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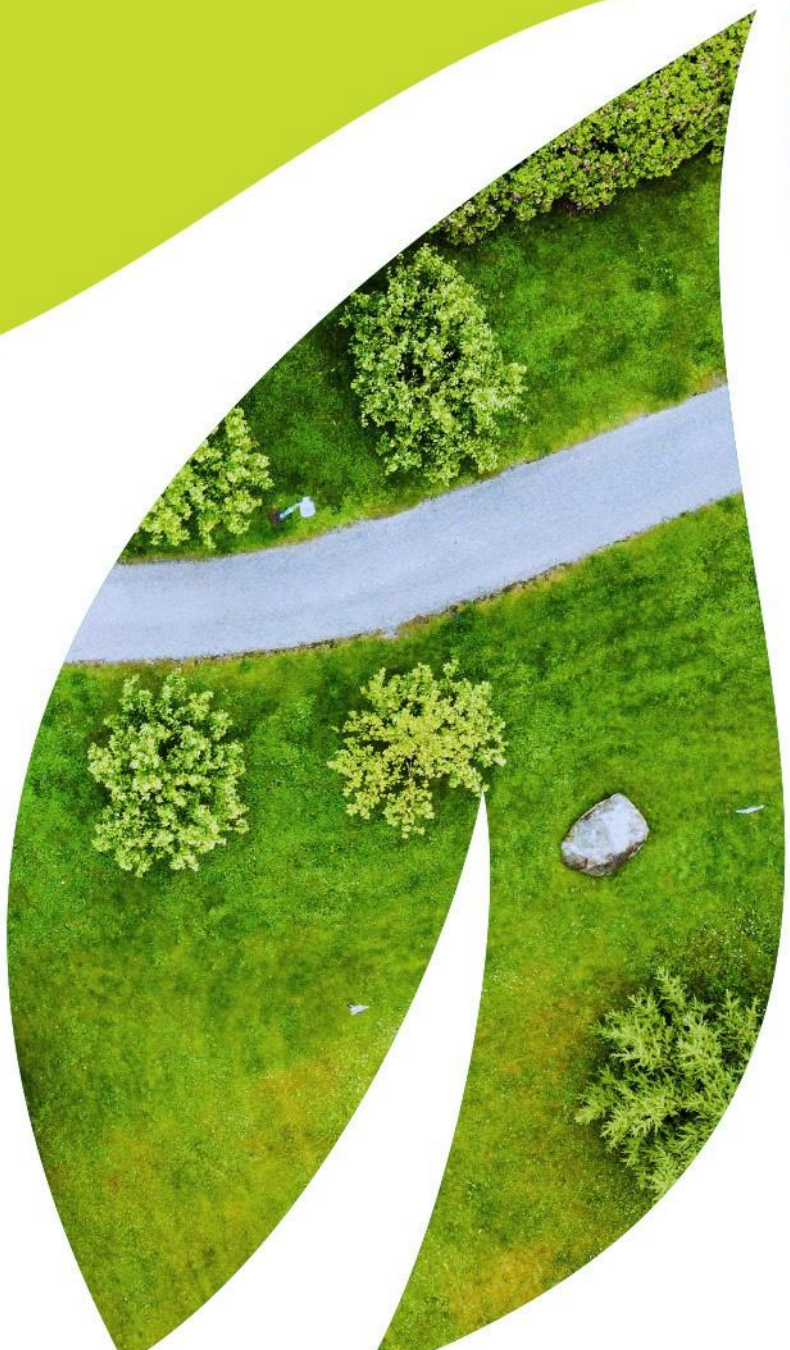
Arboricultural Impact Assessment

Milldale Wastewater Treatment Plant



Arboricultural Impact Assessment

Prepared for: **Woods**

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Statement of Qualifications and Experience

Aaron Norman

I am a consultant arborist at Arborlab Consultancy Services Ltd. Arborlab is a multi-disciplinary consultancy specialising in arboricultural planning. I have been employed at Arborlab since December 2019.

I hold the certificate in arboricultural (Level 4) from Primary ITO, which I completed in 2014.

I have 14 years of professional experience in the arboricultural field. My experience includes contract arboriculture and several Milldale staged projects.

I confirm that, in my capacity as author of this report, I have read and abide by the Environment Court of New Zealand's Code of Conduct for Expert Witnesses Practice Note 2023.

Jon Redfern

I am the principal consultant arborist at Arborlab Consultancy Services Ltd and have been employed at Arborlab since March 2017.

I hold a diploma in horticulture (arboriculture) (Level 6) from Wintec, which I completed in 2004.

I have 10 years of contract arboriculture and 20 years as consultant in the arboricultural field, including roles such as council arborist (seconded). My experience includes tree risk assessments, quality auditing, tree consultancy and management of large residential lots such as other Milldale stages and Tamaki Regeneration projects.

I confirm that, in my capacity as peer report reviewer of this report, I have read and abide by the Environment Court of New Zealand's Code of Conduct for Expert Witnesses Practice Note 2023.

Introduction

This report has been prepared in support of the application by Fulton Hogan Land Development (FHLD) for a resource consent to the Environmental Protection Authority (EPA) under the Fast-Track Approvals Act 2024 (FTAA).

Resource consent is required for the construction and operation of a Wastewater Treatment Plant (WWTP) involving earthworks, wastewater discharges and vegetation removal.

Purpose of the report

1. To identify trees within the project boundary, assess the arboricultural impact of the works, outline regulation triggers and provide recommendations for mitigation.

Summary and Context

2. FHLD has engaged Arborlab Consultancy Services Limited to carry out an arboricultural assessment of effects relating to the proposed construction of a WWTP, within Lot 4 DP 353309, Wainui Road Upper Orewa (the site), adjacent to Lysnar Road and Waterloo Stream. The proposal is part of the Milldale residential development project.

3. The findings and recommendations of this report are based on a visual ground-based assessment undertaken during a site inspection on the 05th of December 2024. The assessment was made referencing draft design plan P24-189-2000-EW-WWTP, provided by Woods.

4. The survey identified 315 trees growing within the site including a riparian margin. For the purposes of this report, the trees have been given identification numbers 1-154, some of these numbers represent groups of trees. The details of the trees are outlined within Appendix A of this report and summarised below:

    - 129 native trees, consisting primarily of *Cordyline australis* and *Kunzea ericoides*
    - 107 non-pest plant exotic trees, consisting primarily of *Populus nigra*
    - 79 pest plant trees, consisting primarily of *Ligustrum sinense*

5. As part of the WWTP project, Waterloo Stream is proposed to be enhanced by removing all 79 pest plants and 15 non-pest plant exotic trees from within the riparian margin, within the project area. The enhancement will also plant new native species and retain all 129 existing native trees.

6. Two of the trees proposed to be removed are golden elm (*Ulmus glabra* 'Lutescens'), as required by the Biosecurity Act 1993, Dutch elm disease biosecurity measures will need to be implemented on-site.

7. There are 92 poplar trees, planted in formed rows, growing within a riparian margin / watercourse that drains into Waterloo Stream. Earthworks for the construction of the WWTP are outside their Protected Root Zones (PRZ) and they will be retained and protected.

8. As the works require alterations to trees growing within a riparian margin, requirements of the Auckland Unitary Plan, chapter E26 Infrastructure have been considered. It is assessed that the removal of pest plant trees will comply with the permitted activity standards outlined in E.26.3.3.1 (A74). Due to the dimensions of the 15 trees exceeding 6m in height and/or 600mm in girth, a restricted discretionary resource consent is required for their removal in accordance with rule E.26.3.3.1 (A77).

9. In accordance with arboricultural best practice, this report references the Structural Root Zone (SRZ) and the Tree Protection Zone (TPZ).

10. The SRZ and TPZ are expressed as a radius measurement from the trunk centre. They are calculated from trunk/stem diameter and shown on Arborlab plans as a circular area around the trunk. However, best practice requires the consideration and assessment of impediments and likelihood of root growth within a tree's TPZ and SRZ. A number of factors can influence root growth, therefore, the TPZ and SRZ measurements can only be considered nominal and the arborist needs to consider all limitations and mitigating factors to assess the adverse effects and to apply any mitigation requirements.

11. A tree protection methodology has been provided for the works that recommends measures to manage and/or mitigate any effects caused by the works being undertaken near the PRZ of the poplar trees being retained. Provided the tree protection methodologies proposed are adhered to, it can be expected that the adverse effects, because of the works, will be negligible.

12. Overall, 94 trees are proposed to be removed, of which 15 require resource consent and mitigation planting.

Site Details

The Wastewater Treatment Plan site (the Site) is located within Lot 4 DP 353309 which has a total area of 10.45 ha. The Site is on the northern side of Lysnar Road, Wainui and is located directly adjacent to the Milldale development and just outside the Wainui Precinct.

The parent site is characterised by undeveloped rural land that has historically been used for farming. The topography of the parent site generally slopes from north-west to south-east and has two stands of poplar trees. There is an unnamed tributary of the Waterloo stream that bisects the southern portion of the site.

The area subject to the works and enhancement planting covers a total land area of approximately 1.21 ha and has been positioned in the southern corner of the parent site, directly adjacent to Lysnar Road as illustrated in Figure 1 below. The works site is generally flat and has been utilised as a construction compound supporting the delivery of ongoing delivery of the Milldale development.

A full description of the Site and surrounds is provided in the application AEE.

13. An overview of the site is outlined on Figure 1 below and proposed within land zoned as Future Urban. The general location of the WWTP is outlined in yellow, the vegetation identified within the riparian margin of Waterloo Steam is outlined in green, the poplar trees within the watercourse are outlined in blue.

Figure 1: Aerial image of the site

Proposed Works

FHLD is seeking approval to authorise the construction and operation of a Wastewater Treatment Plant (WWTP) on Lysnar Road, Wainui. The key elements of the proposal include:

- Site compound;
- Wastewater Treatment Plant;
- Site Establishment;
- Ownership & Operation; and
- Duration & Disestablishment.

A full description of the project is provided in the application AEE.

14. It is proposed to undertake earthworks within the footprint of the WWTP so that a suitable hard surface is established.

15. The edge of the cut is offset from the centre of the watercourse by approximately 20m – 30m and is approximately 35m from the centre of Waterloo Stream. Given the separation between Waterloo Stream and the edge of the cut, it is unlikely that vegetation growing within its riparian margin will be affected by the earthworks, however, all non-native trees are proposed to be removed as part of the

stream enhancement.

16. The removal of trees will be undertaken by a reputable, approved arboricultural contractor to ensure damage to the retained trees and underlying vegetation is minimised.

17. All branches and debris are to be processed through a tree mulcher / chipper which can be used on site if needed, expect for the elm trees which will be processed separately and stored on-site for at least 3 months as per bio-security requirements.

18. Where possible or practical, the tree removal will retain stumps at ground level, which will assist with soil retention during the establishment of the replacement canopy and minimise potential root damage to the retained trees that could occur while removing stumps.

19. The group of poplar trees encompasses approximately 5m – 15m southwest from the centre line of the watercourse. There is an approximate 10m offset between the trees and the edge of the excavations. Given the dimensions of the trees, this places the excavations outside their PRZ, which measures approximately 7m – 8m in radius, and their TPZ which measures approximately 4.2m – 7.6m in radius. It is assessed that it is unlikely that any root activity will be within the footprint of the earthworks.

20. To ensure the poplar trees are protected, the edge of the cut will be clearly marked out prior to excavations commencing. A temporary fence, that will remain in place for the duration of the project, will then be installed along the edge of the line, slightly offset (approx. 500mm) to allow for working space. No works and/or excavations will occur beyond this fence and no materials, debris and/or vehicles etc, will be placed within the root zones of the trees.

21. All works should be undertaken in accordance with the tree protection methodology outlined in Appendix D of this report.

Tree Summary

22. There are 315 trees growing within the project boundary, consisting of 129 native trees, 107 exotic trees and 79 pest plants.

23. The native trees are listed within Table 1 below and the exotic trees are listed within Table 2, with an action (remove / retain) provided for each tree.

Table 1: Native trees identified within the project boundary

Botanical Name	Quant.	Action
Cordyline australis	57	Retain
Cyathea dealbata	14	Retain
Geniostoma ligustrifolium	2	Retain
Kunzea ericoides	23	Retain
Melicytus ramiflorus	11	Retain
Myrsine australis	22	Retain

Table 2: Exotic trees identified within the project boundary

Botanical Name	Quant.	Pest Plant	Action
Populus nigra	92	No	Retain
Acacia dealbata	3	No	Remove
Eucalyptus sp.	5	No	Remove
Pinus pinaster	3	No	Remove
Pinus radiata	1	No	Remove
Prunus sp.	1	No	Remove
Ulmus glabra 'Lutescens'	2	No	Remove
Crataegus monogyna	1	Yes	Remove
Ligustrum sinense	74	Yes	Remove
Salix fragilis	4	Yes	Remove

Advice and Analysis

24. It has been assessed that the works do not enter the root zone of the poplar trees which are proposed to be retained. Isolating these trees from the construction activities will ensure that remain unaffected. Therefore, provided the trees are isolated the potential adverse effects on these trees will be negligible.

25. Of the 94 trees proposed to be removed, 79 have been identified as pest plants within the Regional Pest Management Plan (RPMP) and 15 are exotic non-pest plant trees. Part of the project is to enhance stream through riparian planting, which will include a significant amount of native revegetation/pioneer plants. There are no regulatory standards or guidelines for replacement planting, however, previous replacement planting numbers for Milldale stages have been considered on a 3:1 basis. Using this as a basis, we recommend that replacement planting should include 45 shade trees that can be incorporated into riparian margin planting and develop canopy above the riparian canopy.

Recommendation/s

26. Removal of any vegetation should be undertaken by qualified arborists implementing modern arboricultural techniques, taking care to avoid damage to any retained vegetation.

27. Auditing reports should be compiled by an Appointed Arborist and made available to Auckland Council upon request.

Bio-security Measures

28. The following measures are required when working on or near elm trees.

    (https://www.tiakitamakimakaurau.nz/protect-and-restore-our-environment/pests-in-auckland/pest-search/ophnov/)

    a. You must not distribute, move or release Dutch elm disease within the Auckland region.

    b. You must not move any untreated Dutch elm plant material within the Auckland region.

    c. You must destroy all elm plants on land that you occupy if they are infected with Dutch elm disease and you are directed to do so by an authorised person.

    d. You must mulch any elm plants that you have been instructed to destroy, and you must not move this infected elm material further than 500m from the site of the parent tree for at least three months after mulching.

    e. You must clean all vehicles, machinery or other equipment used in connection with untreated elm material with one of the following disinfectants before moving that vehicle, machinery or equipment off-site: Sterigene, 5% bleach, or 80% ethanol or methylated spirits.

    f. You must not store elm wood for firewood or other purposes.

29. In general, all debris will remain on-site, all equipment and machinery will need to be cleaned and sterilised prior to entering the site and again before leaving.

Authored by
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Reviewed by
Jon Redfern

Appendix A: Vegetation Inventory

Summary data for the trees is outlined in Table 3 below and are ordered with tree requiring resource consent first, because of this the numbers are not sequential.

Table 3: Vegetation of inventory

Tree No.	Quant.	Botanical Name	Height (m)	AUP Girth (mm)	Diameter at 1.4 Metres (cm)	Diameter at Root Crown (cm)	SRZ (m)	TPZ (m)	PRZ (m)	Health	Native	Pest Plant	Action	RC Required
1	2	*Eucalyptus sp.*	12	600	19.1	25.5	1.9	2.3	3	Fair	No	No	Remove	Yes
2	1	*Pinus pinaster*	15	2100	66.8	76.4	3	8	7.5	Fair	No	No	Remove	Yes
3	1	*Pinus pinaster*	15	2050	65.3	73.2	2.9	7.8	7.5	Fair	No	No	Remove	Yes
4	1	*Pinus pinaster*	14	1650	52.5	57.3	2.6	6.3	7	Fair	No	No	Remove	Yes
5	2	*Eucalyptus sp.*	15	1200	38.2	49.3	2.5	4.6	5	Fair	No	No	Remove	Yes
6	2	*Acacia dealbata*	7	750	23.9	28.6	2	2.9	6	Fair	No	No	Remove	Yes
8	1	*Acacia dealbata*	10	780	24.8	29.9	2	3	4	Fair	No	No	Remove	Yes
40	1	*Pinus radiata*	17	1590	50.6	57.6	2.6	6.1	6	Fair	No	No	Remove	Yes
46	1	*Prunus sp.*	4.5	610	19.4	22	1.8	2.3	1.5	Fair	No	No	Remove	Yes
Trees 57 and 58 below require bio-security measures														
57	1	*Ulmus glabra 'Lutescens'*	7	1050	33.4	39.5	2.2	4	5	Fair	No	No	Remove	Yes
58	1	*Ulmus glabra 'Lutescens'*	7	910	29	33.7	2.1	3.5	5	Fair	No	No	Remove	Yes
60	1	*Eucalyptus sp.*	15	1840	58.6	70	2.9	7	8	Good	No	No	Remove	Yes
7	9	*Myrsine australis*	2.5	120	3.8	5.1	1.5	2	1	Fair	Yes	No	Retain	No
9	1	*Kunzea ericoides*	6	600	19.1	22.9	1.8	2.3	3	Fair	Yes	No	Retain	No
10	1	*Melicytus ramiflorus*	4	360	11.5	15	1.5	2	1.5	Fair	Yes	No	Retain	No
11	10	*Cordyline australis*	6	300	9.5	11.5	1.5	2	1.5	Fair	Yes	No	Retain	No
12	6	*Melicytus ramiflorus*	5	340	10.8	13.4	1.5	2	1.5	Fair	Yes	No	Retain	No
13	4	*Cordyline australis*	5	310	9.9	11.5	1.5	2	1.5	Fair	Yes	No	Retain	No

Tree No.	Quant.	Botanical Name	Height (m)	AUP Girth (mm)	Diameter at 1.4 Metres (cm)	Diameter at Root Crown (cm)	SRZ (m)	TPZ (m)	PRZ (m)	Health	Native	Pest Plant	Action	RC Required
14	14	*Cyathea dealbata*	3	450	14.3	20.7	1.7	2	1.5	Fair	Yes	No	Retain	No
15	1	*Ligustrum sinense*	5	410	13.1	18.8	1.6	2	2	Fair	No	Yes	Remove	No
16	1	*Melicytus ramiflorus*	6	390	12.4	14.6	1.5	2	2	Fair	Yes	No	Retain	No
17	1	*Melicytus ramiflorus*	6	390	12.4	13.4	1.5	2	2	Fair	Yes	No	Retain	No
18	1	*Cordyline australis*	7	700	22.3	27.1	1.9	2.7	1.5	Fair	Yes	No	Retain	No
19	1	*Cordyline australis*	5	360	11.5	13.4	1.5	2	1	Fair	Yes	No	Retain	No
20	1	*Melicytus ramiflorus*	6	420	13.4	18.8	1.6	2	2	Fair	Yes	No	Retain	No
21	6	*Cyathea dealbata*	4	420	13.4	17.5	1.6	2	2	Fair	Yes	No	Retain	No
22	1	*Cordyline australis*	6	450	14.3	18.5	1.6	2	1.5	Fair	Yes	No	Retain	No
23	1	*Myrsine australis*	6	350	11.1	15	1.5	2	1.5	Fair	Yes	No	Retain	No
24	5	*Cyathea dealbata*	4	420	13.4	17.5	1.6	2	2	Fair	Yes	No	Retain	No
25	1	*Cordyline australis*	6	470	15	17.5	1.6	2	1.5	Fair	Yes	No	Retain	No
26	1	*Ligustrum sinense*	5	410	13.1	18.8	1.6	2	2	Fair	No	Yes	Remove	No
27	1	*Ligustrum sinense*	4	300	9.5	12.4	1.5	2	2	Fair	No	Yes	Remove	No
28	3	*Cordyline australis*	7	780	24.8	28.6	2	3	2	Fair	Yes	No	Retain	No
29	35	*Ligustrum sinense*	1.5	90	2.9	3.2	1.5	2	0.5	Fair	No	Yes	Remove	No
30	1	*Kunzea ericoides*	7	1050	33.4	39.2	2.2	4	1.5	Fair	Yes	No	Retain	No
31	1	*Crataegus monogyna*	3	360	11.5	13.4	1.5	2	1.5	Fair	No	Yes	Remove	No
32	3	*Myrsine australis*	3	60	1.9	4.8	1.5	2	1.5	Fair	Yes	No	Retain	No
33	2	*Cordyline australis*	5	390	12.4	14.3	1.5	2	1.5	Fair	Yes	No	Retain	No
34	20	*Ligustrum sinense*	1.5	90	2.9	3.2	1.5	2	0.5	Fair	No	Yes	Remove	No
35	1	*Cordyline australis*	5	460	14.6	15.9	1.5	2	1.5	Fair	Yes	No	Retain	No
36	12	*Cordyline australis*	5	300	9.5	12.7	1.5	2	1.5	Fair	Yes	No	Retain	No
37	1	*Ligustrum sinense*	4	340	10.8	14.6	1.5	2	1.5	Fair	No	Yes	Remove	No
38	1	*Myrsine australis*	3	90	2.9	4.8	1.5	2	1.5	Fair	Yes	No	Retain	No

Tree No.	Quant.	Botanical Name	Height (m)	AUP Girth (mm)	Diameter at 1.4 Metres (cm)	Diameter at Root Crown (cm)	SRZ (m)	TPZ (m)	PRZ (m)	Health	Native	Pest Plant	Action	RC Required
39	1	*Salix fragilis*	12	2000	63.7	79.6	3	7.6	6	Fair	No	Yes	Remove	No
41	1	*Kunzea ericoides*	13	1330	42.3	49.7	2.5	5.1	5	Fair	Yes	No	Retain	No
42	7	*Cyathea dealbata*	4	450	14.3	19.1	1.7	2	5	Fair	Yes	No	Retain	No
43	1	*Melicytus ramiflorus*	4	390	12.4	19.7	1.7	2	2	Fair	Yes	No	Retain	No
44	2	*Cordyline australis*	6.5	600	19.1	22.3	1.8	2.3	1	Fair	Yes	No	Retain	No
45	1	*Salix fragilis*	4.5	1500	47.7	52.5	2.5	5.7	8	Fair	No	Yes	Remove	No
47	2	*Cordyline australis*	4.5	360	11.5	12.4	1.5	2	1	Fair	Yes	No	Retain	No
48	15	*Ligustrum sinense*	3	75	2.4	2.9	1.5	2	1	Fair	No	Yes	Remove	No
49	1	*Cordyline australis*	5	600	19.1	23.9	1.8	2.3	1	Fair	Yes	No	Retain	No
50	4	*Cyathea dealbata*	3	400	12.7	15.9	1.5	2	1.5	Fair	Yes	No	Retain	No
51	1	*Kunzea ericoides*	7	450	14.3	21	1.7	2	2.5	Fair	Yes	No	Retain	No
52	1	*Kunzea ericoides*	7	500	15.9	21.6	1.7	2	2.5	Fair	Yes	No	Retain	No
53	10	*Cyathea dealbata*	1.5	50	1.6	8	1.5	2	1	Fair	Yes	No	Retain	No
54	1	*Cordyline australis*	3	250	8	10.8	1.5	2	1	Fair	Yes	No	Retain	No
55	7	*Geniostoma ligustrifolium*	2	60	1.9	3.2	1.5	2	1	Fair	Yes	No	Retain	No
56	3	*Myrsine australis*	2	60	1.9	4.8	1.5	2	1	Fair	Yes	No	Retain	No
59	1	*Kunzea ericoides*	10	1500	47.7	52.5	2.5	5.7	5	Fair	Yes	No	Retain	No
61	1	*Salix fragilis*	7	1200	38.2	47.7	2.4	4.6	5	Fair	No	Yes	Remove	No
62	1	*Salix fragilis*	5	900	28.6	38.2	2.2	3.4	4	Fair	No	Yes	Remove	No
63	1	*Populus nigra*	27	2000	63.7	70	2.9	7.6	8	Fair	No	No	Retain	No
64	1	*Populus nigra*	27	2000	63.7	70	2.9	7.6	8	Fair	No	No	Retain	No
65	1	*Populus nigra*	27	2000	63.7	70	2.9	7.6	8	Fair	No	No	Retain	No
66	1	*Populus nigra*	27	2000	63.7	70	2.9	7.6	8	Fair	No	No	Retain	No
67	1	*Populus nigra*	27	2000	63.7	70	2.9	7.6	8	Fair	No	No	Retain	No
68	1	*Populus nigra*	27	2000	63.7	70	2.9	7.6	8	Fair	No	No	Retain	No

Tree No.	Quant.	Botanical Name	Height (m)	AUP Girth (mm)	Diameter at 1.4 Metres (cm)	Diameter at Root Crown (cm)	SRZ (m)	TPZ (m)	PRZ (m)	Health	Native	Pest Plant	Action	RC Required
69	1	*Populus nigra*	27	2000	63.7	70	2.9	7.6	8	Fair	No	No	Retain	No
70	1	*Populus nigra*	27	2000	63.7	70	2.9	7.6	8	Fair	No	No	Retain	No
71	1	*Populus nigra*	27	2000	63.7	70	2.9	7.6	8	Fair	No	No	Retain	No
72	1	*Populus nigra*	27	2000	63.7	70	2.9	7.6	8	Fair	No	No	Retain	No
73	1	*Populus nigra*	27	2000	63.7	70	2.9	7.6	8	Fair	No	No	Retain	No
74	1	*Populus nigra*	27	2000	63.7	70	2.9	7.6	8	Fair	No	No	Retain	No
75	1	*Populus nigra*	27	2000	63.7	70	2.9	7.6	8	Fair	No	No	Retain	No
76	1	*Populus nigra*	27	2000	63.7	70	2.9	7.6	8	Fair	No	No	Retain	No
77	1	*Populus nigra*	27	2000	63.7	70	2.9	7.6	8	Fair	No	No	Retain	No
78	1	*Populus nigra*	27	2000	63.7	70	2.9	7.6	8	Fair	No	No	Retain	No
79	1	*Populus nigra*	27	2000	63.7	70	2.9	7.6	8	Fair	No	No	Retain	No
80	1	*Populus nigra*	27	2000	63.7	70	2.9	7.6	8	Fair	No	No	Retain	No
81	1	*Populus nigra*	27	2000	63.7	70	2.9	7.6	8	Fair	No	No	Retain	No
82	1	*Populus nigra*	27	2000	63.7	70	2.9	7.6	8	Fair	No	No	Retain	No
83	1	*Populus nigra*	27	2000	63.7	70	2.9	7.6	8	Fair	No	No	Retain	No
84	1	*Populus nigra*	27	2000	63.7	70	2.9	7.6	8	Fair	No	No	Retain	No
85	1	*Populus nigra*	27	2000	63.7	70	2.9	7.6	8	Fair	No	No	Retain	No
86	1	*Populus nigra*	27	2000	63.7	70	2.9	7.6	8	Fair	No	No	Retain	No
87	1	*Populus nigra*	27	1800	57.3	63.7	2.7	6.9	8	Fair	No	No	Retain	No
88	1	*Populus nigra*	27	1800	57.3	63.7	2.7	6.9	8	Fair	No	No	Retain	No
89	1	*Populus nigra*	27	2000	63.7	70	2.9	7.6	8	Fair	No	No	Retain	No
90	1	*Populus nigra*	27	2000	63.7	70	2.9	7.6	8	Fair	No	No	Retain	No
91	1	*Populus nigra*	27	2000	63.7	70	2.9	7.6	8	Fair	No	No	Retain	No
92	1	*Populus nigra*	27	2000	63.7	70	2.9	7.6	8	Fair	No	No	Retain	No
93	1	*Populus nigra*	27	2000	63.7	70	2.9	7.6	8	Fair	No	No	Retain	No

Tree No.	Quant.	Botanical Name	Height (m)	AUP Girth (mm)	Diameter at 1.4 Metres (cm)	Diameter at Root Crown (cm)	SRZ (m)	TPZ (m)	PRZ (m)	Health	Native	Pest Plant	Action	RC Required
94	1	*Populus nigra*	27	2000	63.7	70	2.9	7.6	8	Fair	No	No	Retain	No
95	1	*Populus nigra*	27	2000	63.7	70	2.9	7.6	8	Fair	No	No	Retain	No
96	1	*Populus nigra*	27	1350	43	47.7	2.4	5.2	8	Fair	No	No	Retain	No
97	1	*Populus nigra*	27	1500	47.7	52.5	2.5	5.7	8	Fair	No	No	Retain	No
98	1	*Populus nigra*	27	1500	47.7	52.5	2.5	5.7	8	Fair	No	No	Retain	No
99	1	*Populus nigra*	27	1500	47.7	52.5	2.5	5.7	8	Fair	No	No	Retain	No
100	1	*Populus nigra*	27	1500	47.7	52.5	2.5	5.7	8	Fair	No	No	Retain	No
101	1	*Populus nigra*	27	1500	47.7	52.5	2.5	5.7	8	Fair	No	No	Retain	No
102	1	*Populus nigra*	27	1500	47.7	52.5	2.5	5.7	8	Fair	No	No	Retain	No
103	1	*Populus nigra*	27	1500	47.7	52.5	2.5	5.7	8	Poor	No	No	Retain	No
104	1	*Populus nigra*	27	1500	47.7	52.5	2.5	5.7	8	Fair	No	No	Retain	No
105	1	*Populus nigra*	9	1250	39.8	47.7	2.4	4.8	8	Fair	No	No	Retain	No
106	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
107	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
108	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
109	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
110	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
111	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
112	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
113	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
114	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
115	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
116	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
117	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
118	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No

Tree No.	Quant.	Botanical Name	Height (m)	AUP Girth (mm)	Diameter at 1.4 Metres (cm)	Diameter at Root Crown (cm)	SRZ (m)	TPZ (m)	PRZ (m)	Health	Native	Pest Plant	Action	RC Required
119	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
120	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
121	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
122	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
123	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
124	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
125	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
126	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
127	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
128	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
129	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
130	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
131	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
132	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
133	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
134	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
135	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
136	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
137	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
138	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
139	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
140	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
141	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
142	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
143	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No

Tree No.	Quant.	Botanical Name	Height (m)	AUP Girth (mm)	Diameter at 1.4 Metres (cm)	Diameter at Root Crown (cm)	SRZ (m)	TPZ (m)	PRZ (m)	Health	Native	Pest Plant	Action	RC Required
144	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
145	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
146	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
147	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
148	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
149	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
150	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
151	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
152	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
153	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No
154	1	*Populus nigra*	25	1100	35	38.2	2.2	4.2	7	Fair	No	No	Retain	No

Appendix B: Tree Maps

Figure 2: Overview of tree locations and general cut and fill area (red outline)

Figure 3: Overview of tree locations within the riparian margin of Waterloo Steam

Figure 4: Overview of poplar tree locations

Figure 5: Overview of the tree locations and their root zones with the design plans of the WWTP overlayed

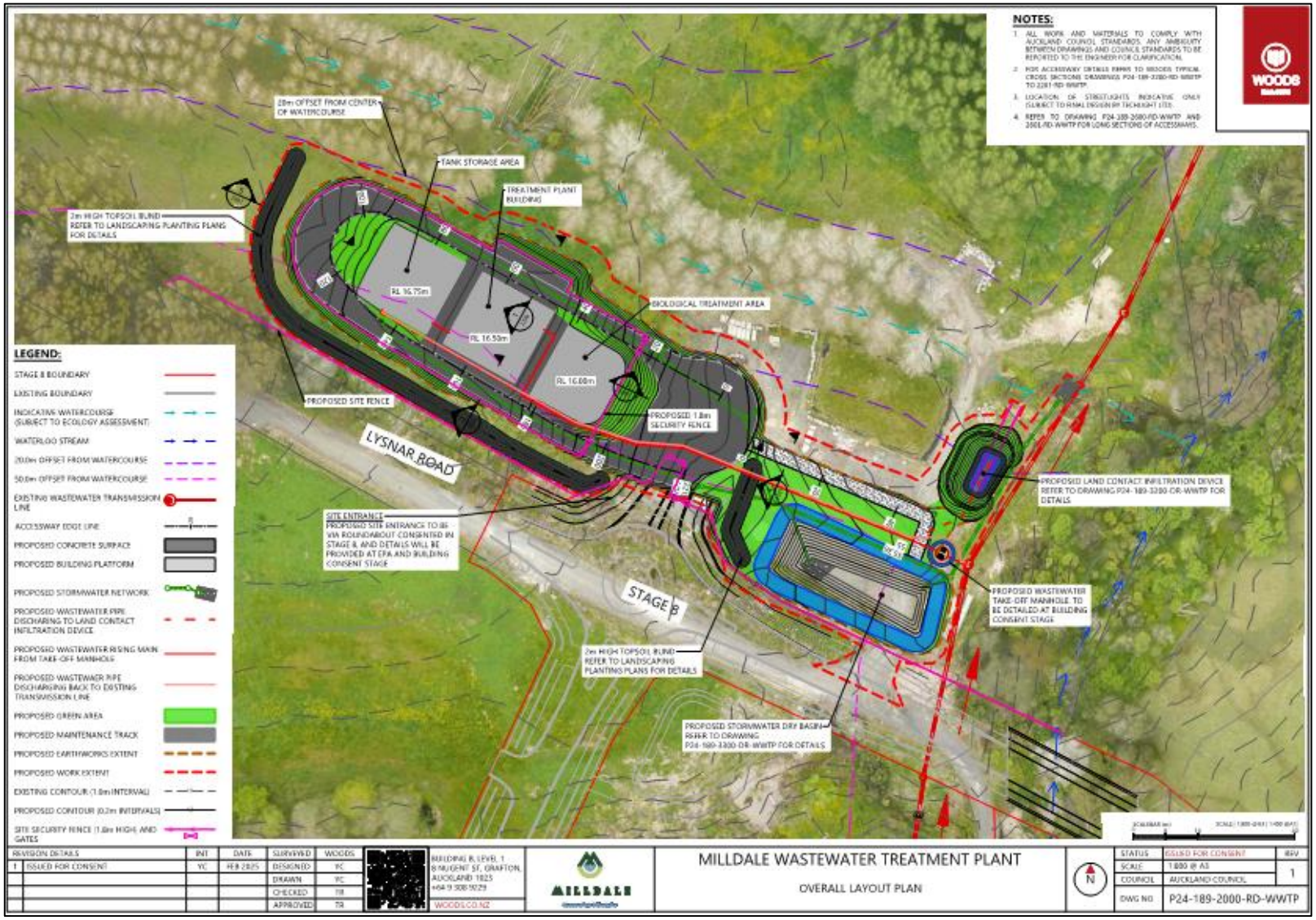


Figure 6: Design plans of the WWTP – Overall Layout Plan, Feb 2025, Rev 1 (Issued for Consent)

Appendix C: Tree Assessment Methodology and Limitations

Assessments are undertaken through a Visual Tree Assessment (VTA) consistent with modern arboricultural practices (Mattheck and Breloer, 1994).

Unless stated all assessments are undertaken from ground level.

Unless specified GPS plotting and measurements will be indicative only and subject to the resilience and accuracy of GPS data on the day of data collection. All attempts are made to ensure that GPS plotting and subsequent desk top analysis will be as accurate as possible.

Tree health assessments are generally based upon industry best practice, the assessor's experience and in accordance with (but not limited too):

i) MIS306 Tree Inspection for Access and Work

ii) MIS501 Tree Risk Assessment

iii) BS 5837 2012 Trees in Relation to Design, Demolition and Construction to Construction

iv) AS 4970-2009 Protection of Trees on Development Sites

Unless detailed in the report no tissue sampling was carried out and all data was collected without the use of any invasive and/or diagnostic tools. The tools used onsite to gather the necessary tree data will generally be a measuring tape and hand-held devices.

The tree girth and canopy width will be measured using a standard nylon tape measure. Unless specified the tree height will be estimated.

Given the dynamic nature of trees, arboricultural assessments are generally valid for up to 12-months from the date of inspection and ongoing frequency-based inspections are recommended.

Tree locations are generally plotted using a combination of GPS and overhead mapping (GPS survey) through online software. GPS surveys can be variable, for example, discrepancies with aerial angles, GPS coordination variances. To assist with GPS surveys, the plot locations are manually adjusted on site using overhead photographs (LINZ imagery). This method, although generally accurate and suitable for tree assessments, is not as accurate as a topographical survey or 'ground truthing'.

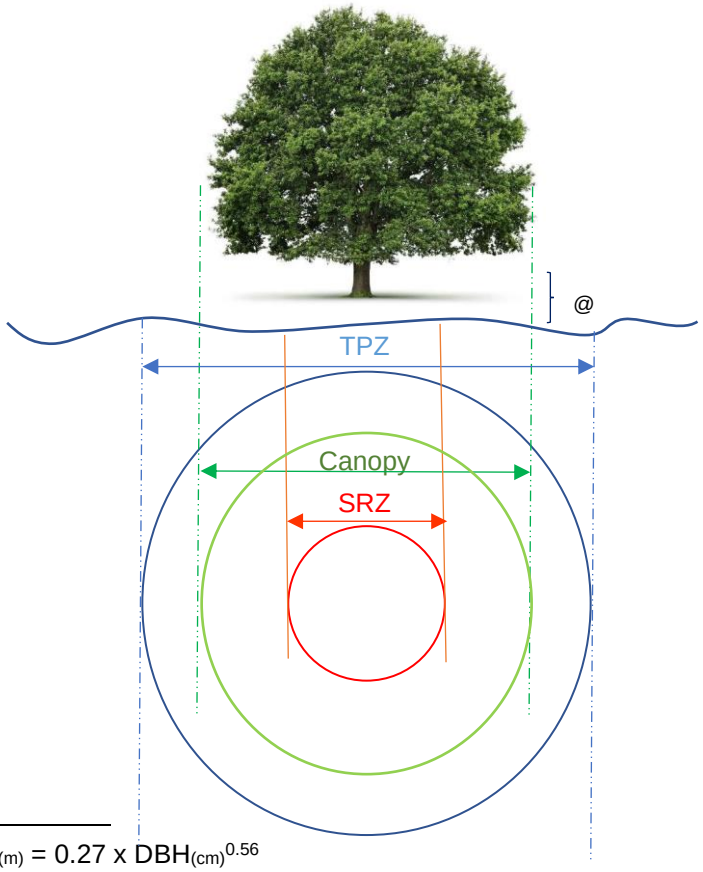
AS 4970-2009 Protection of Trees on Development Sites provide a tree protection zone (TPZ) and structural root zone (SRZ), expressed as a radius measurement from the trunk centre. The TPZ incorporates the SRZ. These measurements are calculated from trunk/stem size. When determining potential encroachment impacts, the following factors are considered;

- Potential loss of root mass
- Species and tolerance of root disturbance
- Tree size and age, vigour

- Stability
- Soil characteristics and volume, topography and drainage
- The presence of existing or past structures or obstacles affecting root growth, and
- Design.

The Standards describe the TPZ as the optimal combination of crown and root area that requires protection during the construction process so that the tree can remain viable. The TPZ is an area that is isolated to ensure that tree sensitive construction measures are implemented so that any disturbance or encroachment is mitigated. The Standards describes the SRZ as the area of the root system used for stability, mechanical support and anchorage of the tree. Construction and work activities in this area are avoided or heavily limited. The Standards specify the TPZ at a maximum of 15m.

Structural Root Zone (SRZ)1 and Tree Protection Zone (TPZ) 2 measurements have been recorded in accordance with Auckland Council's Tree Owner Approval Guide and are considered to be from the trunk centre. This method provides a TPZ that addresses both tree stability and growth requirements. TPZ distances are measured as a radius from the centre of the trunk at ground level.



[1] SRZ calculation: $SRZ_{(m)} = 0.27 \times DBH_{(cm)}^{0.56}$
[2] TPZ calculation: $TPZ_{(m)} = DBH_{(m)} \times 12$

AS4970-2009, s3: The radius of the TPZ is calculated for each tree by multiplying its Diameter @ Breast Height measured @ 1.4m from ground level (DBH × 12 = TPZ). (DBH = Trunk Girth @ 1.4m ÷ π).
To calculate the SRZ: Radius SRZ = **D**iameter **A**bove **R**oot **C**rown (**DRC** x 50) ^ 0.42 x 0.64. If the DRC is less than 0.15m the SRZ will be 1.5m.

Appendix D: Tree Protection Methodology for Milldale – Lysnar Road

Pre-works

1. An arborist (appointed arborist) experienced in tree protection systems, protocols and construction methodologies around trees, is to be engaged for the project.

2. Prior to works commencing, the consent holder is to arrange a pre-start meeting with the works principal, contractor, representatives of Council and the appointed arborist. The pre-start meeting is to identify:

    - Areas where the appointed arborist will need to be on site monitoring works. The expected work timings near the tree.
    - Work methodologies required.
    - Access to the site for vehicles and equipment and potential for storage of the equipment in relation to the tree.
    - Onsite audit recording method and final report requirements.

3. The construction area and areas where excavations will be required are to be identified prior to construction.

During works

4. All works within a tree's root zone (Protected Root Zone (PRZ)), as defined by Auckland Council's definition, will be managed by the appointed arborist.

5. The appointed arborist will audit all works and potential effects on the tree.

6. Tree protection methodology amendments shall require approval from the appointed arborist.

7. The poplar trees will be isolated from the work site by a temporary fence that will be emplaced at the edge of the excavation footprint.

8. No chemicals or harmful fluids are to be emptied or disposed of within the PRZ.

9. Damage and/compaction to existing soil structure is to be avoided by the exclusion of machinery, structures and vehicles from the PRZ, unless protected with appropriate, fit for purpose, temporary load bearing surfaces.

10. The removal of trees will be undertaken by a reputable, approved arboricultural contractor.

11. To ensure damage to the retained trees and underlying vegetation is minimised, modern tree removal techniques will be employed, such as the use of a pulling rope attached within the tree's structure when directional felling, and lowering of branches through manual rigging where dismantling is required.

Post works

12. Auditing reports are to be compiled by the appointed arborist and made available to Council if requested.

APPENDIX E: Auckland Unitary Plan Operative in part, J1 Definitions

Protected root zone: "*The circular area of ground around the trunk of a protected tree, the radius of which is the greatest distance between the trunk and the outer edge of the canopy. For columnar crown species the protected root zone is half the height of the tree".*

Figure J1.4.5 Protected root zone A

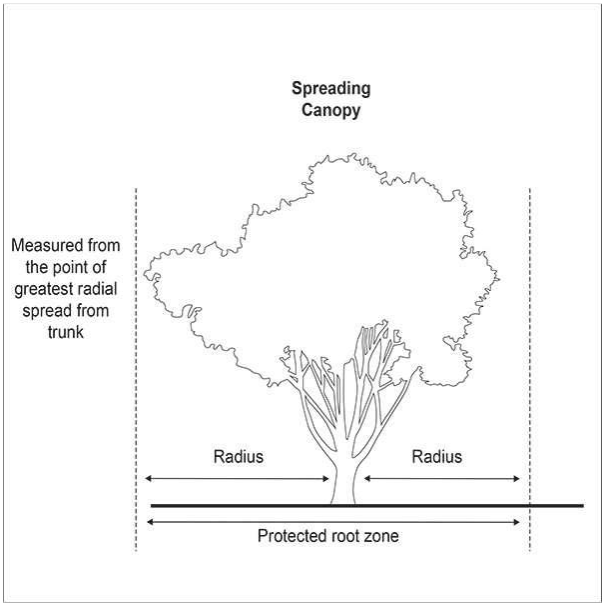


Figure J1.4.6 Protected root zone B