushfire Risk Management. West Australian Planning Commission.
xi. WAPC. (2014b). Draft State Planning Policy 3.7 Planning for Bushfire Risk Management Guidelines. West Australian Planning Commission.
xii. WAPC. (2014c). Draft State Planning Policy 3.7 Planning for Bushfire Risk Management Guidelines Appendixes. West Australian Planning Commission, Department of Fire and Emergency Services.


WAPC has provided specific advice that draft State Planning Policy 3.7 Planning for Bushfire Risk Management is a seriously entertained document that must be given due consideration. Whilst the format of this report is consistent with draft SPP3.7 Appendix 3, to satisfy local government requirements the development is assessed against the requirements of both PfBPG and draft SPP3.7.

# 2.0 Site Details

## 2.1 Description

### 2.1.1 Location

Lot 51 Tunbridge Street (the site) is located in the Municipality of the Shire of Augusta Margaret River in the Locality of Margaret River, approximately 200m northwest of the Margaret River CBD. The site (Figure 2A) is approximately 1.4ha (13,944 m²) in area and is located within 200m of the Bussell Highway.

### 2.1.2 Proposed Land Use

The site is proposed to be subdivided into 23 Residential Lots ranging in size from 278 to 512 m². A single residential dwelling with associated outbuildings will be developed on each lot.

### 2.1.3 Access

The site is immediately accessed by a future cul-de-sac that originates from Tunbridge Street and extends the length of the site. Tunbridge Street borders the southern site boundary and connects directly to the Bussell Highway, located approximately 260m east of the site, which provides multiple routes for access egress. Tunbridge Street also has multiple linkages to other roads within the Margaret River Town Site allowing access and egress from the north, west and south. The existing extensive public road network therefore facilitates multiple egress and access routes to the site at all times and in all weather conditions.

The extended length of the cul-de-sac (being 60m more than the Acceptable Solution) is identified as acceptable due to the limited potential bushfire impact on the proposed development, being:

i. Egress from the cul-de-sac being directly away from any approaching potential bushfire front and being towards safer areas;
ii. Less than 15% of the development by land area identified as being subject to a BAL rating higher than BAL-29;
iii. More than 40% of the development by land area identified as being subject to a BAL-LOW rating; and
iv. Less than 140m of the cul-de-sac length being within 100m of vegetation identified as a potential bushfire threat.

The suitability of the extended cul-de-sac in allowing emergency and other vehicles to move through the proposed development easily and safely at all times has been independently verified by Riley Consulting Traffic and Transportation Consultants.

### 2.1.4 Water Supply

The site is to be serviced by reticulated scheme water and firefighting hydrants that satisfy Acceptable Solution A4.1.

### 2.1.5 Vegetation & Conservation Value

Whereas an independent environmental report is currently being prepared, the existing site is proposed to be landscaped to a Low Threat state or developed with the exception of

vegetation that is specifically identified as being retained within the development plan. Should any priority or declared rare flora be identified, these shall be retained within the development as part of an overall Landscaping Plan.

### 2.1.6 Climate

Data collected from the Bureau of Meteorology indicates that the site experiences a temperate climate characterised by mild winter periods and hot, dry summers. The bushfire danger period occurs during the dryer summer months where grass curing has occurred and humidity is low. The effect of climate on potential bushfire behaviour is incorporated into modelling of bushfire impact in section 3 of this report in accordance with AS3959 through the selection of a Fire Danger Index of 80 as assigned to Western Australia.

CSIRO CAWCR Technical Report No. 10 identifies that an FDI exceeding 50 has occurred only in the 99th percentile of historical weather data for the greater region. Consistent with the required precautionary approach, this affords a significant safety margin in the modelling of potential bushfire impact on the site determined in this report. As a comparison, the reported FDI during the Margaret River 2011 Bushfires was 37.

### 2.1.7 Site Topography

Across the site itself, an average 5° incline exists from the Woodland vegetation near the northern site boundary toward Tunbridge Street and the southern site boundary. Plot B Woodland vegetation north of the site; Plot A Forest vegetation east of the site; and Plot D Forest vegetation west of the site are effectively flat or upslope in relation to the site. The Woodland vegetation within Plot C is downslope, less than 5°, in relation to the site. Topography potentially affecting bushfire behaviour that may impact the site is identified in Figure 2D and incorporated into bushfire modelling provided in Section 3 of this report.

### 2.1.8 Bushfire Fuels

The following AS3959 vegetation structures are located within the site or within 100m of the site boundary:

(i) Class A Forest

(ii) Class B Woodland

(iii) Areas exempt from classification in accordance with AS3959 s2.2.3.2

AS3959 vegetation structures within 100m of the site are mapped in Figure 2C and illustrated in the associated plates. Bushfire fuel loads are identified as consistent with AS3959 Table B2 for radiant heat flux modelling purposes.

### 2.1.9 Conclusion

The development is situated in a suburban area at the interface with areas of continuous vegetation structure that could support extended bushfire behaviour. The design of the subdivision ensures areas of low threat vegetation (e.g. POS, Low Threat landscaping) provide a substantial buffer from extended continuous vegetation structures north of the site. Bushfire specific design considerations are included in the development as detailed in this report to ensure access, water supply and potential bushfire impact are appropriately addressed. These design standards incorporate worst case scenario bushfire impact as assessed in Section 3 and detailed in Section 4 of this report.


Figure 2A: Site Overview

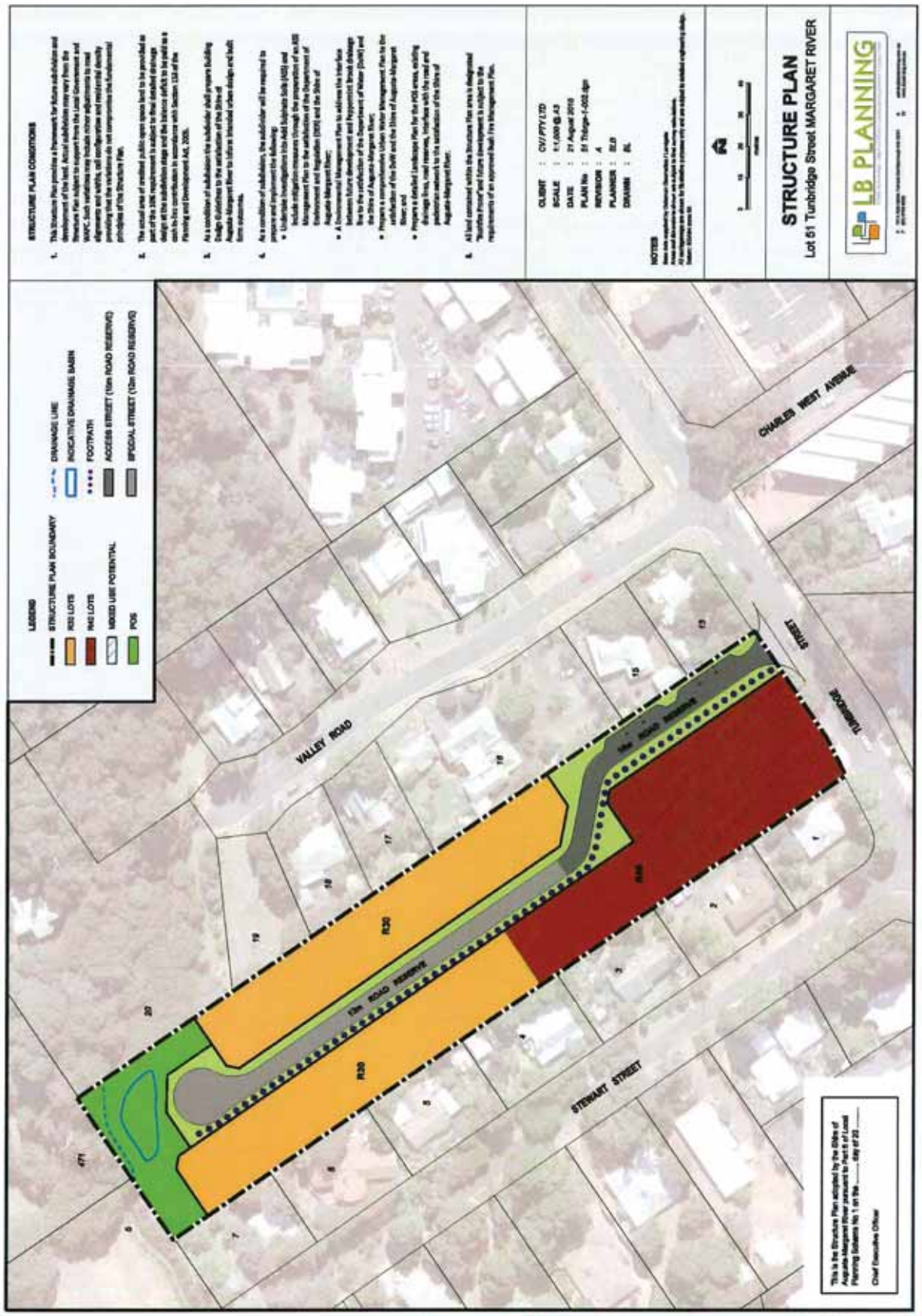



Figure 2B: Overall Development Plan (Client, 2015)

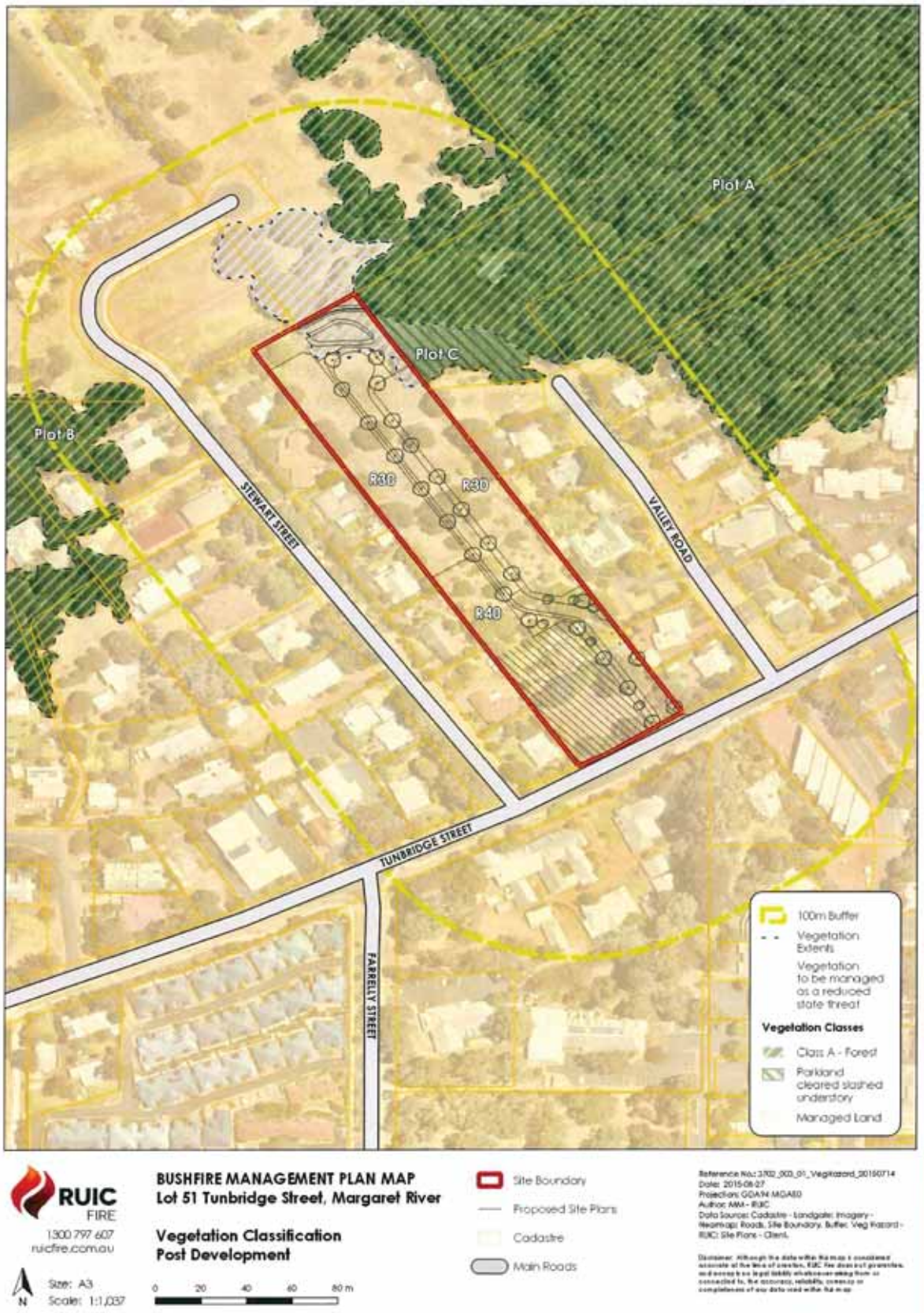



Figure 2C: Vegetation Classification – Pre-development

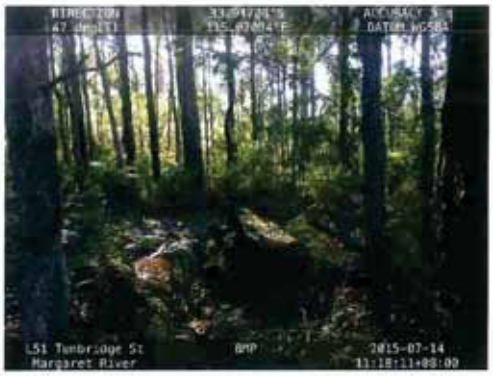



Plate 1: Plot A Class A Forest


Plate 2: Plot A Class A Forest


Plate 3: Plot B Class B Woodland


Plate 4: Plot B Class B Woodland


Plate 5: Plot C Parkland Cleared


Plate 6: Plot C Parkland Cleared


Plate 7: Plot D Class A Forest


Plate 8: Plot D Class A Forest

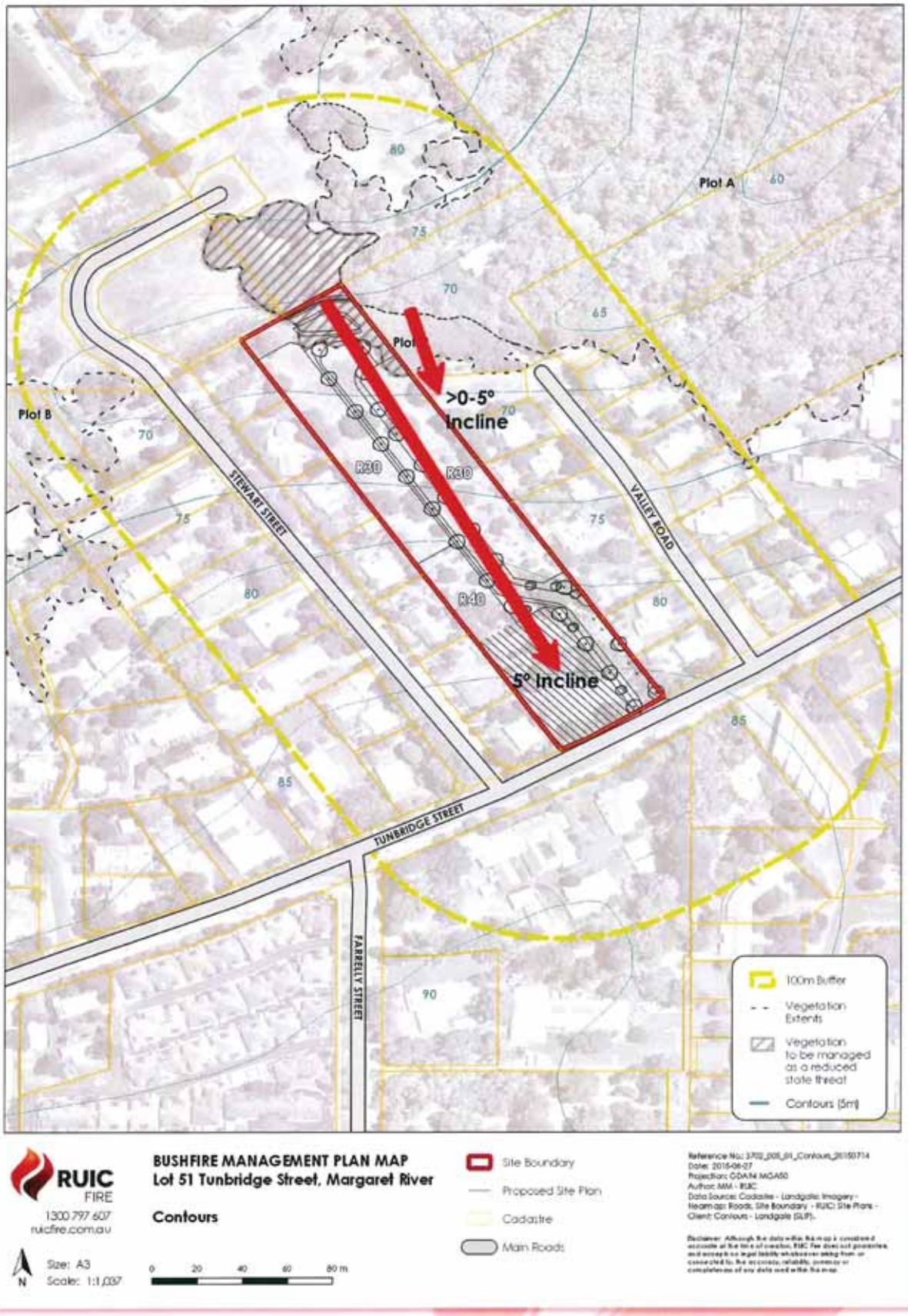



Figure 2D: Topography

# 3.0 Bushfire Assessment

## 3.1 Potential for Bushfire Activity

The site itself shall be landscaped to a Low Threat state and will not contain vegetation that will support the propagation of bushfire. Additionally the majority of the site is bordered by Low Threat existing urban development. Vegetation external to the north east corner of the site does facilitate bushfire behaviour that may impact future dwellings adjacent to this vegetation.

Whereas a significant bushfire event remains a credible threat, the proposed subdivision is not subject to an unacceptable level of radiant heat impact or hazard level as detailed in sections 3.2 and 3.3 of this report.

## 3.2 Bushfire Hazard Assessment

Bushfire Hazard Assessment in accordance with PfBPG Appendix 1 on the basis of the "predominant vegetation" identifies that post development the site shall have a Low Bushfire Hazard rating. Prior to development of the site, vegetation threats within the lot boundaries are identified as Extreme (woodland vegetation); and Low (managed grassland) as mapped in Figure 3A. Once the site has been developed, vegetation hazards within the lot boundaries are identified as Low (residential development, Low Threat POS).

It is concluded the predominant Bushfire Hazard Rating by land area of the site is Low. Despite this, the proponent has adopted a precautionary approach and has included bushfire considerations and design standards into the development as far as reasonably practicable. These design strategies are detailed in Section 4 of this report.

## 3.3 Bushfire Impact Analysis & BAL Ratings

Worst case scenario radiant heat impacts from the identified classified vegetation are illustrated in Figure 3B, detailed modelling is provided in Appendix 1 of this report. The modelling identifies that through the separation afforded by the proposed site layout, public roads and future landscaping, the maximum potential radiant heat impact for the proposed lots within the development will be **BAL-29.** This satisfies SPP3.7 Element 1: Location, Acceptable Solution 1,

## 3.4 Bushfire Landscaping Guidelines

It is important that landscaping design within the proposed development does not constitute a bushfire threat. This may be achieved through aligning landscaping design of Public Open Space (POS), Road Reserves and Parks & Recreational Reserves with Low Threat exclusion clauses defined in AS3959:2009 s2.2.3.2. Examples include:

i. Landscaping design within POS and Recreational Reserves being consistent with AS3959:2009 s2.2.3.2(f) to ensure vegetation does not create vertically and horizontally continuous fuel structures that may contribute to bushfire intensity (Figure 3C and 3D);

ii. Where areas of bushland are to be included as part of landscaping design, ensuring they are consistent with AS3959:2009 s2.2.3.2(c) being less than 0.25ha in area and not within 20m of each other or proposed dwellings;

iii. Utilising non-vegetated areas within the development consistent with AS3959:2009 s2.2.3.2 (e) to provide enhanced separation between buildings and vegetation identified as a bushfire threat external to the site boundaries; and

iv. Utilising Fire-Wise plant species that are resistant to the effects of fire (guidance can be found at http://www.cfa.vic.gov.au/plan-prepare/landscaping-for-bushfire/).

Figure 3A: Low Threat vegetation

Figure 3B: Low Threat POS

## 3.5 Risk Assessment

Risk is not an event (SAHB 436:2013 s2.1). It is not an explosion, bushfire, flood or other emergency. Risk cannot be expressed as either positive or negative, but rather as the likelihood of a consequence, positive or negative, occurring. In the context of planning for bushfire protection, bushfire is considered a risk source that can impact upon the objectives of preventing damage or loss to life, property and the environmental assets (prioritised in that order).

Management of bushfire related risk is a shared responsibility (Keelty, 2011). Risk criteria are sourced from Emergency Management Australia (2010); FESA (2010); and stakeholder consultation. Residual bushfire related risk to identified assets within the proposed development following implementation of the risk mitigation strategies is summarised in Table 3A in accordance with:

- ISO31000:2009 Risk management – principles and guidelines;
- SAHB 436:2013 Risk management guidelines – Companion to AS/NZS ISO 31000:2009;
- National Inquiry on Bushfire Mitigation and Management (2010).

The risk assessment demonstrates that after application of the risk management strategies incorporated into the design of the development, the residual bushfire related risk post subdivision is significantly reduced compared to the current state.

Table 3A: Risk Assessment of Development

| Risk Number | Risk Statement | Impact Category | Pre-subdivision Risk Level | Prevention Controls (Planning Specific) | Post-subdivision Residual Risk Level |
|---|---|---|---|---|---|
| 1. | There is the potential that a bushfire will impact the proposed development which in turn will cause death or injury to persons. | People | Moderate | • Enhanced construction in accordance with AS3959.<br>• Multiple egress routes for residents to evacuate to areas greater than 100m from the vegetation interface.<br>• Reticulated firefighting water supply | Moderate |
| 2. | There is the potential that a bushfire will impact the proposed development, which in turn will cause destruction of or damage to the proposed dwellings. | Infrastructure | Moderate | • Enhanced construction in accordance with AS3959.<br>• Location ensures maximum BAL-29 rating for habitable dwellings.<br>• Multiple egress routes for residents to evacuate to areas greater than 100m from the vegetation interface.<br>• Reticulated firefighting water supply | Moderate |
| 3. | There is the potential that a bushfire will impact the proposed development, which in turn will cause destruction of or damage to environmental assets. | Environment | Low | • Development does not impact vegetation within Shire reserves. | Low |

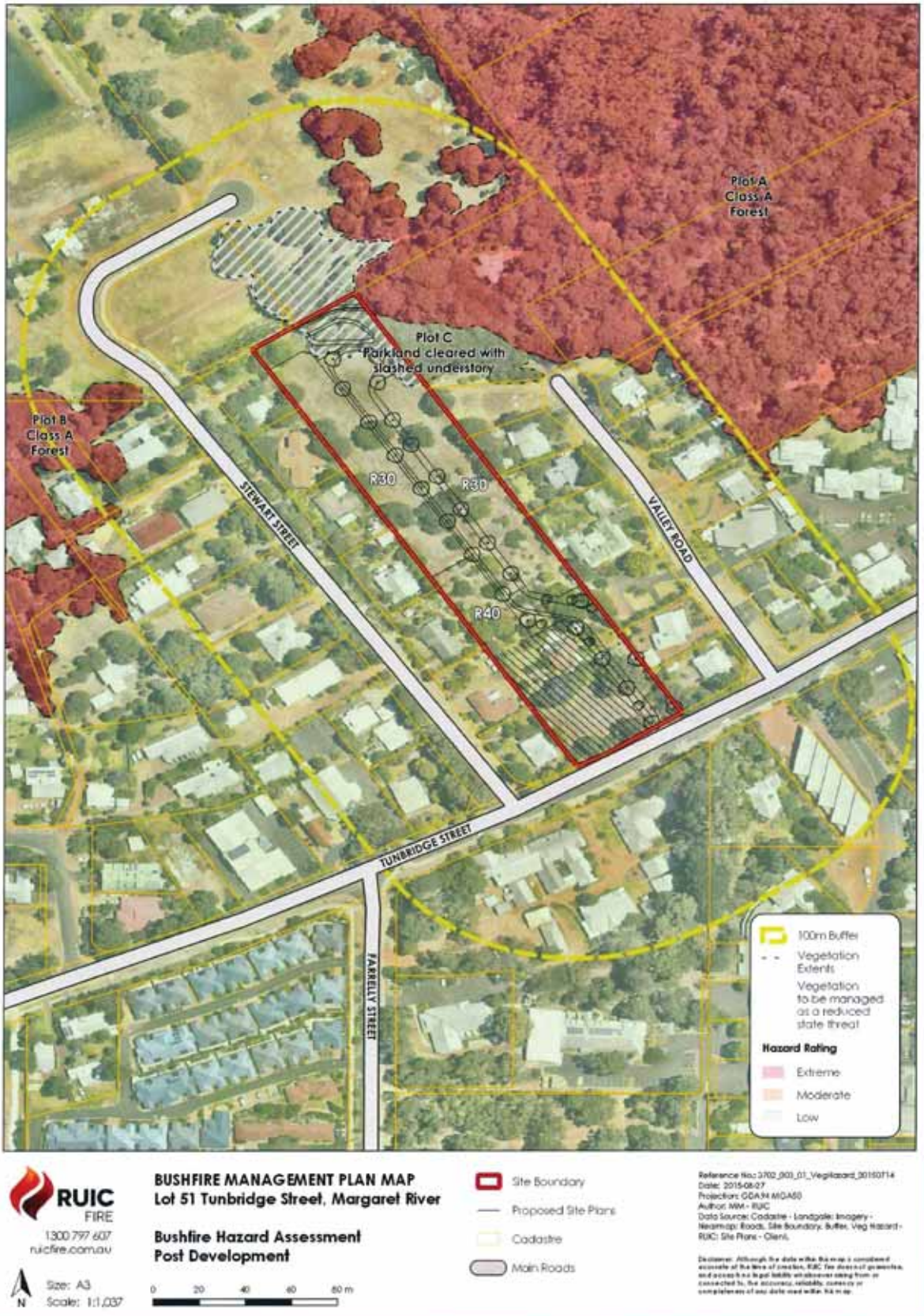



Figure 3A: Bushfire Hazard Rating Post-Development

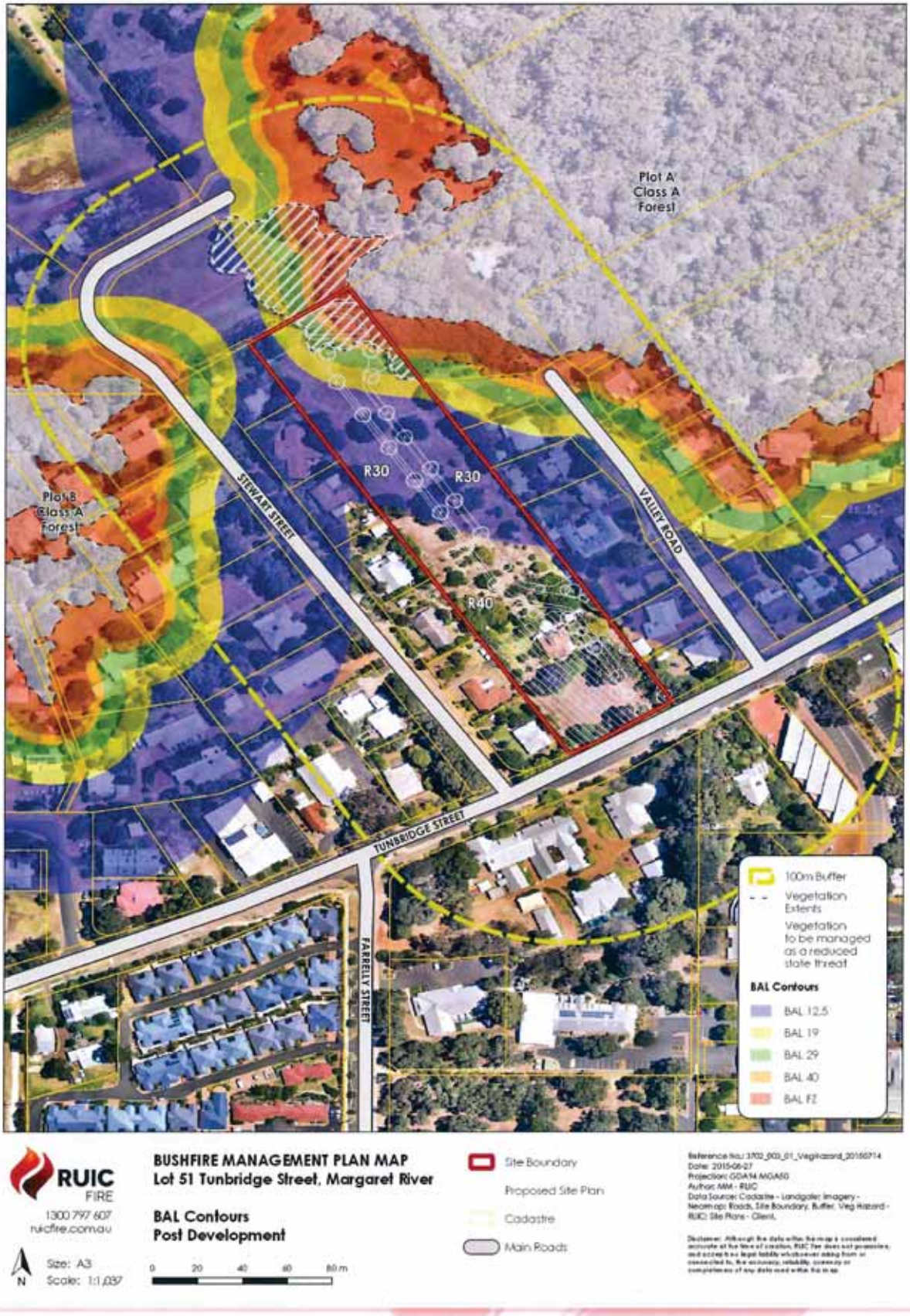



Figure 3B: Bushfire Attack Level Contours Post-Development

## 3.6 Performance Criteria and Compliance

All proposed building envelopes are located on land having a Low Hazard Rating and the development is identified as being subject to a moderate level of bushfire related risk. In order to reduce the level of risk further, the development incorporates bushfire mitigation measures into the overall design in accordance with the requirements of draft SPP3.7. The compliance of the development against the Elements and Performance Principles of draft SPP3.7 is summarised in Table 3B. Where Performance Based Solutions are utilised, detailed justification is provided in the relevant section of this report.

Table 3B: Element & Performance Principle Compliance SPP3.7 Appendix 4

| Element | Compliance | Acceptable Solution (AS) or Performance Based Solution (PBS) |
|---|---|---|
| 1. Location | ✓ | Acceptable Solution 1 General Site Location |
| 2. Siting of Development | ✓ | Acceptable Solution 2 Separation from Moderate Hazards<br>Performance Based Solution 1 Building Protection Zone<br>Acceptable Solution 3 Hazard Separation Zone |
| 3. Vehicular Access | ✓ | Performance Based Solution 2 Vehicle Access |
| 4. Water | ✓ | Acceptable Solution 4 Firefighting Water |

## 3.7 Conclusion

The Bushfire Hazard rating, bushfire related risk level and BAL rating applicable to the proposed lots are not prohibitive of development. The current design of the proposed development satisfies all Elements and Performance Principles of SPP3.7 Appendix 4.

## 4.0 Bush Fire Risk Mitigation

The bush fire risk mitigation strategies detailed in this report are designed to comply with the Performance Criteria detailed in PfBPG; WAPC Planning Bulletin 111/2013; and draft SPP3.7. The format of mitigation strategies is aligned with SPP3.7 Appendix 4 in accordance with direction provided in SPP3.7 Guidelines.

- The notation (P3) refers to Performance Principle 3 of draft SPP3.7 Appendix 4. Where a Performance Based Solution is offered detailed justification is provided.
- The notation (A3.1) refers to Acceptable Solution 3.1 of draft SPP3.7 Appendix 4.
- The notation (E3.1) refers to Explanatory Note 3.1 of draft SPP3.7 Appendix 4.
- Where discrepancy occurs between State and Local bushfire planning provisions the higher standard of mitigation has been selected.

Where performance based design solutions are proposed, detailed justification is provided in the relevant section.

### 4.1 Element 1 - Location of Development

**Intent:** To ensure that the subdivision, development or land use is located in areas with the least possible risk of bushfire, to help minimise risk to people, property and infrastructure.

**Performance Principle (P1):** The subdivision, development or land use is located in an area where the bushfire hazard assessment classification is or will be moderate or low, and the risk can be managed.

Acceptable Solution 1 **Development Location A1.1**

Post-development, the site is subject to a Low/Moderate Hazard Rating and all future habitable dwellings will be subject to a maximum BAL-29 rating. This satisfies (P1; A1.1).

### 4.2 Element 2 – Siting of Development

**Intent:** To ensure that the siting of development minimises the level of bushfire impact.

**Performance Principle (P2):** The siting and design of the subdivision, development or land use (including paths and landscaping) is appropriate to the level of bushfire risk that applies to the site and minimises the bushfire risk to people, property and infrastructure.

Acceptable Solution 2 **Hazard Separation – Moderate Bushfire Hazard Level A2.1**

Every building is sited a minimum distance of 100 metres from any vegetation classified in AS3959 as forests, woodlands, closed shrub, open shrub, mallee/mulga and rainforest and 50 metres from unmanaged grassland, or has its construction standard increased to align with the appropriate BAL for that location. Where a building cannot be located a minimum distance of 100m from the vegetation the building must be constructed to the higher standard as described in AS3959.

All new dwellings within 100m of bushfire prone vegetation will be constructed in accordance with AS3959:2009 to facilitate the reduced separation distance, therefore complying with A2.1.

Performance Based Solution 1 **Building Protection Zone A2.2**

The Building Protection Zone is a low fuel area immediately surrounding a building and is designed to minimise the likelihood of flame contact with buildings. Features such as

driveways, footpaths, roads, vegetable patches, lawn or landscaped garden (including deciduous trees and fire resistant plant species) may form part of building protection zones. Areas of vegetation deemed Low Threat Vegetation and managed in a reduced fuel state inclusive of Public Open Space and nature strips may form part of a building's defendable space. Isolated shrubs and trees may be retained within building protection zones.

Acceptable Solution A2.1 standard for the building protection zone is modified to remove the reference to tree crowns being spaced in accordance with the BCA as the Building Code of Australia does not comment on landscaping measures. The BCA directly references AS3959:2009 for the calculation of bushfire radiant heat flux, therefore AS3959:2009 s2.2.3.2 (f) Low Threat Vegetation is subsequently used to define the standard required for vegetation within the building protection zone. The existing public road network and landscaping satisfies this criteria. It is also modified to facilitate overlapping BPZ's and lot sizes as a result of the required density of the development.

a) Standard:

   i. Width: each lot in its entirety is to be kept as a Building Protection Zone. This includes vacant and undeveloped lots. Building Protection Zones will overlap between dwellings to ensure the entire site is maintained as a continuous low threat area;

   ii. fuel load: reduced to and maintained at 2 tonnes per hectare and maintained in accordance with AS3959:2009 s2.2.3.2 (f) stated here as:

      "Including grassland managed in a minimal fuel condition, maintained lawns, golf courses, maintained public reserves and parklands, vineyards, orchards, cultivated gardens, commercial nurseries, nature strips and windbreaks. NOTE: Minimal fuel condition means there is insufficient fuel available to significantly increase the severity of the bushfire attack (recognizable as short-cropped grass for example, to a nominal height of 100 mm)."

   iii. no tall shrubs or trees located within 2 metres of a building;

   iv. no tree crowns overhanging the building; and

   v. fences and sheds within the building protection zone are constructed using non-combustible materials (eg. iron, brick, limestone).

b) Implementation:

   Prior to the sale of any lot within the development.

c) Development:

   It is the responsibility of the developer to ensure the BPZ standard is established for each building envelope.

d) Maintenance:

   It is the responsibility of the individual property owner to ensure the BPZ standard continues to be achieved post completion of the development.

Acceptable Solution 3 **Hazard Separation Zone A2.3**

Hazard Separation Zones assist in reducing fire intensity when a bushfire impacts on buildings within a subdivision. Separation may be necessary on the perimeter of a subdivision but may also be needed where bushfire hazards exist within a subdivision. This separation reduces the overall vulnerability of a subdivision and related development and assists with fire control operations. Where the full Hazard Separation Zone cannot be achieved, enhanced construction in accordance with AS3959 is required (A2.1).

All new dwellings within 100m of bushfire prone vegetation will be constructed in accordance with AS3959:2009 to facilitate the reduced separation distance, therefore complying with A2.1 and A2.3.

## 4.3 Element 3 - Vehicular Access

**Intent:** To ensure that the vehicular access serving a subdivision/development is available during a bushfire event.

**Performance Principle (P3):** The internal layout, design and construction of public and private vehicular access in the subdivision/development allows emergency and other vehicles to move through it easily and safely at all times.

**The following Acceptable Solutions do not apply to the proposed development:**

A3.2 Public Roads

A3.4 Battle Axes

A3.5 Private Driveways

A3.6 Emergency Access Ways

A3.7 Fire Service Access Routes

A3.8 Gates

A3.9 Signs

Performance Based Solution 2 **Element 3 Vehicular Access P3**

Justification:

Due to the small scale of the development and required land area of the proposed lots, a single access point to the proposed development is identified as allowing emergency and other vehicles to enter and exit the development at all times. The extended length of the cul-de-sac (being 60m more than the Acceptable Solution) is justified due to the limited potential bushfire impact on the proposed development, being:

i. Egress from the cul-de-sac being directly away from any approaching potential bushfire front and being towards safer areas;
ii. Less than 8% of the development by land area identified as being subject to a BAL rating higher than BAL-29;
iii. More than 40% of the development by land area identified as being subject to a BAL-LOW rating; and
iv. Less than 140m of the cul-de-sac length being within 100m of vegetation identified as a potential bushfire threat.

The suitability of the extended cul-de-sac in allowing emergency and other vehicles to move through the proposed development easily and safely at all times has been independently verified by Riley Consulting Traffic and Transportation Consultants (Appendix 1).

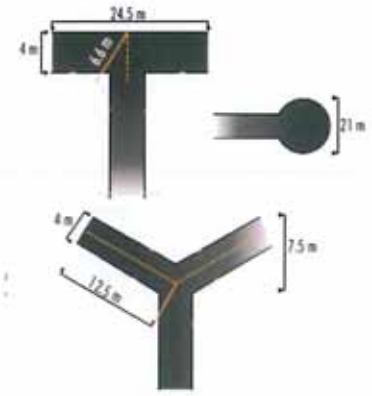
Performance Based Solution:

The cul-de-sac shall meet the remaining requirements of Acceptable Solution A3.3.

(a) Standard:

i. As per table 4A

ii. heads: 21m turnaround or as detailed below (Ref: WAPC, 2014c p19 "Turning areas":




(b) Implementation:

i. Prior to sale of the first lot within each stage that the cul-de-sac services.

(c) Development:

i. It is the responsibility of the developer to ensure the cul-de-sacs meet the required standard.

(d) Maintenance:

i. It is the responsibility of the Local Government to ensure the cul-de-sacs continue to meet the required standard.

Table 4A: Vehicle access technical requirements

| Technical Requirement | Public Roads (N/A) | Cul-de-sacs | Battle-axes (NA) | Private Driveways (NA) | Emergency Access Ways (NA) | Fire Service Access Routes (NA) |
|---|---|---|---|---|---|---|
| Trafficable Surface (m) | 6 | 6 | 4 | 4 | 6 | 6 |
| Horizontal Clearance (m) | 6 | 6 | 6 | 6 | 6 | 6 |
| Vertical Clearance (m) | 4 | N/A | 4 | 4 | 4 | 4 |
| Maximum Grade | 1 in 8 | 1 in 8 | 1 in 8 | 1 in 8 | 1 in 8 | 1 in 7 |
| Maximum Grade over <50m | 1 in 5 | 1 in 5 | 1 in 5 | 1 in 5 | 1 in 5 | 1 in 4 |
| Maximum Average Grade | 1 in 7 | 1 in 7 | 1 in 7 | 1 in 7 | 1 in 7 | 1 in 5 |
| Weight Capacity (t) | 15 | 15 | 15 | 15 | 15 | 15 |
| Crossfall | 1 in 33 | 1 in 33 | 1 in 33 | 1 in 33 | 1 in 33 | 1 in 33 |
| Curves Inner Radius (m) | 12 | 12 | 12 | 12 | 12 | 12 |

## 4.4 Element 4 – Water Supply

**Intent:** To ensure that water is available to the subdivision, development or land use to enable people, property and infrastructure to be defended from bushfire.

**Performance Principle (P4):** The subdivision, development or land use is provided with a permanent and secure water supply that is sufficient for firefighting purposes.

Acceptable Solution 4 **Reticulated Area A4.1**

The site is to be serviced by reticulated scheme water and firefighting hydrants satisfying Water Corporation Design Standard DS63 to the satisfaction of the Department of Fire and Emergency Services. This satisfies Acceptable Solution A4.1.

## 4.5 Works and Responsibilities

Table 4B summarises the responsible party for each mitigation strategy and the time frame in which it must be completed.

Table 4B: Developer Schedule of Works

| Strategy | Implementation | | Maintenance | |
|---|---|---|---|---|
| | Responsible | Time Frame | Responsible | Time Frame |
| Amendments to BMP | Any amendments to this BMP shall be approved by the relevant Jurisdiction Having Authority. | | | |
| Building Protection Zone | Developer | Prior to sale of any lots | Individual Land Owners | Ongoing |
| Construction to AS3959 | Individual Land Owners | On construction of all dwellings | Individual Land Owners | Ongoing |
| Firefighting Water Hydrants | Developer | Prior to sale of any lots | Water Corporation | Ongoing |
| Firefighting Services & Response | DFES and Local Government | Ongoing | DFES and Local Government | Ongoing |
| Fuel Load Reduction and Fire Break Notice | Local Government | Annually | Local Government | Annually |
| Inspection and Issue of Works Orders or Fines. | Local Government | Ongoing | Local Government | Ongoing |

## 5.0 References

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WAPC. (2014b) Draft State Planning Policy 3.7 Planning for Bushfire Risk Management Guidelines. West Australian Planning Commission.

WAPC. (2014c) Draft State Planning Policy 3.7 Planning for Bushfire Risk Management Guidelines Appendixes. West Australian Planning Commission, Department of Fire and Emergency Services.

# 6.0 Appendix 1 – BAL Calculations

## 6.1 Introduction

Modelling of potential radiant heat flux impact on the site is completed using AS3959 Methodology 1 for Plots A and B. Where the assumptions of AS3959 are inappropriate for determining the potential bushfire impact on the site, alternative modelling is provided with full justification. Alternative modelling is utilised for the proposed wetland retained within the site. Plots are illustrated in Figure 6A (numbers represent plot locations).

The methodology adopted for the analysis detailed in this report is derived from the International Fire Engineering Guidelines (1) and modified to the bushfire context and project.

## 6.2 Deviations from Deemed to Satisfy Requirements

Potential bushfire behaviour within the wetland are not consistent with the assumptions utilised in AS3959 listed here as:

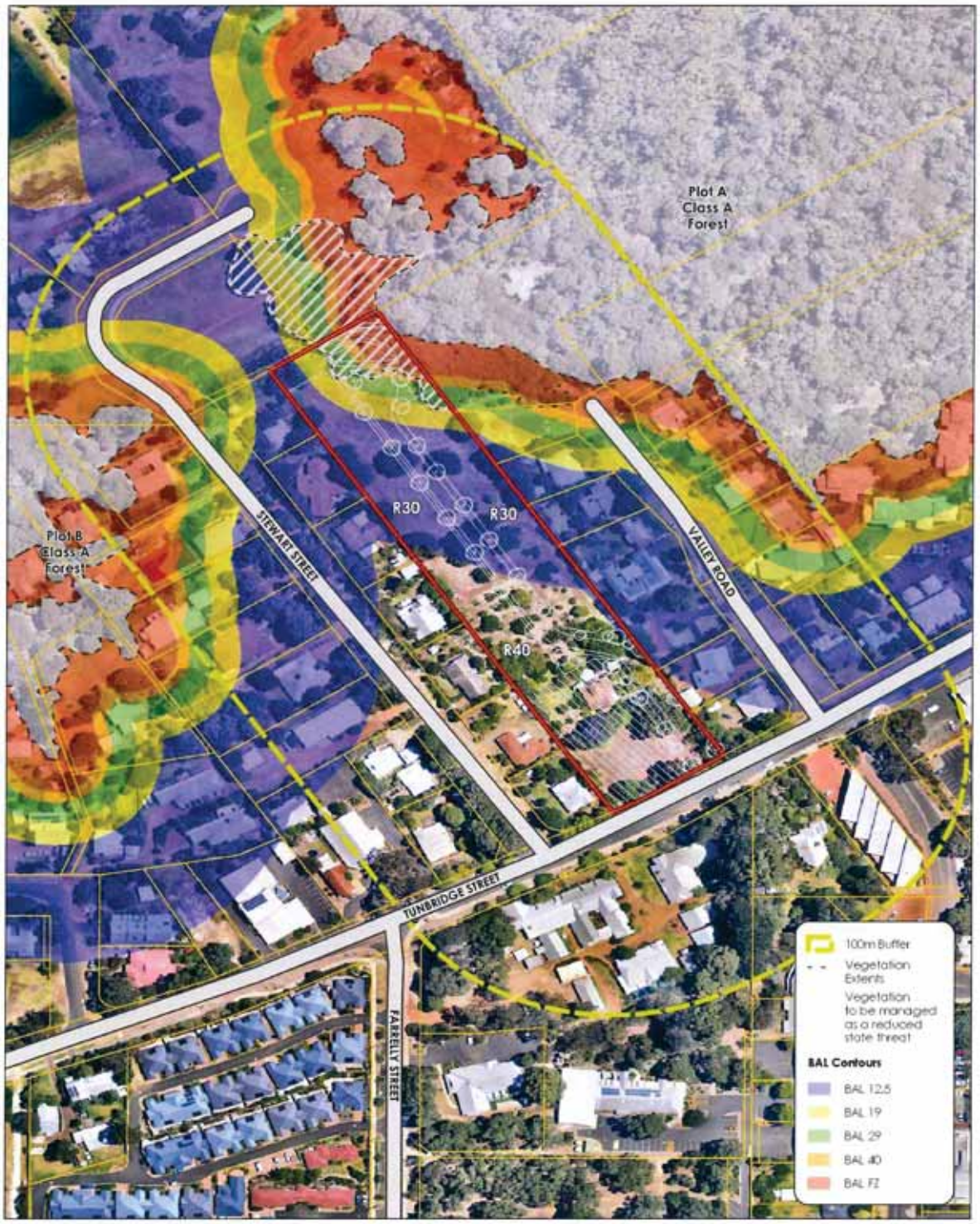
(i) The physical dimensions of the plots does not facilitate a continuous bushfire front of landscape scale extending from other areas of classified vegetation; and
(ii) The density of fuel load per hectare per unit area is significantly reduced by the physical fuel load available compared to that detailed in AS3959 Table B2.

The alternative modelling Standard inputs from AS3959 Table 2.4.1 unless otherwise stated.

## 6.3 Factors of Safety

The following factors of safety are included in the alternate modelling:

1. The proposed dwelling is assumed to be a black box receiver that does not reflect any of the radiant heat flux received. In reality the building is a grey surface that will reflect some of the received radiation;
2. The calculations assume no fire brigade or resident intervention whilst the fire is developing;
3. AS3959 assigns an FDI of 80 for Western Australia. An FDI of 100 is used for all calculations in this report. This safety factor is compounded through subsequent calculation phases. CSIRO CAWCR Technical Report No. 10 (3) identifies that an FDI above 60 is not achieved for the study area except for the 99th percentile of historical weather data;
4. Despite literature (1-4) identifying fire development in treed fuels may take between 200-300m of fire run and the unrestricted head fire width development to 100m, any fire with a single run of 100m or more is calculated using the quasi-steady Rate of Spread (RoS);
5. Base fuel load taken as Class B Woodland despite minimal understory fuel load; and
6. Radiant heat flux shielding in accordance with AS3959:2009 c3.5 is ignored.




RUIC FIRE
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**BUSHFIRE MANAGEMENT PLAN MAP**
**Lot 51 Tunbridge Street, Margaret River**

**BAL Contours**
**Post Development**

Size: A3
Scale: 1:1,037

0 20 40 60 80 m

Site Boundary
Proposed Site Plan
Cadastre
Main Roads

Reference No: 3702_003_01_VegHazard_20150714
Date: 2015-08-27
Projection: GDA94 MGA50
Author: MM - RUIC
Data Source: Cadastre - Landgate; Imagery - Nearmap; Roads, Site Boundary, Buffer, Veg Hazard - RUIC; Site Plans - Client.

Disclaimer: Although the data within this map is considered accurate at the time of creation, RUIC Fire does not guarantee, and accepts no legal liability whatsoever arising from or connected to, the accuracy, reliability, currency or completeness of any data used within this map.

*Figure 6A: BAL Contours and Plot Locations*

## 6.4 BAL Ratings

### 6.4.1 Plots A and B

AS3959 Methodology 1 is used for the calculation of radiant heat flux for Plots A and B. Results are detailed in Table 6A.

*Table 6A: BAL Ratings and Setbacks Plots A-B*

| PLOT | Vegetation Classification | Effective Downslope | BAL Ratings and Separation (m) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | FZ | 40 | 29 | 19 | 12.5 | LOW |
| A | CLASS A FOREST | Flat | <16 | 16-<21 | 21-<31 | 31-<42 | 42-<100 | >100 |
| B | CLASS B WOODLAND | Flat | <10 | 10-<14 | 14-<20 | 20-<29 | 29-<100 | >100 |

### 6.4.2 Parkland Cleared vegetation

#### 6.4.2.1 Modelling Parameters

- Class B Woodland fuel structure
- Fully developed fire front;
- AS3959 McArthur fire model;
- Standard AS3959 inputs except for fuel load as identified in 6.4.2.2 below and FDI of 100;
- No firefighting intervention.

#### 6.4.2.2 Fuel Load

Class B understory fuel load assigned from AS3959 Table B2 as 15t/ha; total fuel load of 25t/ha in accordance with AS3959 Table B2. Fuel structure is restricted by land area surrounding the available fire run path, resulting in a reduced fuel load density per 1ha unit area.

Fuel structure available for consumption in fire by land area is 13% of 1ha fuel area used for AS3959 Table B2. Calculated fuel load available for consumption is therefore 1.95t/ha understory; 3.25t/ha total fuel load (inclusive of canopy).

#### 6.4.2.3 Modelling Outputs

BAL ratings as a function of separation distance for the proposed wetland are calculated using the detailed methodology of AS3959 using the identified modelling parameters. Setbacks detailed in Table 6B.

*Table 6B: BAL Ratings and Setbacks Wetlands fire*

| PLOT | Vegetation Classification | BAL Ratings and Setbacks (m) | | | | | |
|---|---|---|---|---|---|---|---|
| | | FZ | 40 | 29 | 19 | 12.5 | LOW |
| Wetland | CLASS B WOODLAND | <2 | 2-<3 | 3-<5 | 5-<7 | 7-<100 | >100 |

## 6.5 Discussion

The potential fire behaviour throughout the parkland cleared vegetation immediately north east of the site will significantly inhibited by the lack of understory fuel load. Accordingly the worst case scenario is deemed to be radiant heat impact from the Class A Forest in Plot A which is subsequently illustrated in Figure 6A and used for the determination of land use suitability in this report.

## 6.6 References

1. MCALPINE, R. 1988. Acceleration of point source fire to equilibrium spread Thesis Master of Science, University of Montana.
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3. DFES 2014. Construction standards of new homes at the edge of the freeway. Perth: Government of Western Australia.
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