Arboricultural Impact Assessment

Proposed Wastewater System at

18-20 Sturdee Lane, Lovett Bay

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1 Contents

2 Summary

This Arboricultural Impact Assessment (AIA) is based on one hundred and twelve (112) trees located at 18-20 Sturdee Lane, Lovett Bay (subject site). The proposed works include installation of a new wastewater effluent treatment system.

Refer to the Tree Assessment Table (Attachment A) for tree descriptions, Retention Values and Tree Protection Zones. Refer to the Tree Location Plans (Attachment C) for tree locations.

Works are proposed within the Tree Protection Zones of Trees 5-18, 20, 25-27, 31, 32-35, 39, 57, 59, 67, 68, 69, 70, 80, 83. This includes installation of the effluent transfer pipe and flushing main, establishment of the effluent dispersal zones and installation of a new AWTS tank and disinfection unit. Recommendations have been made regarding installation methods and tree protection measures to limit the potential for impact on the retained trees. No notable impact is expected.

Tree 53 (Spotted Gum) is proposed to be removed irrespective of the proposed wastewater system works. This tree is in poor health and poor structural condition with a Short Estimated Remaining Life Expectancy. It is recommended that the trunk and lower branching structure be retained to create habitat opportunities for wildlife.

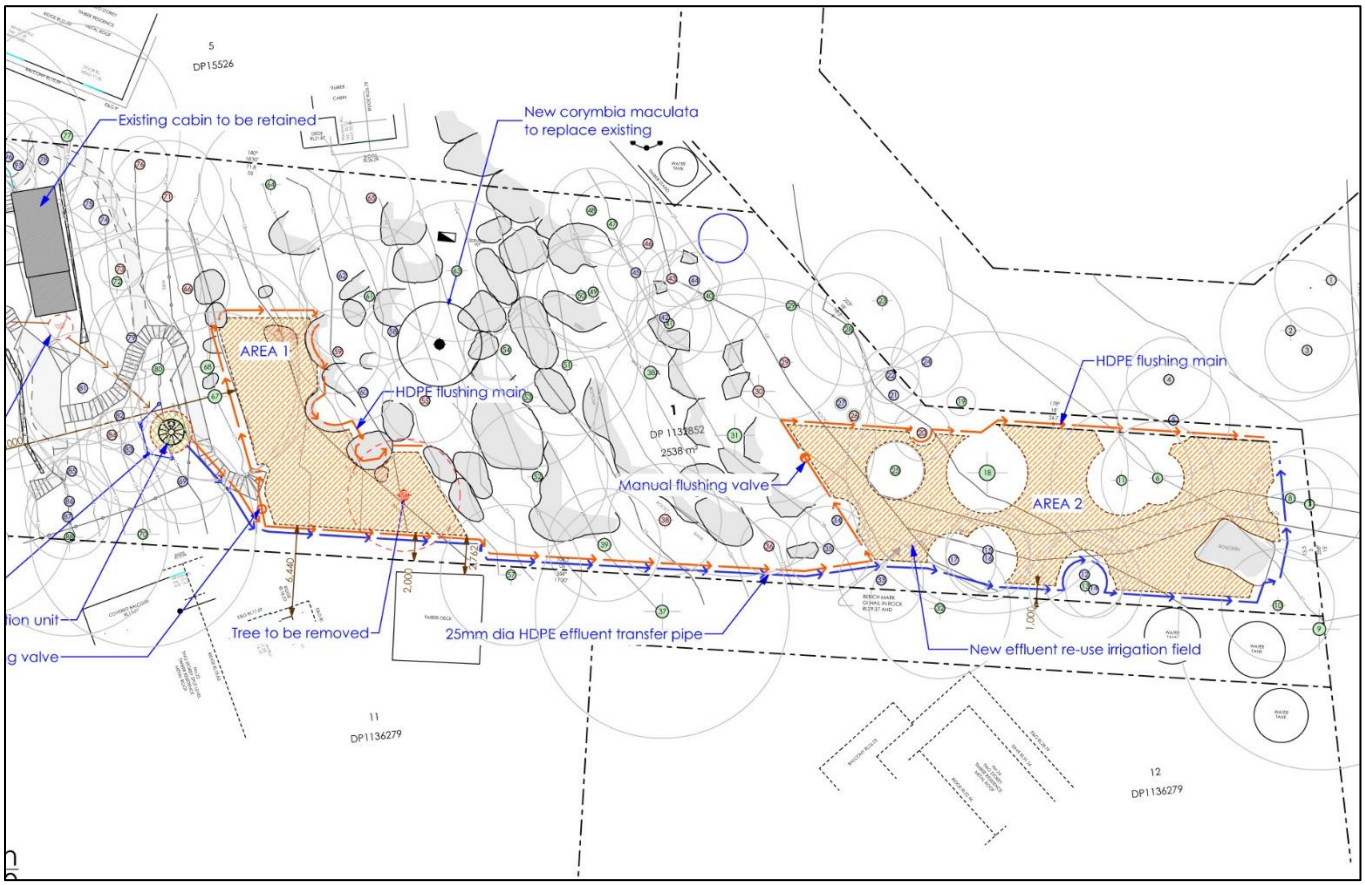

Figure A: Excerpt from the Wastewater System Site Plan showing the area of proposed works.

3 Introduction

3.1 Background

This Arboricultural Impact Assessment (AIA) was prepared for Adam & Fiona Loader in relation to the existing trees and proposed wastewater system at 18-20 Sturdee Lane, Lovett Bay (subject site).

The purpose of this AIA is to assess the likely impacts of the proposed wastewater system on the existing site trees and make recommendations regarding installation methods and tree protection measures to limit adverse impacts on trees recommended for retention.

This AIA has been prepared in accordance with the Australian Standard 4970-2009, *Protection of trees on development sites.*

3.2 Subject Site/Proposed Works

The subject site is the rear of the property and is currently free of built structures.

It is proposed to install a wastewater effluent management system at the rear of the site. This will involve the installation of a new AWTS tank and disinfection unit, installation of 25mm diameter HDPE effluent transfer pipe and flushing main. The treated effluent is to be dispersed through 2 effluent field zones through 13mm dripline (running across the surface, covered under leaf mulch).

3.3 Subject Trees

All trees located on the site and within 5.0m on adjoining properties were assessed. The tree population of the site is made up of locally native species dominated by a Spotted Gum, *Corymbia maculata* overstorey.

All of the assessed trees are protected under Part 3 of SEPP *Vegetation in Non-Rural Areas*, 2107 (Northern Beaches Council).

A detailed description of the subject trees is included in the Tree Assessment Table (Attachment A).

4 Methodology

4.1 Site Inspection

Site inspection and tree assessment was undertaken by Alexis Anderson on the 5th of December, 2018. The trees were assessed from ground level using a Tree Assessment Table, which is included as Attachment A. The definitions and explanations of terms used are outlined in the Tree Table Definitions page which is included at Attachment B.

4.2 Plan Review

The set of Wastewater System Plans prepared by James de Soyres + Associates (WW01-04), dated 08/03/2019 and the Onsite Wastewater Assessment prepared by Martens (March 2019) were reviewed as part of this assessment.

4.3 Tree Protection Zones

Tree assessments in accordance with the Australian Standard 4970-2009, *Protection of trees on development sites*, require calculation of a Tree Protection Zone (TPZ) and Structural Root Zone (SRZ). The following is a brief explanation of these terms:

Tree Protection Zone -TPZ: This is the area that should be isolated from construction disturbance so that the tree remains viable. Some disturbance within the TPZ may be possible following arboricultural assessment.

Structural Root Zone -SRZ: This is the area or undisturbed soil and roots required to maintain tree stability. Excavation within the SRZ can lead to whole tree failure.

Refer to the Tree Assessment Table (Attachment A) for the Tree Protection Zones of the assessed trees.

4.4 Retention Values

Retention values are derived from a combination of Estimated Life Expectancy rating and Landscape and Environmental Significance ratings.

- **HIGH Retention Value**: These trees are worthy of retention and design consideration should be made where possible to allow their retention.
- **MEDIUM Retention Value**: These trees are worthy of retention and minor design consideration should be made to retain these trees wherever possible (e.g. placement of ancillary structures, garden retaining walls, driveway levels).
- **LOW Retention Value**: These trees should not be considered to be a constraint to design layout. Some of these trees should be removed irrespective of any proposed development.

The method of determining and defining retention values used in this report has been derived from the ©Retention Index developed by Tree Wise Men® Australia Pty Ltd.

4.5 Consideration for Tree Retention and Removal

Where demolition of existing structures, excavation or fill is proposed within the Tree Protection Zone (TPZ), arboricultural assessment and sensitive construction methods will be required.

Tree removal recommendations have been based on tree Retention Values and construction offsets. Trees may generally be recommended for removal in the following circumstances:

- Trees located within construction footprints.
- Trees with construction proposed within SRZ where root loss cannot be avoided through sensitive design or careful construction.
- Trees with a TPZ loss of more than 25%, may be recommended for removal providing tree sensitive design cannot be implemented to avoid significant root and canopy loss.
- Trees with low Retention Values may be recommended for removal irrespective of proposed development.

5 Potential Impacts of Proposed Works

5.1 Potential Impacts of Proposal on Retained Trees

Tree Number	Retention Value	Works proposed within the Tree Protection Zone (TPZ)
6, 7, 8, 9, 10, 11, 13, 18, 25, 31, 32, 67, 68	High	Located within (or TPZ within) the effluent dispersal field. The dispersal piping is to be 13mm conduit laid upon the ground surface and covered with leaf litter mulch. No root damage is expected as a result of this. Studies have indicated that irrigation of trees with sewage effluent can have a beneficial impact on growth rates.[1][2]
5, 12, 14, 15, 16, 17, 27, 33, 34, 35	Medium	
20, 26, 59	Low	
7, 8, 10, 13	High	Installation of the HDPE effluent transfer pipe and flushing main is within the Structural Root Zone of these trees. The potential for root injury can be avoided by running the pipe across the ground surface between the gaps in surface boulders and burying the pipe with leaf/woodchip mulch. If shallow excavation is required within the SRZ's, excavation must be undertaken using hand tools with care to avoid root damage. Piping can be threaded above or below any exposed roots as necessary.
5, 12, 14, 16, 17, 39, 57, 67, 68, 70	Medium	
20, 26, 33, 34, 35, 59	Low	
67, 68, 70, 80	High	The new AWTS tank and disinfection unit is proposed within the TPZ of these trees. A base slab will be required beneath the tank. It is likely that the slab level will be cut into the slope with a shallow retaining wall at the rear. Less than 10% of the TPZ area of each tree will be affected. Damage and loss of fine absorbing roots and woody transport roots is likely. No excavation is proposed within the Structural Root Zones. The stability of these trees is unlikely to be compromised.
69, 83	Medium	

Incidental Impacts: There is the potential for incidental/accidental damage to the trunk and shallow roots of all retained trees throughout the wastewater system installation process. Trees are commonly impacted on construction sites in the following ways.

[1] Fatma Hassan & Hayssam Ali, Journal of Forest Industries, 2013 2 (2), 40-44, *Impact of irrigation with sewage effluent on the growth and wood properties of two forest tree seedlings.*

[2] Hayssam et al. Saudi Journal of Biological Science, 2011, 18(2) 201-207, *Use of sewage effluent in irrigation of some woody tree seedlings.*

- Stripping of topsoil and removal of organic material form the soil surface.
- Compaction of the topsoil and damage to surface roots through use of heavy machinery and frequent foot traffic.
- Soil contamination through washing out barrows and disposal or spillage of chemical materials.
- Root loss due to unforeseen excavation for plumbing upgrades and landscape construction.
- Bark/trunk and branch injuries from accidental contact with machinery.

These impacts can be easily avoided through communication with contractors and basic tree protection measures.

5.2 Trees to be removed

Tree 53 (Spotted Gum) is proposed to be removed irrespective of the proposed wastewater system works. This tree is in poor health and poor structural condition with a Short Estimated Remaining Life Expectancy. It is recommended that the trunk and lower branching structure be retained to create habitat opportunities for wildlife.

6 Recommendations

6.1 Site Establishment –Prior to Commencement

Appointment of a Project Arborist: An Arborist with an AQF Level 5 qualification in Arboriculture and experience in tree protection within construction sites should be engaged prior to the commencement of work on the site. The Project Arborist should be present at the following times:

- During excavation for the AWTS tank base stand.
- At any time that excavation is required for the HDPE effluent transfer pipe or flushing main within a Structural Root Zone.
- At project completion to verify tree protection and retention.

Tree Protection Fencing: Considering the steep slope and rocky terrain and lack of machinery required for this project, tree protection fencing is not considered to be necessary for this project.

6.2 During Wastewater System Installation

Tree Protection Zones: Refer to the Tree Assessment Table (Attachment A) for the spread of TPZ's of retained trees. The following should be prohibited within the Tree Protection Zones:

- Stripping of topsoil or organic surface material.
- Storage of material and machinery.
- Disposal of solid, liquid or chemical waste.
- Any excavation, fill or other construction activity other than that discussed in this report.

If the existing groundcover is stripped within a Tree Protection Zone, it should be replaced with leaf and woodchip mulch to a depth of 80mm.

Installation of HDPE effluent transfer pipe and flushing main: The transfer pipe and flushing main pipe should be installed above the ground surface by following a path between the gaps in surface boulders and burying the pipe with leaf/woodchip mulch. If the pipe is required to be buried, all excavation must be undertaken using hand tools with care to avoid root damage. Piping can be threaded above or below any exposed roots as necessary.

AWTS Tank Stand Construction: All excavation for the tank stand must be undertaken using hand tools under the guidance of the Project Arborist. All tree roots within the alignment of the proposed base slab must be cleanly cut using a hand saw or secateurs. The purpose of this is to minimise the surface area of pruning wounds.

7 Statement of Impartiality

- This report prepared by Bluegum Tree Care & Consultancy (BTCC) reflects the impartial and expert opinion of Alexis Anderson.
- BTCC is acting independently of and not as the advocate for the owners of the subject trees.
- BTCC does not undertake tree pruning and removal works and will not have any involvement with pruning or removing trees which are the subject of this report.

8 Limitations

- The findings of this report are based upon and limited to visual examination of trees from ground level without any climbing, internal testing or exploratory excavation.
- The tree assessment was undertaken for the purpose of pre-development planning. Detailed tree risk assessment was not requested or included in the scope of works.
- This report reflects the health and structure of trees at the time of inspection. Bluegum cannot guarantee that a tree will be healthy and safe under all circumstances or for a specified period of time. There is no guarantee that problems or defects with assessed trees, will not arise in the future. Liability will not be accepted for damage to person or property as a result of failure of assessed trees.

Tree No.	Common Name/ Genus Species	DBH (mm)	Height (m)	Canopy Spread Radius (m)	Age Class	Health / Vitality	Structural Condition	Tree Protection Zone (m)	Structural Root Zone (m)	Estimated Life Expectancy (ELE)	Landscape and Environmental Significance	Retention Value	Comments	Works Proposed Within the Tree Protection Zone	Recommended Action.
5	Forest She Oak, *Allocasuarina torulosa*	170	12	3	M	F	G	2.0	1.7	Medium (10-30 yrs)	3	Medium		The HDPE flushing main line is within the TPZ/SRZ. Wastewater effluent field within the TPZ.	Retain
6	Forest She Oak, *Allocasuarina torulosa*	250	14	5	M	G	G	3.0	1.9	Medium (10-30 yrs)	2	High		Wastewater effluent field within the TPZ.	Retain
7	Forest She Oak, *Allocasuarina torulosa*	300	14	5	M	G	G	3.6	2.1	Medium (10-30 yrs)	2	High		The HDPE effluent transfer pipe is within the TPZ/SRZ. Wastewater effluent field within the TPZ.	Retain
8	Spotted Gum, *Corymbia maculata*	180	22	3	M	G	G	2.2	1.7	Long (30+ yrs)	2	High		The HDPE effluent transfer pipe is within the TPZ/SRZ. Wastewater effluent field within the TPZ.	Retain
9	Spotted Gum, *Corymbia maculata*	900	26	12	M	G	G	10.8	3.2	Long (30+ yrs)	1	High		Wastewater effluent field within the TPZ.	Retain
10	Forest She Oak, Allocasuarina torulosa	300	13	5	M	G	G	3.6	2.1	Medium (10-30 yrs)	2	High		The HDPE effluent transfer pipe is within the TPZ/SRZ. Wastewater effluent field within the TPZ.	Retain
11	Spotted Gum, *Corymbia maculata*	450	26	12	M	G	G	5.4	2.5	Long (30+ yrs)	2	High		Wastewater effluent field within the TPZ.	Retain
12	Spotted Gum, *Corymbia maculata*	200	12	3	M	F	G	2.4	1.8	Long (30+ yrs)	3	Medium		The HDPE effluent transfer pipe is within the TPZ/SRZ. Wastewater effluent field within the TPZ.	Retain
13	Spotted Gum, *Corymbia maculata*	300	18	4	M	F	G	3.6	2.1	Long (30+ yrs)	2	High		The HDPE effluent transfer pipe is within the TPZ/SRZ. Wastewater effluent field within the TPZ.	Retain
14	Forest She Oak, *Allocasuarina torulosa*	150	7	3	M	G	G	2.0	1.6	Medium (10-30 yrs)	3	Medium		The HDPE effluent transfer pipe is within the TPZ/SRZ. Wastewater effluent field within the TPZ.	Retain
15	Spotted Gum, *Corymbia maculata*	200	15	3	M	F	G	2.4	1.8	Long (30+ yrs)	3	Medium		Wastewater effluent field within the TPZ.	Retain
16	Spotted Gum, *Corymbia maculata*	290	15	4	M	F	G	3.5	2.1	Long (30+ yrs)	3	Medium		The HDPE effluent transfer pipe is within the TPZ/SRZ. Wastewater effluent field within the TPZ.	Retain
17	Forest She Oak, *Allocasuarina torulosa*	250	8	4	M	F	G	3.0	1.9	Medium (10-30 yrs)	3	Medium		The HDPE effluent transfer pipe is within the TPZ/SRZ. Wastewater effluent field within the TPZ.	Retain
18	Spotted Gum, *Corymbia maculata*	660	28	12	M	G	F	7.9	2.9	Long (30+ yrs)	1	High		Wastewater effluent field within the TPZ.	Retain
19	Spotted Gum, *Corymbia maculata*	190	20	3	M	F	G	2.3	1.7	Long (30+ yrs)	2	High		Nil.	Retain

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20	Spotted Gum, *Corymbia maculata*	250	17	2	M	F	F	3.0	1.9	Short (0-10 yrs)	3	Low	Canopy decline.	The HDPE flushing main line is within the TPZ/SRZ. Wastewater effluent field within the TPZ.	Retain
21	Spotted Gum, *Corymbia maculata*	150	13	2	EM	F	G	2.0	1.6	Long (30+ yrs)	3	Medium		Nil.	Retain
22	Spotted Gum, *Corymbia maculata*	150	13	2	EM	F	G	2.0	1.6	Long (30+ yrs)	3	Medium		Nil.	Retain
23	Spotted Gum, *Corymbia maculata*	430	25	5	M	F	G	5.2	2.4	Long (30+ yrs)	2	High		Nil.	Retain
24	Spotted Gum, *Corymbia maculata*	200, 100	13	2	EM	F	G	3.0	1.9	Long (30+ yrs)	3	Medium		Nil.	Retain
25	Spotted Gum, *Corymbia maculata*	300	13	4	M	F	G	3.6	2.1	Long (30+ yrs)	2	High		Wastewater effluent field within the TPZ.	Retain
26	Spotted Gum, *Corymbia maculata*	100	7	1	EM	P	F	2.0	1.5	Short (0-10 yrs)	4	Low	Almost dead.	The HDPE flushing main line is within the TPZ/SRZ. Wastewater effluent field within the TPZ.	Retain
27	Spotted Gum, *Corymbia maculata*	150	12	1	EM	F	G	2.0	1.5	Long (30+ yrs)	3	Medium		Nil.	Retain
28	Spotted Gum, *Corymbia maculata*	300	23	4	M	F	G	3.6	2.1	Medium (10-30 yrs)	2	High		Nil.	Retain
29	Dead Tree	200	18	_	_	_	_	_	_	_	5	Low		Nil.	Retain as habitat
29A	Cheese Tree, *Glochidion ferdinandi*	200	8	5	M	G	G	2.4	1.8	Long (30+ yrs)	2	High		Nil.	Retain
30	Dead Tree	600	25	_	_	_	_	_	_	_	5	Low		Nil.	Retain as habitat
31	Spotted Gum, *Corymbia maculata*	850	30	10	M	G	G	10.2	3.1	Long (30+ yrs)	2	High		Wastewater effluent field within the TPZ.	Retain
32	Spotted Gum, *Corymbia maculata*	400	19	6	M	F	G	4.8	2.3	Long (30+ yrs)	2	High		Wastewater effluent field within the TPZ.	Retain
33	Spotted Gum, *Corymbia maculata*	220	16	3	M	F	G	2.6	1.9	Medium (10-30 yrs)	3	Medium		The HDPE effluent transfer pipe is within the TPZ/SRZ. Wastewater effluent field within the TPZ.	Retain

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34	Spotted Gum, *Corymbia maculata*	160	17	2	M	F	G	2.0	1.6	Medium (10-30 yrs)	3	Medium		The HDPE effluent transfer pipe is within the TPZ/SRZ. Wastewater effluent field within the TPZ.	Retain
35	Spotted Gum, *Corymbia maculata*	190	18	3	M	F	G	2.3	1.7	Medium (10-30 yrs)	3	Medium		The HDPE flushing main line is within the TPZ/SRZ. Wastewater effluent field within the TPZ.	Retain
36	Spotted Gum, *Corymbia maculata*	180	19	2	M	P	F	2.2	1.6	Short (0-10 yrs)	3	Low	In an advanced state of decline.	Nil.	Retain
37	Spotted Gum, *Corymbia maculata*	800	27	9	M	G	G	9.6	3.1	Long (30+ yrs)	2	High		Nil.	Retain
38	Forest She Oak, *Allocasuarina torulosa*	300, 200	8	_	_	_	_	_	_	_	_	Low	Dead.	Nil.	Retain
38A	Spotted Gum, *Corymbia maculata*	500, 150	28	9	M	G	G	6.5	2.7	Long (30+ yrs)	2	High		Nil.	Retain
39	Spotted Gum, *Corymbia maculata*	800	27	11	M	F	F	9.6	3.1	Medium (10-30 yrs)	2	High		The HDPE flushing main line and transfer pipe is within the TPZ/SRZ.	Retain
40	Spotted Gum, *Corymbia maculata*	450, 200	25	5	M	P	G	7.0	2.6	Medium (10-30 yrs)	2	High	Thinnning of the canopy.	Nil.	Retain
41	Spotted Gum, *Corymbia maculata*	300	22	4	M	F	G	3.6	2.1	Long (30+ yrs)	2	High		Nil.	Retain
42	Spotted Gum, *Corymbia maculata*	190	11	2	EM	F	G	2.3	1.7	Long (30+ yrs)	3	Medium		Nil.	Retain
43	Spotted Gum, *Corymbia maculata*	200	12	1	EM	P	P	2.4	1.8	Short (0-10 yrs)	4	Low	Almost dead.	Nil.	Retain
44	Spotted Gum, *Corymbia maculata*	120	12	1	EM	F	F	2.0	1.5	Long (30+ yrs)	3	Medium		Nil.	Retain
45	Spotted Gum, *Corymbia maculata*	150	16	1	EM	F	G	2.0	1.5	Medium (10-30 yrs)	3	Medium	Supressed.	Nil.	Retain
46	Spotted Gum, *Corymbia maculata*	200	22	2	M	P	F	2.4	1.8	Short (0-10 yrs)	3	Low	Canopy thinning. Supressed.	Nil.	Retain
47	Spotted Gum, *Corymbia maculata*	280	25	3	M	F	G	3.4	2.0	Medium (10-30 yrs)	2	High	Canopy thinning.	Nil.	Retain

Tree No.	Common Name/ Genus Species	DBH (mm)	Height (m)	Canopy Spread Radius (m)	Age Class	Health / Vitality	Structural Condition	Tree Protection Zone (m)	Structural Root Zone (m)	Estimated Life Expectancy (ELE)	Landscape and Environmental Significance	Retention Value	Comments	Works Proposed Within the Tree Protection Zone	Recommended Action.
48	Spotted Gum, *Corymbia maculata*	340	25	4	M	F	G	4.1	2.2	Medium (10-30 yrs)	2	High	Canopy thinning.	Nil.	Retain
49	Spotted Gum, *Corymbia maculata*	340	25	6	M	F	G	4.1	2.2	Medium (10-30 yrs)	2	High	Canopy thinning.	Nil.	Retain
50	Cheese Tree, *Glochidion ferdinandi*	200	9	5	M	G	G	2.4	1.8	Long (30+ yrs)	2	High		Nil.	Retain
51	Spotted Gum, *Corymbia maculata*	500	24	7	M	G	G	6.0	2.6	Long (30+ yrs)	2	High		Nil.	Retain
52	Forest She Oak, *Allocasuarina torulosa*	600	13	5	M	F	F	7.2	2.8	Medium (10-30 yrs)	2	High		Nil.	Retain
53	Forest She Oak, *Allocasuarina torulosa*	410	12	5	M	F	F	4.9	2.4	Medium (10-30 yrs)	2	High		Nil.	Retain
54	Forest She Oak, *Allocasuarina torulosa*	310	12	4	M	F	F	3.7	2.1	Medium (10-30 yrs)	2	High		Nil.	Retain
55	Dead Tree	300	22	_	_	_	_	_	_	_	5	Low	Dead.	Nil.	Retain
56	Spotted Gum, *Corymbia maculata*	440	20	6	LM	P	P	5.3	2.4	Short (0-10 yrs)	3	Low	In an advanced state of decline. Severe trunk wound from 0-2 metres.	Nil.	Remove. Retain trunk and lower branching structure for wildlife habitat.
57	Red Bloodwood, *Corymbia gummifera*	500	18	6	M	F	F	6.0	2.6	Medium (10-30 yrs)	2	High	Cavity at the base. Good butress root support.	The HDPE flushing main line and transfer pipe is within the TPZ/SRZ.	Retain
58	Spotted Gum, *Corymbia maculata*	200	18	2	M	P	F	2.4	1.8	Medium (10-30 yrs)	3	Medium	Supressed. In decline.	Nil.	Retain
59	Forest She Oak, *Allocasuarina torulosa*	550	13	5	LM	P	F	6.6	2.7	Short (0-10 yrs)	3	Low	Declining health. Dieback of the upper canopy. Severe trunk cavity at the base.	The HDPE flushing main line is within the TPZ/SRZ. Wastewater effluent field within the TPZ.	Retain
60	Blueberry Ash, *Eleaocarpus reticulatis*	120	8	3	M	G	G	2.0	1.5	Medium (10-30 yrs)	3	Medium		Nil.	Retain
61	Spotted Gum, *Corymbia maculata*	540	25	7	M	F	G	6.5	2.7	Long (30+ yrs)	2	High	Dead branches.	Nil.	Retain
62	Red Bloodwood, *Corymbia gummifera*	300	12	3	M	F	F	3.6	2.1	Medium (10-30 yrs)	3	Medium	Supressed.	Nil.	Retain

Tree No.	Common Name/ Genus Species	DBH (mm)	Height (m)	Canopy Spread Radius (m)	Age Class	Health / Vitality	Structural Condition	Tree Protection Zone (m)	Structural Root Zone (m)	Estimated Life Expectancy (ELE)	Landscape and Environmental Significance	Retention Value	Comments	Works Proposed Within the Tree Protection Zone	Recommended Action.
63	Spotted Gum, *Corymbia maculata*	500	26	7	M	F	F	6.0	2.6	Medium (10-30 yrs)	2	High	Upper canopy thinning.	Nil.	Retain
64	Spotted Gum, *Corymbia maculata*	420	25	6	M	F	G	5.0	2.4	Long (30+ yrs)	2	High		Nil.	Retain
65	Red Bloodwood, *Corymbia gummifera*	300	12	3	M	P	P	3.6	2.1	Short (0-10 yrs)	3	Low	Almost dead.	Nil.	Retain
66	Forest She Oak, *Allocasuarina torulosa*	350	12	3	LM	P	G	4.2	2.2	Short (0-10 yrs)	3	Low		Nil.	Retain
67	Spotted Gum, *Corymbia maculata*	250, 250, 200	20	6	M	G	G	4.9	2.3	Long (30+ yrs)	2	High		The new AWTS tank stand is proposed within the TPZ. The HDPE flushing main line is within the TPZ/SRZ. Wastewater effluent field within the TPZ.	Retain
68	Spotted Gum, *Corymbia maculata*	450	27	8	M	G	G	5.4	2.4	Long (30+ yrs)	2	High		The new AWTS tank stand is proposed within the TPZ. The HDPE flushing main line is within the TPZ/SRZ. Wastewater effluent field within the TPZ.	Retain
69	Forest She Oak, *Allocasuarina torulosa*	200	11	3	M	F	G	2.4	1.8	Medium (10-30 yrs)	3	Medium		The new AWTS tank stand is proposed within the TPZ.	Retain
70	Spotted Gum, *Corymbia maculata*	550	22	8	M	G	G	6.6	2.6	Long (30+ yrs)	2	High		The HDPE flushing main line and transfer pipe is within the TPZ/SRZ. The new AWTS tank stand is proposed within the TPZ.	Retain
71	Cheese Tree, *Glochidion ferdinandi*	400	10	4	LM	P	G	4.8	2.3	Short (0-10 yrs)	3	Low	Covered with vine. Almost dead.	Nil.	Retain
72	Forest She Oak, *Allocasuarina torulosa*	450, 200	16	6	M	F	G	5.9	2.5	Long (30+ yrs)	2	High	Vine is starting to smother the canopy.	Nil.	Retain
73	Spotted Gum, *Corymbia maculata*	100	7	1	EM	P	G	2.0	1.5	Short (0-10 yrs)	4	Low	Almost dead.	Nil.	Retain
74	Spotted Gum, *Corymbia maculata*	100	8	1	EM	F	G	2.0	1.5	Medium (10-30 yrs)	3	Medium	Supressed.	Nil.	Retain
75	Narrow-leaved Geebung, *Persoonia linearis*	150	5	2	M	F	G	2.0	1.5	Medium (10-30 yrs)	3	Medium	Supressed.	Nil.	Retain
76	Umbrella Tree, *Schefflera actinophylla*	90, 90, 90	7	2	M	G	G	2.0	1.5	Long (30+ yrs)	4	Low	Weed species. Exempt from protection under the LEP.	Nil.	Retain

Tree No.	Common Name/ Genus Species	DBH (mm)	Height (m)	Canopy Spread Radius (m)	Age Class	Health / Vitality	Structural Condition	Tree Protection Zone (m)	Structural Root Zone (m)	Estimated Life Expectancy (ELE)	Landscape and Environmental Significance	Retention Value	Comments	Works Proposed Within the Tree Protection Zone	Recommended Action.
77	Spotted Gum, *Corymbia maculata*	530	26	8	M	F	G	6.4	2.6	Long (30+ yrs)	2	High	Dead branches in the lower canopy.	Nil.	Retain
78	Fiddle Leaf Fig, *Ficus lyrata*	80, 80	8	3	M	G	G	2.0	1.5	Long (30+ yrs)	3	Medium		Nil.	Retain
79	Spotted Gum, *Corymbia maculata*	230	13	3	EM	F	G	2.8	1.9	Long (30+ yrs)	3	Medium		Nil.	Retain
80	Red Bloodwood, *Corymbia gummifera*	630	24	10	M	F	G	7.6	2.8	Long (30+ yrs)	2	High	Large dead limb in the lower canopy.	The new AWTS tank stand is proposed within the TPZ.	Retain
81	Blueberry Ash, *Eleaocarpus reticulatis*	200, 150	10	4	M	F	G	3.0	1.8	Long (30+ yrs)	3	Medium	Canopy smothered by vine.	Nil.	Retain
82	Sweet Pittosporum, *Pittosporum undulatum*	120, 80	7	2	M	G	G	2.0	1.5	Long (30+ yrs)	3	Medium		Nil.	Retain
83	Spotted Gum, *Corymbia maculata*	180	4	3	EM	G	G	2.2	1.6	Long (30+ yrs)	3	Medium		The new AWTS tank stand is proposed within the TPZ.	Retain
84	Sweet Pittosporum, *Pittosporum undulatum*	90	4	1	EM	P	G	2.0	1.5	Short (0-10 yrs)	4	Low	Poor health.	Nil.	Retain
85	Ginkgo Tree, *Ginkgo biloba*	50	4	1	EM	F	G	2.0	1.5	Long (30+ yrs)	3	Medium		Nil.	Retain
86	Blueberry Ash, *Eleaocarpus reticulatis*	190	9	3	M	F	G	2.3	1.7	Medium (10-30 yrs)	3	Medium	Pockets of decay at the base.	Nil.	Retain
87	Blueberry Ash, *Eleaocarpus reticulatis*	120	7	3	M	F	G	2.0	1.5	Medium (10-30 yrs)	3	Medium		Nil.	Retain
88	Spotted Gum, *Corymbia maculata*	500	25	7	M	G	G	6.0	2.5	Long (30+ yrs)	2	High		Nil.	Retain
89	Spotted Gum, *Corymbia maculata*	350, 280	23	7	M	G	G	5.4	2.4	Long (30+ yrs)	2	High		Nil.	Retain
90	Kentia Palm, *Howea forsteriana*	100	8	2	M	G	G	2.0	1.5	Long (30+ yrs)	3	Medium	Part of a group of 6 Palm Trees -(mostly Bangalow Palms).	Nil.	Retain
91	Golden Robinia, *Robinia pseudoacacia* 'Frisia'	200	8	5	M	G	G	2.4	1.7	Long (30+ yrs)	3	Medium		Nil.	Retain
92	Cypress Pine, *Cupressus sp.*	530	17	3	M	G	G	6.4	2.6	Long (30+ yrs)	2	High		Nil.	Retain
93	Spotted Gum, *Corymbia maculata*	930	28	10	M	F	G	11.2	3.2	Long (30+ yrs)	2	High	Dead branches in the lower and central canopy.	Nil.	Retain

Tree No.	Common Name/ Genus Species	DBH (mm)	Height (m)	Canopy Spread Radius (m)	Age Class	Health / Vitality	Structural Condition	Tree Protection Zone (m)	Structural Root Zone (m)	Estimated Life Expectancy (ELE)	Landscape and Environmental Significance	Retention Value	Comments	Works Proposed Within the Tree Protection Zone	Recommended Action.
94	Sweet Viburnum, *Viburnum odoratissimum*	250	5	5	M	G	G	3.0	1.9	Long (30+ yrs)	3	Medium		Nil.	Retain
95	Forest She Oak, *Allocasuarina torulosa*	180	9	3	M	G	G	2.2	1.7	Medium (10-30 yrs)	3	Medium		Nil.	Retain
96	Fiddle Leaf Fig, *Ficus lyrata*	100	7	4	M	G	G	2.0	1.5	Long (30+ yrs)	3	Medium		Nil.	Retain
97	Umbrella Tree, *Schefflera actinophylla*	70, 60	7	3	M	G	G	2.0	1.5	Long (30+ yrs)	4	Low		Nil.	Retain
98	Fiddle Leaf Fig, *Ficus lyrata*	90	8	3	M	G	G	2.0	1.5	Long (30+ yrs)	3	Medium		Nil.	Retain
99	Blueberry Ash, *Eleaocarpus reticulatis*	90	7	1	EM	F	F	2.0	1.5	Medium (10-30 yrs)	3	Medium	Trunk decay at the base.	Nil.	Retain
100	Blueberry Ash, *Eleaocarpus reticulatis*	90	7	1	EM	G	G	2.0	1.5	Medium (10-30 yrs)	3	Medium		Nil.	Retain
101	Fiddle Leaf Fig, *Ficus lyrata*	100	8	3	M	G	G	2.0	1.5	Long (30+ yrs)	3	Medium		Nil.	Retain
102	Spotted Gum, *Corymbia maculata*	340	23	8	M	G	G	4.1	2.2	Long (30+ yrs)	2	High		Nil.	Retain
103	Spotted Gum, *Corymbia maculata*	180	10	2	EM	P	F	2.2	1.7	Medium (10-30 yrs)	3	Medium		Nil.	Retain
104	Spotted Gum, *Corymbia maculata*	160	8	2	EM	F	F	2.0	1.6	Medium (10-30 yrs)	3	Medium	Supressed. Canopy skew to the N.	Nil.	Retain
105	Sweet Pittosporum, *Pittosporum undulatum*	300	8	3	M	F	G	3.6	2.1	Medium (10-30 yrs)	3	Medium		Nil.	Retain
106	Spotted Gum, *Corymbia maculata*	300	16	4	M	F	G	3.6	2.1	Long (30+ yrs)	3	Medium		Nil.	Retain
107	Magnolia, *Magnolia grandiflora*	200	7	4	M	G	G	2.4	1.8	Long (30+ yrs)	3	Medium		Nil.	Retain
108	Spotted Gum, *Corymbia maculata*	50	7	1	IM	F	G	2.0	1.5	Medium (10-30 yrs)	3	Medium	Supressed. Canopy skew to the NW.	Nil.	Retain
109	Spotted Gum, *Corymbia maculata*	310	20	5	M	F	G	3.7	2.1	Long (30+ yrs)	3	Medium		Nil.	Retain
110	Cypress Pine, *Cupressus sp.*	350	16	4	M	G	G	4.2	2.2	Long (30+ yrs)	2	High		Nil.	Retain
111	Norfolk Island Pine, *Araucaria heterophylla*	640	23	7	M	G	G	7.7	2.8	Long (30+ yrs)	2	High		Nil.	Retain
112	Spotted Gum, *Corymbia maculata*	400	12	6	M	F	G	4.8	2.3	Long (30+ yrs)	2	High		Nil.	Retain

Attachment B: TREE ASSESSMENT DEFINITIONS

Height. Tree height is estimated from ground level. This assessment is made independently of data plotted on survey plan. These measurements have not been confirmed with clinometer or other surveying instrument.

Diameter at Breast Height (DBH). Trunk diameter is measured at 1.4 metres above ground level. A diameter tape is used which calculates the diameter from a measurement of the circumfrence. DBH is primarily used for the calculation of the TPZ and SRZ.
If a tree has more than 4 trunks, the diameter of the four largest trunks is recorded. For irregular trunk formations the DBH is calculated as outlined in Appendix A of AS4970-2009 -*Protection of Trees on Development Sites*.

Canopy Spread Radius. Average canopy spread radius is estimated from the centre of trunk to the outer edge of canopy. Refer to Comments column for detail of heavily skewed canopy spread.

Age Class - This is an estimation of the tree's current age class based on size, growth habit, local environmental conditions and comparison with surrounding trees.

- **Immature (IM)**: This is a juvenile specimen that is likely to have germinated within the previous 5 years.
- **Early Mature (EM)**: This is a tree that is established within its growing environment, though has not reached an age of reproductive maturity or the natural growth habit of a mature individual.
- **Mature (M)**: This is a tree has reached both reproductive maturity and a physical form and shape typical for the species. Trees can have a Mature Age Class for the majority of their life span.
- **Late-Mature (LM)**: There trees show early signs of senescence with symptoms such as reduced canopy density and an accumulation of dead branches.
- **Over-mature (OM)**: These trees show symptoms of irreversible decline such as canopy dieback with dead branches concentrated in the upper canopy.

Health/Vitality - Good (G), Fair (F) or Poor (P). This is primarily based on the extent of vigorous new foliage growth at branch tips and the colour, size and density of foliage generally. The percentage of live branches to dead branches is considered. The location of any dead branches is also considered. The presence of any pest or disease is considered as part of this assessment. Health can vary with climatic conditions.

Structural Condition - **Good (G), Fair (F) or Poor (P).** This is an assessment of tree structure and stability. Root anchorage, trunk lean, structural defects, canopy skew and any hazardous features are considered. Dead branches can be considered as part of Structural Condition if they are of a size and location that could cause injury or property damage.

Tree Protection Zone (TPZ). This is a radial distance of (12X) the DBH measured from centre of trunk. TPZ is rounded to the nearest 0.1 metre. A TPZ should not be less than 2m or greater than 15m. The TPZ for palms and other monocots should not be less than 1m outside of the crown projection. Existing constraints to root spread can vary the TPZ. For a tree to remain viable, construction activity should be excluded or undertaken with care within the TPZ. Disturbance within up to 10% of the TPZ area is considered to be a minor encroachment. Disturbance to more than 10% of the TPZ area is considered a major encroachment. Major encroachment into the TPZ is possible depending on the type of disturbance, and species tolerance to disturbance. Exploratory excavation may be required to quantify the presence of roots at the alignment of proposed ground disturbance.
This is based upon the Australian Standard AS 4970, 2009, *Protection of trees on development sites* and the Matheney & Clarke "*Guidelines for adequate tree preservation zones for healthy, structurally stable trees*".

Structural Root Zone (SRZ). This is a radial distance based on the following formula- **SRZ =(D x 50) $^{0.42}$ x 0.64** (for trees less than 150mm Diameter, a minimum SRZ of 1.5 metres). SRZ measurements are rounded to the nearest 0.1m. .
The Structural Root Zone is the area of soil and roots required to maintain tree stability. Excavation within the SRZ can result in whole tree failure. Fully elevated construction is possible within SRZ with specific rootzone assessment. Existing constraints to root spread can vary the SRZ. This method of determining SRZ is outlined at Section **3.3.5** of Australian Standard AS 4970, 2009, *Protection of trees on development sites.*

Estimated Remaining Life Expectancy: This gives a length of time that the Arborist believes a particular tree can be retained from the time of assessment with an acceptable level of risk based on the information available at the time of the inspection. This system of rating does not take into consideration the likely impacts of any proposed development. Ratings are **Long** (retainable for 30 years or more with an acceptable level of risk), **Medium** (retainable for 10-30 years), **Short** (retainable for 0-10 years) and **Removal** (tree requiring removal due to risk/hazard or absolute unsuitability).

Landscape & Environmental Significance*. This is an assessment of the impact of the tree on the surrounding landscape amenity and natural environment. Rarity, habitat value, physical prominence, historical and cultural significance of the tree are considered in this rating system. The Landscape & Environmental Value ratings used in this report are:

1. Very High Value: This is an outstanding specimen that holds irreplaceable environmental, landscape or cultural value.

2. High Value: An excellent specimen that holds environmental, landscape or cultural value that is present in other site trees or that could be replaced.

3. Moderate Value: Can be a good to fair specimen with environmental, landscape or cultural value that is common within other trees in the locality.

4. Low Value: Removal would not result in any loss of site amenity or environmental value. Can include undesirable or weed species or trees growing in unsuitable locations.

5. Very Low Value : Dead or hazardous with no other environmental or cultural value. Could also include weed species. These trees should be removed or pruned in a way to make safe irrespective of any development.

***Note**: The concept of using a five (5) point scale to assess tree significance was derived from the Tree Wise Men® Australia Pty Ltd ©Significance Rating Scale.

Retention Value*. Retention values are derived from a combination of Estimated Life Expectancy rating and Landscape and Environmental Significance ratings.

<table>
<tr><td rowspan="6">Landscape & Environmental Significance</td><td></td><td colspan="4">Estimated Life Expectancy</td></tr>
<tr><td></td><td>Long</td><td>Medium</td><td>Short</td><td>Removal</td></tr>
<tr><td>Very High (1)</td><td colspan="2" rowspan="2">HIGH</td><td rowspan="2">MEDIUM</td><td rowspan="2"></td></tr>
<tr><td>High (2)</td></tr>
<tr><td>Medium (3)</td><td colspan="2">MEDIUM</td><td rowspan="3" colspan="2">LOW</td></tr>
<tr><td>Low (4)</td><td colspan="2" rowspan="2"></td></tr>
<tr><td>Very Low (5)</td></tr>
</table>

HIGH Retention Value: These trees are worthy of retention and major design consideration should be made where feasible to allow this.

MEDIUM Retention Value: These trees are worthy of retention and minor design consideration should be made to retain these trees wherever possible (e.g. placement of ancillary structures, garden retaining walls, driveway levels).

LOW Retention Value: These trees should not be considered to be a constraint to design layout. Some of these trees should be removed irrespective of any proposed development.

***Note:** The method of determining and defining retention values used in this report has been derived from the ©Retention Index developed by Tree Wise Men® Australia Pty Ltd.

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FOR APPROVAL PURPOSES ONLY

NOT FOR CONSTRUCTION

Notes: Do not scale from drawings

Note: location of existing buried services is diagrammatic only.

5

DP15526

Bay

Lovett

Domestic water pressure pump

Existing cabin to be retained

Rainwater collection tank below house

Stormwater overflow to Pittwater

Rainwater supply line to house

Rainwater supply line from house

New corym to replace

Existing dwelling to be retained

Waste storage under deck

Existing sewerage collection tank below house

Construction materials storage

Existing cabana to be retained

AREA 1

HDPE flushing main

Existing treatment tank to be demolished and connection diverted to new system

New AWTS tank and disinfection unit

Tree to be removed

25mm dia HDPE effluer

TIMBER JETTY

TIMBER RET. WALL

SEAWALL

RAMP

TIMBER JETTY

BENCH MARK NIAL IN JETTY RL1.46 AHD

TWO STOREY TIMBER RESIDENCE METAL ROOF

RIDGE RL21.08

BALCONY RL15.39

TIMBER CABIN

RIDGE RL26.79

DECK

METAL ROOF

COVERED BALCONY RL12.31

TIMBER DECK

RIDGE RL18.55

E&G RL17.59

33,000

6,440

2,000

2,762

Tree Location Plan

Sheet 1

18-20 Sturdee Lane, Lovett Bay

Bluegum Tree Care and Consultancy®

LEGEND

High Retention Value (SRZ)		Low Retention Value (SRZ)	
Medium Retention Value (SRZ)			

-This plan was prepared with the Wastewater System Detail Plan-North, WW-02, James de Soyres + Associates as a base.

Scale:	Date of printing:
1:200	3/06/2019
Project No:	Drawing No: Rev:
1708a	**WW-02**

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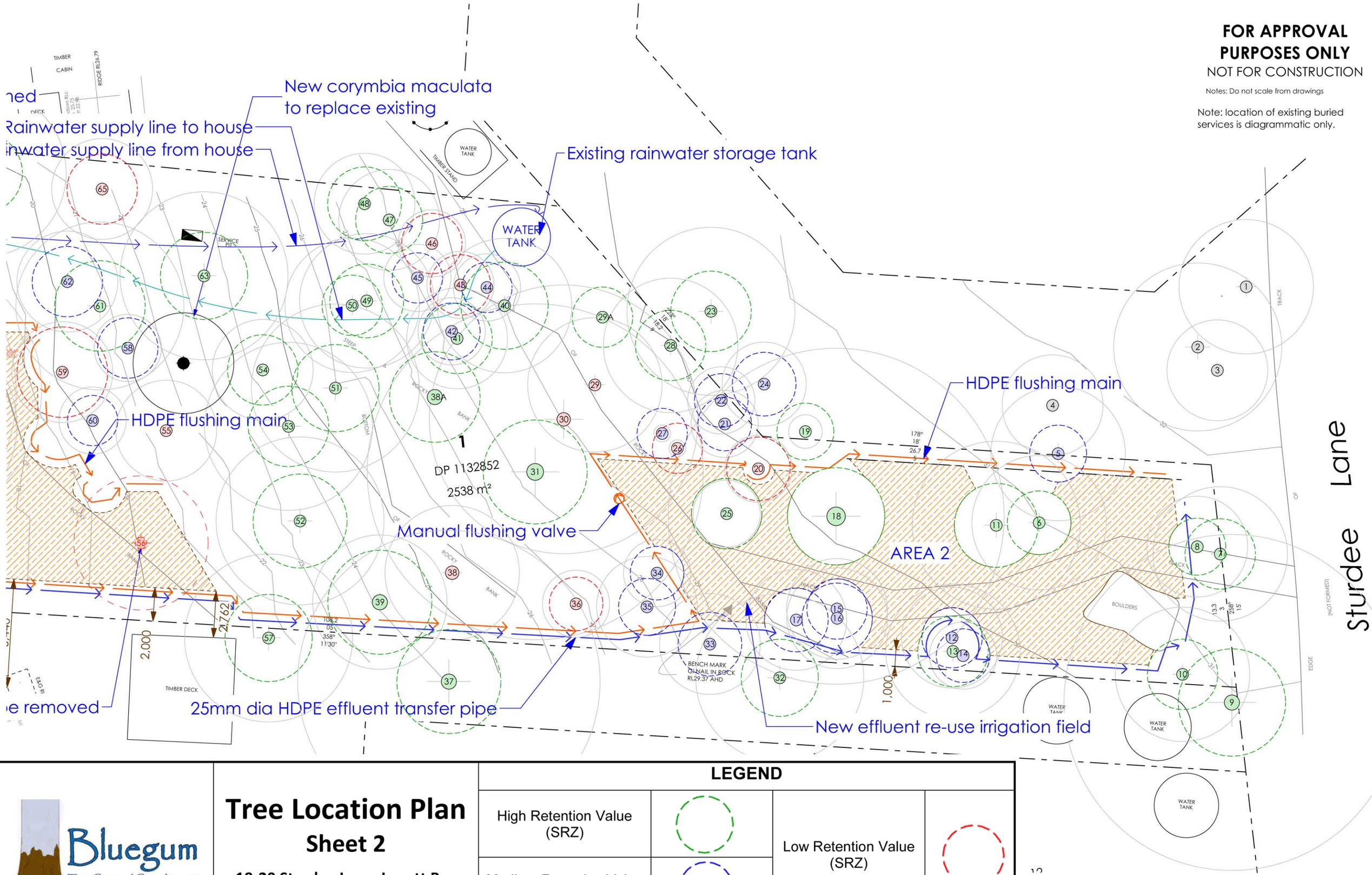
Notes: Do not scale from drawings

Note: location of existing buried services is diagrammatic only.



Tree Location Plan
Sheet 2

18-20 Sturdee Lane, Lovett Bay

Bluegum Tree Care and Consultancy®

LEGEND

High Retention Value (SRZ)		Low Retention Value (SRZ)	
Medium Retention Value (SRZ)			

-This plan was prepared with the Wastewater System Detail Plan-North, WW-03, James de Soyres + Associates as a base.

Scale:	Date of printing:
1:200	3/06/2019

Project No:	Drawing No:	Rev:
1708a	**WW-03**	