City of Busselton

STRUCTURE PLAN

LOT 34 SHEOAK DRIVE YALLINGUP

Garrison Holdings Pty Ltd

March 2019

larry smith planning
urban and strategic planning & design

City of Busselton

STRUCTURE PLAN – RURAL RESIDENTIAL

Lot 34 Sheoak Drive, Yallingup

March 2019

for Garrison Holdings Pty Ltd et al

Prepared by:

larry smith planning

In association with:

aurora environmental
development engineering consultants
ecosystem solutions

Larry Smith Planning
Urban and Strategic Planning & Design
A.B.N. 50 009 254 666
Mobile: +61 418 916908
Email: larryps@bigpond.com

ENDORSEMENT PAGE

This structure plan is prepared under the provisions of the City of Busselton Local Planning Scheme No. 21.

IT IS CERTIFIED THAT THIS STRUCTURE PLAN WAS APPROVED BY RESOLUTION OF THE WESTERN AUSTRALIAN PLANNING COMMISSION ON: **5 April 2019**

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:

M. Wieclaw Witness

5 April 2019 Date

5 April 2029 Date of Expiry

TABLE OF AMENDMENTS

Amendment No	Summary of Amendment	Amendment Type	Date Approved by WAPC

structure plan summary

Lot 34 Sheoak Drive, Yallingup is located within the Biddle Road Precinct of the Commonage Rural Residential area and has a total area of 15.07ha. The lot was created by the current owner, Garrison Holdings Pty Ltd, from the subdivision in the mid-1990's of Location 4207, McLachlan Road. The subdivision created a total of 75 lots of varying sizes including a number of rural production lots with an overall density of 1 lot / 2.08ha.

Lot 34 was set aside for a local village and tourist development. The lot is zoned Rural Residential under the City of Busselton Local Planning Scheme No 21 with an Additional Use (A39) for a range of tourist, recreational, community and commercial uses.

Sealed road access to the lot is from Sheoak Drive and Sonning Loop. The lot is mostly cleared except for an area of remnant vegetation in the north-eastern portion of the lot. The lot contains a large, stream fed dam and generally slopes up to the north-east and south east from the creekline.

An area of approximately 2ha of remnant Jarrah / Marri vegetation remains in the north-east portion of the lot and is in Good to Very Good condition. It is considered unlikely that the subject site supports any flora or fauna species of conservation significance as it has been substantially cleared for its previous agricultural use. No wetlands of conservation significance occur on the site and no known sites of Aboriginal or European heritage are present. A land capability assessment together with soils sampling of the site have determined that the proposed lots are suitable for on-site effluent disposal.

The lot is zoned Rural Residential under the City of Busselton Local Planning Scheme No 21. The lot is also the subject of Additional Use provisions (A39) for a range of tourist, recreational, community and commercial uses.

The City of Busselton has recently entered into a contract of sale to purchase a site to the north of Lot 34 within the adjoining rural residential estate, being Pt Lot 201 Balmoral Drive, as a 'Reserve for Public Purposes'. The site is nearby to the current Yallingup Bakery, on the south side of Biddle Road. It is understood that the City intends to construct the Community Centre and Fire Station originally mooted for Lot 34 on Lot 201. It is possible that other "commercial" uses may also develop at the general location of Lot 201. The City has expressed the view that it considers Lot 34 no longer appropriate or necessary for the Community facilities together with those other uses listed under AU39 in Schedule 2.

Lot 34 is not identified as either a Strategic or Non-Strategic Tourist Site under the City's Local Tourism Planning Strategy nor is it located within a Strategic Tourism Precinct.

Plan 1 : Structure Plan for Lot 34 Sheoak Drive, Yallingup proposes a total of nine lots. The dam is retained in a larger 4ha lot.

The City of Busselton Local Planning Scheme No 21 has been amended (Amendment No 34) to remove Lot 34 and Additional Use A39 from Schedule 2 Additional Uses so that all proposed lots may only be used for rural residential and related purposes.

The proposed Structure Plan departs from the Commonage Structure Plan and Biddle Road Cluster Precinct in so far as:

- it seeks a reduced lot size of 0.9ha in respect of proposed lots 2 and 3. These two lots abut the large Lot 9 and the dam and for all intent and purposes the marginal reduction lot size will not impact the

"useability" of the lots nor be visually obvious to the residents or others in the vicinity. Further, the lots are consistent with those in Mistover Place to immediate south-west of Lot 34 which is an enclave of lots mostly in the range of 0.5ha to 0.8 ha in area; and

- it seeks a minimal increase in the overall subdivision density in recognition of the owner's preparedness to meet local community preferences to forego the more intensive development options provided by the current Additional Use zone provisions and; the community benefit provided by the preparedness of the Owner of Lot 34 to cede the land for and construct the balance portion of Kinross Loop to connect it with Sheoak Drive which otherwise would have to be purchased and constructed by the City. The net effect of the density increase sought is to increase the overall original subdivision density from 1 lot / 2.08ha to 1 lot / 1.88ha. It is to be noted that the proposed additional eight lots will have a significantly reduced overall impact on the amenity of the immediate locality than the tourist / commercial development currently permitted under the Additional Use zoning.

Three of the proposed lots are accessed by Sheoak Drive and Sonning Loop which are constructed with the balance lots being accessed by a new cul-de-sac leading northwards off Kinross Loop extension. The cul-de-sac serving Lots 3 to 7 will be connected by an Emergency Access Way (EAW) to Sonning Loop providing alternative emergency access to the internal lots.

All lots will be subject of the land use and development control provisions of Clause 5.37 of the City of Busselton LPS 21 except for proposed Lot 1 which has a reduced side setback to the EAW of 10 metres to ensure an adequate Building Envelope.

A Bushfire Management Plan has been prepared for the site which will significantly reduce the fire threat to people and property within the subdivision. The Structure Plan proposes a Development Exclusion Area as delineated on *Plan 1 : Structure Plan* excluding development within areas having a BAL-29 rating or higher. The Exclusion Area will also ensure the protection of mature remnant Jarrah / Marri woodland in the north-eastern portion of Lot 34 (within proposed Lots 1 and 4) and the mature Marri's on Lots 1 and 2 Sonning Loop which may provide roosting habitat for Black Cockatoos.

Plan 2 : Dam Easement identifies an Easement in favour of the City of Busselton over part of the northern portion of proposed Lot 9. The area the subject of the Easement contains an existing emergency vehicle access and standpipe providing water supply from the dam for firefighting purposes. The existing standpipe will be retained for continued firefighting use and protected within the easement.

The subdivision will not be staged and the cul-de-sac will be constructed to the City's Rural Road standards. All lots will be serviced with underground electricity and communications services and drainage will be via roadside swales.

Overview – Lot 34 Structure Plan

Item	Data		Structure Plan Ref (Section No)
Total area covered by the Structure Plan	15.0749ha		
Area of each land use proposed: • Residential • Commercial • Industrial • Rural Residential	Hectares 0 0 0 13.9276	Lot yield 0 0 0 9	
Total estimated lot yield	9		
Estimated number of dwellings	9		
Original overall site density Amended overall site density Estimated lot 34 site density	1 lot / 2.08ha site area 1 lot / 1.88ha site area 1 lot / 1.67ha site area		
Estimated population	23 (@2.6p/household)		
Number of high schools	0		
Number of primary schools	0		
Estimated commercial floorspace	0		
Estimated area and percentage of public open space given over to:: • Regional open space • District open space • Neighbourhood parks • Local parks	 0 hectares 0 hectares 0 hectares 0 parks 0 hectares 0 parks	 0% 0% 0% 0%	
Estimated percentage of natural area	2 hectares 0 parks	13%	

Lot 34 Sheoak Drive, Yallingup

City of Busselton

PART 1 : STRUCTURE PLAN IMPLEMENTATION

part 1 – table of contents

part 1 – plans:

1. structure plan area

This Structure Plan applies to the whole of Lot 34 on Deposited Plan 37901, Sheoak Drive, Yallingup within the City of Busselton and as contained in Certificate of Title Volume 2546 / Folio 384 [Appendix 1 : Certificate of Title].

2. operation

This Structure Plan *[Plan 1 : Structure Plan & Plan 2 : Dam Easement]* come into operation on the date the Structure Plan is approved by the WA Planning Commission.

3. staging

It is not proposed to stage the subdivision. The extension of Kinross Loop to Sheoak Drive and EAW connection to Sonning Loop will be constructed as part of the subdivision by the owner.

4. subdivision & development requirements

1. No further subdivision of lots identified on the approved Structure Plan shall be allowed.
2. No development shall be permitted within a Development Exclusion Area.
3. Neither fencing nor clearing of remnant indigenous vegetation shall be permitted within a Development Exclusion Area except to construct and maintain an approved accessway, the management of fire risk or as otherwise approved by the City of Busselton. The Development Exclusion Areas delineated on the Structure Plan identify mature remnant Jarrah / Marri woodland which may provide roosting habitat for Black Cockatoos.
4. The approved Bushfire Management Plan shall be implemented to the satisfaction of the City of Busselton.
5. A reduced setback of 10 metres between the building envelope of proposed Lot 1 and the Emergency Access Way is permitted. Excepting this, all development and land use is to be in accordance with the City of Busselton Local Planning Scheme No 21.

5. local development plans

No Local development Plans are required by this Structure Plan.

6. other requirements

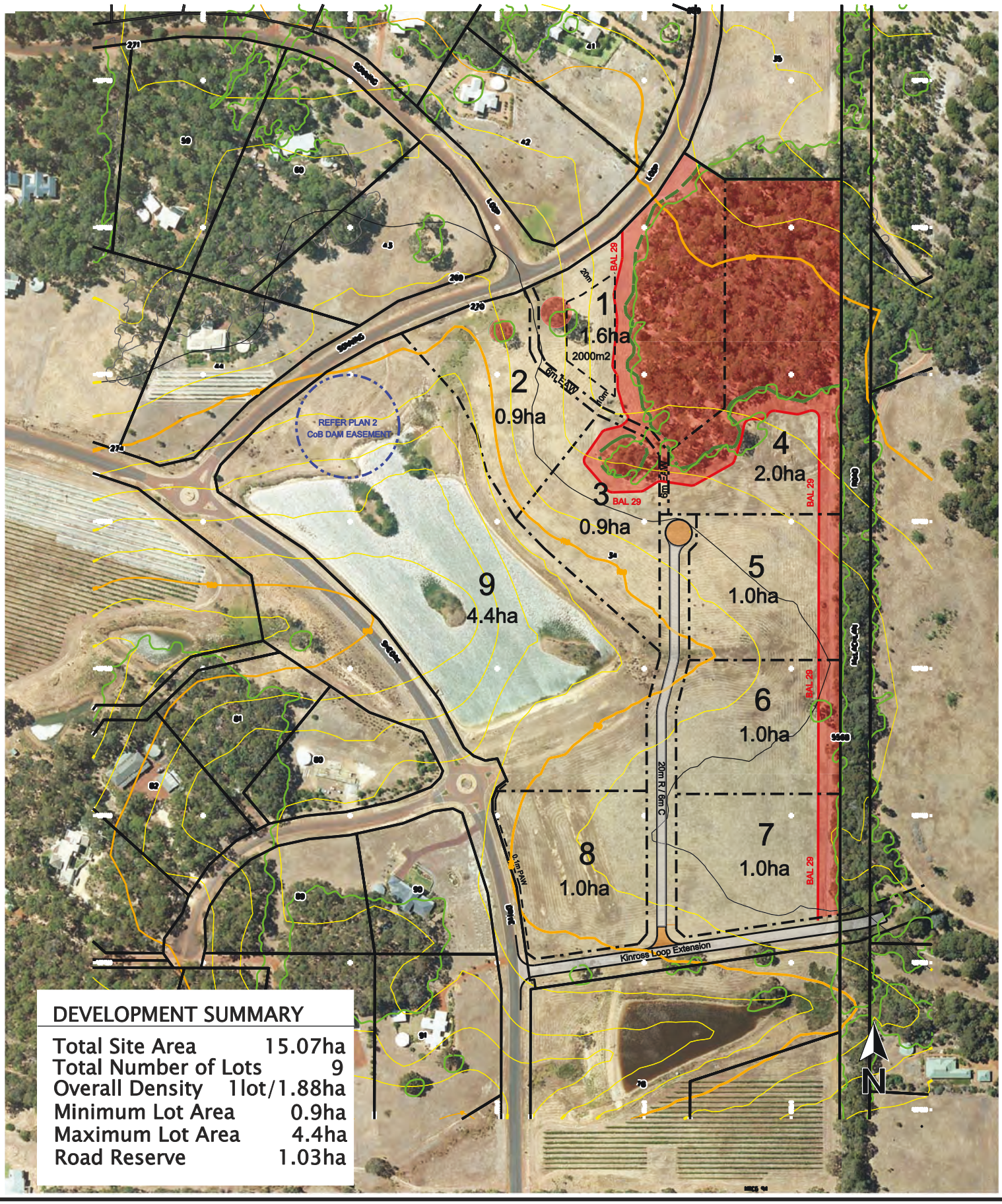
There are no infrastructure requirements applying to this Structure Plan.

The City of Busselton has adopted a Development Contribution Policy for the general rural areas of the City to assist towards the provision of Community Infrastructure.

7. additional information

The Structure Plan does not require the submission of any additional information.

Additional Information	Approval Stage	Consultation Required



DEVELOPMENT SUMMARY

Total Site Area	15.07ha
Total Number of Lots	9
Overall Density	1lot/1.88ha
Minimum Lot Area	0.9ha
Maximum Lot Area	4.4ha
Road Reserve	1.03ha

LOT 34 SHEOAK DVE, YALLINGUP

STRUCTURE PLAN : PLAN 1

NOTES

Base data supplied by 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.

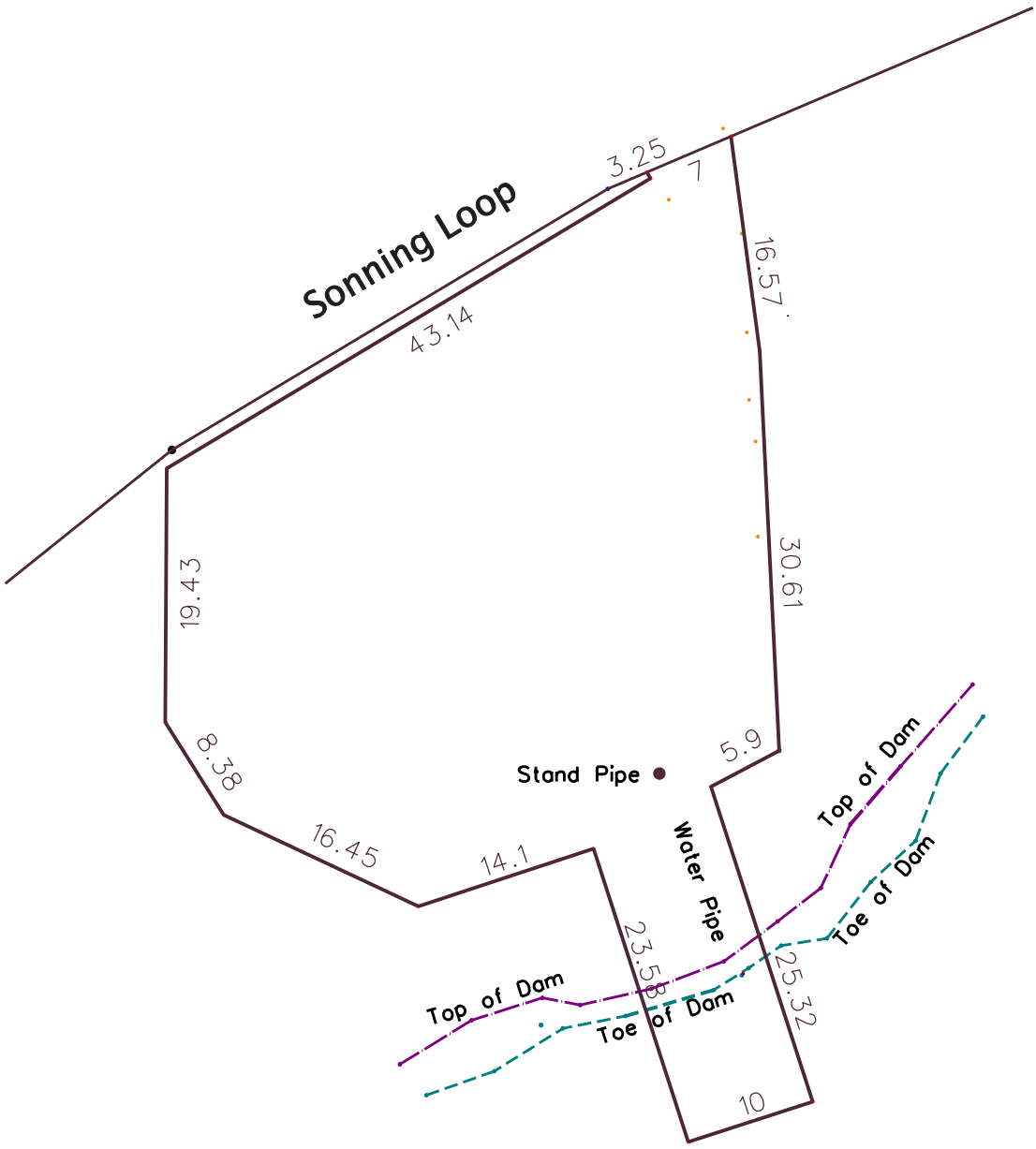
Legend

Development Exclusion Area

METRES 0 10 25 50 75 100

GARRISON HLDS PTY LTD : CLIENT
1:250@A3 : SCALE
5 SEPT 2018 : DATE
9108-SP-V1.1 : PLAN No
: REVISION
LS : PLANNER
LS : DRAWN

larry smith planning
Tel. 0418-916908 Email: larryps@bigpond.com



Proposed Easement in favour of City of Busselton

LOT 34 SHEOAK DVE, YALLINGUP STRUCTURE PLAN

DAM EASEMENT PLAN 2

NOTES

Base data supplied by Landgate.

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GARRISON HLDS PTY LTD : CLIENT
NTS : SCALE
5 SEPT 2018 : DATE
9108-SP2-V1.0 : PLAN No
: REVISION
LS : PLANNER
LS : DRAWN

larry smith planning
Tel. 0418-916908 Email: larryps@bigpond.com

Lot 34 Sheoak Drive, Yallingup

City of Busselton

PART 2 : EXPLANATORY & TECHNICAL APPENDICIES

part 2 – table of contents

figures:

appendices :

1. planning background

1.1 introduction & purpose

Lot 34 Sheoak Drive, Yallingup is located within the Biddle Road Cluster Precinct of the Commonage Rural Residential area and has a total area of 15.09ha [Figure 1 : Aerial View]. The lot was created by the current owner, Garrison Holdings Pty Ltd, from the subdivision in the mid-1990's of Locn 4207 McLachlan Road. The subdivision created a total of 75 lots of varying sizes including a number of rural production lots.

Lot 34 was set aside for a local village and tourist development. The lot is zoned Rural Residential under the City of Busselton Local Planning Scheme No 21 with an Additional Use (A39) for a range of tourist, recreational, community and commercial uses.

The City of Busselton has recently entered into a contract of sale to purchase a site to the north of Lot 34 within the adjoining rural residential estate, being Pt Lot 201 Balmoral Drive, as a 'Reserve for Public Purposes'. The site is nearby to the current Yallingup Bakery, on the south side of Biddle Road. It is understood that the City intends to construct the Community Centre and Fire Station originally mooted for Lot 34 on Lot 201. It is possible that other "commercial" uses may also develop at the general location of Lot 201. The City has expressed the view that it considers Lot 34 no longer appropriate or necessary for the Community facilities together with those other uses listed under AU39 in Schedule 2.

Lot 34 is not identified as either a Strategic or Non-Strategic Tourist Site under the City's Local Tourism Planning Strategy nor is it located within a Strategic Tourism Precinct.

The proposed Structure Plan [Figures 2 & 3] for Lot 34 Sheoak Drive, Yallingup proposes a total of nine lots – eight additional lots. Most of the proposed lots are in the range of 1ha in area. The existing dam is retained in a larger 4ha lot. The Structure plan seeks a minimal increase in overall density and marginal reduction in lot size for two of the proposed nine lots.

The City of Busselton Local Planning Scheme No 21 has been amended (Amendment No 34) to remove Lot 34 and Additional Use A39 from Schedule 2 Additional Uses so that all proposed lots may only be used for rural residential and related purposes.

The Structure Plan proposes that areas of remnant vegetation within the north-east portion of the site be protected within Development Exclusion Areas.

All lots will be serviced with underground electricity and communications services and drainage will be via roadside swales. Soil testing has confirmed suitability for on-site effluent disposal. It is not proposed to stage the subdivision.

1.2 land description

The subject land is described as Lot 34 on Deposited Plan 37901, Sheoak Drive, Yallingup within the City of Busselton and as contained in Certificate of Title Volume 2546 / Folio 384 [Appendix 1 : Certificate of Title]. The lot has an area of 15.07ha and is bounded by Sheoak Drive to the west and Sonning Loop to the north, both of which are constructed and sealed roads. The lot is vacant and contains a large, stream fed dam in the western portion [Figure 1 : Aerial View].

Figure 1 : Aerial View

LOT 34 SHEOAK DRIVE, YALLINGUP

larry smith planning
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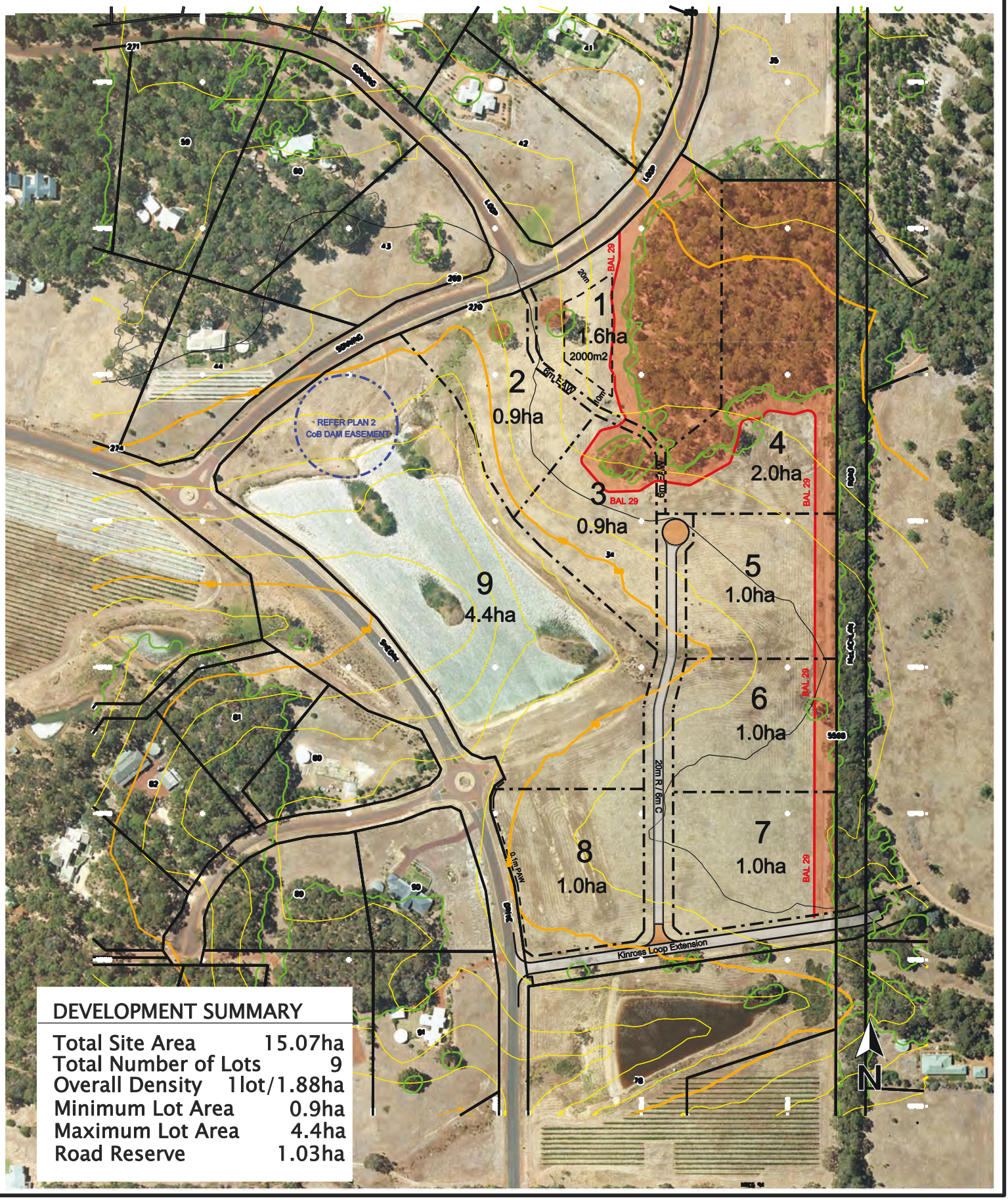

DEVELOPMENT SUMMARY

Total Site Area	15.07ha
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LOT 34 SHEOAK DVE, YALLINGUP

STRUCTURE PLAN FIGURE 2

NOTES

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All carriageways are shown for illustrative purposes only and are subject to detailed engineering design.

Legend

Development Exclusion Area

METRES 0 10 25 50 75 100

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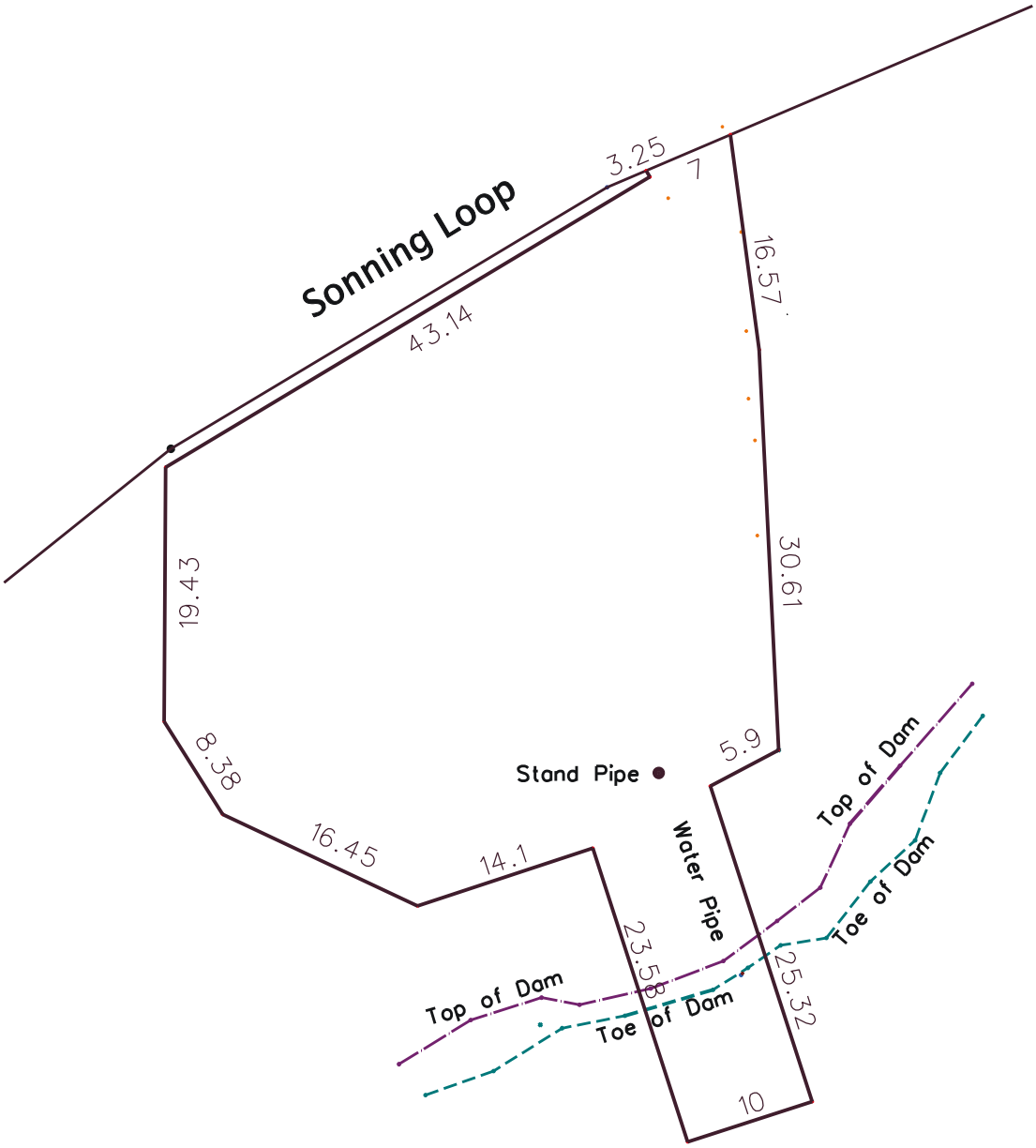

Lot 9

Proposed Easement in favour of City of Busselton

LOT 34 SHEOAK DVE, YALLINGUP STRUCTURE PLAN

DAM EASEMENT FIGURE 3

NOTES

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NTS : SCALE
5 SEPT 2018 : DATE
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Tel. 0418-916908 Email: larryps@bigpond.com

The lot is abutted by rural residential subdivision to the west and south. The lot is bounded on the east by former road reserve which contains extensive Jarrah / Marri remnant vegetation in very good condition beyond which is further rural residential subdivision. It is nestled on a west facing hill and rises from approximately 106 metres AHD (AHD) near Sheoak Drive up to 126m AHD in the north-eastern corner.

The north-eastern portion of the lot comprises an area of approximately 2ha of remnant Jarrah / Marri vegetation mostly in good to very good condition

1.3 planning framework

The following section considers and discusses only those documents directly relevant to the design and approval of the proposed Structure Plan as the land is zoned Rural Residential. As such subdivision and development of the land for rural residential purposes is therefore compliant with the higher level planning documents including:

- SPP 6.1 – Leeuwin-Naturaliste Ridge Policy;
- South-West Framework;
- SPP 2 – Environment and Natural Resources Policy; and
- SPP 3 – Urban Growth and Settlement

1.3.1 zoning

Lot 34, as with the adjoining lots, is zoned Rural Residential under the ***City of Busselton Local Planning Scheme No 21*** and located within a Landscape Value Area. All adjacent lots have been subdivided for rural residential purposes.

Clause 4.2.8 of the Scheme sets out the Objectives and Policies of the Rural Residential zone:

> *"Objectives*
>
> *(a) To encourage development for the purpose of closer rural settlement on land which is suitable for such a purpose, and is in reasonable proximity to existing urban areas.*
>
> *(b) To ensure that development maintains the rural character of the locality, maintains a high level of residential amenity and minimises disturbance to the landscape through construction of buildings and structures, clearing, earthworks and access roads.*
>
> *(c) To enable a range of activities and land uses associated with the residential occupation of land.*
>
> *(d) To discourage or prohibit development not compatible with the predominantly rural nature and residential amenity of the zone.*
>
> *(e) To enable the development of land for other purposes where it can be demonstrated by the applicant that suitable land or buildings for the proposed purposes are not available elsewhere, and where such purposes would not detrimentally affect the rural residential character of nearby land.*
>
> *(f) To direct and control the form rural residential subdivision takes to prevent a demand for the unreasonable and uneconomic provision or extension of services and facilities.*
>
> *(g) To promote and encourage cluster subdivision and other innovative rural residential designs, having consideration for conservation values.*

(h) To discourage ribbon development along Caves Road and other roads and to maintain the rural and natural ambience of transport corridors generally.

Policies

(a) To encourage rural residential subdivision by permitting a range of lot sizes in conventional subdivision subject to a general minimum lot area of 1 hectare with an average minimum lot area of approximately 2 hectares; and providing greater flexibility for lots created within appropriate cluster subdivisions or by strata or survey strata subdivision, dependent upon the special physical characteristics of the land.

(b) To ensure the provision of road, electricity, postal and telephone services and, where appropriate and practical, water services.

(c) To ensure the provision of community facilities and emergency services in the vicinity of rural residential developments.

(d) To ensure that services, facilities and recreation areas are centrally located.

(e) To encourage generally, and require specifically in rural residential subdivision, the provision of vegetation and fauna corridors and the revegetation of the land.

(f) To adequately protect any areas or sites of conservation value within the design of any subdivision and development.

(g) To provide flexibility for the development of appropriately located and scaled tourist facilities consistent with preservation of residential amenity.

(h) To implement and adhere to the adopted recommendations and outcomes of the Local Rural Planning Strategy, adopted by local government and endorsed by the Commission.

(i) To provide opportunities for small-scale agriculture on cleared land of a type that will not lead to land use conflicts with the rural residential use of adjoining land."

It is considered that the proposed Structure Plan is consistent with the Objectives and Policies of the Zone as it maintains the rural character of the locality through minimal disturbance of the land and promotes the cluster subdivision approach resulting in significant landscape gains.

Further it was originally subdivided as part of a broader estate providing a range of lot sizes, opportunities for small scale agriculture and protected areas of significant remnant vegetation.

Lot 34 is also the subject of an Additional Use – A39 – under Schedule 2 of the Scheme. The Additional Use provides as follows:

No.	PARTICULARS OF LAND	LAND USE PERMITTED/SPECIFIED	CONDITIONS
A39	Portion Location 4207 McLachlan Road, Yallingup	Community Centre; Child Care Centre; Recreation Facility; Art & Craft Studio & Sales; Rural Holiday Resort; Private Recreation; Licensed Restaurant; Reception Centre; and Shop having a gross leasable area of 150m2.	The additional uses specified shall be deemed to be "D" uses for the purpose of Part 4 of the Scheme.

The City of Busselton Local Planning Scheme No 21 has been amended (Amendment No 34) to remove Lot 34 and Additional Use A39 from Schedule 2 Additional Uses so that all proposed lots may only be used for rural residential and related purposes.

Clause 6.4 of the Scheme sets down provisions relating to the Landscape Value Area and in particular requires:

> *"6.4.1 The local government shall not grant planning approval for the clearing or development of any land identified within a Landscape Value area on the Scheme map, unless it has considered -*
>
> *(a) whether the development will be compatible with the maintenance and enhancement, as far as is practicable, of the existing rural and scenic character of the locality;*
>
> *(b) whether the development will materially affect any wildlife refuge, significant wetland, coastal environment or any identified site containing Aboriginal archaeological relics; and*
>
> *(c) disturbance to the natural environment, including -*
>
> *(i) visual effects of clearing for development;*
>
> *(ii) maintenance of rural character; and*
>
> *(iii) habitat disturbance.*
>
> *6.4.2 The local government shall not grant planning approval for the carrying out of development on land within the Landscape Value area or on land on or near any ridgelines where, in the opinion of the local government, that development is likely to substantially detract from the visual amenity of the area, having regard to, among other things, the cumulative visual effect of the development related to other development that may be anticipated in the locality and in the area generally."*

The proposed Structure Plan is consistent with Clause 6.4 as it is compatible with the local rural landscape, retains and protects significant areas of remnant vegetation and enhances the rural landscape.

Lot 34 is also the subject of an Additional Use – A39 – under Schedule 2 of the Scheme.

1.3.2 regional & sub-regional structure plans

The ***Commonage Policy Area Consolidated Structure Plan*** is the primary document directly relevant to the proposed Structure Plan as it establishes the primary criteria for subdivision within the Commonage Area. Lot 34 is located within the Biddle Road Cluster Precinct of the Commonage Rural Residential area which provides for a reduction in lot size to 1 ha and an increase in density to 1 lot / 2h. Lot 34 was created by the current owner, Garrison Holdings Pty Ltd, from the subdivision in the mid-1990's of Locn 4207 McLachlan Road. The subdivision complied with the Biddle Road Cluster Precinct provisions and created a total of 75 lots of varying sizes including a number of rural production lots. .

The Commonage Structure Plan is a compilation of a number of individual Structure Plans and is in excess of a decade old and in need of review. Since its adoption in 2004 there have been a number of more recent local and regional strategies including the City of Busselton (Draft) Local Planning Strategy.

The proposed Structure Plan departs from the Commonage Structure Plan and Biddle Road Cluster Precinct in so far as:

- it seeks a reduced lot size of 0.9ha in respect of proposed lots 2 and 3. These two lots abut the large dam and for all intent and purposes the marginal reduction lot size will not impact the "useability" of the lots nor be visually obvious to the residents or others in the vicinity. Further, the lots are consistent with those in Mistover Place to immediate south-west of Lot 34 which is an enclave of lots mostly in the range of 0.5ha to 0.8 ha in area; and
- it seeks an increase in the overall subdivision density in recognition of the Owner's preparedness to meet local community preferences to forego the more intensive development options provided by the current Additional Use zone provisions; the significant community benefit provided by the preparedness of the Owner of Lot 34 to cede the land for and construct the balance portion of Kinross Loop to connect it with Sheoak Drive which otherwise would have to be purchased and constructed by Council and the City of Busselton's desire to improve density and lot yield outcomes within the Commonage. The net effect of the density increase sought is to increase the overall original subdivision density from 1 lot / 2.08ha to 1 lot / 1.88ha. It is to be noted that the proposed additional eight lots will have a significantly reduced overall impact on the amenity of the immediate locality than the tourist / commercial development currently permitted under the Additional Use zoning.

1.3.3 planning strategies

The ***City of Busselton Local Rural Planning Strategy*** establishes the broad land use framework for the rural areas of the City. The Strategy defines eight Precincts of which the Commonage area including the subject site is part of Precinct 6.

The Strategy seeks to:

- Consolidate rural residential land use and provide for a diversification in small-scale and low-key tourist, rural and home based activities in a manner that sustains the existing natural environment, landscape values and residential amenity of the area with well-developed pedestrian and habitat/biodiversity links; and
- Promote the retention of rural amenity and appropriately scaled rural land uses where compatible with rural residential amenity.

The Strategy identifies a number of Objectives under the key areas of Environment, Economic and Social and requires the land use and subdivision be in accordance with the Commonage Consolidated Structure Plan.

The proposed Structure Plan for Lot 34 is consistent with the Rural Strategy as it:

- Protects the substantial tracts of remnant vegetation;
- Augments the environmental corridor of the former McLachlan Road reserve;
- Facilitates continuation of the mosaic of rural and natural landscape created by the original subdivision; and
- In foregoing the originally intended tourist / commercial development of the site, maintains the rural residential ambience sought by the local community.

The ***City of Busselton Local Planning Strategy*** (Draft) provides a comprehensive review of the planning of the whole of the City setting broad planning directions for the longer term future which will be

progressively implemented through the review of the Local Planning Scheme and local Planning Strategies and Structure Plans.

In respect of the Commonage area, the Strategy recognises the area as a major rural residential precinct within which the greater bulk of rural housing growth was to be confined. The Commonage Precinct is regarded as being well placed to the major services offered by the Dunsborough Townsite and its limited to poor agricultural values ensures that higher value agricultural land to the south is not impacted by subdivisional pressures for rural residential.

More specifically the Strategy proposes to identify suitable areas for re-subdivision/consolidation of existing rural-residential development with the object of increasing lot yields to limit the risk for additional rural residential pressures outside of the Precinct.

The ***City of Busselton Local Tourism Planning Strategy*** has a specific land use focus to identify locations and sites that are important for sustainable tourism industry growth within the City. The aim of the Strategy is to inform the Local Planning Strategy and Town Planning Scheme for the City. The Strategy recognises that the City of Busselton lies within the Vasse Region, adjacent to the Augusta and Margaret River and that the tourism industry in the City is closely related to developments in those areas.

The Strategy classifies tourist accommodation sites as:

- Strategic tourism sites of State level importance to be retained for tourism only purposes.
- Strategic tourism locations or activity locations.
- Non-strategic tourist zoned land suitable for tourist development.

Lot 34 is not identified as a Strategic or Non-Strategic Tourist Site nor is it located within Strategic Tourism Precinct.

1.3.4 planning policies

State Planning Policy 3.7 – Planning in Bushfire Prone Areas requires that land that has a bushfire risk or designated as being bushfire prone be accompanied by a BAL assessment to determine the extent and nature of measures to be undertaken in the subdivision and development of the land to reduce fire risks. A BAL assessment has been undertaken for the proposed Structure and is discussed further in Section 3.2 of Part 2.

The ***Acid Sulfate Soils Planning Guidelines*** require that subdivision or development of land consider the impact of Acid Sulfate Soils. An assessment of the risk of Acid Sulfate Soils has been undertaken and is further discussed in Section 2.3 of Part 2.

The ***Stormwater Management Manual for WA*** identifies water sensitive design principles. Stormwater management is discussed further in Section 3.1 of Part 2 and recognises the need for preparation of a Stormwater / Urban Water Management Plan as a condition of subdivision approval.

1.3.5 other approvals and decisions

There are no other approvals and decisions pertaining to this proposal.

1.3.6 pre-lodgement consultations

Pre-lodgement consultation has been held with the City of Busselton to discuss the re-subdivision of Lot 34 in lieu of proceeding with the tourist / commercial development under the Additional Use zone.

.

2. site conditions & constraints

The following section provides an overview of the environmental site conditions and constraints. *Aurora Environmental* was engaged by the Owner to undertake an Environmental Assessment. The full Assessment Report appears as Appendix 2.

2.1 land use

Save for an area of remnant vegetation in the north-east of the site, Lot 34 has predominately been cleared of native vegetation as a consequence of its former agricultural use. Site specific features for the subject site include:

- An area of approximately 2ha of predominantly Marri / Jarrah woodland in good to very good condition in the north-east of the site;
- A small, annual creek entering the site from the east;
- A large dam feed by the creek; and
- Evidence of gravel extraction for on-farm tracks understood to be excavated during the earlier use of the property for agricultural purposes.

2.2 topography, landform and soils

The Site is nestled on a west facing hill. It rises from approximately 106 metres (m) Australian Height Datum (AHD) near Sheoak Drive up to 126m AHD in the north-eastern corner. Assessment of the slope at the Site (using the topographic contours) shows that the steepest area (eastern edge of the dam, up-slope in a north-easterly direction) has an approximate grade of 10%. The estimated slope for flattest area of the Site (the southern hillside area) is approximately 3%. The gradient at the Site is classed as 'very gently inclined' to 'gently inclined'.

The Department of Agriculture mapping shows the Site is located within the Cowaramup Uplands system. This unit can be further classified into three sub-systems:

- Cowaramup deep sandy rises Phase (216CoCod2) – Pale deep sands with some gravelly pale deep sands and pale shallow sands.
- Cowaramup gentle slope Phase (216COCO2) – Loamy gravels and duplex sandy gravels.
- Cowaramup vales Phase (216COCOv) – Loamy gravels and duplex sandy gravels.

The soil on the site is generally comprised of a loamy soil with some lateritic gravel of variable depth to approximately 1m BGL, with increasing clay content with depth through to 2m BGL.

2.3 acid sulfate soils

Acid Sulfate Soils (ASS) is the common name given to naturally occurring soil and sediment containing iron sulfides. Mapping prepared by the Department for Planning and Infrastructure (DPI) indicates that the majority of the subject site is classified as having a "*moderate to low risk of ASS, generally occurring at a greater depth than 3 metres*". The northern portion of the site is classified as "*no known risk of ASS,".*

2.4 flora & vegetation

2.4.1 flora

A search for known rare and Priority flora within or in proximity to the subject site was undertaken through a review of databases.

One record of *Acacia semitrullata* was recorded (in 1980) approximately 680m north-east of the site and one record of *Caladenia excelsa* was recorded (in 1967) approximately 580m north-west. Both of these records are dated, but indicate the potential presence of these species in the general locality. *Caladenia excelsa* grows on hilltops, slopes and swales in deep white, grey or brown sands or sandy loam of the Leeuwin-Naturaliste Ridge (DoEE, 2017a). *Acacia semitrullata* also grows in sand in open heath and is frequently found in areas fringing seasonally dry swamps and in sand over laterite in shallow depressions in Jarrah Forest.

The Site has gravelly loams in the upper soil profile and therefore is unlikely to support these species.

2.4.2 vegetation

The majority of Lot 34 has been cleared and used for grazing. A small area of approximately 2ha of remnant Jarrah / Marri vegetation in the upper north-eastern portion of the lot is considered to be in a Good to Very Good condition.

2.4.3 environmentally sensitive areas

The EPBC Act Protected Matters Report identified one Threatened Ecological Community (TEC) protected under the EPBC Act as potentially present in the search area and specifically:

- *Banksia* Woodlands of the Swan Coastal Plain ecological community.

According to the DPaW's Threatened and Priority Ecological Community Database there are no known occurrences of TECs or priority ecological communities (PECs) within a 5km radius of the site. The vegetation on the site is not representative of a *Banksia* Woodland dominated community.

2.5 fauna

A search of the DPaW Threatened Fauna database was undertaken to establish whether Scheduled species as listed under the *Wildlife Conservation Act 1954* have been recorded in proximity to the subject site.

The site contains one natural habitat type comprising Jarrah-Marri Forest which is in Good-Excellent condition. However, the dam in the lower portion of Lot 34 provides open water which may be used by water birds and amphibians.

One habitat tree, an isolated Marri in the cleared portion of the site adjacent to Sonning Loop, containing at least one large vertical entry hollow which may be of suitable size for use by Black Cockatoos was recorded on Lot 34. There were no obvious signs (e.g. scratchings, chew marks around the entrance) that the hollow was, or has been, used by Black Cockatoos.

It is considered unlikely that the remnant habitat on Lot 34 supports a diverse faunal assemblage, or provide critical habitat that conservation significant fauna would be reliant upon for their survival.

2.6 hydrogeology

The Site is located within the Busselton-Capel Groundwater Area and is in the Cape to Cape North sub-area. This area is characterised by a surficial aquifer (Leeuwin) and a fractured rock aquifer.

The surficial aquifer in the Cape to Cape North sub-area ranges from alluvial and colluvial deposits in river valleys to dunes and swales which can reach a thickness exceeding 100m, but the saturated thickness of the aquifer is small and in places dune sands lie over dry bedrock with no watertable development.

In the east of the subarea, the fractured rock is the basement rocks of the Leeuwin Complex, which are granitic with an overlying weathered profile. The fractured rock aquifer is an unreliable source of groundwater due to the nature of the aquifer system and irregular recharge from rainfall meaning that yields are likely to be low.

Three piezometers were installed on Lot 34 by Aurora Environmental in 2015 during a study into the Site's suitability for on-site effluent disposal. The piezometers were sampled in late March 2015 and were found to be dry to a depth of at least 2m below ground level (BGL). No additional sampling was conducted through the winter months. Aurora Environmental revisited the site on 18 April 2017. One piezometers (PZ3) located in the northern portion of the site was unable to be located and was presumed destroyed and the other two piezometers were still present on the Site. Groundwater was recorded between 1.25m BGL to 1.825m BGL. The presence of groundwater in late April 2017 is a reflection of the above average rainfall recorded in February and March.

2.7 wetlands

The Site is located within the Gunyulgup Brook catchment, in the Gunyulgup Surface Water sub-area of the Busselton Coast Surface Water Area.

The Site features a large man made dam which captures overland surface water runoff from the north, east and south of the Site. No wetlands are mapped as occurring on the site.

2.8 aboriginal heritage

All Aboriginal sites in Western Australia are provided protection under the *Aboriginal Heritage Act 1972*. An online search for relevant Aboriginal heritage information was undertaken using the Department of Aboriginal Affairs (DAA) Aboriginal Inquiry.

A search of the DAA Aboriginal Heritage Inquiry System did not identify any registered Aboriginal Sites occurring within or near the Site.

2.9 european heritage

A search was undertaken of the Australian Heritage Places Inventory and the State Heritage Register on 12 June 2017. No European Heritage sites of significance were listed within the Site.

2.10 contamination

A search of the Contaminated Sites database indicates that there are no registered contaminated sites in the locality of Yallingup. During the site inspection it was noted that gravel extraction on the southern side of the remnant vegetation on Lot 34 had occurred at some point. There was no evidence of any backfilling of materials on the site or importation of fill material. Based on the review of the aerial photos in

conjunction with the site observations of the Site and information from the current land owner, Lot 34 has only been used for grazing. This represents a very low risk of contamination being present. No further investigations relating to the potential presence of contamination is required.

2.11 effluent disposal

Aurora Environmental completed an evaluation of Lot 34 to ascertain its suitability to accommodate on-site effluent disposal. The evaluation included test pitting at nine locations on to a depth of 2m below ground level to record the soil profile across the site. The evaluation confirmed that the site is capable of supporting on-site effluent disposal.

The site appears to be well drained given the moderate slope of the site and there was no evidence of perched water. The soil structure comprises single grain, loose and incoherent organic soil of the A-horizon, overlying the massive (coherent) to weakly structured B and C horizons that were generally present below 0.5m. The soils are generally a gravelly loam in the upper profile with increasing clay content with depth. Saturated soils were not encountered in any of the test pits during the site work and it was considered that groundwater was lower than 2m below ground level. Soil permeability was completed at three locations indicating that the site has adequate permeability for the purposes of waste water disposal in trenches and beds. Soil samples indicate that the in situ soils have a high capacity to adsorb phosphorus and that soil amendment will not be needed.

On-site wastewater treatment options effectively fall into two categories:

- Conventional systems such as septic tank system with leach drain; or
- Alternative wastewater treatment systems such as aerobic treatment units (ATUs) with irrigation/subsoil disposal, split treatment systems that utilise composting toilets and a separate greywater treatment system or a septic system with an amended soil infiltration system.

The type of system to be used must be selected based on its suitability for the site conditions i.e. the soil conditions, vulnerability of the receiving environment and the nature of the proposal. Based on the information from the 2015 site evaluation and the 2017 site assessment the following is recommended:

- The natural soils, particularly at a depth of greater than 0.5m BGL, are considered to be loamy grading into more clay at depth. These soils will require a separation distance of 0.6m above the highest known groundwater levels. The current highest known groundwater levels are between 1.25m BGL and 1.825m BGL.
- Future landowners will need to provide plans showing the type of wastewater treatment and disposal system to be used. Where the land application area requirements for a primary treatment system cannot be met (i.e. 429m^2) it is recommended that a secondary treatment system be used in order to reduce the land application area requirements (to 225m^2). The current lots are sufficiently large enough to accommodate this requirement. This will be regulated by the local government during the assessment of the building license application.
- Wastewater treatment systems approved for use in Western Australia by the Department of Health are used.

3. technical studies

The following section provides an overview of the fire management and engineering conditions and constraints and specifically:

- *Ecosystem Solutions* was engaged by the Owner to undertake a Bushfire Management Plan. The full Assessment Report appears as Appendix 3.
- *Development Engineering Consultants* was engaged by the Owners to undertake an Engineering Assessment. The full Assessment Report appears as Appendix 4.

3.1 bushfire management plan

The Western Australian Planning Commission (WAPC) and the Fire and Emergency Services Authority of Western Australia (FESA) jointly developed *State Planning Policy 3.7: Planning in Bushfire Prone Areas* and *Guidelines for Planning in Bushfire Prone Areas* the objectives of which are to:

- Avoid any increase in the threat of bushfire to people, property and infrastructure;
- Reduce the vulnerability to bushfire through the identification and consideration of bushfire risks in decision making at all stages of the planning and development process;
- Ensure higher order strategic planning documents, strategic planning proposals, subdivision and development applications take bushfire protection requirements into account; and
- Achieve an appropriate balance between bushfire risk management measures, biodiversity conservation values, environmental protection and landscape amenity.

These guidelines form the foundation for fire risk management planning in WA at a community and land development level.

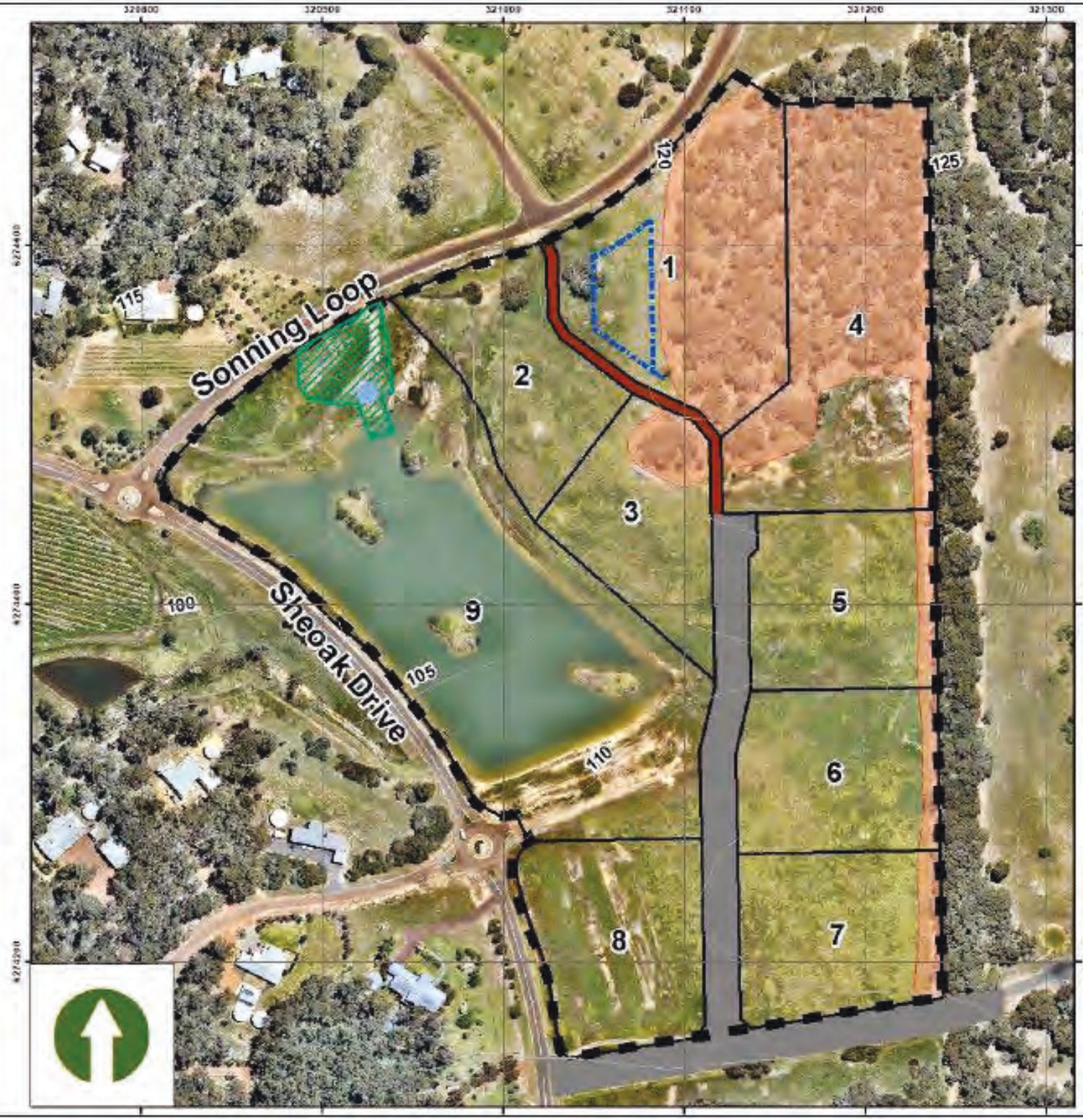
A Bushfire Hazard Level Assessment has been prepared which considers vegetation type and structure, climate and the topography of the site. The assessment identifies two principal on-site vegetation types and specifically Class B – Woodland being the Jarrah / Marri Woodland within the north-eastern portion of and upslope from the areas of development. The second is the grasslands of the balance of the site which will require maintenance by the Owners under the City's fuel hazard reduction requirements.

A Bushfire Management Plan has been prepared for Lot 34 to reduce the impacts to residents and fire fighters in the event of bushfire within or near the site [Figure 4 : Bushfire Management Plan]. The Management Plan:

- Concludes that the development is located in an area that is, or will be on completion, be subject to either a moderate bushfire hazard level or BAL-29 or lower.
- Provides for a Development Exclusion Area over the Class B – Woodland of BAL-29 rating or higher within which no development is permitted. Additionally, development within the lots will be required to maintain a minimum 14m distance from the Class B - Woodland.
- Any new dwelling within the lots will be subject to a detailed BAL Assessment and relevant BAL setbacks to APZ standards will apply. In addition to the APZ, a 25 metre Building Protection Zone (BPZ) will be required.

BUSHFIRE MANAGEMENT PLAN

Site	Lot 34 Sheoak Drive, Yallingup
Project	Bushfire Management Plan
Client	Garrison Holdings Pty Ltd
Scale	1: 1,930



Legend

- The Site
- Proposed Lots
- Elevation (m) AHD
- Building Envelope
- Development Exclusion Area
- Access
- Emergency Access Way
- Easement to benefit City of Busselton
- Standpipe

0 25 50 100 150

Metres

Prepared by Kelly Paterson
Ecosystem Solutions
September 2018
Projection - MGA50
Datum - GDA94
The details on this map have not been surveyed.
This map is for planning/discussion purposes only.

ecosystem solutions

FIGURE 4

- Public road access to and from the lots is via Sheoak Drive, Sonning Loop and an internal cul-de-sac connecting to the extension of Kinross Loop cumulatively providing access in all major directions.
- A 6 metre Emergency Access Way (EAW) links the new internal cul-de-sac to Sonning Loop providing an alternate access/egress path for residents between Sheoak Drive and the road to be constructed during the subdivision process. The EAW will be provided as an easement in gross provides an alternative link to public roads during emergencies.
- The primary water supply for firefighting purposes will be the dam within Proposed Lot 9, as confirmed by the City of Busselton. An easement benefitting the City is to be placed over this area providing access to fire fighters in an emergency situation [Plan 2 – Dam Easement]. The existing standpipe will be retained for continued firefighting use and protected within the easement.

The Bushfire Management Plan (BMP) for Lot 34 demonstrates that all fire protection requirements for issues including fire suppression response, development design, access, water supply, building locations and other relevant performance criteria contained in *Guidelines for Planning in Bushfire Prone Areas* (WAPC, 2015) can be achieved to the satisfaction of the WAPC.

3.2 engineering

The site is located to the east of the junction of Sonning Loop and Sheoak Drive both of which are sealed rural roads using red laterite Ferricrete aggregate. Sheoak Drive is fully kerbed both sides along the lot frontage with formal piped drainage into the lake, whereas Sonning Loop is partly sealed to prevent scour from rainfall runoff, and rainfall runoff is captured in a table drain which also drains to the lake.

Access to the land is from both abutting roads, which also contain underground power and Telstra services. Two Western Power transformers are located adjacent to the site, one mid-way along the boundary of Sonning Loop and the other in Sheoak Drive at the south east corner at the south west corner of the site.

The only earthworks on the site will be that required for the construction of the proposed new roads, being the road on the southern boundary through to Kinross Loop and the cul-de-sac running north off this road.

The subdivisional roads will be designed and constructed to City of Busselton rural road standards, and will be a 6.2 metre sealed pavement with 1.2m wide sealed shoulders. Seal is to be a two coat chip seal, with Intersections and cul-de-sac bulbs will be sealed with Asphalt and kerbed.

The existing cul-de-sac turn around on Kinross Loop will be modified to a straight through road joining seamlessly to the new road off Sheoak Drive.

The existing roundabout on Sheoak Drive at the intersection with Mistover Place will be modified to remove the road stub into the land.

Drainage for the new road will be by way of runoff from the sealed pavement onto the verge as is normal in rural road construction. Some drainage runoff channels may be required, and where necessary these will be rock pitched to control scour. Outfall will be to existing road table drains. It is not expected that a drainage detention basin will be required.

Single and three phase HV and LV underground distribution infrastructure currently exists on the eastern side of Sheoak Drive and Sonning Loop. The proposed development will require new WP infrastructure to be installed as the existing pad mounted transformers on the development site are of sole use type. The proposed green title lots are to be serviced via 3 phase power.

The site is remote from Water Corporation reticulated supply and there is no possibility of this being extended to the development. The new residences will therefore be required to supply their own potable water supply by way of roof rainwater collection tanks. These tanks are also to have a dedicated fire outlet.

The site is remote from Water Corporation sewer services, and there is no possibility of such being extended to the site.

Telstra services exist in the area and NBN Co has already completed their Brownfields Rollout of the area, having installed their Fixed Wireless network. It provides coverage of lot 34.

Due to the surrounding terrain and Radio Base Station location, Telstra are only able to provide 3G mobile coverage to the proposed development. That should nevertheless provide a useful alternative to the Fixed Line or Fixed Wireless services.

appendix 1 :

Certificate of Title – Lot 34

WESTERN AUSTRALIA

REGISTER NUMBER	
34/DP37901	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
1	18/9/2003

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

VOLUME 2546 FOLIO 384

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

REGISTRAR OF TITLES

REGISTRAR OF TITLES WESTERN AUSTRALIA

LAND DESCRIPTION:

LOT 34 ON DEPOSITED PLAN 37901

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

GARRISON HOLDINGS PTY LTD
IN 1/3 SHARE
MILLHURST NOMINEES PTY LTD
IN 2/3 SHARE
BOTH OF 237 GEOGRAPHE BAY ROAD, QUINDALUP
AS TENANTS IN COMMON

(AF I623201) REGISTERED 11 SEPTEMBER 2003

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

1. G614641 RESTRICTIVE COVENANT BENEFIT REGISTERED 21.10.1997.
2. EASEMENT BURDEN CREATED UNDER SECTION 27A OF T. P. & D. ACT - SEE DEPOSITED PLAN 37901
3. *I623202 NOTIFICATION CONTAINS FACTORS AFFECTING THE WITHIN LAND. LODGED 11.9.2003.
4. *I623204 NOTIFICATION CONTAINS FACTORS AFFECTING THE WITHIN LAND. LODGED 11.9.2003.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

----------END OF CERTIFICATE OF TITLE----------

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND:	DP37901.
PREVIOUS TITLE:	2529-827.
PROPERTY STREET ADDRESS:	NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AREA:	CITY OF BUSSELTON.

appendix 2 :

Environmental Assessment – Aurora Environmental

2 Bulwer Street
PERTH WA 6000
T: (+61) 8 9227 2600
F (+61) 8 9227 2699
www.auroraenvironmental.com.au

Environmental Assessment
Lot 34 Sheoak Drive, Yallingup

Prepared For:	Garrison Holdings Pty Ltd & Millhurst Nominees Pty Ltd 237 Geographe Bay Road Quindalup WA 6281
Report Number:	AP2017-108
Report Version:	V1
Report Date:	10 July 2017

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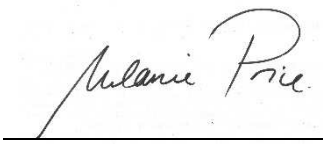
An internal quality review process has been applied to each project task undertaken by us. Each document is carefully reviewed and signed off by senior members of the consultancy team prior to issue to the client.

Document No: GAR-2017-002_ENAS_001_pz

Report No: AP2017-108

Author:	Paul Zuvela Manager – Environmental Impact Assessment		10 July 2017
		Signature	Date
Reviewed by:	Melanie Price Associate Environmental Scientist		10 July 2017
		Signature	Date

DISTRIBUTION

NO. OF COPIES	REPORT FILE NAME	REPORT STATUS	DATE	PREPARED FOR	INITIALS
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1	GAR2017-002-ENAS_001_pz_V1	Final	10 July 2017	Garrison Holdings Pty Ltd & Millhurst Nominees Pty Ltd	PZ

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LIST OF APPENDICES

1. Proposed Subdivision
2. Soil Assessment Report
3. DPaW Flora and Vegetation Database Search Results
4. Protected Matters Search Results
5. DPaW Fauna Database Search Results

LIST OF ABBREVIATIONS

AHD	Australian Height Datum
ASS	Acid Sulfate Soils
ATU	Aerobic Treatment Unit
BAL	Bushfire Attack Level
BGL	Below ground level
DAA	Department of Aboriginal Affairs
DER	Department of Environment Regulation
DoEE	Department of the Environment and Energy
DoW	Department of Water
DPaW	Department of Parks and Wildlife
EPA	Environmental Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999 [Cth]*
ha	Hectare(s)
IBRA	Interim Biogeographic Regionalisation for Australia
Km	Kilometer(s)
LPS	Local Planning Scheme
m	Metre(s)
PEC	Priority Ecological Community
T&PF	Threatened and Priority Flora
TEC	Threatened Ecological Community
USCS	Unified Soil Classification System
WIR	Water Information Reporting database

1 INTRODUCTION

1.1 OVERVIEW

Aurora Environmental was commissioned by Garrison Holdings Pty Ltd (the landowner) to undertake an environmental assessment of Lot 34 Sheoak Drive, Yallingup (the Site).

Garrison Holdings was originally proposing to undertake a village style development (Sonnington Village) on Lot 34. However, the proposal did not proceed due to a lack of support for an amendment to the City of Busselton Local Planning Scheme (LPS) No. 21. The landowner has abandoned these plans and reverted back to a conventional rural-residential style development of the site (Appendix 1).

Lot 34 is approximately 5 kilometres (km) south-east of Yallingup in the south west region of Western Australia. The site has been used for grazing, but is otherwise vacant. The surrounding land uses comprise rural-residential and rural uses such as livestock grazing and vineyards (Plate 1).

PLATE 1: SITE CONTEXT

Source: Western Australian Local Government Environmental Planning Tool

1.2 PURPOSE

This environmental assessment has been undertaken to demonstrate that the environmental impacts associated with the proposed rural-residential development can be adequately managed.

1.3 SCOPE OF WORK

The following scope of work was undertaken:

- Conduct a high-level desktop environmental assessment to identify the site's environmental attributes and potential constraints;

- Compile relevant information and data collected during the desktop assessment into a report which includes advice about whether any additional environmental work is required and possible management strategies or management plans that may be required to address environmental constraints;
- Complete a site inspection to assess the current site condition and validate the findings from the desktop research phase.

The assessment considered:

- Site geology, soils and topography;
- Desktop information about conservation significant flora, vegetation and fauna (including searches of Department of Parks and Wildlife's (DPaW) NatureMap and the Department of Environment and Energy's (DoEE) Protected Matters Search Tool).
- Desktop information about surface water features including wetlands and waterways;
- Available groundwater information;
- Acid sulfate soils (ASS) risk;
- The Department of Environment Regulation's (DER) Contaminated Sites on-line database and a review of publically available historical aerial photographs to ascertain the potential contamination risk.
- Aboriginal heritage issues based on desktop information available from the Department of Aboriginal Affairs' (DAA) Aboriginal Heritage Inquiry System;
- Surrounding land uses and the potential for land use conflicts between the preferred use for the site and adjacent land uses; and
- Previous Environmental Protection Authority (EPA) advice relating to the site or nearby sites.

1.4 SITE IDENTIFICATION

The Site is Lot 34 (on Plan 37901) Sheoak Drive, Yallingup. It is 15.079ha in area and is bound by Sheoak Drive to the west, Sonning Loop to the north and private property to the east and south.

There are no buildings on Lot 34. There is a large dam on the site near the intersection of Sheoak Drive and Sonning Loop (Plate 1).

1.5 PLANNING CONTEXT

The site is zoned 'Rural Residential' in the City of Busselton Town Planning Scheme No. 21 and is located in a Special Control Area in recognition of its landscape value and is identified as additional use A39.

2 ENVIRONMENTAL SETTING

2.1 CLIMATE

The Geographe-Naturaliste area experiences a Mediterranean climate with warm to hot dry summers and mild wet winters. High pressure cells dominate climatic patterns during summer and the passage of cold fronts and associated low pressure cells dominate during winter. Strong sea breezes occur from late November to early March. The nearest weather station to the site is Cape Naturaliste (Station No. 9519) which is located 13.9km to the north-west. The Cape Naturaliste weather station has data from 1903 to 2017.

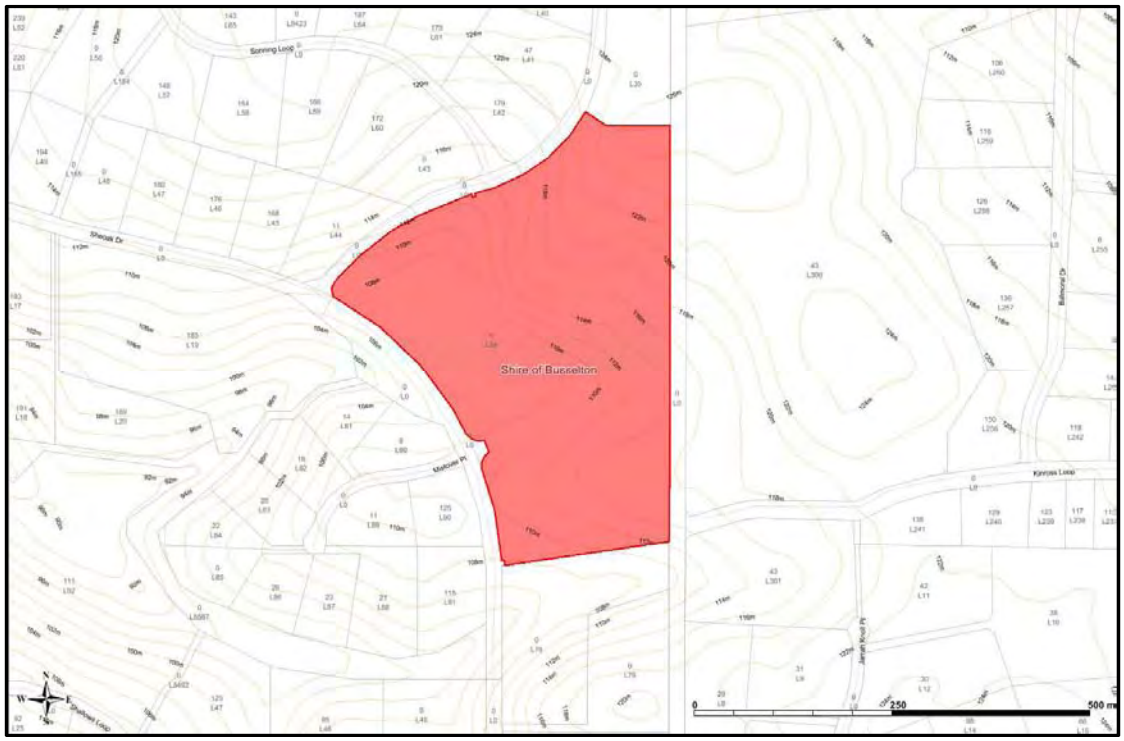
Rainfall in the Cape Naturaliste area is seasonal with the majority of rainfall being received during the winter months (May to September). Mean monthly rainfall is highest in June at 162.9 mm, with an average of 16.9 rain days (Bureau of Meteorology (BOM), 2017). The lowest mean monthly rainfall is 10.8 mm in January, with an average of 1.9 rain days (BOM, 2017). The average annual rainfall is 804.6 mm, with an average of 108.5 rain days per year (BOM, 2017).

The mean annual maximum and minimum temperatures for the Cape Naturaliste Station are 20.7°C and 12.7°C, respectively (BOM, 2017). The highest temperatures are usually experienced in February, when the mean monthly maximum temperature is 25.9°C (BOM, 2017). Minimum temperatures occur in July, when the mean monthly maximum is 16.3°C (BOM, 2017).

2.2 TOPOGRAPHY

The Site is nestled on a west facing hill. It rises from approximately 106 metres (m) Australian Height Datum (AHD) near Sheoak Drive up to 126m AHD in the north-eastern corner of Lot 34 (Plate 2).

PLATE 2: SITE TOPOGRAPHY



Source: Western Australian Local Government Environmental Planning Tool

Assessment of the slope at the Site (using the topographic contours) shows that the steepest area (eastern edge of the dam, up-slope in a north-easterly direction) has an approximate grade of 10%. The estimated slope for flattest area of the Site (the southern hillside area) is approximately 3%. The gradient at the Site is classed as 'very gently inclined' to 'gently inclined' according to CSIRO (2009).

2.3 GEOLOGY AND SOILS

2.3.1 Geology

The Yallingup Environmental Geology Sheet (Leonard, 1991) indicates the predominant surface geology within the Site comprises Unit Sgm_2, Silty Gravelly Sands. The Silty Gravelly Sand unit is described as "moderate brown to reddish brown, mottled, fine - to coarse – grained quartz: trace feldspar, pisolithic gravels, variable silt content" (Leonard, 1991). Regionally, Unit Sgm_2 is generally flat to gently sloping (up to 10°), with an elevation of between 35m AHD and 121m AHD. Physical properties of Unit Sgm_2 as noted by Leonard (1991) include moderate to high permeability, low to moderate slope stability, high ease of excavation and low shrink/swell potential. The equivalent unit on a geological map is Colluvium (Qc) and the Unified Soil Classification System (USCS) maps Unit Sgm_2 as SM; silty sand (Leonard, 1991).

Unit G_2, Gravel, is mapped as being present across the north-east corner of the site (Leonard, 1991). The Gravel unit is described as "brown to reddish brown, ferruginous, pisolithic; occasionally cemented in a clay-silt matrix, moderately sorted (Leonard, 1991). Regionally, Unit G_2 is generally flat to gently sloping (up to 10°), with an elevation of between 5m AHD and 149m AHD. Physical properties of Unit G_2 as noted by Leonard (1991) include high permeability, moderate slope stability, high ease of excavation and low shrink/swell potential. The equivalent unit on a geological map is Laterite (CzI) and the USCS maps Unit G_2 as GP; poorly graded gravel (Leonard, 1991).

2.3.2 Soil Landscape Mapping

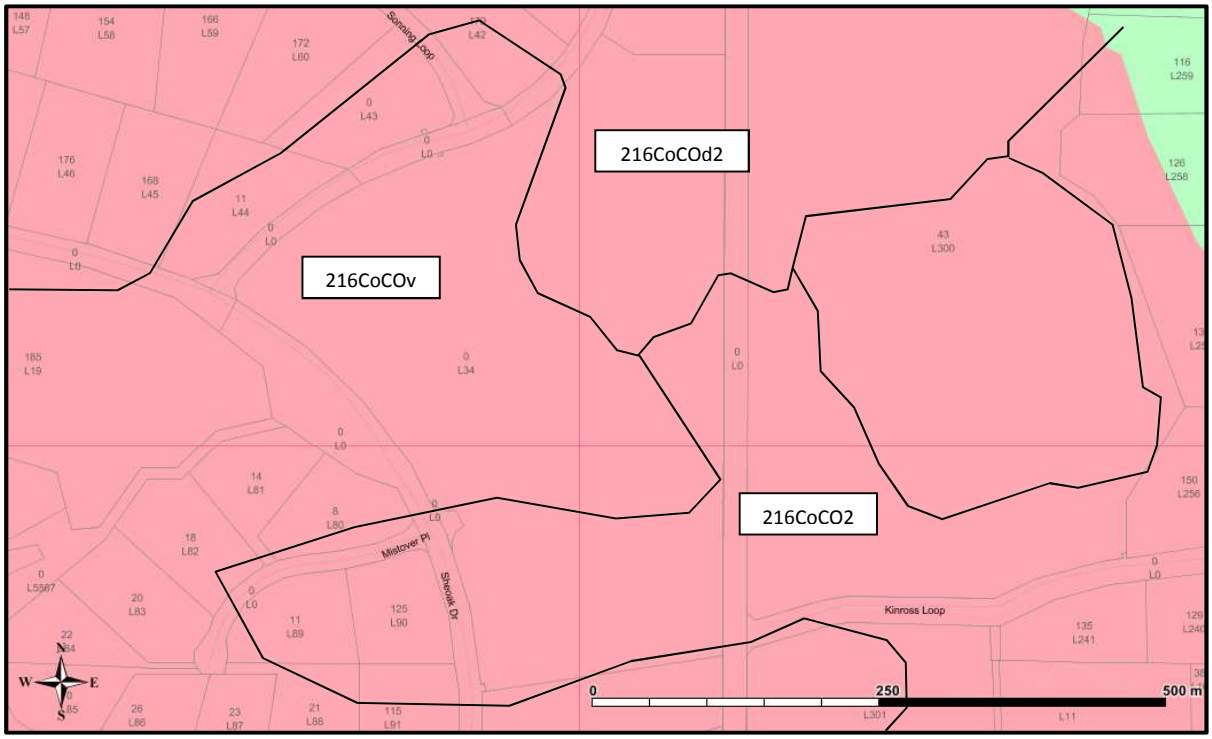
The Site is located in the Leeuwin Block geomorphic zone. The Leeuwin Block is a narrow area along the west coast extending between Cape Naturaliste and Cape Leeuwin, dominated by a gently undulating lateritic plateau lying 20-80m above sea level (Department of Agriculture, 2004). Soils on the plateau include loamy gravels and grey deep sandy duplex soils. Within the Leeuwin Block zone, there are three distinct land systems:

- Cowaramup Uplands system – A lateritic plateau with broad swampy depressions. Main soils are loamy gravels, duplex sandy gravels, semi-wet and wet soils. Principal vegetation is jarrah – marri forest.
- Gracetown Ridge system – Located along the coast between Cape Naturaliste and Cape Leeuwin and consisting of dunes and rocky coast. Main soils are yellow and red deep sands, calcareous deep sands and calcareous stony soils. Principal vegetation is mixed coastal scrub, peppermint woodland and jarrah-marri-karri forest.
- Wilyabrup Valleys system – Comprises the major valleys in the Margaret River district from Dunsborough to Witchcliffe. Main soils are loamy gravels, duplex sandy gravels and loamy earths. Principal vegetation is jarrah-marri-karri forest.

The Department of Agriculture (2004) mapping shows the Site is located within the Cowaramup Uplands system (Plate 3). This unit can be further classified into sub-systems. Three sub-systems are mapped on the site (Plate 3), these being: Unit 216COCod2, Unit 216CoCO2 and Unit 216CoCOv. These are described by the Department of Agriculture (2004) as:

- Cowaramup deep sandy rises Phase (216CoCod2) – Pale deep sands with some gravelly pale deep sands and pale shallow sands.
- Cowaramup gentle slope Phase (216COCO2) – Loamy gravels and duplex sandy gravels.
- Cowaramup vales Phase (216COCOv) – Loamy gravels and duplex sandy gravels.

PLATE 3: SOIL LANDSCAPE MAPPING



Source: Western Australian Local Government Environmental Planning Tool

A site evaluation involving test pitting at nine locations across the site was completed by Aurora Environmental in 2015. The purpose of the evaluation was to ascertain the site's suitability to accommodate on-site wastewater treatment and disposal. A copy of the evaluation is provided in Appendix 2, which includes bore logs for each test pit.

The soils were found to comprise a shallow A-horizon (organic soil), overlying B-horizon soil (mineral soils) and C-horizon soils (mineral soils including relict textures e.g. saprolite). The soil structure comprises single grain, loose and incoherent organic soil of the A-horizon, overlying the massive (coherent) to weakly structured B and C horizons that were generally present below 0.5m.

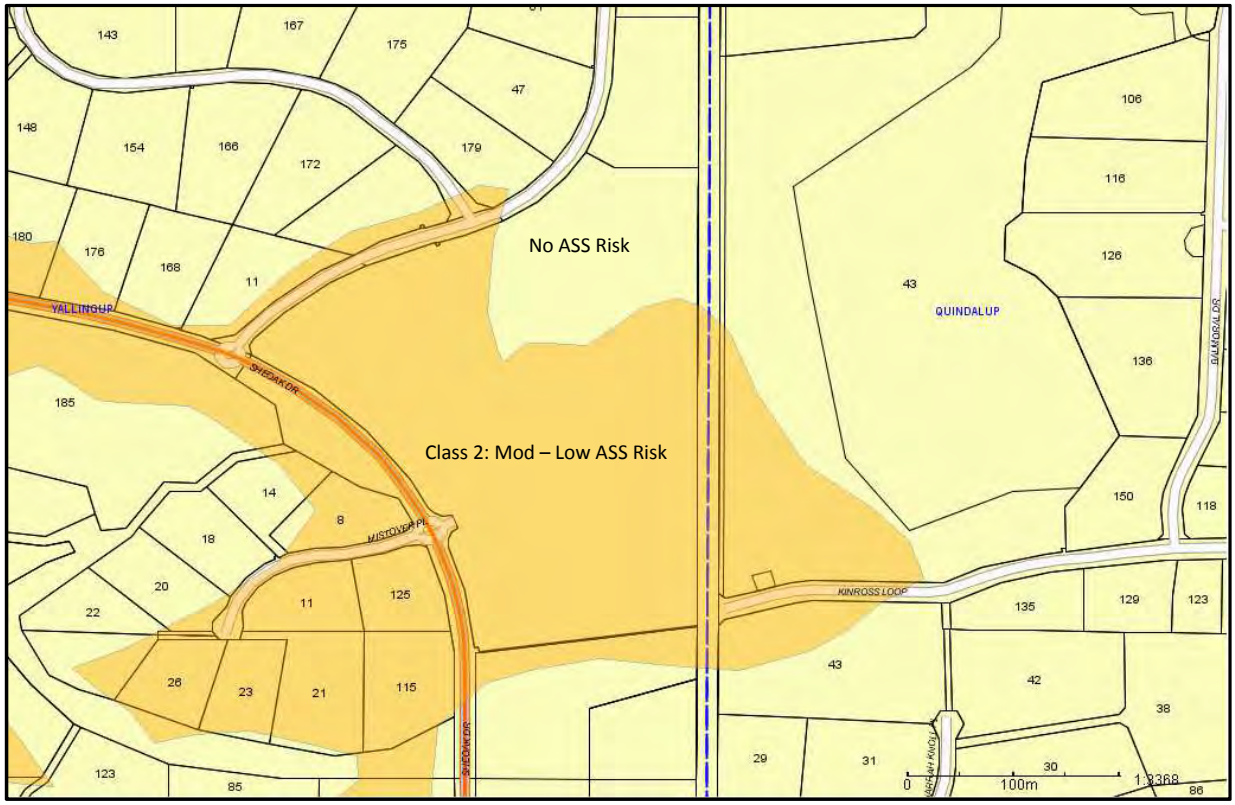
The soil on the site is generally comprised of a loamy soil with some lateritic gravel of variable depth to approximately 1m BGL, with increasing clay content with depth through to 2m BGL where test pitting was terminated.

2.4 ACID SULFATE SOILS

ASS is the common name given to soils and sediments containing iron sulfides. When exposed to air due to drainage or disturbance, these soils produce sulfuric acid, often releasing toxic quantities of iron, aluminium and heavy metals.

A search of the WA Atlas (https://www2.landgate.wa.gov.au/bmvf/app/waatlas/#) was undertaken to determine the risk of ASS. Majority of the Site is mapped as 'Class 2' – moderate to low risk of ASS being present within 3m of the natural soil surface (Plate 4). The northern portion of the Site is mapped as having no risk of ASS.

PLATE 4: ACID SULFATE SOIL RISK MAPPING



Source: Landgate Western Australian Atlas

2.5 FLORA AND VEGETATION

The following information has been assembled using information obtained from DPaW's NatureMap, the DoEE *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Reporting Tool, Landgate's Western Australia Atlas and the Western Australian Local Government Association's Environmental Planning tool.

2.5.1 Biogeographical Information

The study area is located in the Jarrah Forest biogeographical region, one of 89 bioregions recognized under the Interim Biogeographic Regionalisation for Australia (IBRA). There are two sub-regions in the Jarrah Forest bioregion, these being JAF01 and JAF02. The site is located in Southern Jarrah Forest sub-region (JAF02) which comprises the duricrust plateau of Yilgarn Craton characterised by

Jarrah-Marri forest on laterite gravels and in the eastern part, by Wandoo-Marri woodlands on clayey soils. Eluvial and alluvial deposits support *Agonis* shrublands.

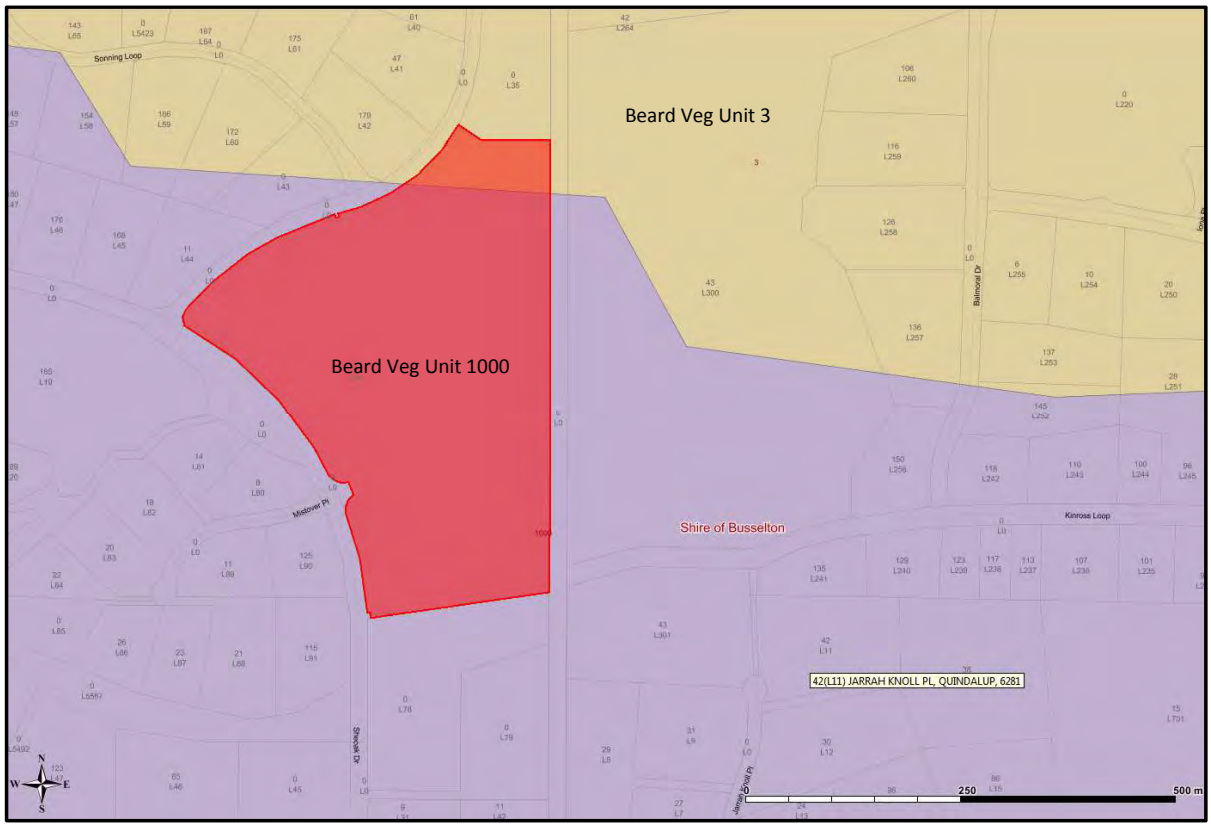
2.5.2 Beard Vegetation Mapping

The Site includes two Beard vegetation units: Units 3 and 1000. Unit 1000 is mapped across the majority of the Site with only the northern extent of the Site being mapped as Unit 3 (Plate 5). These units are described as:

- Unit 3: Medium forest comprising Jarrah and Marri;
- Unit 1000: Mosaic, medium forest comprising Jarrah and Marri / Low woodland of *Banksia* and a Low forest of Teatree (*Melaleuca* spp.).

The representation of these units is presented in Table A.

PLATE 5: BEARD VEGETATION MAPPING



Source: Western Australian Local Government Environmental Planning Tool

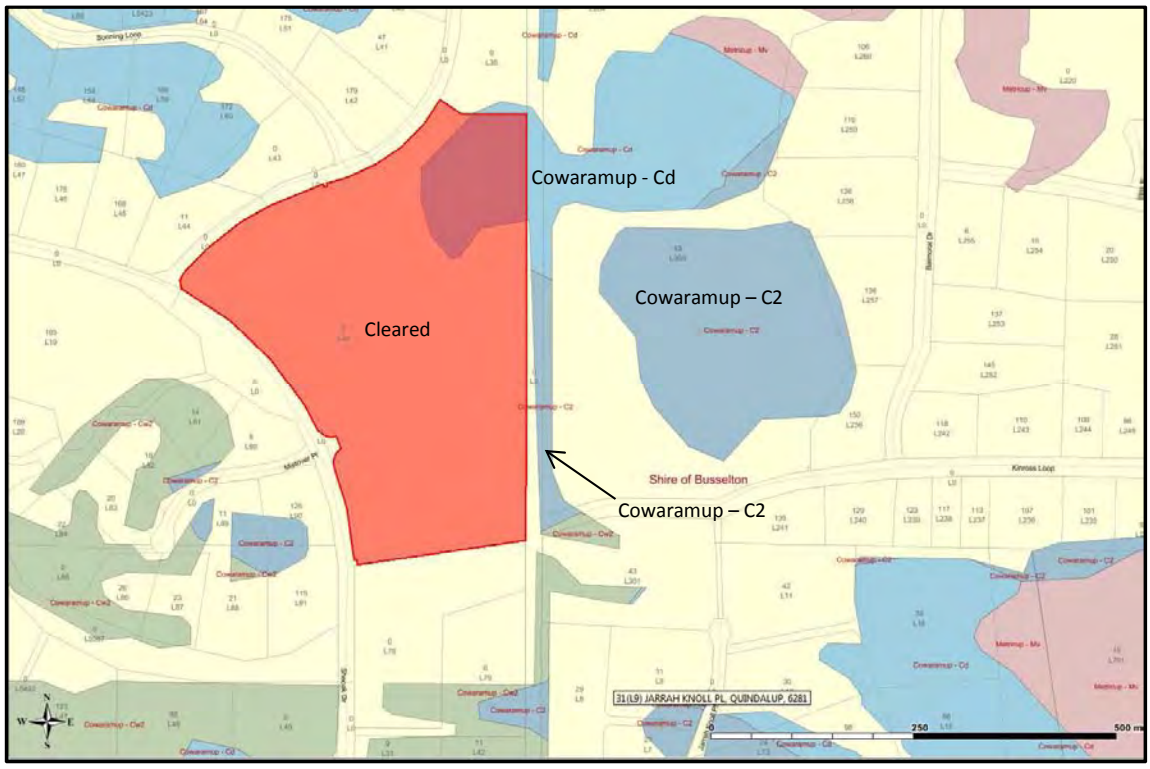
TABLE A: BEARD VEGETATION TYPES WITHIN THE SITE AND ITS REPRESENTATION

BEARD VEGETATION TYPE	PRE-EUROPEAN EXTENT (ha)	CURRENT EXTENT (ha)	REMAINING (%)	CURRENT EXTENT IN IUCN CLASS I-IV RESERVES (%)
3 – Statewide	2,661,405.06	1,806,812.23	67.89	18.21
3 – Jarrah Forest Bioregion	2,390,591.42	1,607,399.74	67.24	16.09
3 – City of Busselton	53,189.12	33,797.98	63.54	17.86
1000 – Statewide	99,835.86	26,570.66	26.61	8.80
1000 – Jarrah Forest Bioregion	5,428.06	2,803.49	51.65	7.08
1000 – City of Busselton	12,034.21	4,245.32	35.28	16.4

Mapping by Heddle *et al.* (1980) is based on the relationship between vegetation and landform soil units. The remnant vegetation on the Site is mapped as belonging to the Cowaramup Complex and is mapped as being in the Cd unit (Plate 6). This unit is described as Woodland of *Eucalyptus marginata* subsp. *marginata-Corymbia calophylla-Banksia ilicifolia* on sandy rises and low woodland of *Melaleuca preissiana* on lower slopes in the hyperhumid to humid zones.

There is 58.09% of the pre-European extent of the Cowaramup Cd Complex remaining and 16.12% of the current remaining area within lands protected in IUCN reserves Classes I-IV.

PLATE 6: VEGETATION COMPLEX MAPPING



Source: Western Australian Local Government Environmental Planning Tool

2.6 FLORA OF CONSERVATION SIGNIFICANCE

A desktop search of the following sources was conducted for this report:

- DPaW's threatened and priority flora (T&PF) database (Search 04-0417FL);
- Western Australian Herbarium records (Search 04-0417FL);
- DPaW's NatureMap database (searched 30 March 2017); and
- DoEE's Protected Matters Search Tool (using a radial buffer of 2km from the site, searched 3 June 2017).

The search returns are provided in Appendices 3 and 4, and summarised in Table B. The geographical locations for the species identified from DPaW T&PF database and the Western Australian Herbarium records were provided to Aurora Environmental. None of these species have been recorded on the Site. However, one record of *Acacia semitrullata* was recorded (in 1980) approximately 680m north-east of the site and one record of *Caladenia excelsa* was recorded (in 1967) approximately 580m north-west. Both of these records are dated, but indicate the potential presence of these species in the general locality. *Caladenia excelsa* grows on hilltops, slopes and swales in deep white, grey or brown sands or sandy loam of the Leeuwin-Naturaliste Ridge (DoEE, 2017a). *Acacia semitrullata* also grows in sand in open heath and is frequently found in areas fringing seasonally dry swamps and in sand over laterite in shallow depressions in Jarrah Forest. The Site has gravelly loams in the upper soil profile and therefore are unlikely to support these species.

TABLE B: THREATENED AND PRIORITY FLORA

SPECIES	INFORMATION SOURCE			CONSERVATION STATUS	
	T&PF DATABASE	NATURE MAP	PROTECTED MATTERS SEARCH TOOL	*WILDLIFE CONSERVATION ACT 1950*	*EPBC Act*
Caladenia caesarea subsp. *maritima*	X			Threatened	Critically Endangered
Caladenia excelsa		X		Threatened	Endangered
Caladenia huegelii			X	Threatened	Endangered
Caladenia viridescens	X			Threatened	Critically Endangered
Drakaea micrantha			X	Threatened	Vulnerable
Eucalyptus x phylacis			X	Threatened	Endangered
Gastrolobium argyrotrichum		X		Threatened	Endangered
Gastrolobium papilio			X	Threatened	Endangered
Wurmbea calcicola	X			Threatened	Vulnerable
Amphidium tortuosum	X			Priority 1	-
Agrostocrinum scabrum subsp. *littorale*	X			Priority 2	-

TABLE B: THREATENED AND PRIORITY FLORA

SPECIES	INFORMATION SOURCE			CONSERVATION STATUS	
	T&PF DATABASE	NATURE MAP	PROTECTED MATTERS SEARCH TOOL	*WILDLIFE CONSERVATION ACT 1950*	*EPBC Act*
Andersonia sp. echidna (A.R. Annels ARA 5500)	X			Priority 2	-
Hydrocotyle sp. hamelinensis (G.J. Keighery s.n. PERTH 02391325)	X			Priority 2	-
Millotia tenuifolia var. *laevis*	X			Priority 2	-
Acacia inops	X			Priority 3	-
Acacia lateriticola var. Glabrous variant (B.R.Maslin 6765)	X			Priority 3	-
Boronia anceps	X			Priority 3	-
Cyathochaeta teretifolia	X			Priority 3	-
Galium leptogonium	X			Priority 3	-
Johnsonia inconspicua	X			Priority 3	-
Pimelea ciliata subsp. *longituba*	X			Priority 3	-
Stylidium lowrieanum	X			Priority 3	-
Acacia semitrullata	X	X		Priority 4	-
Banksia sessilis var. *cordata*	X				
Boronia tenuis	X				
Calothamnus graniticus subsp. *leptophyllus*	X				
Drosera fimbriata	X				
Eucalyptus rudis subsp. *cratyantha*	X				
Gahnia sclerioides	X				
Gonocarpus pusillus	X				
Laxmannia jamesii	X				

2.6.1 Vegetation

The majority of Lot 34 has been cleared and used for grazing (Plate 7). A small area of remnant vegetation in the upper landscape comprises Jarrah / Marri Forest.

2.6.2 Vegetation Condition

The remnant vegetation on Lot 34 is considered to be in a Good to Very Good condition (after Keighery, 1994) (Plates 7 and 8).

PLATE 7: EXAMPLE OF VEGETATION IN VERY GOOD CONDITION

The site assessment identified that the southern portion of the remnant vegetation had been burnt recently (Plate 8).

PLATE 8: EXAMPLE OF VEGETATION IN GOOD CONDITION

2.6.3 Vegetation of Conservation Significance

The EPBC Act Protected Matters Report (generated on 3 June 2017, Appendix 4) identified one Threatened Ecological Community (TEC) protected under the EPBC Act as potentially present in the search area. The TEC's identified was:

- *Banksia* Woodlands of the Swan Coastal Plain ecological community.

According to the DPaW's Threatened and Priority Ecological Community Database (Search 11-0417EC) there are no known occurrences of TECs or priority ecological communities (PECs) within a 5km radius of the site.

The vegetation on the site is not representative of a *Banksia* Woodland dominated community.

2.7 SIGNIFICANT FAUNA

Aurora Environmental conducted a search of the following databases to identify potential fauna species that may be found in the vicinity of the site:

- DPaW's Threatened and Priority Fauna database (Appendix 5) – Search Fauna 5441;
- DPaW's NatureMap database (searched on 30 March 2017) for species which are declared as "Rare or likely to become extinct", "Birds protected under international agreement" and "Other specially protected fauna" identified as occurring within a 2km radius of the site (Appendix 5).
- The EPBC Act 1999 Protected Matters Search Tool (searched on 3 June 2017) using a radial buffer of 2km from the site (Appendix 4).

2.7.1 Database Search Results

The database searches cover an area much wider than the site. Therefore, the results from the search will include a range of species which rely on habitats that are not present on the site. The species identified from the database searches are provided in Table C along with an assessment of probability of these species being found on the site, or potential to use the habitat present on the site.

2.7.2 Fauna Habitat

The site contains one natural habitat type comprising Jarrah-Marri Forest which is in Good-Excellent condition. However, the dam in the lower portion of Lot 34 provides open water which may be used by water birds and amphibians.

One habitat tree (an isolated Marri in the cleared portion of the site adjacent to Sonning Loop) containing at least one large vertical entry hollow which may be of suitable size for use by Black Cockatoos was recorded on Lot 34 (Plates 9 and 10). There were no obvious signs (e.g. scratchings, chew marks around the entrance) that the hollow was, or has been, used by Black Cockatoos.

It is considered unlikely that the remnant habitat on Lot 34 supports a diverse faunal assemblage, or provide critical habitat that conservation significant fauna would be reliant upon for their survival.

PLATE 9: LOCATION OF TREE HOLLOW

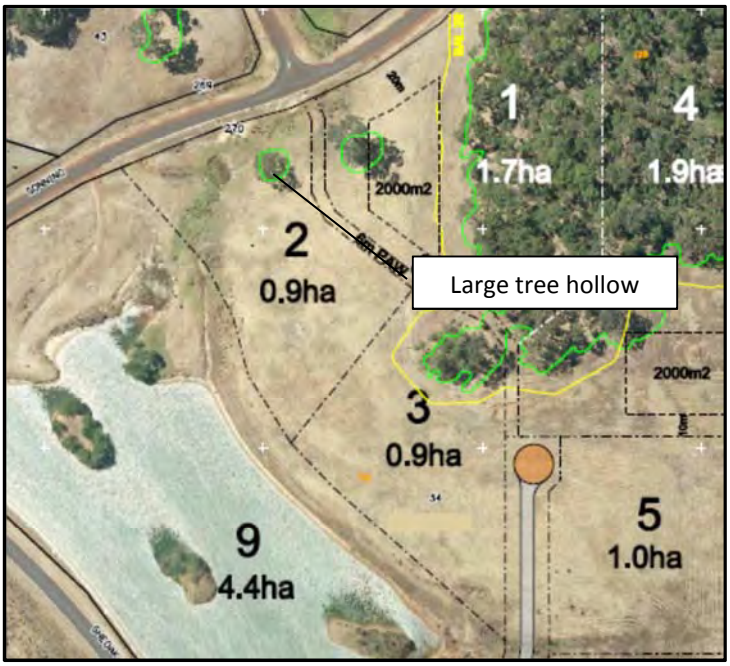


PLATE 10: LARGE TREE HOLLOW

TABLE C: THREATENED AND PRIORITY FAUNA

SPECIES	CONSERVATION STATUS		PREFERRED HABITAT	POTENTIAL TO BE FOUND WITHIN THE SITE (BASED ON PREFERRED HABITAT AND AVAILABLE HABITAT ON SITE).
	WILDLIFE CONSERVATION ACT 1950	*EPBC ACT*		
AVIFAUNA				
Calidris canutus Red Knot	Vulnerable	Endangered / Migratory	A migratory species. Medium shorebird that is found along coastal areas.	**Highly unlikely.** The Site is not located along the coast.
Calidris ferruginea Curlew Sandpiper	Vulnerable and International Agreement	Critically Endangered	Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters (Higgins & Davies 1996).	**Unlikely.** Species unlikely to be present as it would normally be found around coastal areas. The dam on the Site provides potentially suitable habitat.
Calyptorhynchus banksii naso Forest Red-tailed Black Cockatoo	Vulnerable	Vulnerable	Eucalypt forests, feeds on marri, jarrah, blackbutt, karri, sheoak and snottygobble. The Forest Red-tailed Black-Cockatoo nests in the large hollows of marri, Jarrah and Karri (Johnstone and Kirkby, 1999). In Marri, the nest hollows of the Forest Red-tailed Black Cockatoo range from 8-14m above ground, the entrance is 12 – 41cm in diameter and the depth is one to five metres (Johnstone and Storr, 1998).	**Potentially present.** Suitable habitat is present on the Site.
Calyptorhynchus baudinii Baudin's Black	Endangered	Vulnerable	Mainly eucalypt forests where it feeds primarily on Marri seeds, (Morcombe, 2004), *Banksia*, *Hakea* and *Erodium* sp. Also strips bark from	**Potentially present.** Suitable habitat is present on the Site.

TABLE C: THREATENED AND PRIORITY FAUNA

SPECIES	CONSERVATION STATUS		PREFERRED HABITAT	POTENTIAL TO BE FOUND WITHIN THE SITE (BASED ON PREFERRED HABITAT AND AVAILABLE HABITAT ON SITE).
	WILDLIFE CONSERVATION ACT 1950	*EPBC ACT*		
Cockatoo			trees in search of beetle larvae (Johnstone and Storr, 1998). This species of cockatoo nests in large tree hollows, 30–40cm in diameter and more than 30cm deep.	
Calyptorhynchus latirostris Carnaby's Black Cockatoo	Endangered	Endangered	Forests, woodlands, heathlands, farms; feeds on *Banksia*, *Hakea* and Marri. Carnaby's Black-Cockatoo has specific nesting site requirements. Nests are mostly in smoothed-barked eucalypts with the nest hollows ranging from 2.5 to 12m above the ground, an entrance from 23-30cm diameter and a depth of 0.1-2.5m (Johnstone and Storr, 1998).	**Potentially present.** Suitable habitat is present on the Site.
Leipoa ocellata Malleefowl	Vulnerable	Vulnerable	Mallee and other dry scrubs of southern Australia.	**Highly unlikely.** Species highly unlikely to be present due to absence of suitable habitat. It is more commonly found in the goldfields region.
Numenius madagascariensis Eastern Curlew	Vulnerable and International Agreement	Critically Endangered	During the non-breeding season in Australia, the eastern curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass (Zosteraceae). Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. The birds are often recorded among saltmarsh and on mudflats fringed by mangroves, and sometimes	**Highly unlikely.** Species highly unlikely to be present due to absence of suitable habitat.

TABLE C: THREATENED AND PRIORITY FAUNA

SPECIES	CONSERVATION STATUS *WILDLIFE CONSERVATION ACT 1950*	 *EPBC ACT*	PREFERRED HABITAT	POTENTIAL TO BE FOUND WITHIN THE SITE (BASED ON PREFERRED HABITAT AND AVAILABLE HABITAT ON SITE).
			within the mangroves. The birds are also found in coastal saltworks and sewage farms (Marchant & Higgins, 1993).	
CRUSTACEANS				
Engaewa reducta Dunsborough Burrowing Crayfish	Endangered	Critically Endangered	Vegetated surface seepages, swamp plains and shallow swampy headwater tributaries of Carbunup River/Mary Brook and Station Gully catchments and other small coastal watercourses draining into Geographe Bay. All known occurrences are found in the area bound by the Carbunup River in the east and the Leeuwin-Naturaliste Ridge in the west. The vegetation is usually dense heathland and the soils have a high sand content. The species can be identified by conspicuous chimneys of soil pellets that are expelled at the burrow opening.	**Highly unlikely.** The Site conditions are unlikely to be suitable for the species.
MAMMALS				
Dasyurus geoffroii Chuditch	Vulnerable	Vulnerable	Chuditch are known to have occupied a wide range of habitats from woodlands, dry sclerophyll (leafy) forests, riparian vegetation, beaches and deserts. Riparian vegetation appears to support higher densities of Chuditch, possibly because food supply is better or more reliable and better cover is offered by dense vegetation. Chuditch appear to utilise native vegetation along road sides in the wheatbelt (CALM, 1994). The	**Unlikely** Eucalypt woodland is suitable habitat for the species. However, the small size of the remnant woodland is unlikely to be large enough to support the species which has a much larger home range.

TABLE C: THREATENED AND PRIORITY FAUNA

SPECIES	CONSERVATION STATUS *WILDLIFE CONSERVATION ACT 1950*	 *EPBC ACT*	PREFERRED HABITAT	POTENTIAL TO BE FOUND WITHIN THE SITE (BASED ON PREFERRED HABITAT AND AVAILABLE HABITAT ON SITE).
			estimated home range of a male Chuditch is over 15km^2 whilst that for females is 3-4km^2 (Sorena and Soderquist, 1995). This species is rarely recorded on the coastal plain (Dell, 2000).	
Pseudocheirus occidentalis Western Ringtail Possum	Critically Endangered	Vulnerable	The western ringtail possum was once found in a variety of habitats including coastal peppermint, coastal peppermint-tuart, jarrah-marri associations, sheoak woodland, and eucalypt woodland and mallee. Coastal populations mostly inhabit peppermint-tuart associations with highest densities in habitats with dense, relatively lush vegetation. In these areas the main determinants of suitable habitat for western ringtail possums appears to be the presence of *Agonis flexuosa* either as the dominant tree or as an understorey component of eucalypt forest or woodland (Jones *et al.,* 1994). Inland, the largest known populations occur in the upper Warren area east of Manjimup (Wayne *et al.,* 2005). In this area the peppermint tree is naturally absent and jarrah-marri associations constitute the species refuge and foraging habitat.	**Possible.** Lot 34 is within the modelled distribution of the species. Western Ringtail Possums can be found in Jarrah-Marri forest, but are typically in low densities. No evidence of dreys were found during the site assessment.
MIGRATORY SPECIES / MARINE SPECIES				
Actitis hypoleucos Common Sandpiper		Migratory	A small wader that forages on the ground or in shallow water. In Australia it is found along coastlines and some inland wetlands.	**Unlikely**. More likely to be found along the coastal areas. The dam may provide some suitable habitat for the species. However, the species is a migratory bird

TABLE C: THREATENED AND PRIORITY FAUNA

SPECIES	CONSERVATION STATUS		PREFERRED HABITAT	POTENTIAL TO BE FOUND WITHIN THE SITE (BASED ON PREFERRED HABITAT AND AVAILABLE HABITAT ON SITE).
	WILDLIFE CONSERVATION ACT 1950	*EPBC ACT*		
				which has a very large range meaning that the Site is unlikely to form important habitat for the species.
Apus pacificus Fork-tailed Swift	International Agreement	Migratory	Low to very high airspace over varied habitat from rainforest to semi desert (Morcombe, 2004).	**Flyover Only.** It is potentially a very occasional summer visitor to air space above the Site but is entirely aerial and largely independent of terrestrial habitats. Not listed as a potential species as it is only likely to occur in the general area on very rare occasions.
Ardea alba Great Egret	International Agreement	Migratory	Wetlands, flooded pasture, dams, estuarine mudflats, mangroves and reefs (Morcombe, 2004).	**Possible.** A possible infrequent visitor to the general locality in low numbers and may use the dam and open pasture areas.
Ardea ibis Cattle Egret	International Agreement	Migratory	Moist pastures with tall grasses, shallow open wetlands and margins, mudflats (Morcombe, 2004).	**Possible.** A possible infrequent visitor to the general locality in low numbers and may use the dam and open pasture areas.
Calidris acuminata Sharp-tailed Sandpiper	International Agreement	Migratory	A small wader that is a summer migrant to Australia. It prefers the grassy edges of shallow inland freshwater wetlands.	**Possible**. A possible infrequent visitor to the general locality that may use the dam and open pasture areas.
Calidris ferruginea Curlew Sandpiper	Vulnerable and International Agreement	Critically Endangered	Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in salt works and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore	**Possible**. A possible infrequent visitor to the general locality that may use the dam.

TABLE C: THREATENED AND PRIORITY FAUNA

SPECIES	CONSERVATION STATUS		PREFERRED HABITAT	POTENTIAL TO BE FOUND WITHIN THE SITE (BASED ON PREFERRED HABITAT AND AVAILABLE HABITAT ON SITE).
	WILDLIFE CONSERVATION ACT 1950	*EPBC ACT*		
			drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters (Higgins & Davies 1996).	
Calidris melanotos Pectoral Sandpiper	International Agreement	Migratory	A medium sized shorebird that is most commonly found on mudflats with short grass or weedy vegetation.	**Unlikely**. More likely to be found along the coastline. This is a migratory species which is able to fly long distances. The Site is unlikely to be important for this species.
Calidris ruficollis Red-necked Stint	International Agreement	Migratory	The Red-necked Stint is a migratory species that flies to Australia for the summer months. It is found on the coast, in sheltered inlets, bays lagoons, estuaries, mudflats and protected sandy or coralline shores.	**Unlikely.** Species is more likely to be found along the coastline.
Charadrius leschenaultii Greater Sand Plover	International Agreement	Migratory	A small wader that is found in coastal and estuarine areas of Australia. The greatest numbers of the species occur in the northern parts of Australia and is only occasionally recorded in the south-west of Western Australia.	**Unlikely.** Species unlikely to be present on the Site as it is more commonly found in coastal and estuarine areas.

TABLE C: THREATENED AND PRIORITY FAUNA

SPECIES	CONSERVATION STATUS		PREFERRED HABITAT	POTENTIAL TO BE FOUND WITHIN THE SITE (BASED ON PREFERRED HABITAT AND AVAILABLE HABITAT ON SITE).
	WILDLIFE CONSERVATION ACT 1950	*EPBC ACT*		
Haliaeetus leucogaster White-bellied Sea-Eagle	International Agreement	Migratory	They nest and forage usually near the coast over islands, reefs, headlands, beaches, bays, estuaries, mangroves, but will also live near seasonally flooded inland swamps, lagoons and floodplains, often far inland on large pools of major rivers. Established pairs usually sedentary, immatures dispersive (Morcombe, 2004). White-bellied Sea-Eagles build a large stick nest, which is used for many seasons in succession.	**Possible.** The species may potentially fly over the Site when foraging. However, it is more likely to be found in coastal areas.
Merops ornatus Rainbow Bee-eater	International Agreement	Migratory	Open country, of woodlands, open forest, semi-arid scrub, grasslands, clearings in heavier forest, farmlands (Morcombe, 2004). Breeds underground in areas of suitable soft soil firm enough to support tunnel building.	**Possible.** Possible visitor to the site, but unlikely to breed on the site due to unfavourable soil conditions. The species generally prefers loose sandy soils.
Motacilla cinerea Grey Wagtail	Not listed	Listed Marine Species	The species is widely distributed, with several populations breeding in Europe and Asia and migrating to tropical regions in Asia and Africa. The species is always associated with running water when breeding, although they may use man-made structures near streams for the nest. Outside the breeding season, they may also be seen around lakes, coasts and other watery habitats.	**Possible.** The dam on the Site provides an open water source for this species. As the species has a very large range, it is unlikely to rely upon the site for their survival.
Numenius madagascariensis	Vulnerable and International	Critically Endangered	During the non-breeding season in Australia, the eastern curlew is most commonly associated with sheltered coasts, especially estuaries, bays,	**Highly unlikely.** Species highly unlikely to be present due to absence

TABLE C: THREATENED AND PRIORITY FAUNA

SPECIES	CONSERVATION STATUS		PREFERRED HABITAT	POTENTIAL TO BE FOUND WITHIN THE SITE (BASED ON PREFERRED HABITAT AND AVAILABLE HABITAT ON SITE).
	WILDLIFE CONSERVATION ACT 1950	*EPBC ACT*		
Eastern Curlew	Agreement		harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass (Zosteraceae). Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. The birds are often recorded among saltmarsh and on mudflats fringed by mangroves, and sometimes within the mangroves. The birds are also found in coastal saltworks and sewage farms (Marchant & Higgins, 1993).	of suitable habitat.
Pandion haliaetus Osprey		Listed Marine Species	The osprey is found in a wide variety of habitats, nesting in any location near a body of water providing an adequate food supply. The osprey's diet consists almost exclusively of fish.	**Highly unlikely.** Given the species diet is almost exclusively fish, there is no suitable source of food for the species on the Site.
Tringa nebularia Common Greenshank	International Agreement	Migratory	The Common Greenshank is found in a wide variety of inland wetlands and sheltered coastal habitats of varying salinity (DoEE, 2017b).	**Possible.** The species may occasionally be found in wetland areas.

2.8 HYDROLOGY

The Site is located within the Gunyulgup Brook catchment, in the Gunyulgup Surface Water sub-area of the Busselton Coast Surface Water Area.

The Site features a large man made dam which captures overland surface water runoff from the north, east and south of the Site.

No wetlands are mapped as occurring on the Site according to the Wetland Atlas mapping of Hill *et al.* (1996) or DPaW's Geomorphic Wetlands of the Swan Coastal Plain dataset (Landgate, 2017).

2.9 HYDROGEOLOGY

The Site is located within the Busselton-Capel Groundwater Area and is in the Cape to Cape North sub-area. This area is characterised by a surficial aquifer (Leeuwin) and a fractured rock aquifer.

The surficial aquifer in the Cape to Cape North sub-area ranges from alluvial and colluvial deposits in river valleys to dunes and swales which can reach a thickness exceeding 100m, but the saturated thickness of the aquifer is small and in places dune sands lie over dry bedrock with no watertable development (Department of Water (DoW), 2009). The sand and limestone deposits are restricted to a few kilometres along the coast (DoW, 2009).

In the east of the subarea, the fractured rock is the basement rocks of the Leeuwin Complex, which are granitic with an overlying weathered profile (DoW, 2009). They are overlain by shallow surficial deposits. In fractured rock aquifers, the rock body is solid and groundwater storage and movement can occur only along fractures in the rock, which are usually relatively limited and in most instances are not well connected (DoW, 2009). The fractured rock aquifer is an unreliable source of groundwater due to the nature of the aquifer system and irregular recharge from rainfall meaning that yields are likely to be low. The fractures in the rock are recharged through rainfall and groundwater seepage, which can be fed by nearby surface water streams (seepage down into the fractures), springs and underground streams (which may then discharge into surface water systems) (DoW, 2009).

The Site is not located within a Groundwater Protection Zone.

The DoW Water Information Reporting (WIR) database indicates that there are four groundwater bores within a 1km radius of the site. The Site References for these are:

- 61000498 – located in Quindalup, drilled to a depth of 5.55m
- 61000500 – located in Quindalup, drilled to a depth of 3.6m
- 61000502 – located in Quindalup, drilled to a depth of 3.52m
- 61015267 – located in Yallingup, unknown drill depth.

Bores 61000498, 61000500 and 61000502 are located in the Dunsborough Lakes development and are not considered representative of the groundwater conditions at the Site. Bore 61015267 is located in Yallingup approximately 800m west of the site, but there is no groundwater level information for this bore in the WIR database.

Three piezometers (PZ1, PZ2 and PZ3) were installed on Lot 34 by Aurora Environmental in 2015 during a study into the Site's suitability for on-site effluent disposal. The piezometers were sampled in late March 2015 and were found to be dry to a depth of at least 2m below ground level (BGL). No additional sampling was conducted through the winter months.

Aurora Environmental revisited the site on 18 April 2017. One piezometers (PZ3) located in the northern portion of the site was unable to be located and was presumed destroyed and the other two piezometers were still present on the Site. An additional piezometer (not installed by Aurora Environmental) was also found on the Site during the 2017 site assessment. This piezometer was located in the south-eastern portion of the site. The three piezometers (PZ1, PZ2 and the unnamed piezometer) found on the Site were dipped using a static water level meter. The depth to groundwater for each is presented in Table D.

TABLE D: GROUNDWATER LEVELS 18 APRIL 2017

PIEZOMETER	DEPTH TO GROUNDWATER	
	mBTOC	mBGL
PZ1	2.335	1.825
PZ2	1.76	1.25
PZ3	Destroyed	-
Unnamed	1.99	1.33

Groundwater was recorded between 1.25m BGL to 1.825m BGL. The presence of groundwater in late April 2017 is a reflection of the above average rainfall recorded in February and March (22.4mm in February (average of 11.4mm) and 45.6mm in March (average of 22.9mm)).

2.10 INDIGENOUS HERITAGE

The *Aboriginal Heritage Act 1972* defines Aboriginal Heritage Sites and provides for the preservation of places and objects customarily used by or traditionally important to Aboriginals and prohibits the concealment, destruction or alteration of any Aboriginal Heritage Sites. An Aboriginal site may:

- Exist in any area of Western Australia;
- Not have been recorded in the register of Aboriginal sites or elsewhere;
- Not have been identified in previous heritage surveys or reports on that area but remains fully protected under the Act.

A search of the DAA Aboriginal Heritage Inquiry System did not identify any registered Aboriginal Sites occurring within or near the Site.

2.11 EUROPEAN HERITAGE

A search was undertaken of the Australian Heritage Places Inventory and the State Heritage Register on 12 June 2017. No European Heritage sites of significance were listed within the Site. The Leeuwin-Naturaliste Ridge Area (Place ID 9410) is listed on the Register of the National Estate as a naturally

significant site. This area is approximately 27,000ha of reserved land and vacant Crown land between Caves Road and the coast, extending from Cape Naturaliste to Cape Leeuwin. Place ID will not be impacted by the subdivision of the site.

A search of the Protected Matters database (Appendix 4) confirmed no World or National Heritage Places are on or in the vicinity of the Site.

2.12 ASSESSMENT OF POTENTIAL CONTAMINATION

2.12.1 Contaminated Sites Database

A search of the Contaminated Sites database (https://secure.dec.wa.gov.au/idelve/css/) on 12 June 2017 indicates that there are no registered contaminated sites in the locality of Yallingup. This does not exclude the potential for contamination being present, it only indicates that it has not been reported and registered as a contaminated site.

2.12.2 Review of Historical Aerial Photographs

Historical aerial photographs of the Site that are publically available on Landgate's Map viewer (https://www.landgate.wa.gov.au/bmvf/app/mapviewer/) are limited to the period 1996 to 2016. A review of these photos indicated that the main change that has occurred on the Site in this period was the construction of the dam in the western portion of the Site. The dam was constructed between 1996 and 2001. The current land owner advised Aurora Environmental that the land was purchased from a beef farmer who had bought the land as a Crown Grant.

During the site inspection it was noted that gravel extraction on the southern side of the remnant vegetation on Lot 34 had occurred at some point. There was no evidence of any backfilling of materials on the site or importation of fill material.

Based on the review of the aerial photos in conjunction with the site observations of the Site and information from the current land owner, Lot 34 has only been used for grazing. This represents a very low risk of contamination being present. No further investigations relating to the potential presence of contamination is required.

2.13 SURROUNDING AND CONFLICTING LAND USE

The Site is surrounded by a mix of rural (e.g. viticulture and grazing) to the west and south, rural-residential land uses to the north and south-west and bushland to the east. The proposed land use is consistent with the surrounding land uses.

2.14 PREVIOUS EPA ADVICE

A search of the EPA's website using the term Yallingup identified one project that has been assessed by the EPA. The Smiths Beach development was a contentious coastal tourism and residential development which was approved (Ministerial Statement No. 831) by the Minister for the Environment. No other projects on, or near the site have been formally assessed by the EPA.

3 PROPOSED DEVELOPMENT

The landowner proposes to the subdivide Lot 34 into nine rural-residential lots ranging from 0.9 to 4.4 hectares (ha). The proposed subdivision (Appendix 1) retains all native vegetation as well as the dam that is on the Site.

The remnant vegetation on Lot 34 will be retained in private ownership across two lots. Each lot has sufficient cleared areas to accommodate a building envelope of at least 2000m^2 located outside of the Bushfire Attack Level (BAL) 29 contour.

4 ENVIRONMENTAL ASSESSMENT

Based on the site's environmental values the following have been identified as potential environmental issues relevant to the development of Lot 34:

- Flora, vegetation and fauna habitat;
- Bushfire management; and
- Wastewater disposal.

The above issues are addressed in the following sections.

4.1 FLORA, VEGETATION AND FAUNA HABITAT

The proposed subdivision layout has been designed to maximize the retention of remnant vegetation on Lot 34 (Appendix 1). Based on the current subdivision design, Aurora Environmental does not consider that there will be any impacts to conservation significant fauna or flora. Therefore, referrals to the EPA, or the DoEE are unlikely to be required.

The large marri tree on Lot 2 was found to contain at least one hollow that may be large enough for black cockatoos to utilize for breeding. It is recommended that this tree be retained on the lot.

The retention of the vegetation will avoid the loss of flora, vegetation and fauna habitat. It is recommended that a notification is included on the title of Lots 1 and 4 alerting prospective purchasers that the vegetation on these lots is to be retained. However, it will also be necessary to manage fuel loads in accordance with the Bushfire Management Plan – refer to Section 4.2.

4.2 BUSHFIRE

Lot 34 is located in a bushfire prone area. The area of remnant vegetation on Lot 34 is deemed a high risk area, as is the vegetation to the east of Lot 34. To address the risks associated with bushfire, the landowner has commissioned a Bushfire Assessment. The Bushfire Assessment has mapped BAL29 contours for the site. These are shown on the proposed subdivision plan (Appendix 1). All future dwellings will be constructed outside of the BAL29 contour.

Future landowners will be required to manage the fire risk on their properties in accordance with the City of Busselton's requirements.

4.3 WASTEWATER DISPOSAL

The absence of reticulated sewerage infrastructure to Lot 34 means that wastewater generated from each dwelling constructed on the site will need to be treated and disposed of on-site. This practice is consistent with the approach that has been applied on surrounding rural-residential lots.

Aurora Environmental (2015) completed an evaluation of Lot 34 to ascertain its suitability to accommodate on-site effluent disposal. A copy of the report is provided in Appendix 2.

The evaluation included test pitting at nine locations on Lot 34 to a depth of 2m below ground level to record the soil profile across the site. The evaluation found the following:

- The site appears to be well drained given the moderate slope of the site and there was no evidence of perched water.
- Some overland flow was noted in the depression between the northern and southern hill slopes where very minor erosion comprised poorly developed rills.
- The soils present on the site comprise a shallow A-horizon (organic soil), overlying soil layers comprising B-horizon soil (mineral soils) and C-horizon soils (mineral soils including relict textures e.g. saprolite).
- The soil structure comprises single grain, loose and incoherent organic soil of the A-horizon, overlying the massive (coherent) to weakly structured B and C horizons that were generally present below 0.5m. The soils are generally a gravelly loam in the upper profile with increasing clay content with depth.
- Saturated soils were not encountered in any of the test pits during the site work and it was considered that groundwater was lower than 2m below ground level.
- Three piezometers were sampled in late March 2015 and were found to be dry. However, groundwater was detected at 1.25 to 1.825m BGL in April 2017. The results indicate that the minimum of 0.6m separation between the natural surface and groundwater for loamy soils can be achieved. A 1.2m separation between groundwater and the underside of the septic tank effluent drainage receptacle may be difficult to achieve if winter high groundwater levels exceed the groundwater levels recorded on Lot 34.
- Soil permeability was completed at three locations adjacent to selected test pits using a CL26100 constant head permeameter in accordance with Standards Australia (2012). Field permeability values at the test locations were 0.11, 0.17 and 0.62 m/day indicating that the site has adequate permeability for for the purposes of waste water disposal in trenches and beds.
- Two soil samples from each test pit location (at 0.5m and 1.5m below ground level) were analysed for their phosphorus retention index (PRI). The PRI values recorded ranged from 108 to 9,850 indicating that the in situ soils have a high capacity to adsorb phosphorus and that soil amendment will not be needed.

On-site wastewater treatment options effectively fall into two categories:

- Conventional systems such as septic tank system with leach drain; or
- Alternative wastewater treatment systems such as aerobic treatment units (ATUs) with irrigation/subsoil disposal, split treatment systems that utilise composting toilets and a separate greywater treatment system or a septic system with an amended soil infiltration system.

The Department of Health has a list of systems that have been approved for use in Western Australia. The minimum requirements for on-site sewage disposal are outlined in the Draft Government Sewerage Policy 2016 (Government of Western Australia, 2016).

Of relevance to the Site are the following requirements of the Draft Government Sewerage Policy (Government of Western Australia, 2016):

- Separation from highest known groundwater levels: the discharge point of the on-site sewage system in loams and heavy soils should be 0.6m above groundwater, in gravels should be 1m above the highest known groundwater level. Where this separation cannot be achieved, a secondary treatment system (an ATU) with an inverted or semi-inverted disposal area may be used.
- Provide sufficient land for application of wastewater: for loamy soils the land application area required is 429m^2 for a primary treatment system (i.e. septic system) or 225m^2 for a secondary treatment system (an ATU).
- The system selected must be one that has been approved for use in Western Australia by the Department of Health.

The type of system to be used must be selected based on its suitability for the site conditions i.e. the soil conditions, vulnerability of the receiving environment and the nature of the proposal. Based on the information from the 2015 site evaluation and the 2017 site assessment the following is recommended:

- The natural soils, particularly at a depth of greater than 0.5m BGL, are considered to be loamy grading into more clay at depth. These soils will require a separation distance of 0.6m above the highest known groundwater levels. The current highest known groundwater levels are between 1.25m BGL and 1.825m BGL. Based on current information, the minimum separation requirements can be achieved. However, the groundwater conditions measured are unlikely to be representative of winter high conditions. Groundwater testing in late winter through to mid-Spring (depending on seasonal rainfall) is recommended.
- Future landowners will need to provide plans showing the type of wastewater treatment and disposal system to be used. Where the land application area requirements for a primary treatment system cannot be met (i.e. 429m^2) it is recommended that a secondary treatment system be used in order to reduce the land application area requirements (to 225m^2). The current lots are sufficiently large enough to accommodate this requirement. This will be regulated by the local government during the assessment of the building license application.
- Wastewater treatment systems approved for use in Western Australia by the Department of Health are used.

5 CONCLUSION

The landowner of Lot 34 is proposing to subdivide the Site into nine lots ranging from 0.9ha to 4.4ha. Aurora Environmental has completed an environmental assessment of Lot 34 using information collated from desktop research and a site assessment. The environmental assessment was supported by a previous investigation of the site's suitability to accommodate on-site effluent disposal. The environmental assessment has characterised the Site's environmental values.

Based on the outcomes of the environmental assessment, Aurora Environmental considers that the proposed subdivision does not raise any significant environmental issues which would preclude the subdivision from proceeding. The retention of native vegetation within the development avoids direct impacts to the vegetation/fauna habitat through activities such as clearing. One isolated mature marri tree in the northern portion of Lot 34 (within the proposed Lot 2) was found to contain a tree hollow that may be of suitable size to support breeding by Black Cockatoos.

A bushfire assessment was commissioned by the landholder as Lot 34 is located in a bushfire prone area. Areas containing native vegetation present a high risk of bushfire occurring. The bushfire assessment has mapped BAL29 contours. The building envelope on Lot 1 is located outside of the BAL 29 contours.

A site evaluation by Aurora Environmental (2015) confirmed that the site is capable of supporting on-site effluent disposal. The site is characterised by gravelly loams with increasing clay content at depth. For the purposes of the assessment the soils are considered to be loamy. Field permeability testing showed that the soils are well drained and have a high PRI value indicating that soil amendment will not be required. The proposed lots are sufficiently large enough to meet required land application area specified for primary and secondary treatment units in the State Government's Draft Sewerage Policy (Government of Western Australia, 2016). Based on current information, the highest known groundwater levels at the site meet the required separation distance from the base of the sewage disposal system. However, the groundwater levels recorded are unlikely to be representative of winter high conditions.

6 REFERENCES

Aurora Environmental (2015). *Site and Soil Evaluation for On-site Effluent Disposal, Lot 34 Sheoak Drive, Yallingup.* Report No. AD2015/001. Unpublished report prepared for Garrison Holding Pty Ltd & Millhurst Nominees Pty Ltd. Aurora Environmental, Perth Western Australia.

Australian Standards (2012) Australian/ New Zealand Standard. On-site Domestic Wastewater Management. AS/NZS 1547:2012

Bureau of Meteorology (BOM) (2017). *Climate statistics for Australian locations*, available at: http://www.bom.gov.au/climate/averages/tables/cw_009106.shtml.

CSIRO (2009) *Australian Soil and Land Survey Field Handbook,* CSIRO Publishing.

CALM, Conservation and Land Management (1994). *Chuditch Recovery Plan 1992-2001.* By Peter Orell and Keith Morris for the Chuditch Recovery Team.

Dell, J. (2000). *A draft summary assessment of the fauna values of the Kemerton Bushland*. Unpublished report for the Conservation Branch, Policy Division, Department of Environmental Protection.

Department of Agriculture (2004). *Soil-Landscape Mapping in South-Western Australia.* Government of Western Australia.

DoEE, Department of Environment and Energy (2017a). *Caladenia excelsa* – Giant Spider Orchid, available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=56717.

DoEE, Department of Environment and Energy (2017b). *Tringa nebularia — Common Greenshank, Greenshank*, available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=832.

DoW, Department of Water (2009). *Busselton-Capel Groundwater Area Sub-Area Reference Sheets. Plan companion for the South West Groundwater Areas Allocation Plan*. Department of Water, Perth, Western Australia.

Government of Western Australia (2016). *Government Sewerage Policy. Draft for Consultation.* Government of Western Australia, Perth, WA.

Heddle, E. M., Loneragan, O. W., and Havel, J. J. (1980). *Vegetation of the Darling System.* IN: Atlas of Natural Resources, Darling System, Western Australia.

Higgins, P.J. & S.J.J.F. Davies, eds (1996). *Handbook of Australian, New Zealand and Antarctic Birds*. Volume Three - Snipe to Pigeons. Melbourne, Victoria: Oxford University Press.

Hill, A. L. & Department of Environmental Protection & Water and Rivers Commission (1996). *Wetlands of the Swan Coastal Plain*. Volume 2, Wetland mapping, classification and evaluation, Water and Rivers Commission; [Perth, W.A.]: Dept. of Environmental Protection, [Leederville, WA].

Johnstone, R.E. and T. Kirkby (1999) *Food of the Forest Red-tailed Black Cockatoo Calyptorhynchus banksii naso in south-west Western Australia*. *Western Australian Naturalist*. 22:167-177.

Johnstone, R.E. and Storr, G.M. (1998) *Handbook of Western Australian Birds: Volume 1 – Non-passerines (Emu to Dollarbird)*. Western Australian Museum, Perth Western Australia.

Jones, B.A., R.A. How and D.J. Kitchener (1994). *A field study of Pseudocheirus occidentalis (Marsupialia: Petauridae). II. Distribution and habitat*. Population studies in Wildlife Research 21: Page(s) 175-187.

Keighery, B.J. (1994) Bushland plant survey. A guide to plant community survey for the community. Wildflower Society of WA (Inc.), Nedlands, Western Australia.

Landgate (2017). Home - Landgate. [ONLINE] Available at: http://www.landgate.wa.gov.au. [Accessed 12 June 2017].

Leonard (1991) *Yallingup Sheet 1930 IV and Part Sheet 1830 I*, Geological Survey of Western Australia, 1:50,000 Environmental Geology Series

Marchant, S. & P.J. Higgins, eds. (1993). *Handbook of Australian, New Zealand and Antarctic Birds*. Volume Two - Raptors to Lapwings. Melbourne, Victoria: Oxford University Press.

Morcombe, M. (2004) *Field Guide to Australian Birds*. Steve Parish Publishing, Archerfiled, Queensland.

Sorena M. and T. Soderquist (1995), *Western Quoll Dasyurus geoffroyi*. pp 62-64 in Strahan R. (ed). (1995). The Mammals of Australia. Australian Museum / Reed Books.

Wayne, A.F., Rooney J. F., Ward C. G., Vellios V.C., and Lindenmayer D.B. (2005). *The life history of Pseudocheirus occidentalis (Pseudocheiridae) in the jarrah forest of south-western Australia*. Australian Journal of Zoology 53, 325-337.