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Arboricultural Assessment of Effects

of
A new concrete footpath and bridge

at
36 Sandspit Road, Warkworth

Prepared for	**Burnette O'Connor** *The Planning Collective* PO Box 591 Warkworth Auckland	**Prepared by**	**Andrew Benson** **(Ph.D., BSc, FdSc)** Urban tree ecophysiologist
		Date	18 May 2022
		Job ref #	2349
		Reviewed by	Ian Lawson

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1. Instructions

1.1 As part of a wider subdivision proposal at 36 Sandspit Road, it is proposed to construct a 2 m-wide concrete footpath and timber bridge over the Mahurangi River. The Tree Consultancy Company have been engaged by The Kilns to provide an arboricultural assessment of effects of the project as this relates to public trees and those located within 10 m of an urban stream. The scope of services is as follows.

- Review the information provided, carry out a site visit and ground-based visual tree inspection
- Liaise with the project team around arboricultural limitations. Assist with design alternatives
- Liaise with council's senior urban forest specialist around potential impacts to street trees
- Prepare a brief arboricultural assessment, detailing our findings and any mitigating measures available
- Prepare and submit an application for Tree Owner Approval

2. Statutory context

2.1 The following rules of the Auckland Unitary Plan apply to this assessment.

D17 – Historic Heritage Overlay

D17.4.2
(A26) Removal of trees greater than 3 m in height or greater than 300 mm girth

E15 – Vegetation Management and Biodiversity

E15.4.1
(A19) Vegetation alteration or removal within 10m of urban streams

E17 – Trees in Roads

E17.4.1
(A8) Works within the protected root zone that do not comply with Standard E17.6.3
(A10) Tree removal of any tree greater than 4 m in height or greater than 400 mm in girth

3. Site description and proposed activities

3.1 The subject site is 36 Sandspit Road, Warkworth. It is a rural-style property on the outskirts of Warkworth of some 2.75 ha but is zoned as Future Urban Zone in the Unitary Plan. Mahurangi River borders the southern boundary with a 20 m riparian margin extending north and south. There is a Historic Heritage Area Overlay over a portion of the site, as well as a Significant Ecological Area Overlay.

3.2 The wider proposal is to subdivide the site into 49 individual lots with associated access and reticulated service connections. The scope of this assessment relates only to a new 2 m-wide concrete footpath and timber bridge that will provide pedestrian access from Sandspit Road at the Millstream Place intersection to the south of the site. A section of the proposed path will be within the road reserve, which spans a portion of land not immediately within the road corridor (it has the look of being within the subject site but is not).

3.3 I was provided with the following information depicting the footpath alignment which has been relied upon for this assessment.

- A geospatial file of the proposed alignment
- A screenshot of the earthworks at the Sandspit Road interface
- Airey Consultants drawings 85070-01 (March 2022 – Resource Consent)

4. Site assessment

4.1 I visited the site with my colleague (Mathew Clifford) on the 21st of March 2022 to carry out a site survey of the trees with arboricultural features of note. For example, mature or established trees were included in the survey, but areas of understorey, pest plants or minor vegetation were not. Upon receipt of a revised drawing set on the 22nd of March, we visited the site again on the 24th March to survey additional trees not identified in the first survey.

4.2 Using a GNSS survey device (Trimble Catalyst) we recorded the positions of key trees with a roughly 1 m accuracy. We measured trunk circumferences accurately (except for two trees in adjacent private property which were estimated) so as to ascribe a structural root zone radius (Coder, 1996). Tree heights and crown spreads were estimated. We also made qualitative observations of form, structure and vitality and a quantitative estimate of live crown volume, which can often serve as a useful indicator of vitality.

5. Summary of tree details

5.1 Thirty-three trees were recorded in the survey, which includes the footprints of the original and current alignments. There are nine trees (trees 3-10 inclusive, and tree 12) in the road reserve that may be affected by the new path, one of which (tree 12) is in the 20 m riparian margin on the western banks of Viponds Creek.

5.2 There are seven trees on the eastern side of the river that are within the Historic Heritage Area overlay that may be affected by the new path, two of which (trees 13 and 14) are in the 20 m riparian margin on the eastern banks of Viponds Creek

5.3 The trees identified in the survey are shown on the appended site plan (2349_001_B) and the corresponding attributes are included in the tree inventory in Appendix D using the same numbering. In addition to the individual trees, there is a dense canopy of privets. On the southern banks of the river, the canopy is dominated by tree privet (*Ligustrum lucidum*), with patches of giant river reed (*Arundo donax*). On the northern side of the river, Chinese privet (*L. sinense*) is prevalent, with mature hawthorn (*Cratageous monogyna*) in places. A sparse native understorey also exists, with matipo (*Myrsine ausralis*), hangehnage (*Geniostoma ligustrifolium*), cabbage tree (*Cordyline australis*) and mahoe (*Melycitus ramifolus*).

6. Arboricultural assessment of effects

6.1 Beginning at Sandspit Road, the path will be cut into the existing grass berm, with up to 1.5 metres of cut as it enters the forested area. Two trees in private property (1 (cedar) and 2 (sweetgum)) will have earthworks in their root zones when the cut is made, and the embankment on which they sit will be retained. I do not envisage the stability of either tree to be affected by the cut, but a loss of root material and permeable ground will be inevitable, and they will both most likely become water stressed for two or three growing seasons, particularly if there are prolonged periods of drought.

6.2 As the path enters the forested area, the slope will be cut by up to 500 mm to reach subgrade. This will take place in the structural root zone of tree 4 (sheoke, DBH = 68 cm), approximately 2.5 m from its trunk (Figure 1). The allometric root zone projections are design tools, for the purposes of informing design decisions. Conservatively, the effects to tree 4 will be that it will lose the south-eastern quadrant of its structural root zone and possibly become structurally compromised. Further, sheoke is a riparian tree, and I would expect the root losses to induce a swift period of chronic water stress, manifesting in some local twiggy dieback and crown sparseness in the five years post construction.

6.3 Similarly, the embankment will be cut by 150 mm and 180 mm, 1.2 m to the east of trees 9 (sheoke) and 10 (Monterey cypress), firmly within their structural root zones and likely within the zone of rapid taper. I anticipate the effects of this to be a loss of tree stability on the eastern aspect of each tree. Tree 9 is of poor vitality at present, with an estimated 25% of its live crown absent / dead. I expect the earthworks to swiftly result in the demise of this tree, and a decline in tree 10's vitality / crown condition over the five years following the earthworks.

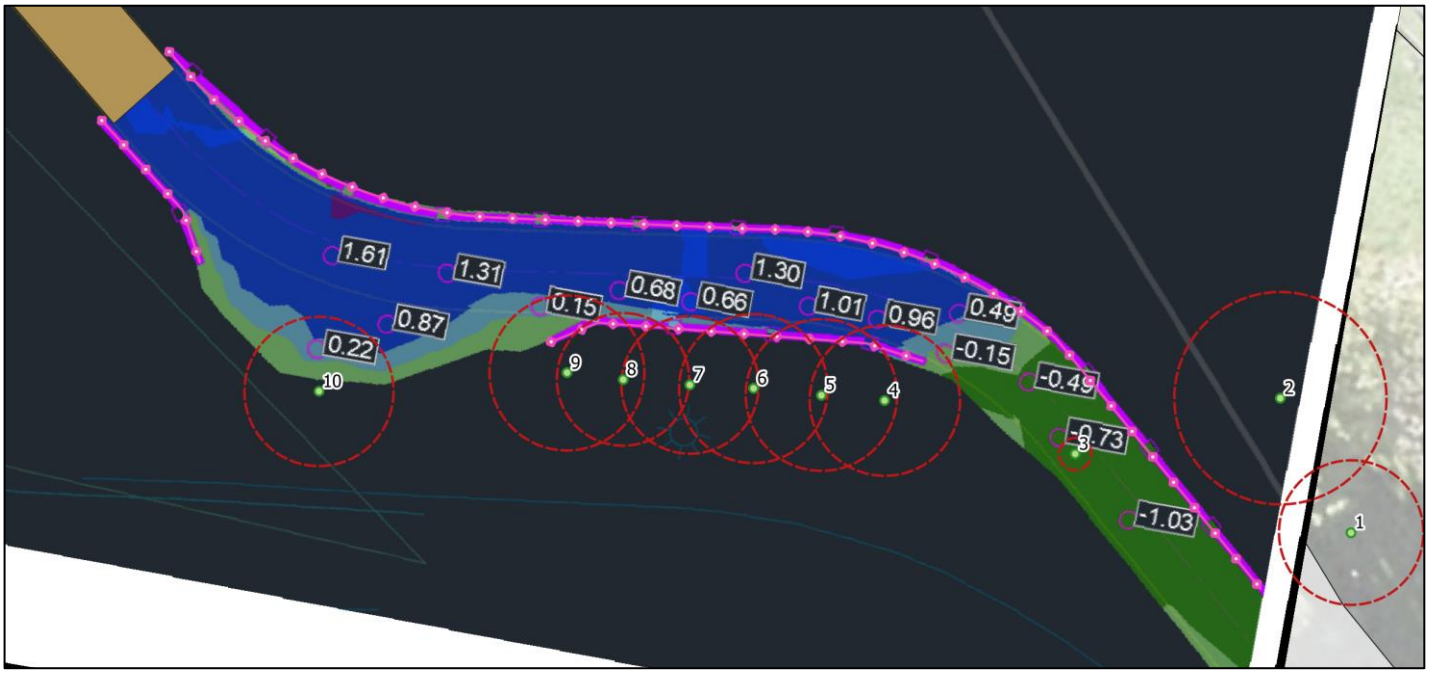


Figure 1: Screenshot of the cut and fill levels at the Sandspit Road intersection. Numbers are to finished footpath surface and so subgrade is -0.3 m from each spot height

6.4 With reference to the remaining sheoke in this section of the path (trees 5-8 inclusive), the path is proposed to be built using fill material on the lower portion of the slope, with a timber-post retaining wall to support its western edge. Up to 1 m of fill material (presumably the cut material from nearby) will be emplaced within the footpath footprint and compacted to achieve the finished subgrade level. Presumably there will need to be some scraping of the slope to remove the loose organic material first. Activities within structural root zones are typically discouraged, because of the potential impacts. In this instance, it could be possible to form the path and retaining wall, but the utmost care must be taken, and the excavations would need to be made using pneumatic soil displacement, e.g., an Air Vac. Wholesale machine tracking and scraping of the soil is inadvisable, as this may lead to losses of / damage to structural roots from the remaining trees, where tree 8 will be most vulnerable to these impacts. Working carefully with pneumatic tools and strategically positioning retaining wall posts will limit the impacts on the trees.

6.5 With reference to tree 12 (tōtara, DBH = 83 cm), this tree is growing atop the crest of the riverbank, meaning that the majority of, if not all its root system must be on its southern aspect, i.e., the riparian slopes. The bridge requires a series of concrete abutments, some 3.5-4 m from the trunk of tree 12, with civil works occurring within its structural root zone. The engineering is such that any roots which are found in the proposed abutment sites will necessarily be lost indefinitely. Further, the civil works activities (machine tracking etc.) to establish the bridge will likely have negative consequences to the tree's growing environment, in that soil structure will be altered (e.g., churned up by machinery). As a worst-case scenario, the impacts of the proposed bridge on tree 12 would be that it would become destabilised, through a combination of root losses and ground disturbance, the outcome of which would likely see the tree failing into the river, particularly during or following a heavy rainfall event. As a best-case scenario, no destabilisation would arise and the impacts of the civil works may amount to a transient period of biological strain (five to ten years) from which the tree would slowly recover, although with some retrenchment[1] of the crown in places as the root:shoot ratio equilibrates.

6.6 Similarly, tree 13 (tōtara, DBH = 24 cm) is within 1.5 m of the proposed bridge on the eastern riverbank and will almost certainly be impacted by the civil works through soil structure modification, root losses and mechanical impacts from construction machinery. The application seeks the removal of this tree.

[1] The outermost parts of the tree crown dieback because of increasing difficulty transporting resources, and a lower, inner live crown gradually takes its place.

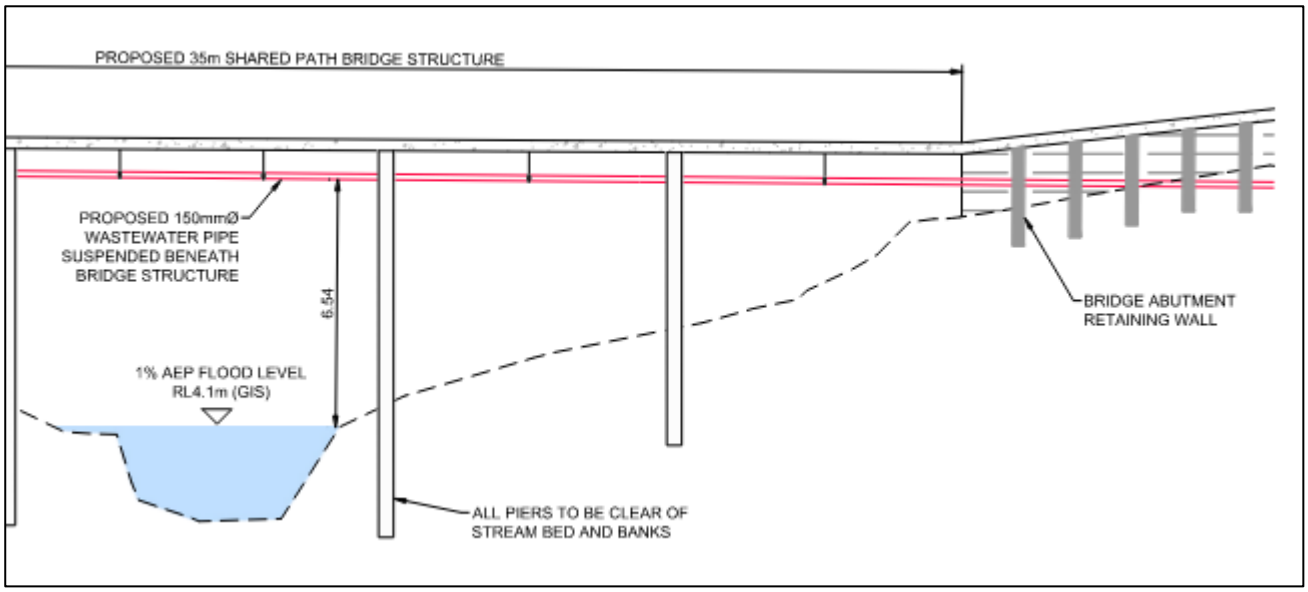


Figure 2: Excerpt from the Airey civil drawings depicting the bridge long section (85070-01_322, rev A)

6.7 Tree 14 (tōtara, DBH = 80 cm) is a very good tree on the slope of the site within the Historic Heritage Area Overlay to the east of the river. The proposed footpath alignment directly conflicts with this tree, and it will consequently need to be removed (Figure 3).

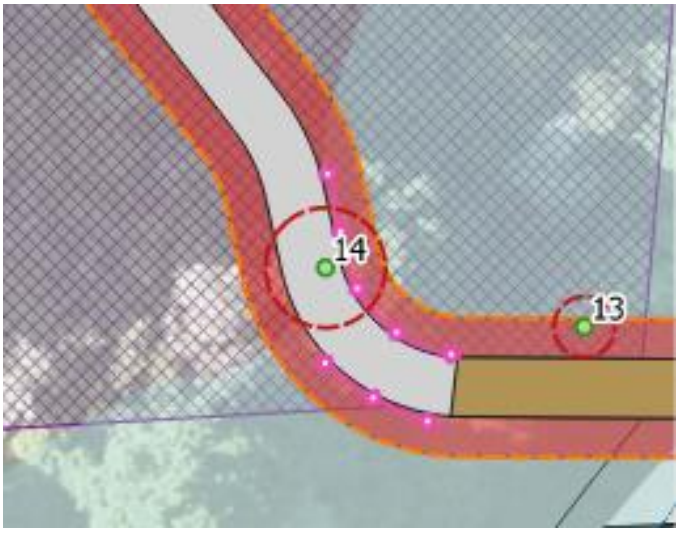


Figure 3: Depiction of the path alignment and tree 14

6.8 The remaining vegetation on the eastern side of the river is largely Chinese privet, with scattered hawthorn (e.g., trees 20-26 inclusive) and young natives (see 5.3) in scarcity. Several mature native trees (16-19, 27-33) were recorded in the first survey, but need not be affected by the revised path alignment with adequate protections in place. The path necessarily requires a swathe of this vegetation to be removed. Conservatively, allowing for a 2 m buffer either side of the path for its construction (i.e., for machinery to operate and bring materials to site), and on both sides of the river, the total cleared area is expected to be 1,030 m^2 (calculated using geospatial software), comprising:

- 363 m^2 from within the road reserve
- 628 m^2 from within the Historic Heritage Overlay
- 354 m^2 from the riparian margin

Note: The figures produce a total greater than 1,030 m^2 because the riparian margin intersects with the road reserve and Historic Heritage Area.

7. Conclusions and recommendations

7.1 A new concrete path and bridge to service pedestrian traffic at a proposed subdivision at 36 Sandspit Road requires the removal of approximately 1,030 m^2 of vegetation. Predominantly this is privet, giant river reed, hawthorn and arboriculturally unremarkable juvenile native trees. One juvenile tōtara (tree 13) and one superior, mature tōtara tree (tree 14) is included in the cleared area.

7.2 The impacts of the civil works on two sheokes (trees 4 and 9) and one Monterey cypress (tree 10) are expected to have negative consequences on tree stability and tree health. Given the adjacent high-use target (Sandspit Road), the application should consider the removal of these trees. This outcome can be refined on site by a supervising arborist with a more comprehensive understanding of how the civil works are impacting the trees. That is, it may eventuate that they need not be removed, although the likelihood of this is low given the scale of the project and the proximity to the trees.

7.3 The effects of constructing the path past four other sheokes (trees 5-8) will depend on how the work is carried out. Careless work practices and wholesale soil scraping with an excavator are likely to sever / damage roots and the trees would likely decline over the five to ten years following construction. Working carefully and using pneumatic excavation techniques under the guidance of a supervising arborist would yield little consequence to the trees.

7.4 The effects of constructing the bridge and its abutments on one mature tōtara (tree 12) are uncertain. The scale of the project is such that the collateral impacts beyond the bridge footprint are expected to alter the tree's growing environment sufficiently that it may decline / retrench and potentially slip into the river during a future heavy rainfall event.

7.5 It is recommended that the path alignment be clearly pegged out prior to any work commencing, and the cleared area clearly demarcated and agreed upon at a pre-start meeting with council's arboricultural and ecological experts (or a delegated person such as the monitoring officer).

7.6 It is recommended that any tree removals are undertaken by trained and experienced arboricultural professionals in a manner which avoids any unnecessary damage or disturbance to the surrounding trees or their root zones.

7.7 It is recommended that a tree protection fence be erected along the cleared area alignment and in other locations shown on the appended site drawing (2349_001_A). The fence shall serve as demarcating a complete construction exclusion zone. There must be no construction activities taking place within the construction exclusion zone.

7.8 It is recommended that silt and sediment control measures adopt aboveground systems in sensitive forested areas, per GD05, e.g., silt socks. Silt control involving buried fences is not permitted in tree root zones and is expressly discouraged in GD05.

7.9 It is recommended that a supervising arborist be engaged at the start of the project to manage and coordinate the work around trees.

7.10 It is recommended that the tree protection measures in Appendix A are adhered to at all times during the project.

7.11 It is recommended that a comprehensive management plan be prepared by a suitably qualified and experienced ecological expert that address the effects of tree removal and provides for replacement trees. The management plan is to include trees capable of achieving large dimensions over time with a replanting ratio of at least 6:1 for each of the sheoke, tōtara and cypress trees that are removed. The management plan must also include a pest plant management regimen to remove and control pest plants at this site.

Please contact the author for further information.

Author	**Reviewer**
	
Andrew Benson (Ph.D. BSc, FdSc) Urban tree ecophysiologist	Ian Lawson Urban forest and tree consultant

Bibliography

Coder KD, 1996. Construction damage assessments: trees and sites. In: University of Georgia, ed. *Cooperative extension service forest resources unit FOR96-39.* Georgia, USA: University of Georgia.

Appendix A – Tree protection methodology

1. Tree protection must form a part of any site-specific hazard management and is to be included in daily toolbox meetings and all site inductions.

2. No work shall take place within the root zone of the trees without prior approval from the works arborist. Any amendments to the tree protection methodology shall require prior written approval from the works arborist.

Pre-start

3. The consent holder is to engage the services of a suitably qualified and experienced on-site supervisory arborist (the 'works arborist'), who is to supervise and coordinate all works and activities within the root zone of protected trees.

4. Prior to any works commencing on site, the consent holder is to arrange a site meeting with the works arborist, council's monitoring officer, council's arborist and the contractor who has overall responsibility for the works. The purpose of this meeting is to discuss conditions of consent. At this meeting, the contractor responsible is to confirm to the satisfaction of the works arborist and council the following:

    - Programming of works
    - Site access and transportation of materials
    - Temporary storage areas for materials
    - Silt and sediment controls
    - Excavations within the vicinity of protected trees

Reporting

5. At the completion of works, the works arborist, at their discretion, shall 'sign off' the work of the contractor, and if requested, provide a brief account of the project to the council arborist (if necessary, with photos). The account of works shall include, but not be limited to:

    - The effects of the works on the subject trees
    - Any remedial work which may be necessary

Protective fencing

6. Prior to works commencing, a tree protection fence is to be erected along the cleared area alignment and in other locations shown on the appended site drawing (2349_001_B). The fence shall serve as demarcating a complete construction exclusion zone. There must be no construction activities taking place within the construction exclusion zone.

7. The fence must remain in place for the duration of the project. There is to be no storage or stockpiling of materials, tools and equipment within the area enclosed by the fence. The protective fence may only be removed / relocated at the direction of the appointed works arborist. Any site activity which needs to take place within the fence must be done under the supervision and in coordination with an appointed supervising arborist.

8. No person, vehicle or machinery are to enter the area enclosed by the fence unless otherwise authorised to do so by the works arborist. If for any reason it becomes necessary to move the protective fence, then the area previously enclosed by the fence shall be regarded in the same way as if the fence were still in place.

9. Suitably visible weather-resistant signs are to be hung on each face of the fence, translated as necessary to read

CONSTRUCTION EXCLUSION ZONE
SENSITIVE ECOLOGICAL ENVIRONMENT
KEEP OUT

Ground protection

10. No material is to be stored, emptied or disposed of in or around the root zone of any of the trees unless otherwise authorised to do so by the works arborist. Any material which is to be stored or temporarily placed in or around the root zone of any of the trees shall be stored carefully on an existing or temporary hard surface such as asphalt or plywood sheets, respectively.

11. If, during the course of the works, machinery or vehicle access / manoeuvring is required in or around the root zone of any of the trees, then those areas are to be covered with a protective overlay sufficient to protect the ground from being muddied, compacted, churned up or otherwise disturbed (for example 'Track Mats', or a layer of mulch or sand/SAP7 overlaid if necessary with a raft of wired planks, plywood or similar) (see detail TP-04).

12. If machinery / vehicles are to be operated or stored within the root zone area on an existing or temporary load-bearing surface, then the machinery / vehicle shall not cause any detrimental effect to the tree(s) through compaction, physical damage, spillage of lubricants and fuels or discharge of waste emissions.

Excavations in and around root zones

13. All excavations which are to take place in or around the root zone of any of the trees shall be done so in conjunction with the works arborist, through a careful combination of pneumatic soil displacement, hand digging and machine excavation and to the satisfaction of the works arborist. Where the works arborist deems it likely that roots will be encountered in the holes, then these areas shall first be explored using hand tools only to check for the presence of such roots.

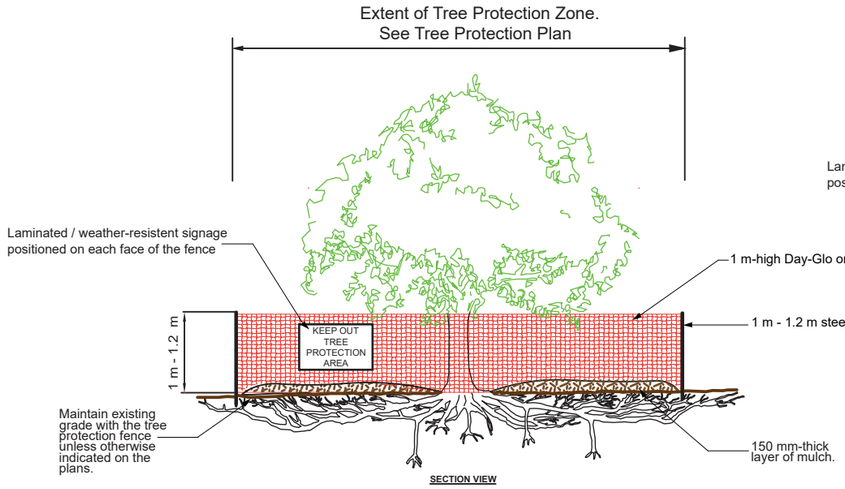
14. Where concrete is to be poured into excavations containing exposed roots, then all exposed roots shall first be covered in a layer of polythene to prevent the concrete from contacting the exposed root (see detail TP-06).

Protecting and pruning roots

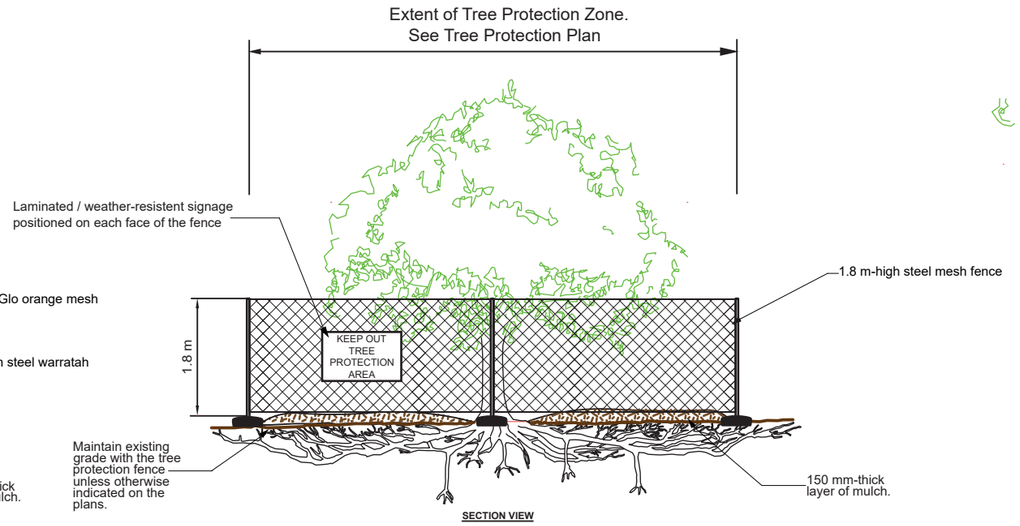
15. Every effort shall be made to avoid root severance from all trees by exploring on-site alternatives to construction / engineering, i.e., adjusting finished levels and post hole locations etc. Where root severance is unavoidable, the severance of any root is to be carried out by the works arborist who shall select the most appropriate implement for the task. Roots shall be cut cleanly to ensure that the traumatic cambium is able to initiate new root growth as effectively as possible, and the exposed cut faces should be covered over immediately with moist soil.

16. Where roots to be retained are encountered, and there is need for these roots to remain exposed in order that works are not impeded, then those roots shall be covered with a suitable protective material (such as moist Hessian or a wool mulch) in order to protect them from desiccation and/or mechanical damage, until such a time as the area around the root can be backfilled with the original material. The wrapping or covering of any roots shall be undertaken by the works arborist.

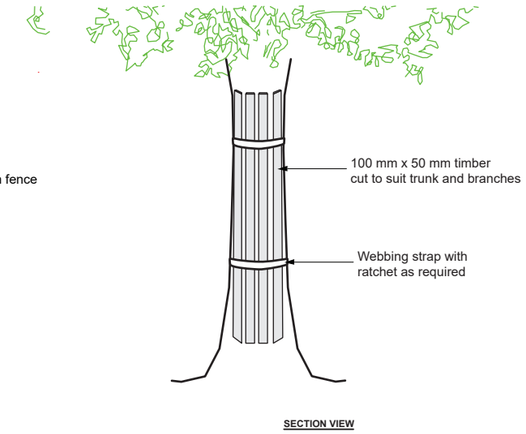
Appendix B – Tree protection details



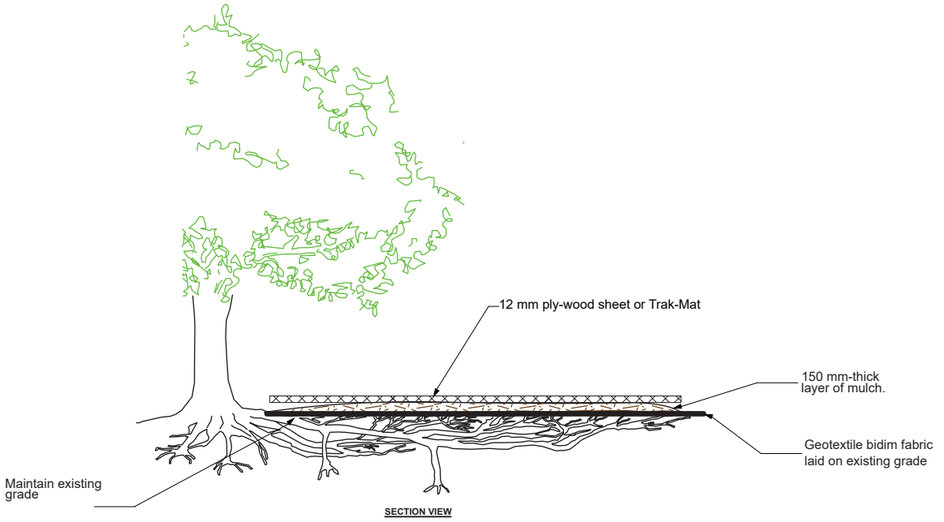
TP-01 TREE PROTECTION - TREE PROTECTION FENCING



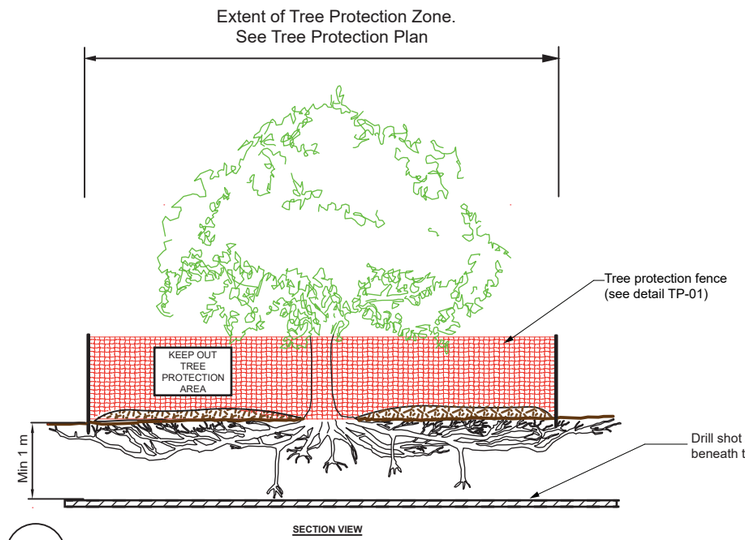
TP-02 TREE PROTECTION - TREE PROTECTION FENCING



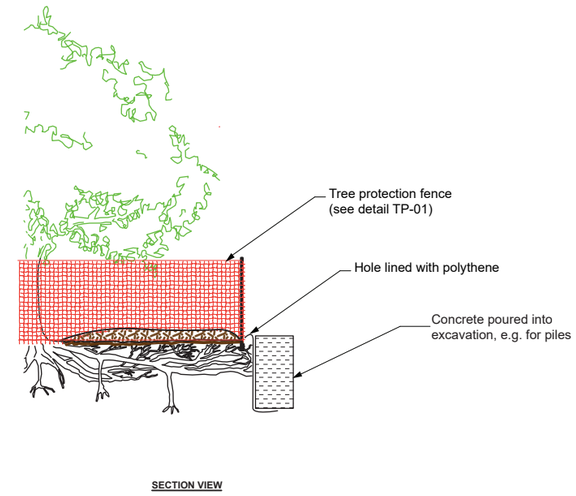
TP-03 TREE PROTECTION - TRUNK PROTECTION



TP-04 TREE PROTECTION - GROUND PROTECTION



TP-05 TREE PROTECTION - DIRECTIONAL DRILLING



TP-06 TREE PROTECTION - EXCAVATIONS CONTAINING ROOTS

All works around trees are to proceed in strict accordance with the tree protection methods
All works around trees are to be supervised by an appointed works arborist
No pruning of branches or roots unless undertaken by the appointed works arborist
No equipment or material is to enter or be stored inside the protective fence
Details scaled as shown

STANDARD TREE PROTECTION DETAIL

The TREE CONSULTANCY – COMPANY –

Drawing TTCC- TP- 2020

Revision 001

Date 13-08-2020

Appendix C – Drawing 2349_001_B

Proposed path
Concrete path
Bridge
Retaining wall
Cleared area
Tree protection fence

Trees (approximate)
Structural root zone
Historic heritage overlay
Steam bank (from topo)
Riparian margin

THE PLANNING COLLECTIVE

36 Sandspit Road, Warkworth
Tree location and site works plan

The TREE CONSULTANCY – COMPANY –

Job ref 2349

Drawing 001

Rev B

14/04/2022

Appendix D – Tree inventory

Tree number	Species	Common name	Height (m)	DBH (cm)	Structural root zone radius (m)*	Overall vitality	Live crown volume	Branch structure	Form	Age class	Zones / Overlays	Proposed activity
1	*Cedrus deodara*	Himalayan cedar	12	63.7	2.7	Fair	90% - 95%	Fair	Fair	Early mature	Residential	Cut the path 4.2 m from tree bases and install a retaining wall
2	*Liquidambar styraciflua*	American sweetgum	20	127.3	3.9	Good	95% - 99%	Fair	Good	Mature	Residential	
3	*Coprosma robusta*	Karamu	4	4.3	0.6	Fair	90% - 95%	Fair	Fair	Early mature	Road reserve	Remove
4	*Casuarina cunninghamiana*	She oak	18	68.4	2.8	Good	90% - 95%	Fair	Fair	Mature	Road reserve	Cut the path to -0.5 m, 2.5 m from the tree base. Install retaining wall – Remove
5	*Casuarina cunninghamiana*	She oak	18	69.4	2.8	Good	90% - 95%	Fair	Fair	Mature	Road reserve	Scrape the loose soil / grass from the slope, build a retaining wall and form the path using fill; +1 m
6	*Casuarina cunninghamiana*	She oak	18	67.2	2.7	Fair	70% - 75%	Fair	Fair	Mature	Road reserve	
7	*Casuarina cunninghamiana*	She oak	18	58.3	2.5	Fair	85% - 90%	Fair	Fair	Mature	Road reserve	
8	*Casuarina cunninghamiana*	She oak	18	54.4	2.4	Good	85% - 90%	Good	Fair	Mature	Road reserve	
9	*Casuarina cunninghamiana*	She oak	14	72.3	2.9	Poor	75% - 80%	Fair	Fair	Mature	Road reserve	Cut 150 mm – 180 mm, 1.2 m from trunks, within the zone of rapid taper - Remove
10	*Cupressus macrocarpa*	Monterey cypress	17	67.5	2.8	Good	95% - 99%	Good	Fair	Mature	Road reserve	
11	*Syzygium paniculatum*	Magenta lilly pilly	10	44.3	2.2	Good	95% - 99%	Good	Good	Mature	Road reserve / Riparian Margin	No works proposed - protect
12	*Podocarpus tōtara*	Tōtara	18	82.8	3.1	Good	90% - 95%	Good	Good	Mature	Road reserve / Riparian Margin	Construct bridge abutments 4 m from tree base
13	*Podocarpus tōtara*	Tōtara	9	23.6	1.5	Good	95% - 99%	Good	Fair	Juvenile	Historic Heritage Area / Riparian Margin	Construct bridge abutments 1.5 m from tree base - Remove
14	*Podocarpus tōtara*	Tōtara	17	80.2	3.0	Good	90% - 95%	Good	Good	Mature	Historic Heritage Area / Riparian Margin	Remove
15	*Crataegus monogyna*	Hawthorn	8	38.8	2.0	Good	90% - 95%	Fair	Fair	Mature	Historic Heritage Area / Riparian Margin	No works proposed - protect
16	*Podocarpus tōtara*	Tōtara	18	45.8	2.2	Good	95% - 99%	Good	Fair	Early mature	Historic Heritage Area / Riparian Margin	
17	*Podocarpus tōtara*	Tōtara	14	49.0	2.3	Good	95% - 99%	Good	Fair	Early mature	Historic Heritage Area / Riparian Margin	
18	*Podocarpus tōtara*	Tōtara	8	25.1	1.6	Good	95% - 99%	Good	Fair	Juvenile	Historic Heritage Area / Riparian Margin	

Tree number	Species	Common name	Height (m)	DBH (cm)	Structural root zone radius (m)*	Overall vitality	Live crown volume	Branch structure	Form	Age class	Zones / Overlays	Proposed activity
19	*Podocarpus tōtara*	Tōtara	11	77.3	3.0	Good	95% - 99%	Fair	Fair	Early mature	Historic Heritage Area / Riparian Margin	No works proposed - protect
20	*Crataegus monogyna*	Hawthorn	9	53.2	2.4	Good	95% - 99%	Fair	Fair	Mature	Historic Heritage Area	Remove
21	*Crataegus monogyna*	Hawthorn	9	36.0	1.9	Good	95% - 99%	Fair	Fair	Mature	Historic Heritage Area	
22	*Crataegus monogyna*	Hawthorn	9	52.1	2.4	Good	95% - 99%	Fair	Fair	Mature	Historic Heritage Area	
23	*Crataegus monogyna*	Hawthorn	9	45.3	2.2	Good	85% - 90%	Fair	Fair	Mature	Historic Heritage Area	No works proposed - protect
24	*Crataegus monogyna*	Hawthorn	9	44.8	2.2	Good	80% - 85%	Fair	Fair	Mature	Historic Heritage Area	Remove
25	*Crataegus monogyna*	Hawthorn	9	25.2	1.6	Good	85% - 90%	Fair	Fair	Mature	Historic Heritage Area	
26	*Crataegus monogyna*	Hawthorn	9	33.7	1.9	Good	80% - 85%	Fair	Fair	Mature	Historic Heritage Area	No works proposed - protect
27	*Kunzea robusta*	Kanuka	9	34.4	1.9	Good	90% - 95%	Fair	Fair	Mature	Historic Heritage Area	No works proposed - protect
28	*Podocarpus tōtara*	Tōtara	12	29.9	1.8	Good	95% - 99%	Good	Fair	Early mature	Historic Heritage Area	
29	*Podocarpus tōtara*	Tōtara	18	65.2	2.7	Good	95% - 99%	Good	Fair	Mature	Historic Heritage Area	
30	*Podocarpus tōtara*	Tōtara	12	33.4	1.9	Good	95% - 99%	Good	Good	Early mature	Historic Heritage Area	
31	*Podocarpus tōtara*	Tōtara	15	51.9	2.4	Good	95% - 99%	Good	Fair	Early mature	Historic Heritage Area	
32	*Podocarpus tōtara*	Tōtara	16	30.9	1.8	Good	95% - 99%	Good	Good	Early mature	Historic Heritage Area	
33	*Podocarpus tōtara*	Tōtara	16	33.4	1.9	Good	95% - 99%	Good	Good	Early mature	Historic Heritage Area	

DBH – [trunk] Diameter at Breast Height

* Coder (1996)

Appendix E – Site photographs

Photo 1: Indicative earthworks at the path's forest entry on Sandspit Road. Trees 3 and 4 are marked with arrows on the right and left, respectively

Photo 2: Trees 1-10 (right to left) at the Sandspit Road intersection

Photos 3 (left) & 4 (right): Tree 12 (left) and the base of tree 14 (right)

Photos 5 (left) & 6 (right): Typical understorey of privet and hawthorn