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Arboricultural Assessment of Effects and Tree Protection Plan

For
Removing a culvert and building a new bridge, including associated construction and traffic management activities within a public reserve

at
Black Bridge Reserve and Te Ararata Creek Reserve,
Walmsley Road, Māngere

Prepared for	**Leighton Gillespie** *Healthy Waters* Level 17 135 Albert Street Auckland	Prepared by	Andrew Benson (Ph.D., BSc, FdSc) Urban tree ecophysiologist
		Date	25 October 2024
		Job ref #	3055

Table of contents

1. Instructions

1.1 Healthy Waters propose to remove a culvert and build a new replacement road bridge at Walmsley Road, Māngere. The Tree Consultancy Company have been instructed by Leighton Gillespie of Healthy Waters to provide an arboricultural assessment of effects of the proposal as this relates to protected trees. For this assessment, a 'protected' tree refers to a tree for which a Resource Consent is usually required to undertake activities to and around it that may affect its wellbeing. This report has been prepared to support a resource consent application under the Severe Weather Emergency Recovery (Auckland Flood Resilience Works) Order 2024. The scope of services is as follows.

- Attend an on-site project briefing with the project team and other specialists.
- Online meetings with the project team.
- Attend an on-site meeting with Auckland Council's regulatory staff.
- A desktop review of the information provided by the client or their representative.
- Carry out a site visit and arboricultural survey of the principal trees.
- Liaise with the design team around constraints and limitations. Offer design solutions where possible
- Prepare an arboricultural assessment of effects, including a scaled site plan depicting the trees, the arboricultural constraints, and the key proposed site features, as well as recommendations for tree protection and mitigation.
- Lodge an application for tree owner approval, if required.

2. Site description, project background, and proposed activities

2.1 The subject site is Black Bridge Reserve and Te Ararata Creek Reserve, to the north and south of Walmsley Road, in Māngere, respectively. According to the Unitary Plan, Black Bridge Reserve is within the Open Space – Informal Recreation Zone, and Te Ararata Creek Reserve is within the Open Space – Conservation Zone. Walmsley Road is zoned as Road. The Te Ararata Creek runs from south to north and passes under Walmsley Road through a concrete twin culvert. To the south of Walmsley Road, either side of the creek, there are residential properties within the Residential – Mixed Housing Urban Zone. To the north of Walmsley Road, either side of Black Bridge Reserve, there are residential properties in the Residential – Mixed Housing Suburban Zone (Figure 1).

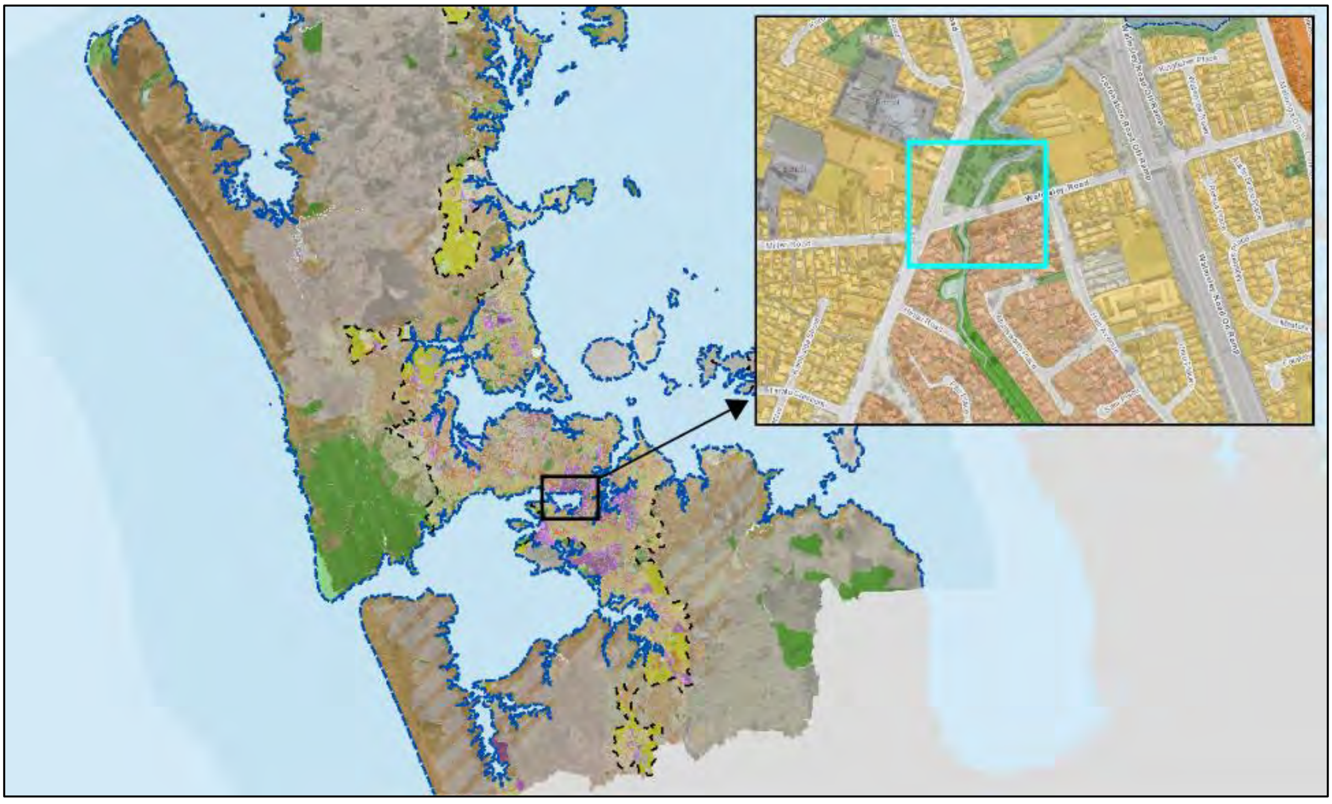

Figure 1: Site location (black rectangle – main image; blue outline – inset). Source – Auckland Council GeoMaps

2.2 During the heavy rain events and floods in the early part of 2023, sections of the Te Ararata Creek at the site became blocked by large debris. Healthy Waters have identified that the blockages at the Walmsley Road bridge culvert caused significant upstream flooding to residential properties. It is proposed to remove the culvert from under the Walmsley Road bridge and provide a widened channel to alleviate blockage risk. To do so, there will be a complete closure of Walmsley Road Bridge with traffic diversions through the surrounding road network, with a pedestrian footbridge through Black Bridge Reserve, to the north. A full description of the proposed works and indicative construction methodology is provided in an Assessment of Effects on the Environment (AEE) prepared by Beca.

2.3 It is estimated that construction would take approximately 10-12 months and would involve the following key steps, generally following the sequence set out below. Several key construction activities are likely to occur concurrently.

- Site establishment – construction yards and site access points would be established in Black Bridge Reserve, as well as slit control and site fencing. Topsoil will be stripped within the construction yard and GAP65 will be laid on the ground (with a geotextile separation layer) and compacted to form a hardstand.
- Construction of temporary pedestrian footbridge – A temporary bailey bridge for pedestrians would be constructed over the Te Ararata Creek in Black Bridge Reserve using piles and abutments. A new temporary pedestrian footpath will be formed to connect the bailey bridge to the existing pedestrian footpaths.
- Remove culvert and shift Watercare pipe bridge abutments – The existing culvert will be demolished; The abutments of an existing Watercare pipe bridge will be shifted to accommodate the increased stream width.
- Construct a new bridge over Walmsley Road and reshape the stream banks - Abutments will be constructed. The stream banks under the bridge and slightly upstream and downstream will be reshaped on either side. The new bridge will be built using cranes to lift pre-cast beams onto the abutments and later forming the road bridge that ties in with the existing Walmsley Road.
- Disestablish – Remove the bailey bridge, construction yard, and restore traffic.

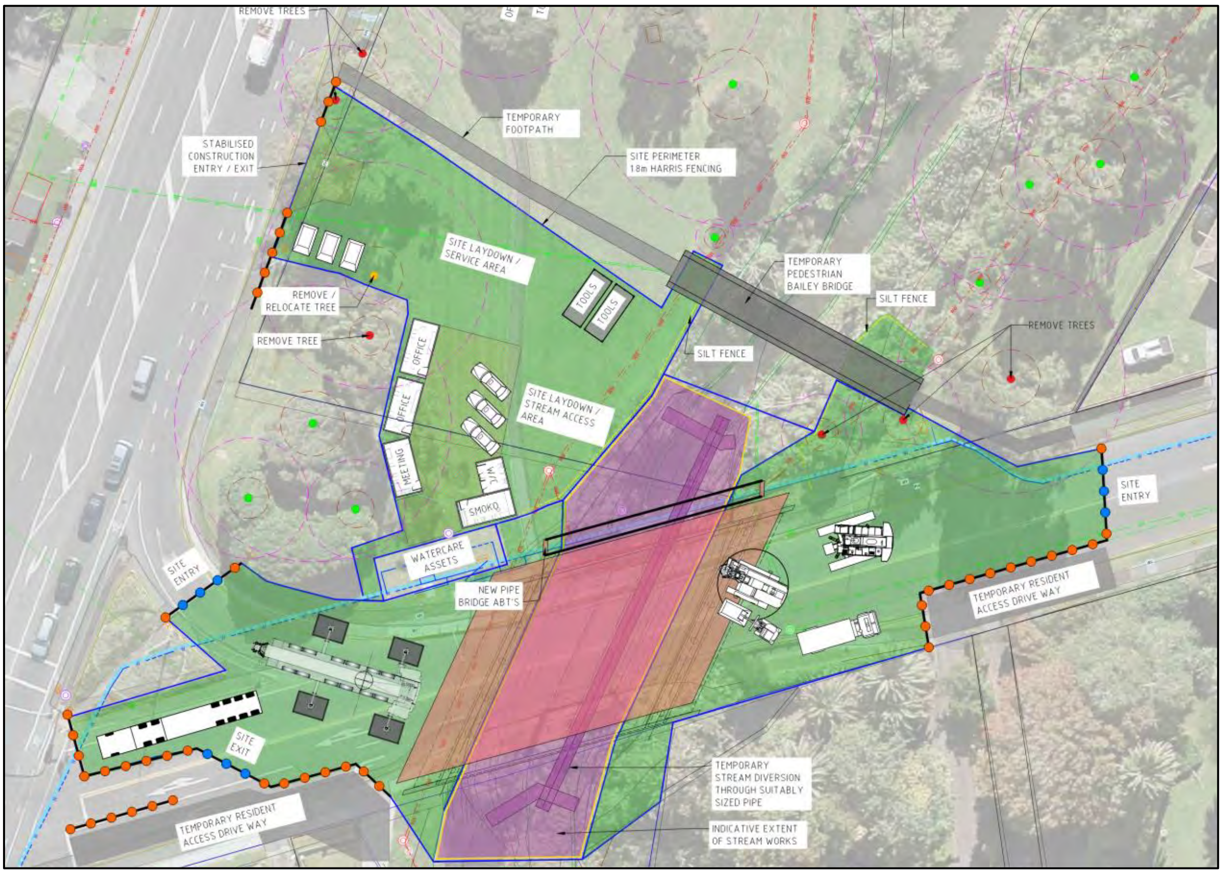

Figure 2: Proposed construction layout. Source – HEB drawing TACR-HEB-01-00-DR-Z002, rev D4 (10/10/2024)

2.4 The information listed below available at the time of assessment preparation, has been relied upon to inform this assessment of effects. I have been advised by Beca's planning team that, it represents the worst-case effects envelope. It is anticipated that subsequent updated plans and information with the final AEE will be within the worst-case effects envelope assessed.

- HEB drawings TACR-HEB-01-00-DR-Z002, rev D4 (23/10/2024)
- Tonkin and Taylor drawings 1017033.2003-023, 027, 033, rev A (04/10/2024)
- HEB Construction Methodology. Te Ararata Improvements. Walmsley Road Bridge (15/10/2024)
- Boffa Miskell planting plan BMC230171_C510, rev C (16/10/2024)

3. Site investigations and methodology

3.1 I visited the site on the 19th of June 2024, with the project team, to receive an overview and briefing of the project. I visited the site again on the 29th of August 2024, with the project team and members of the Auckland Council regulatory team, to brief the council specialists on the project and to answer any questions posed by my expert counterpart at Auckland Council.

3.2 Matthew Lomas (consultant arborist at The Tree Consultancy Company) visited Black Bridge Reserve on the 18th of July 2024 to undertake an arboricultural site survey of the trees in and around Black Bridge Reserve. The purpose of Mr. Lomas' survey was to collect information about the trees and the arboricultural constraints in Black Bridge Reserve, to help inform the construction yard's configuration. I visited the site again on the 4th of September 2024, to undertake an arboricultural site survey of the principal trees potentially impacted by the proposal in Te Ararata Creek Reserve, south of the Walmsley Road Bridge and culvert. Mr. Lomas recorded tree locations with a GNSS device (Trimble Catalyst DA1). I recorded tree locations using the GPS capability of a smartphone, primarily because many of the trees in Te Ararata Creek Reserve were inaccessible to me and their locations could only be estimated.

3.3 For each tree included in our fieldwork surveys, its species was recorded. Where trees could be accessed safely and practicably (e.g., within accessible areas of the reserves), its height was measured with a digital laser rangefinder (Nikon Forestry Pro II), its trunk diameter measured at 1.4 m above ground level with a measuring tape, and its largest crown radius was measured (with the laser rangefinder). For trees not accessible, all dimensions were estimated. Additionally, for each tree, qualitative observations of tree condition (form, structure, vitality) and quantitative estimates of live crown volume were made.

3.4 We also applied the British Standard (BS5837) tree categorisation system to grade the trees based on their arboricultural attributes (British Standards Institute, 2012). The British system was used because New Zealand does not have its own system of tree categorisation. The categorisation system places trees in one of four categories, being A, B, C, and U, in descending order of quality. It is an objective means of grading trees and a useful design tool when considering design alternatives, or to better understand or qualify impacts.

3.5 Trunk diameter measurements are used to ascribe structural root zone radii (Coder, 1996) and tree protection zone radii (Benson et al., 2019), which are planning and design tools to help inform setbacks and clear zones around trees. The structural root zone is the area around a tree within which the tree's main supporting, structural roots are found. The tree protection zone is the area around a tree within which there is a sufficient volume of soil and roots to sustain healthy tree function.

3.6 The impacts of vegetation clearance were quantified using GIS software (QGIS.org, 2022) and a 2024 Near Map aerial photograph. Additionally, the proposed planting palette proffered by Boffa Miskell referenced in 2.4 was input into iTree (The i-Tree Development Team, 2022) to compute future canopy cover growth using the forecast tool. iTree is a software application that computes ecosystem services such as carbon sequestration, pollutant adsorption, as well as estimating canopy cover based on data inputs. Full canopy cover closure was assumed to have occurred when the proposed planting achieved the current canopy cover across the cleared area.

3.7 iTree was also used to estimate canopy cover growth for 95 different species of tree using known dimensions of 45 L-grade nursery trees up to 2050, to estimate the canopy cover growth for a 'typical' new tree. A new 45 L-grade tree will have 24 m^2 of canopy cover in 2050 if it is planted today. The year 2050 is chosen because that is when Auckland Council have set their canopy cover targets for (Auckland Council, 2019). The number of new 45 L-grade trees required to be planted in addition to the proposed planting palette proffered by Boffa Miskell was calculated based on the canopy cover deficits to 2050 once canopy closure of the planting palette had been achieved, and adding one extra tree to account for some attrition. The process is set out, with calculations, in Section 6.

4. Summary of tree details

4.1 Black Bridge Reserve contains numerous established native and exotic trees in varying age classes ranging between 4 m and 18 m in height. There are 16 Category A trees, 47 Category B trees, and 1 Category C tree. The stream banks of the Te Ararata Creek contain low native plants such as flax (*Phormum tenax*), cabbage tree (*Cordyline australis*), karo (*Pittosporum crassifolium*), and karamū (*Coprosma robusta*). The western banks are of higher quality (Category B) than the eastern banks (Category C), largely because of the presence of wilding sheoke (*Casuarina cunninghamiana*) to the east.

4.2 South of Walmsley Road bridge, either side of the stream, there are predominantly exotic trees. There is a group of oak trees (*Quercus robur*) on the eastern side of the stream near to number 8 Walmsley Road, occasional phoenix palms (*Phoenix canariensis*) on the stream banks, and some Category C native and exotic trees growing on the embankments either side of the stream, next to the bridge.

4.3 The trees, their structural root zones, tree protection zones, and the key proposed site features are shown on the site plan (3055_001_B) in Appendix D with the arboricultural information and impacts presented in the tree inventory in Appendix E using corresponding numbering.

5. Arboricultural assessment of effects

5.1 The assessment has been based on an indicative construction methodology and concept design provided by the contractor and design team, to accompany the resource consent application. Whilst the construction methodology and design details have not been finalised, a reasonable worst-case scenario and effects envelope has been assumed within this assessment to account for potential changes to activities and programme. Minor changes to the final construction methodology and detailed design are unlikely to change the overall envelope of effects as presented in this report.

5.2 All construction projects carry an inherent risk of damage to nearby trees. Such damage can be caused by machine tracking through tree root zones, soil churning and soil compaction in tree root zones, overhead branch strikes, spillage, or discharge of phytotoxic substances such as petrol or diesel. These sorts of collateral impacts can, in extreme cases, cause damage to trees, but can be practicably managed through an arboricultural work specification. A critical component of this is to appoint an appropriately qualified and experienced supervising arborist to assist with the work. The assessment of effects in this section is predicated on the recommended tree protection measures in Appendix A being implemented on site during construction.

5.3 The potential impacts of the project are vegetation clearance and tree removal, branch pruning, and earthworks and other civil-related construction activities in tree protection zones.

5.4 With respect to vegetation clearance and tree removal, this is necessitated by civil works to form the pedestrian footbridge over the Te Ararata Creek in Black Bridge Reserve, because of civil works around the stream (e.g., reshaping the stream banks and shifting the Watercare abutments), and for the temporary site entrance from Coronation Road.

5.5 The proposed pedestrian footbridge and footpath conflict with trees 9 (a group of 15 sheoke trees), 10 (a group of three lemonwood trees (*Pittosporum eugenioides*), and 11 (a karaka tree (*Corynocarpus laevigatus*) on the eastern side of the stream. All are Category B trees. It may be possible to preserve a few of the sheoke in group 9, but for the purposes of this assessment, the impacts have been assessed as complete removal of the group. Approximately 571 m^2 of native riparian canopy cover lining the banks of the Te Ararata creek in Black Bridge Reserve will also be cleared. The extent of clearance is required to allow for machine access to the stream banks for reshaping, to move the Watercare abutments, and to construct the bridge.

5.6 Additionally, according to the HEB construction drawing, the construction yard entrance into Black Bridge Reserve from Coronation Road encompasses tree 16 (Category C gum tree, *Eucalyptus sp.*), and be approximately 3 m from the trunk of tree 17 (Category B gum tree). The temporary pedestrian path will join Coronation Road between both of these gum trees. The impacts to the gum trees from forming the stabilised construction access and form the temporary path, will cumulatively involve root zone (roots and soil) loss for both trees. Neither tree has optimal vitality and the biological consequences of the construction work to both trees is likely to further contribute to their sub-optimal overall condition. Therefore, both trees will be removed and later replaced as part of the project's remediation planting plan.

5.7 According to the HEB construction drawings, the construction yard entrance from Coronation Road will cut through tree 15's structural root zone, within 1 m of its trunk. Tree 15 is a Category B pōhutukawa (*Metrosideros excelsa*). According to the construction management plan, the construction yard will be formed by stripping the soil and laying and compacting GAP65 aggregates. Additionally, tree 15 would need to be substantially pruned to accommodate the construction yard and achieve vehicle egress sight lines to Coronation Road, likely removing most, if not all, of the trunks / branches on its northern aspect. The impacts to tree 15 would be root zone (roots and soil) damage likely initiating chronic water stress with a protracted deterioration in overall vitality; and an irrecoverable disfigurement of the crown owing to the pruning. Practicably, tree 15 will need to be removed.

5.8 During the site meeting on the 29th of August, I discussed the option of relocating tree 15 with representatives from Auckland Council's regulatory team, HEB and Healthy Waters. I've since discussed this with the project team in more detail who have indicated that relocating tree 15 is feasible, and so this will be the preferred outcome for tree 15. Relocation of tree 15 will require large equipment and is not without risk. Additionally, there could be underground constraints (e.g., high-voltage power cables or gas mains) that may preclude extraction of the tree and its root system. And so, if for some reason during construction it becomes apparent that relocating tree 15 is no longer possible, it will be cut down and replaced with new trees as part of the project's remediation planting plan.

5.9 Relocating tree 15 will require large lifting frames, excavators, cranes, and flat-bed trucks. Lifting frames will need to be sourced but the other equipment will be on site anyway to enable construction of the road and bridges. A sufficient root ball will need to be extracted to optimise tree 15's chances of success, which means that the root system of tree 14 (*Eucalyptus sp.*) will be severely impacted. That is, excavating a large enough root ball for tree 15's extraction and relocation will necessarily cause substantial damage to and loss of tree 14's root ball. Ergo, tree 14 will be removed. If tree 15 is cut down instead of being relocated, it may be possible to preserve tree 14. However, it may be that that is not realised until tree 15 has been prepped, or partially prepped for relocation before it becomes known that it needs to be cut down. Conservatively, tree 14 will be removed. If there is scope to retain and protect tree 14 during construction, then it will be retained and protected.

5.10 The success of the relocation will depend on the aftercare that tree 15 receives. Transplanting trees necessarily involves severing roots circumferentially around the trunk, essentially removing much of the tree's peripheral root system. This will impose a stress on the tree (Benson et al., 2019) that may lead to strain if proper aftercare is not carried out. Aftercare must involve regular watering during periods of drought (e.g., summer), staking / guying, and mulching with cured wood chip mulch. Aftercare would need to take place for three years post-transplant. If tree 15 is extracted and relocated correctly to another location in Black Bridge Reserve, and if correct aftercare is followed for three years, then the impacts to tree 15 will likely be a period of brief water stress from which it will recover (Benson et al., 2019).

5.11 According to the HEB construction management drawings, to the north of the construction yard in Black Bridge Reserve, the construction yard has been configured around the tree protection zones of those trees that will be retained and that are nearby, being trees 18, 20, and 21. That being the case, nil impacts to these trees are anticipated, nor to any other trees further north.

5.12 In the southern and south-western portions of Black Bridge Reserve, the construction yard encroaches into the tree protection zone of one Category A pōhutukawa (tree 13) and a group of Category B houpara (*Pseudopanax lessonii*) (tree group 12). According to the HEB construction management drawings, site portacoms will be established in the site compound in this area. The potential impacts to the pōhutukawa and houpara are that the tree protection zones will become damaged and anoxic through compaction and the laying of aggregates or other temporary hardstand materials. This could cause the pōhutukawa and some of the houpara to deteriorate. However, there are ways of installing such temporary infrastructure in this zone that does not damage the trees. Portacoms must be installed on dunnage, blocks, or screw piles so that they are off the ground, akin to a house on piles. Soil must not be stripped to emplace aggregates, and instead wood-chip mulch must be used. If necessary, footpaths and walkways can be formed using cellular confinement mesh into which aggregates can be poured[1]. If the site compound is configured and designed in this fashion, then the impacts to the pōhutukawa and houpara will be negligible, or nil.

Figure 3: An example of a cellular confinement mesh (ABG Geosynthetics)

5.13 To the south of Walmsley Road, vegetation clearance around the bridge will be required, for demolition and construction of the new replacement Walmsley Road bridge and stream reshaping. The trees immediately adjacent to the bridge are unremarkable, Category C and U trees in the road reserve and open space zone, although some have the look of being private trees in number 8 Walmsley Road. Trees 44, 45 (ngaio, *Myoporum laetum*), 46 (honey locust, *Robinia pseudoacacia*), and 50 (coral tree, *Erythrina x sykesii*) will likely need to be removed, and perhaps tree 47 (phoenix palm). The root zone of oak tree 51 (Category B tree) will very likely be modified where the stream bank reshaping 'daylights' a few metres from its trunk. The impacts to the oak tree are likely to be root loss that may lead to some short-term (two growing seasons) mild stress. Access to water will not be limiting given its location next to the stream, and so the tree will very likely recover from the root impacts.

[1] https://abg-geosynthetics.com/case-studies/temporary-works/tree-root-protection-abg-trp-geocell-center-parcs-woburn/

6. Canopy cover analysis and remediation planting

6.1 Based on the geospatial analysis, the canopy cover loss from the vegetation clearance is approximately 1,639 m^2. If tree 15 needs to be removed, there will be an additional ≈70 m^2 of canopy cover loss. Boffa Miskell have proposed 893 m^2 of new plants (ground area) which will achieve approximately 1,331 m^2 of canopy cover once established, which will take approximately 12 to 13 years. The outstanding canopy cover deficit is 308 m^2, requiring 14 new 45 L-grade trees. If tree 15 needs to be removed, the canopy cover deficit is 378 m^2, requiring 17 new 45 L-grade trees.

6.2 The new trees need to be medium- to large-growing, climate-ready trees (Kendal. D, 2022) capable of thriving in Auckland's future climate (Cabrelli et al., 2014, Fitzharris, 2007). The following tree species are suggested.

- *Quercus nigra* – water oak
- *Afrocarpus falcatus* – common yellowwood
- *Cassia leptophylla* – golden medallion tree
- *Chiranthodendron pentadactylon* – monkey palm tree
- *Nestigis apetala* – coastal maire
- *Streblus smithii* – Three Kings milk tree
- *Sophora chathamica* – Chatham Island kowhai
- *Metrosideros bartlettii* – Bartlett's rata

7. Statutory assessment

7.1 Chapter E26 of the Unitary Plan contains the rules for vegetation alteration during infrastructure projects. Since this project involves improving stormwater function by removing a culvert and constructing a new replacement road bridge, it qualifies as an infrastructure project. Activity Table E26.3.3.1 contains the rules for vegetation alteration in riparian areas, and Activity Table E26.4.3.1 contains the rules for vegetation alteration in open space zones and roads.

7.2 With reference to the Permitted Standards for the rules in Activity Table E26.3.3.1, Permitted Standard E26.3.5.2 stipulates, among other things, that vegetation alteration or removal must not include trees that are taller than 6 m or have a trunk circumference of more than 600 mm, and that vegetation clearance must not exceed 50 m^2 from riparian areas not identified as a Significant Ecological Area (SEA). The assessment has demonstrated that, more than 50 m^2 of vegetation needs to be removed from within a riparian area, and trees taller than 6 m need to be removed from (e.g., ngaio trees 44 and 45) or altered (e.g., oak tree 51) within a riparian area. Therefore, the Permitted Standard is not met in relation to vegetation alteration in the riparian margin.

7.3 With reference to the Permitted Activity thresholds and Permitted Standards for the rules in Activity Table E26.4.3.1, Rule E26.4.3.1 (A91) states that it is a Permitted Activity to remove trees that are up to 4 m tall or with a trunk circumference of 400 mm. The assessment has demonstrated that, tree removal in the open space zone and in the road reserve involves trees that are taller than 4 m or have trunk circumferences more than 400 mm, therefore the Permitted Activity threshold is exceeded.

7.4 Permitted Standard E26.4.5.2 specifies the permitted thresholds for work in the protected root zone. The Unitary Plan defines the protected root zone as an arbitrary circle centred around the tree's trunk with a radius equivalent to the distance of the farthest extending branch, or half the height of the tree for upright, columnar trees. The Permitted Standard stipulates, among other things, that if the works are not overseen by an appointed supervising arborist, no more than 10% of the protected root zone may be disturbed, no roots greater than 35 mm in diameter may be severed, and that excavations must not exceed 1 m^2. If the works are overseen by an appointed supervising arborist, the works must not disturb more than 20% of the protected root zone and no roots exceeding 80 mm in diameter may be severed. Excavators must be fitted with straight-blade buckets and work from existing or temporary load-bearing surfaces.

7.5 A geospatial analysis of the proposed site features reveals that 19% of tree 51's protected root zone will be disturbed (Figure 4). What is unknown at this stage is whether the machines used to reshape the stream banks will be fitted with straight-blade buckets, or whether roots from the tree 51 measuring 80 mm or more in diameter will need to be cut when the stream banks are reshaped. Furthermore, temporary load-bearing surfaces will be very challenging to use when operating machinery from stream banks, as level ground is usually required for their safe and practicable installation. Therefore, conservatively, the Permitted Standards for working in the protected root zone will not be met.

Figure 4: A screenshot from a geospatial analysis depicting protected root zone (green circles around trees) incursions (red areas).

8. Conclusions

8.1 Healthy Waters propose to remove a culvert from under Walmsley Road within the Te Ararata Creek. To do so, an existing road bridge over the creek will be removed, the culvert demolished, and a new, slightly larger bridge built in its place, along with stream bank reshaping. The arboricultural impacts of the proposal are:

- Removal of up to 27 individual trees and 571 m^2 of terrestrial native riparian vegetation yielding a 1,639 m^2 canopy cover deficit by 2050
  - Either (preferred)
    - Relocation of one pōhutukawa (tree 15) to another location in Black Bridge Reserve. The pōhutukawa tree will likely experience water stress symptoms following extraction, but if correct aftercare is implemented, the tree will recover from the stress within three years.
  - Or (contingency)
    - Removal of one pōhutukawa (tree 15) with an additional 70 m^2 loss in canopy cover.
- Disturbance to the tree protection zones of trees in Black Bridge Reserve for the establishment of a construction yard. If the site compound is prepared using mulch, portacoms are installed on dunnage or blocks, and walkways are made on-grade with cellular confinement mesh, then the impacts to the nearby trees (12 and 13) will be negligible, or nil.
- Stream shaping resulting in disturbance to the root system of tree 51 that will likely yield some short-term stress from which the tree will recover.

9. Recommendations

9.1 It is recommended that a suitably qualified and experienced on-site supervisory arborist (the 'supervising arborist'), be engaged at the start of the project. The role of the supervising arborist will be to coordinate, supervise, and document activities on the site that may affect vegetation, e.g., vegetation clearance, constructing the haul roads, etc.

9.2 Subject to approvals, it is recommended that vegetation removal be limited to trees:

- 9 (a group of 15 sheoke), 10 (a group of three lemonwood), 11, 14, 16, 17, 44-47, 50, and 571 m^2 of vegetation around the Te Ararata Creek in Black Bridge Reserve (3055_002_B).

9.3 If relocating tree 15 is not feasible or cannot be practicably achieved for any reason, then the recommendation 9.2 also included tree 15.

9.4 Vegetation clearance is to be carried out by trained and experienced arboricultural professionals in a manner which avoids any unnecessary damage or disturbance to any retained vegetation and their root zones.

9.5 The relocation of tree 15 is to proceed in accordance with the relocation methodology in Appendix C.

9.6 In the event that any branches need to be pruned from any tree during the project, it is recommended that the branch pruning be undertaken by trained and experienced arboricultural professionals in a manner that avoids any unnecessary damaged or disturbance to any retained vegetation and their root zones. All pruning must be carried out in accordance with current accepted arboricultural best practice (e.g., MIS308).

9.7 Prior to works commencing, construction exclusion fencing must be erected around all trees that are being retained in Black Bridge Reserve as shown on the appended site plan (3055_003_B). It is acceptable to use the proposed construction yard site fencing for this purpose. The fence must remain in place for the duration of works. There is to be no storage or stockpiling of materials, tools and equipment outside of the construction yard. Any activity associated with this project may only take place outside of the fence at the direction of the appointed works arborist.

9.8 Suitably visible weather-resistant signs are to be hung on the inside of the fence at regular intervals, translated as necessary to read.

CONSTRUCTION EXCLUSION ZONE
PROTECTED TREES OUTSIDE OF THIS FENCE

9.9 Silt and sediment control measures are to consist of aboveground methods when within the root zone of trees, as per GD05 recommendations[2], e.g., a filter sock.

9.10 The construction yard configuration must be such that no soil scraping or excavation or deposition of aggregates is to take place in the tree protection zones of trees 12 and 13 or any other nearby trees. A 100 mm-thick later of woodchip mulch must be laid over the ground in these areas. If necessary, a cellular confinement mesh can be laid on top after first placing a piece of geofabric over the mulch, and the confinement mesh can be filled with stones to create a hard surface.

9.11 It is recommended that portacoms must be installed above ground, e.g., on dunnage or blocks.

9.12 In conjunction with the Boffa Miskell planting plan (BMC230171_C510, rev C (16/10/2024))within the first planting season after works are complete (April to September), it is recommended that at least 14 climate-ready (Kendal. D, 2022), 45 L-grade trees be planted at or near to (e.g., in local streets) the site if tree 15 is relocated, and at least 17 new climate-ready trees if tree 15 needs to be removed. Tree planting locations must be selected strategically to avoid any future stream works projects in this area that might necessitate their removal. The trees must be planted in accordance with the specification in Appendix G and be maintained for a period of three years, with the stakes removed after one year. If any tree should die, become damaged or vandalised, or otherwise become irrecoverably deteriorated, it must be replaced *like-for-like* with another 45 L-grade tree and maintained thereafter for three years.

9.13 The final species selection must include equal proportions of native and exotic trees. Suitable species include:

- *Quercus nigra* – water oak
- *Afrocarpus falcatus* – common yellowwood
- *Cassia leptophylla* – golden mediallion tree
- *Chiranthodendron pentadactylon* – monkey palm tree
- *Nestigis apetala* – coastal maire
- *Streblus smithii* – Three Kings milk tree
- *Sophora chathamica* – Chatham Island kowhai
- *Metrosideros bartlettii* – Bartlett's rata

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[2] "***Do not*** *install silt fences across watercourses or in areas of concentrated flows. Avoid trench excavations within the root zones of protected trees and trees that are to be retained."* – Section F-Sediment control practices. P113

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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 tree protection zone of the trees without prior approval from the supervising arborist. Any amendments to the tree protection methodology shall require prior written approval from the supervising arborist. (see 3).

Pre-start

3. The person or organisation who has ultimate responsibility for the project is to engage the services of a suitably qualified and experienced on-site supervisory arborist (the 'supervising 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 person or organisation who has ultimate responsibility for the project is to arrange a site meeting with the supervising arborist, council's monitoring officer, council's arborist and the contractor who has overall responsibility of 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 supervising arborist and council the following:

   - Programming of works
   - Vegetation removal
   - Site access, haul roads, and transportation of materials
   - Construction exclusion / yard fencing
   - Temporary storage areas for materials
   - Silt and sediment controls
   - Tree protection measures including fencing
   - Excavations within the vicinity of protected trees
   - When the supervising arborist is required to be present

Reporting

5. At the completion of works, the supervising 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 to the subject trees
   - Any remedial work which may be necessary

Silt and sediment control

6. Silt and sediment control measures are to consist of aboveground methods when within the root zone of trees, as per GD05 recommendations[3], e.g., a filter sock.

Protective fencing

7. Prior to works commencing, construction exclusion fencing must be erected around all trees that are being retained in Black Bridge Reserve as shown on the appended site plan (3055_003_B). It is acceptable to use the proposed construction yard site fencing for this purpose. The fence must remain in place for the duration of works. There is to be no storage or stockpiling of materials, tools and equipment outside of the construction yard. Any activity associated with this project may only take place outside of the fence at the direction of the appointed works arborist.

[3] *"**Do not** install silt fences across watercourses or in areas of concentrated flows. Avoid trench excavations within the root zones of protected trees and trees that are to be retained."* – Section F-Sediment control practices. P113

8. Suitably visible weather-resistant signs are to be hung on the inside of the fence at regular intervals, translated as necessary to read.

CONSTRUCTION EXCLUSION ZONE
PROTECTED TREES OUTSIDE OF THIS FENCE

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

Ground protection

10. If, during the course of the works, machinery or vehicle access / manoeuvring is required in or around the tree protection 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).

11. If machinery / vehicles are to be operated or stored within the tree protection 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

12. 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 supervising arborist, through a careful combination of hand digging, hydro-excavation, pneumatic excavation, and machine excavation and to the satisfaction of the supervising arborist. Where the supervising arborist deems it likely that roots will be encountered in the areas, then these areas shall first be explored using or hand tools only to check for the presence of such roots.

13. 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).

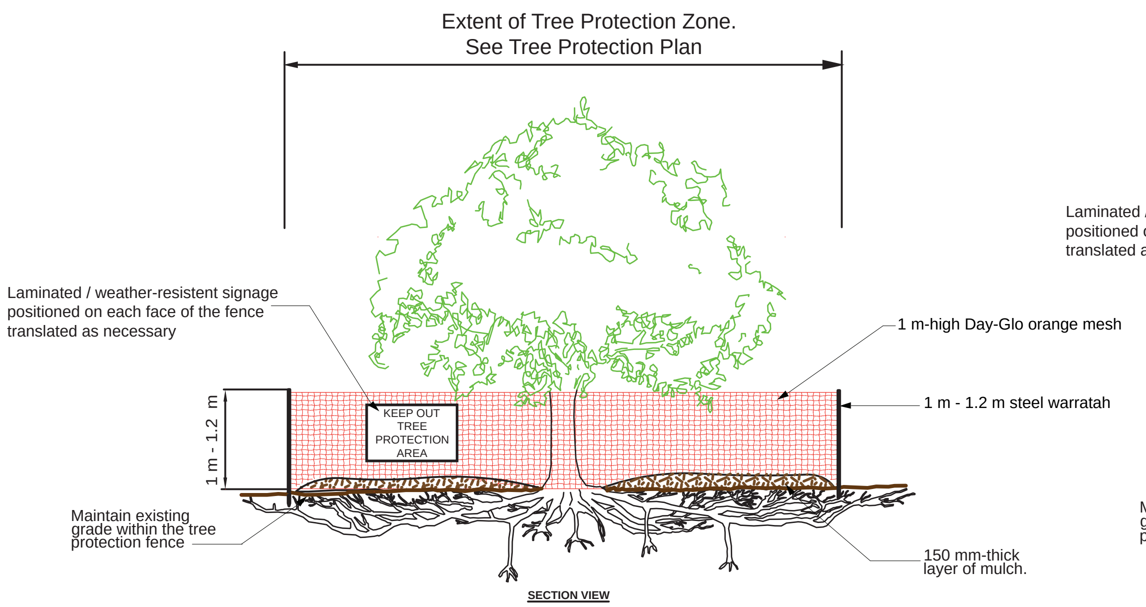
14. The cutting, breaking and lifting of any concrete and / or asphalt in and around the tree protection zone of any of the trees shall be done so in conjunction with the supervising arborist, through a careful combination of machine and hand operated equipment. Ideally, the concrete / asphalt will first be cracked or broken with a steel bar or sledgehammer, and the sections carefully lifted out by hand. At the discretion of the supervising arborist, the cutting, cracking, lifting and removal of concrete / asphalt may proceed with machinery, such as a concrete cutter, and / or small excavator. All excavators and machinery shall sit on the existing concrete / asphalt surface and work slowly backwards away from the trees.

Protecting and pruning roots

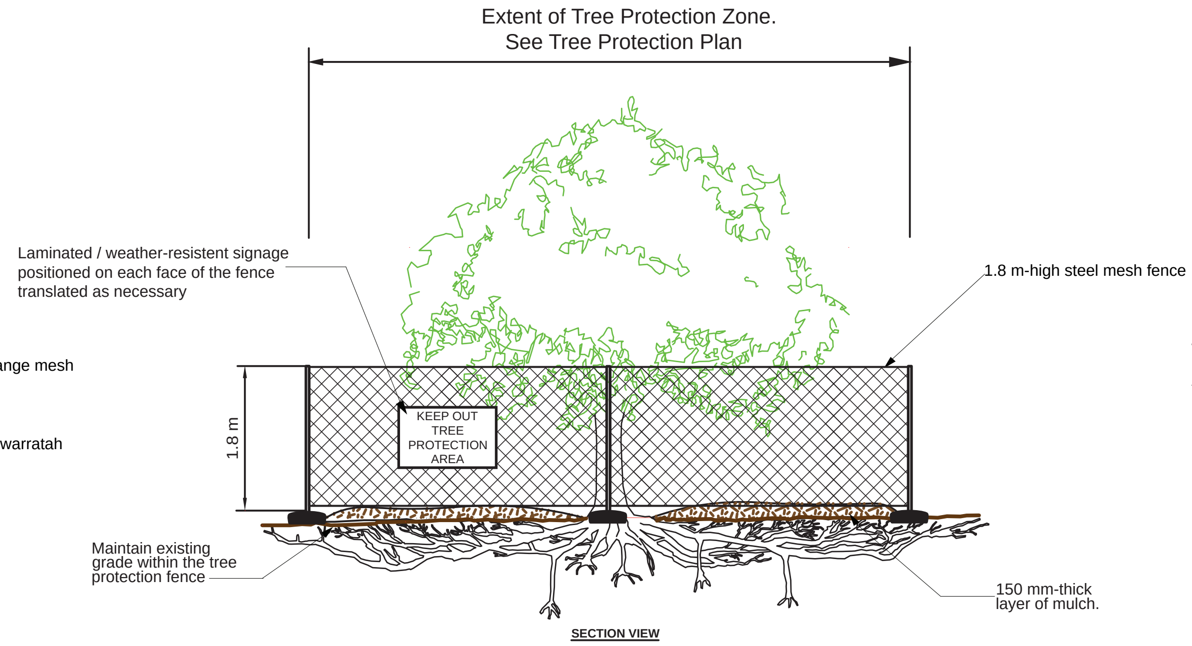
15. Every effort shall be made to avoid root severance from all trees by exploring on-site alternatives to construction / engineering. Where root severance is unavoidable, the severance of any root is to be carried out by the supervising arborist, who shall select the most appropriate implement for the 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 supervising arborist.

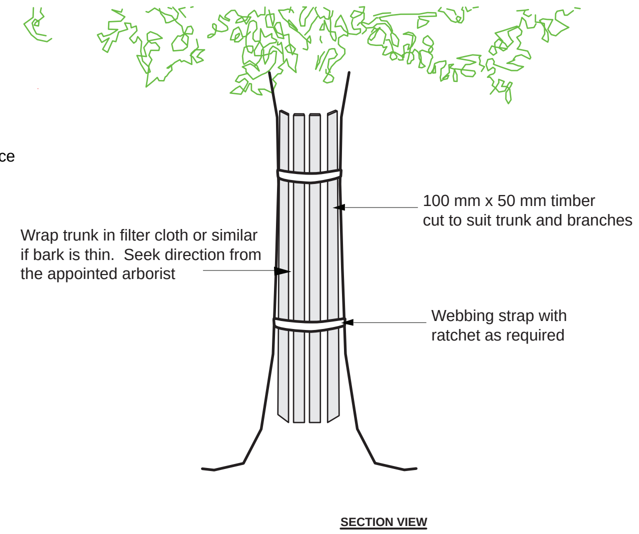
Appendix B – Tree protection details



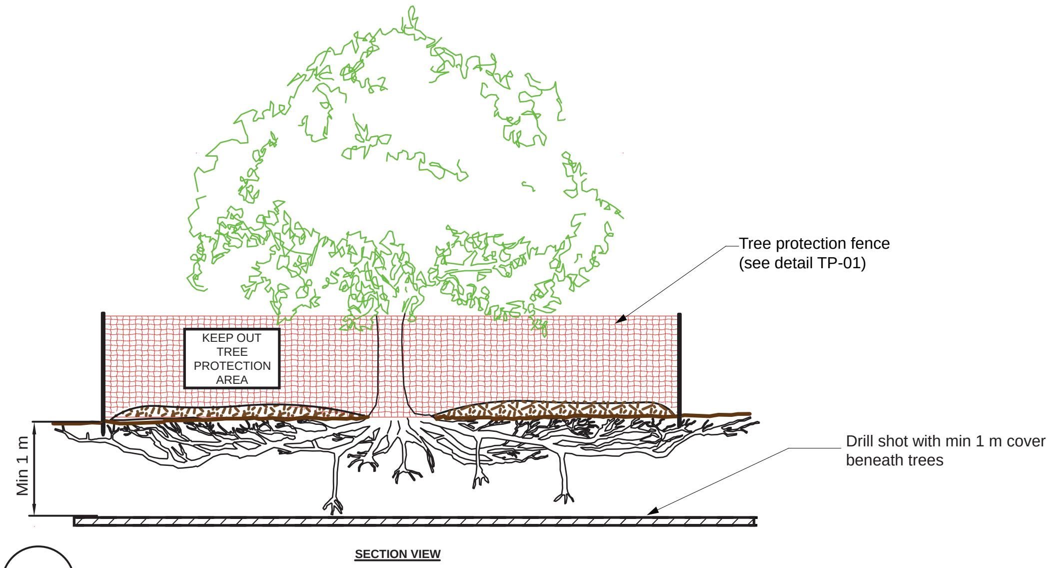
TP-01 TREE PROTECTION - TREE PROTECTION FENCING



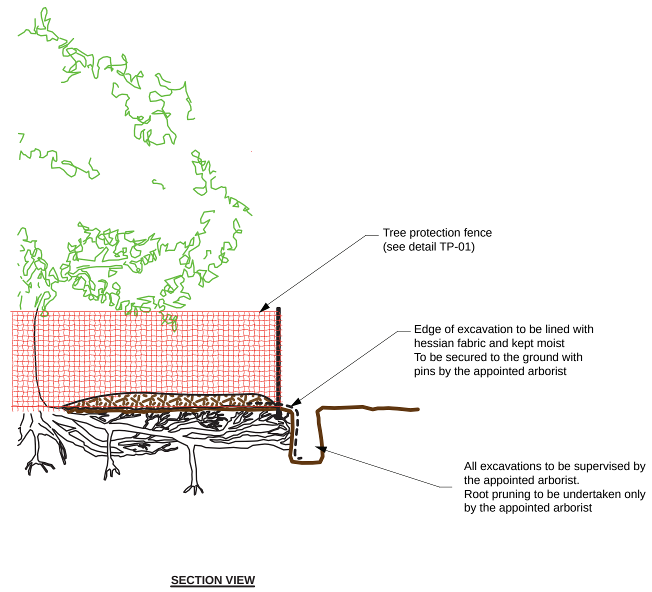
TP-02 TREE PROTECTION - TREE PROTECTION FENCING



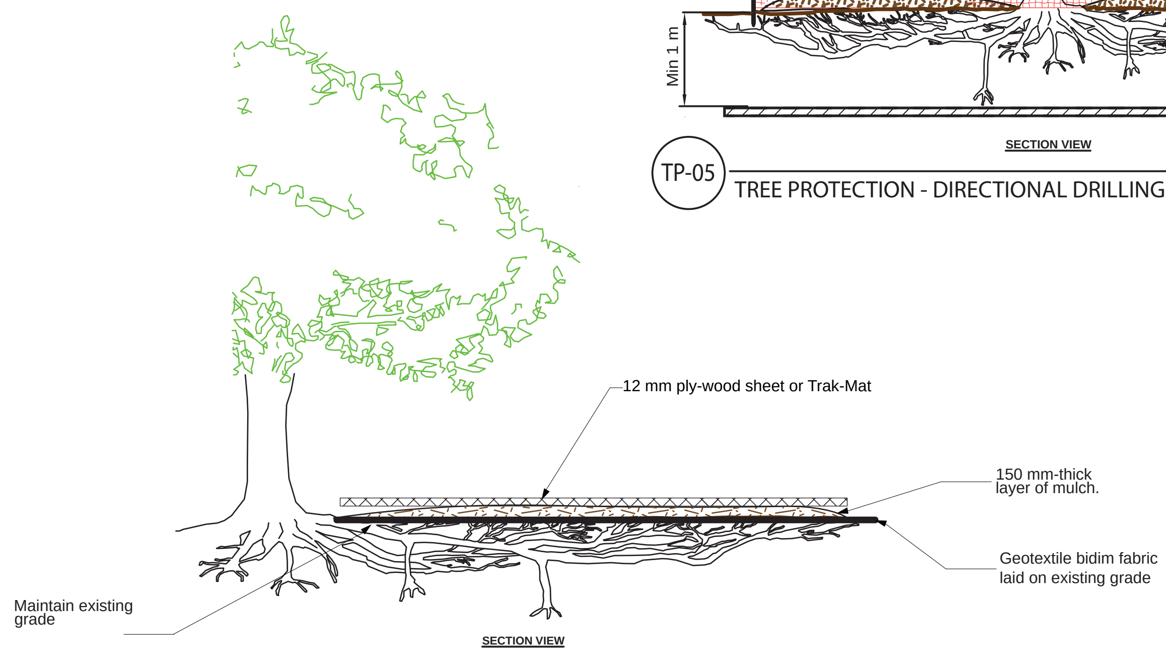
TP-03 TREE PROTECTION - TRUNK PROTECTION



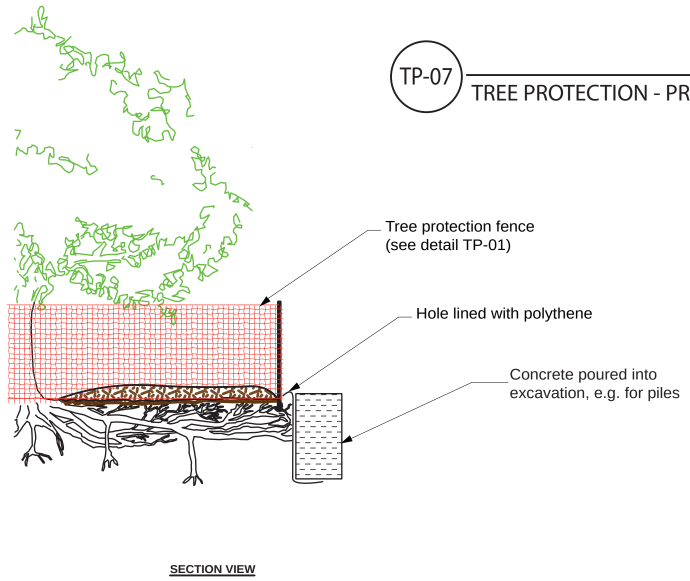
TP-05 TREE PROTECTION - DIRECTIONAL DRILLING



TP-07 TREE PROTECTION - PROTECTING ROOTS



TP-04 TREE PROTECTION - GROUND PROTECTION



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 14-08-2020

1. Prior to tree relocation, there must be an on-site meeting with the urban forest specialist or other such representative from Auckland Council who has responsibility for the site to agree upon a new location for the tree. The new location must be selected such that it does not cause any detrimental effects to any other tree nearby, either by excavation of the pit, or through compaction of the soil during transport, or due to trunk / branch strikes during transport.

2. The relocation of the tree is to be carried out by qualified and experienced arborists who have specific experience with relocating trees.

3. Once determined, a pit is to be excavated at the new location that has a diameter of at least 18 m and approximately 1 m deep.

4. The root ball radius of the pōhutukawa tree (tree 15) tree is to be 9 m (18 m diameter). Preliminary excavations for root ball extractions should proceed at first using hand methods, pneumatic (Air Spade) or hydraulic (hydro-vac) soil displacement. These methods shall encroach no further to the tree than the identified root ball radii unless otherwise approved by the on-site supervising arborist. The depth of excavation should not be less than 0.8 m and not more than 1 m.

5. Once the root ball perimeters have been completely exposed, any roots shall be cut cleanly to ensure that the traumatic cambium is able to initiate new root growth as effectively as possible. The appointed arborist shall undertake all root pruning. The root ball is to then be wrapped in hessian (or similar product) to prevent it from drying out.

6. Suitable lifting tree frames are to be placed on top of the root ball as lifting points for the transplanting. The root ball is then to be secured with a chain that is under cut beneath the root ball and tensioned with webbing straps connecting the upper and lower supports. If necessary, steel I-beams can be driven under the tree for additional support, and the lifting frames secured to the I-beams.

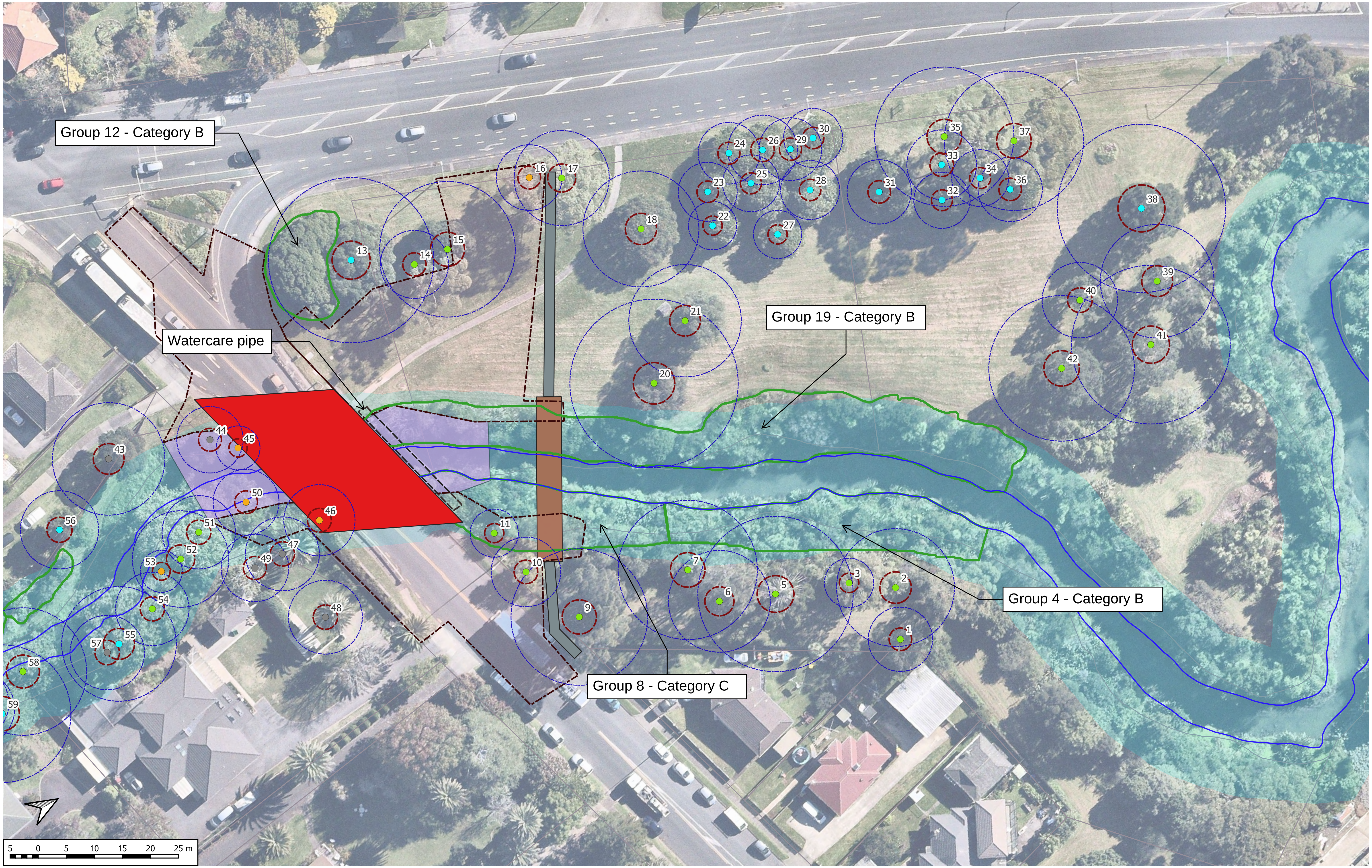
7. Immediately prior to lifting, the base of the root ball is to be sliced away from the growing medium. This is typically carried out with a tensioned cable, by looping a wire rope / cable around the root ball at the bottom of the trench and cinching it tight by pulling with a digger. Once the root ball is fully prepared, the tree shall be lifted and transported to the new location. Anchorage for lifting is to be strictly from the tree frame or chain on top of the root ball. Anchorage from the trunk is strictly prohibited. The tree is to be transported to the new location on the back of flat-bed truck, unless it can be lifted directly from its current location with a crane and placed straight into its new location.

8. When the tree is being placed in the new location, it must be lifted in the same way as it was when it was extracted – using the frames. The tree is then lowered carefully into the pit at the new location, taking care to ensure that the trunk collar is between 0.2 and 0.3 m higher than the existing soil grade, to allow for settlement. Backfill using the native soil shall be used to achieve this. Once in place, any voids in the new pit are to be backfilled with the native soil and lightly compacted in 100 mm layers by hand.

9. Three or four wire rope guys are to be secured to the tree's trunk using webbing stops or similar. It is not acceptable to wrap wire cables around trunks and branches. The wire rope guys must then be affixed to suitable ground anchors approximately 1 m outside of the extracted root ball, and the wire ropes pulled taught, usually by incorporating heavy-duty tie-down straps into the system. The guys must remain in place for one year and be checked periodically to ensure they remain taught.

10. A layer of well-composted wood-chip mulch no less than 150 mm thick is to be laid over the extracted root ball and backfilled pit to help minimise soil drying and root desiccation. Irrigation is to be carried out between 06:00 and 07:00 and between 17:00 and 18:00 every second day during the months of November to April when there has been no natural precipitation for a consecutive 48-hr period (i.e., if it rains, then irrigation can cease for two days after the rain event). Irrigation is to continue for one year, and the mulch must be replenished every six months for three years.

Appendix D – Arboricultural site plans (3055_001 to 003, rev B)



Trees

- Category A
- Category B
- Category C
- Category U

Structural root zone
Tree protection zone
Vegetation groups
Stream banks (from AC GIS contours)
10 m riparian margin

Construction yard
Permanant bridge
Baily bridge
Temp footpath
Streamworks

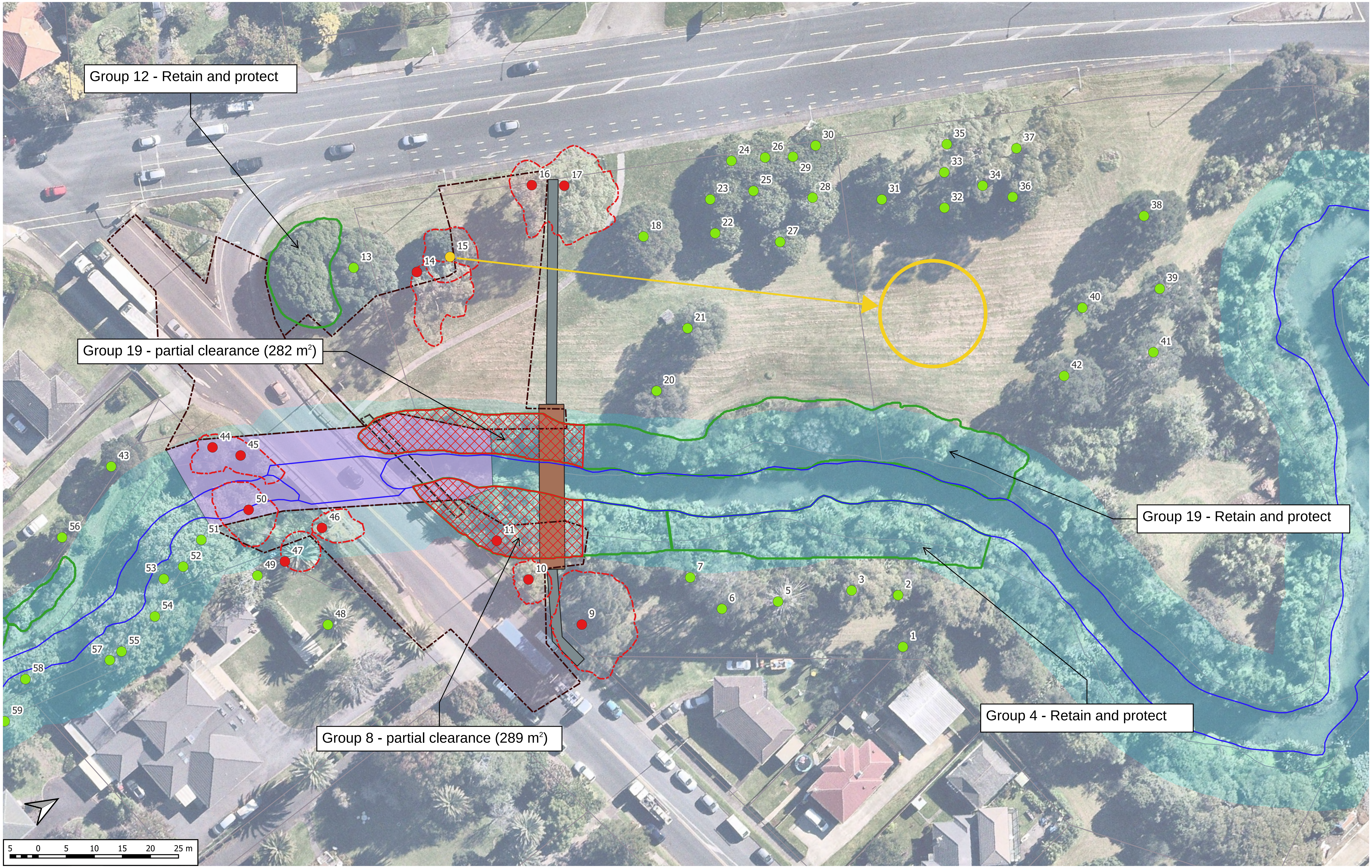
Healthy Waters Design Office
AUCKLAND COUNCIL, LEVEL 3, BLEDISLOE HOUSE

Te Ararata Creek Reserve and Black Bridge Reserve
Walmsley Road Bridge
Tree location and site works plan

The TREE CONSULTANCY COMPANY

Project:	3055
Drawing: 001	Revision: B

24/10/2024



Trees
- Retain and protect
- Remove
- Relocate
- Suggested relocated tree 15
- Stream banks (from AC GIS contours)
- 10 m riparian margin
- Cleared area
- Lost canopy cover
- Construction yard
- Vegetation groups
- Pedestrian bridge
- Temporary footpath
- Streamworks

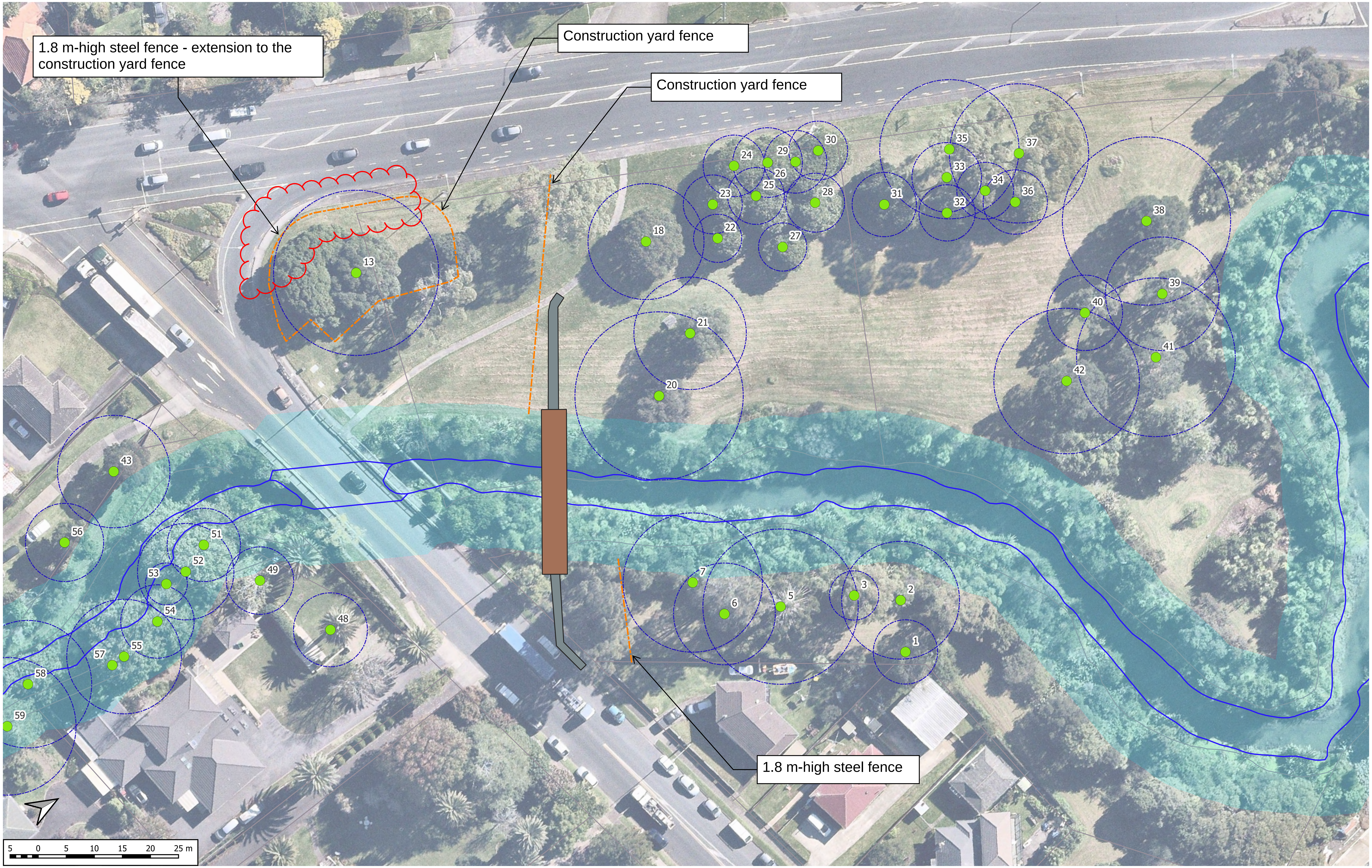
Healthy Waters
Design Office
AUCKLAND COUNCIL, LEVEL 3, BLEDISLOE HOUSE

Te Ararata Creek Reserve and Black Bridge Reserve
Walmsley Road Bridge
Vegetation impacts plan

The TREE CONSULTANCY COMPANY

Project:	3055
Drawing:	002
Revision:	B

24/10/2024



- Retained trees
- Tree protection zone
- Construction exclusion fencing / construction yard fencing
- Bailey bridge
- Temp footpath

Healthy Waters
Design Office
AUCKLAND COUNCIL, LEVEL 3, BLEDISLOE HOUSE

Te Ararata Creek Reserve and Black Bridge Reserve
Walmsley Road Bridge
Tree protection plan

The TREE CONSULTANCY COMPANY

Project:	3055
Drawing: 006	Revision: B

22/10/2024

Appendix E – Tree inventory

Tree number	Number of trees	Species / Common name	Height (m)	DBH (cm)	SRZ radius (m)	TPZ radius (m)	Vitality	Live crown volume	Form	Branch strutcure	Age class	Category	Impacts
1	1	*Ulmus minor* / English elm	13	38.2	2.0	5.7	Good	90% - 95%	Good	Good	Mature	Category B	Nil - retain and protect
2	1	*Eucalyptus sp.* / Gum tree	17.5	70.0	2.8	10.5	Good	90% - 95%	Good	Good	Mature	Category B	Nil - retain and protect
3	1	*Eucalyptus sp.* / Gum tree	9.2	29.3	1.7	4.4	Good	90% - 95%	Good	Good	Mature	Category B	Nil - retain and protect
4	476 m^2	Native riparian plants	4	15.9	1.2	2.4	Good	95% - 99%	Good	Good	Early mature	Category B	Nil - retain and protect
5	1	*Araucaria bidwillii* / Bunya pine	10	92.3	3.3	13.8	Good	90% - 95%	Good	Good	Mature	Category B	Nil - retain and protect
6	1	*Casuarina cunninghamiana* / She oak	14	60.5	2.6	9.1	Good	90% - 95%	Good	Good	Mature	Category B	Nil - retain and protect
7	1	*Casuarina cunninghamiana* / She oak	17	82.8	3.1	12.4	Good	90% - 95%	Good	Good	Mature	Category B	Nil - retain and protect
8	419 m^2	Native riparian plants plus wilding sheoke	7	12.7	1.1	1.9	Good	85% - 90%	Good	Good	Early mature	Category C	Remove 289 m^2
9	15	*Casuarina cunninghamiana* / She oak	17	81.2	3.0	12.2	Good	75% - 80%	Fair	Fair	Mature	Category B	Remove
10	3	*Pittosporum eugenioides* / Lemonwood	5.8	41.4	2.1	6.2	Good	90% - 95%	Fair	Fair	Mature	Category B	Remove
11	1	*Corynocarpus laevigatus* / Karaka	5.2	28.6	1.7	4.3	Good	85% - 90%	Good	Good	Mature	Category B	Remove
12	9	Group of *Pseudopanax lessonii* / Houpara	5	34.4	1.9	5.2	Good	95% - 99%	Good	Fair	Mature	Category B	Establish construction yard in TPZ. Use mulch and avoid excavations. Nil or almost nil impacts
13	1	*Metrosideros excelsa* / Pōhutukawa	8	98.2	3.4	14.7	Good	90% - 95%	Good	Good	Mature	Category A	Establish construction yard in TPZ. Use mulch and avoid excavations. Nil or almost nil impacts
14	1	*Eucalyptus sp.* / Gum tree	12.3	40.4	2.1	6.1	Good	85% - 90%	Good	Good	Mature	Category B	Remove
15	1	*Metrosideros excelsa* / Pōhutukawa	9	80.6	3.0	12.1	Good	85% - 90%	Good	Good	Mature	Category B	Relocate / Remove
16	1	*Eucalyptus sp.* / Gum tree	17.6	39.0	2.0	5.8	Poor	65% - 70%	Good	Fair	Mature	Category C	Remove
17	1	*Eucalyptus sp.* / Gum tree	16	56.5	2.5	8.5	Good	90% - 95%	Good	Good	Mature	Category B	Remove

DBH - [trunk] Diameter at Breast Height (1.4 m); SRZ - Structural Root Zone; TPZ - Tree Protection Zone

Tree number	Number of trees	Species / Common name	Height (m)	DBH (cm)	SRZ radius (m)	TPZ radius (m)	Vitality	Live crown volume	Form	Branch strutcure	Age class	Category	Impacts
18	1	*Metrosideros excelsa* / Pōhutukawa	9.8	68.9	2.8	10.3	Good	90% - 95%	Good	Good	Mature	Category B	Nil - retain and protect
19	1,061 m^2	Native riparian plants	3.5	12.7	1.1	1.9	Good	90% - 95%	Good	Good	Early mature	Category B	Remove 282 m^2
20	1	*Metrosideros excelsa* / Pōhutukawa	9	114.6	3.7	15.0	Good	90% - 95%	Good	Good	Mature	Category B	Nil - retain and protect
21	1	*Metrosideros excelsa* / Pōhutukawa	11.7	66.8	2.7	10.0	Good	90% - 95%	Good	Good	Mature	Category B	Nil - retain and protect
22	1	*Magnolia grandiflora* / Evergreen magnolia	7	28.6	1.7	4.3	Good	95% - 99%	Good	Good	Mature	Category A	Nil - retain and protect
23	1	*Magnolia grandiflora* / Evergreen magnolia	7	35.0	1.9	5.3	Good	95% - 99%	Good	Good	Mature	Category A	Nil - retain and protect
24	1	*Magnolia grandiflora* / Evergreen magnolia	7	36.6	2.0	5.5	Good	95% - 99%	Good	Good	Mature	Category A	Nil - retain and protect
25	1	*Magnolia grandiflora* / Evergreen magnolia	7	33.7	1.9	5.1	Good	95% - 99%	Good	Good	Mature	Category A	Nil - retain and protect
26	1	*Magnolia grandiflora* / Evergreen magnolia	7	41.4	2.1	6.2	Good	95% - 99%	Good	Good	Mature	Category A	Nil - retain and protect
27	1	*Magnolia grandiflora* / Evergreen magnolia	7	28.6	1.7	4.3	Good	95% - 99%	Good	Good	Mature	Category A	Nil - retain and protect
28	1	*Magnolia grandiflora* / Evergreen magnolia	7	35.0	1.9	5.3	Good	95% - 99%	Good	Good	Mature	Category A	Nil - retain and protect
29	1	*Magnolia grandiflora* / Evergreen magnolia	7	37.2	2.0	5.6	Good	95% - 99%	Good	Good	Mature	Category A	Nil - retain and protect
30	1	*Magnolia grandiflora* / Evergreen magnolia	7	35.0	1.9	5.3	Good	95% - 99%	Good	Good	Mature	Category A	Nil - retain and protect
31	1	*Magnolia grandiflora* / Evergreen magnolia	7	38.2	2.0	5.7	Good	95% - 99%	Good	Good	Mature	Category A	Nil - retain and protect
32	1	*Magnolia grandiflora* / Evergreen magnolia	7	33.4	1.9	5.0	Good	95% - 99%	Good	Good	Mature	Category A	Nil - retain and protect
33	1	*Magnolia grandiflora* / Evergreen magnolia	7	41.4	2.1	6.2	Good	95% - 99%	Good	Good	Mature	Category A	Nil - retain and protect
34	1	*Magnolia grandiflora* / Evergreen magnolia	7	33.7	1.9	5.1	Good	95% - 99%	Good	Good	Mature	Category A	Nil - retain and protect

DBH - [trunk] Diameter at Breast Height (1.4 m); SRZ - Structural Root Zone; TPZ - Tree Protection Zone

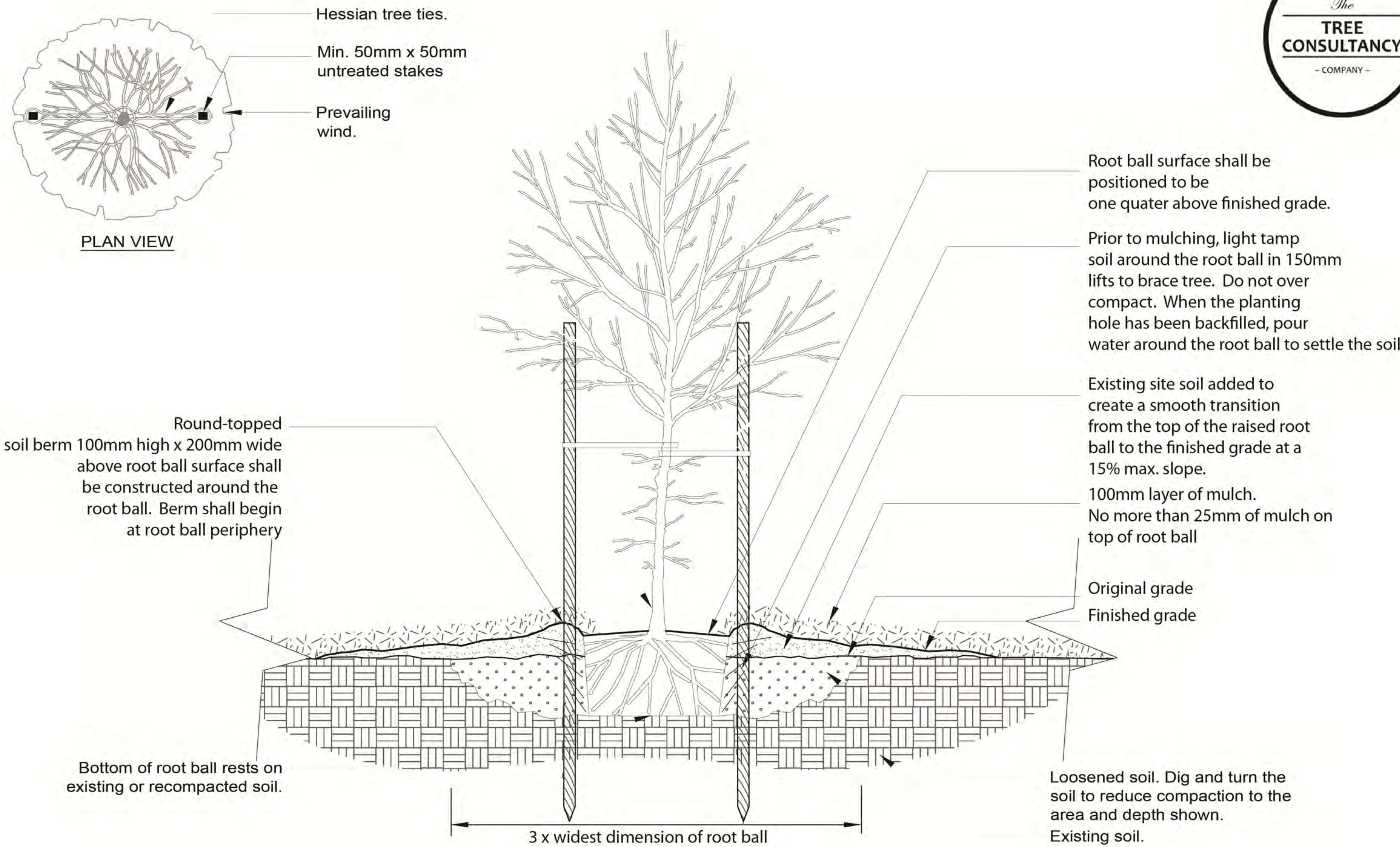
Tree number	Number of trees	Species / Common name	Height (m)	DBH (cm)	SRZ radius (m)	TPZ radius (m)	Vitality	Live crown volume	Form	Branch strutcure	Age class	Category	Impacts
35	1	*Eucalyptus sp.* / Gum tree	17.5	82.8	3.1	12.4	Good	90% - 95%	Good	Good	Mature	Category B	Nil - retain and protect
36	1	*Magnolia grandiflora* / Evergreen magnolia	7	38.2	2.0	5.7	Good	95% - 99%	Good	Good	Mature	Category A	Nil - retain and protect
37	1	*Eucalyptus sp.* / Gum tree	16.6	82.8	3.1	12.4	Good	90% - 95%	Good	Good	Mature	Category B	Nil - retain and protect
38	1	*Metrosideros excelsa* / Pōhutukawa	12.9	143.2	4.2	15.0	Good	85% - 90%	Good	Good	Mature	Category A	Nil - retain and protect
39	1	*Metrosideros excelsa* / Pōhutukawa	12.5	67.5	2.8	10.1	Good	90% - 95%	Good	Good	Mature	Category B	Nil - retain and protect
40	1	*Metrosideros excelsa* / Pōhutukawa	8.6	44.8	2.2	6.7	Good	90% - 95%	Good	Good	Mature	Category B	Nil - retain and protect
41	1	*Metrosideros excelsa* / Pōhutukawa	12.6	94.3	3.3	14.1	Good	90% - 95%	Good	Good	Mature	Category B	Nil - retain and protect
42	1	*Metrosideros excelsa* / Pōhutukawa	13	86.5	3.2	13.0	Good	90% - 95%	Good	Good	Mature	Category B	Nil - retain and protect
43	1	*Ligustrum lucidum* / Tree privet	6	66.8	2.7	10.0	Good	95% - 99%	Fair	Good	Mature	Category U	Nil - retain and protect
44	1	*Myoporum laetum* / Ngaio	8	39.5	2.0	5.9	Poor	45% - 50%	Compromised	Fair	Mature	Category U	Remove
45	1	*Myoporum laetum* / Ngaio	8	26.1	1.6	3.9	Fair	65% - 70%	Fair	Fair	Early mature	Category C	Remove
46	1	*Robinia pseudoacacia* / Black locust	9	42.3	2.1	6.4	Good	95% - 99%	Good	Fair	Early mature	Category C	Remove
47	1	*Phoenix canariensis* / Phoenix palm	9	43.9	2.2	6.6	Good	100%	Good	Good	Mature	Category U	Remove
48	1	*Phoenix canariensis* / Phoenix palm	9	43.9	2.2	6.6	Good	100%	Good	Good	Mature	Category U	Nil - retain and protect
49	1	*Magnolia grandiflora* / Evergreen magnolia	11	40.1	2.1	6.0	Poor	10% - 15%	Fair	Fair	Mature	Category U	Nil - retain and protect
50	1	*Erythrina x sykesii* / Coral tree	10	39.2	2.0	5.9	Good	95% - 99%	Fair	Poor	Early mature	Category C	Remove
51	1	*Quercus robur* / English oak	10	43.6	2.2	6.5	Good	100%	Good	Fair	Early mature	Category B	Earthworks in root zone to reshape stream channel. Some root impacts anticipated, likely some short-term stress

DBH - [trunk] Diameter at Breast Height (1.4 m); SRZ - Structural Root Zone; TPZ - Tree Protection Zone

Tree number	Number of trees	Species / Common name	Height (m)	DBH (cm)	SRZ radius (m)	TPZ radius (m)	Vitality	Live crown volume	Form	Branch strutcure	Age class	Category	Impacts
52	1	*Quercus robur* / English oak	11	57.3	2.5	8.6	Good	100%	Good	Fair	Early mature	Category B	Nil - retain and protect
53	1	*Quercus robur* / English oak	8	25.0	1.6	3.7	Good	100%	Good	Fair	Juvenile	Category C	Nil - retain and protect
54	1	*Quercus robur* / English oak	10	43.6	2.2	6.5	Fair	80% - 85%	Fair	Fair	Early mature	Category B	Nil - retain and protect
55	1	*Quercus robur* / English oak	12	68.1	2.8	10.2	Good	100%	Fair	Good	Mature	Category A	Nil - retain and protect
56	1	*Corynocarpus laevigatus* / Karaka	8	46.5	2.2	7.0	Good	95% - 99%	Fair	Good	Mature	Category A	Nil - retain and protect
57	1	*Phoenix canariensis* / Phoenix palm	8	44.2	2.2	6.6	Good	100%	Good	Good	Mature	Category U	Nil - retain and protect
58	1	*Quercus robur* / English oak	12	75.8	2.9	11.4	Good	100%	Fair	Good	Mature	Category B	Nil - retain and protect
59	1	*Araucaria heterophylla* / Norfolk Island pine	23	81.8	3.1	12.3	Excellent	100%	Good	Good	Early mature	Category A	Nil - retain and protect

DBH - [trunk] Diameter at Breast Height (1.4 m); SRZ - Structural Root Zone; TPZ - Tree Protection Zone

Appendix F – Tree planting specification



P-1

45L Grade Tree Planting Detail