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Arboricultural Assessment of Effects

of
Extension of the Central Interceptor wastewater tunnel into Point Erin Park, resulting in the removal of reserve trees.

Prepared for	***Xenia Meier*** *Watercare* PO Box 5271 Victoria Street West Auckland 1142	**Prepared by** **Date** **Job ref #** **Reviewed by**	**Sean McBride** Director 25 January 2023 2499 Tracey Funnell

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1. Introduction

1.1 Watercare Services Limited (Watercare) proposes to extend the Central Interceptor (CI) pipeline from Tawariki Street to Point Erin Park. The extension of the CI to Point Erin Park is referred to as the Point Erin Tunnel or the Project throughout this report. The CI Tunnel Boring Machine (TBM) will be retrieved from a shaft constructed within Point Erin Park.

1.2 The Tree Consultancy Company has been engaged by Watercare to provide an arboricultural assessment of the Project's effects on existing trees at Point Erin Park. This arboricultural assessment considers the activities proposed within Point Erin Park only and assesses the impacts on trees within the park as a result of the Project. The scope of this report is to:

- Undertake a ground-based tree inspection and capture relevant tree data to identify relevant root zone areas.
- Assess the general condition of the trees at Point Erin Park, including identifying those that are in poor condition and where removal is recommended. Identify those trees which will require either retention or relocation as a direct result of the Project.
- Prepare a tree inventory table and tree plan depicting the above.
- Prepare an arboricultural assessment of effects of the Project in Point Erin Park.

2. Site description and summary of proposed activities

2.1 The Project site considered for this assessment is located in the southern half of Point Erin Park. The Project site is accessed by an accessway near the southeastern corner of the park, where a car park is present. In the north of the site is Point Erin Pools. To the west of the car park, the site opens to a large grassed area that is surrounded by mature vegetation. The grassed area slopes to the west, where the park borders the Curran Street motorway on-ramp. A small open area is present in the southwestern corner. Figure 1 below depicts the Project site, which is the subject of this assessment.

Figure 1 – The subject site(cyan box)

2.2 The extent of the proposed works for the Project in Point Erin Park can be separated into two areas within the park:

a) The first area is proposed to occupy the majority of the grassed area to the west of the existing car park, where a shaft and main contractor's yard will be located. An area will be required to

accommodate a large crane and two excavators, temporary site offices, dewatering tanks and a turning area for trucks during the construction period. This proposed work area is adjacent to and will encroach near a group of early-mature pōhutukawa trees, two mature oak trees and one mature macrocarpa tree. Several newly planted trees will be on the periphery of the proposed contractor's yard.

b) The second area of work is proposed within the southwestern corner of Point Erin Park, where a control chamber and plant room will be situated. The chamber will connect existing infrastructure into the new terminal shaft. A large crane and mini excavator are also required to construct the new infrastructure in this area of the reserve. Two mature pōhutukawa trees are directly adjacent to this area of work. I am advised by Watercare that the control chamber is required to be located in this area as this is where the existing infrastructure is positioned.

2.3 The Project is depicted in the following drawings, which have been relied upon for my assessment. The final layout for the works in Point Erin Park has undergone numerous revisions to ensure that the encroachments on trees are minimised to the extent practicable. More detail on the site optimisation process is provided in the Assessment of Effects on the Environment prepared by Tonkin + Taylor.

- Preliminary site layout (Sketch No. DCIN_DEL_SKT_C_J_30015, Rev A).

3. Site assessment and limitations

3.1 I visited Point Erin Park on the 21st of September, 2022 and investigated the principal trees within the proposed area of work for the Project. I recorded species and measured the trunk diameter of the trees immediately surrounding the area of work. I estimated the tree height and the farthest radial crown spread to depict the Auckland Unitary Plan protected root zone. Qualitative observations of tree condition (form, structure, vitality) and quantitative estimates of live crown volume, which can help to inform an overall picture of tree vitality, were undertaken. The tree location was recorded using a Trimble Catalyst (accuracy of approximately 400 mm), and all relevant data was entered into a data collection application. The tree inspection comprised a ground-based visual inspection in the realms of what is defined as Level 2 Visual Tree Assessment, and any obvious tree risk features noted.

3.2 A second site visit at Point Erin Park was undertaken on the 23rd of September 2022, with Xenia Meier and David Heinrich (Principal Water Project and Design Manager, Watercare) to discuss the initial findings of the tree survey and the types of construction activities that were likely to occur within Point Erin Park. Following that tree inspection and site meeting, a GIS tree plan and tree inventory table were prepared and presented to Watercare for discussion.

3.3 On the 3rd of October 2022, a third site meeting at Point Erin Park was carried out with the wider Project team. At this site visit, a wider Project overview was provided by Watercare, along with the opportunity to discuss aspects of the Project with other specialists.

3.4 During the tree inspections on the 23rd of September, obvious tree risk features that warrant intervention were noted. A site meeting was subsequently undertaken with Bernardo Santos (Senior Urban Forest Specialist at Auckland Council) on the 11th of October 2022. The tree risk features and potential remedial works were described. Also at this meeting, I provided an overview of the Project and work that was proposed to be undertaken to minimise work footprints and impacts on trees (i.e. through refinement of the infrastructure design layout away from trees and placement of contractor's equipment within the yard, as far as reasonably practicable).

4. Summary of tree details and site observations

4.1 Point Erin Park contains a large number of mature trees, of varying species and conditions. Along the southern edge of the large grass area is a widespread group of mature trees, containing macrocarpa, silky oak, English oak, poplar, planes, monkey apple, puriri, and tulip trees. Many of the trees are in fair health and range in structural condition. Of the trees in this southern area, the most dominant is a mature macrocarpa tree, with long-reaching northern lateral limbs.

4.2 The macrocarpa tree located near the southeastern corner of the grassed area was exhibiting an active branch failure, with the second lowest branch opening and closing during a high wind event. Council's tree maintenance contractors (via council's online reporting function) have been notified of the works. The tree also shows signs of numerous historical live branch failures with torn stubs and tear wounds throughout the crown. Although the tree exhibits an obvious tree risk feature with an active failure occurring and has a clear history of previous live branch failure, it is a substantial tree within the park. For this reason, it should be managed as a veteran specimen, and allowed to naturally reduce in size with intervention that is only necessary for public safety. Figure 2 depicts the macrocarpa tree.

Figure 2 - Tree 1 (silky oak), Tree 2 (Lombardy poplar) and Tree 3 (macrocarpa)

4.3 A mature silky oak and Lombardy poplar tree (Figure 2) are located adjacent to the accessway and near the park maintenance access route through bollards. The silky oak is in poor health and of fair form with canopy retrenchment occurring and the main leader previously being removed. It also has basal trunk damage. The Lombardy poplar also has dieback occurring and visible decay within basal roots and near the base. Sounding the trunk with a nylon mallet revealed the decay is almost certainly extensive within the trunk. The species is also known to respond and compartmentalise poorly to wood decay.

4.4 Two mature pōhutukawa trees (Figure 3) are present, along with a semi-mature lime tree along the southwestern boundary edge boarding the Curran Street motorway on-ramp. The pōhutukawa is commencing the 'walking' stage, where lateral limbs fail or settle to the ground, where they can continue to grow. Both of these trees have a single limb that has failed at or near the union. The more southern of the two pōhutukawa has a low-hanging limb that forms an archway over an adjacent footpath that runs beneath.

Figure 3 – Trees 16 and 17 (pōhutukawa)

4.5 Further north of the pōhutukawa and lime along the southwestern boundary edge, the site raises up to a sloping bank where individual pōhutukawa and overtowering pine trees are present. The group of pines are formed on the bank top and slope edge. A stand-alone eucalyptus tree is present more than 15m to the east of this group, in the grass area. Overall, the trees in this area of the reserve are in good condition.

4.6 To the north of the grass area in Point Erin Park, is a band of pōhutukawa trees of approximately 10m in height (Trees 31 in Figure 4). They form a contiguous group with an area of approximately 2500 m². Due to the pōhutukawa being formed of a large group, trees closest to the area of works have been plotted (ten trees in total), with the largest tree having the trunk measured. By measuring the largest trunk diameter, the protected root zone area will include all remaining trees as well, ensuring a sufficient protection zone is plotted.

Figure 4 – Aerial showing Tree group 31, Trees 32 and 33.

4.7 Two mature English oak trees (Trees 32 and 33) are situated in the northeastern corner of the grassed area, adjacent to an access road for the pools. Both trees are in fair condition, with a moderate amount of twiggy deadwood present throughout the crown. There is also clear evidence of previous live branch failure and areas of cambial dieback. The condition of the trees suggests they are in a life stage of senescence, and for this, they should be maintained as veteran specimens. With the deadwood, tear wounds and pockets of decay present, they will be providing benefits outside of direct arboricultural (such as ecological and biodiversity).

4.8 To the south of the oak is a group of seven recently planted trees (likely within the last two seasons). These trees are establishing very well within the reserve, and they have the capability to become large specimens. Although juvenile trees, due to their good establishment, these trees should be regarded as high-value trees, with excellent future potential.

5. Arboricultural assessment of effects

Main construction area

5.1 The main construction area in the large grassed area of Point Erin Park is mainly situated outside of both the Auckland Unitary Plan defined root zone and Tree Protection Zone (a measurement calculated to be 12 times the trunk diameter at 1.4 m above ground level). This is with the exception of tree 3 (large macrocarpa), several of the pōhutukawa trees to the north of the extent of the work (referenced as tree 31), and the two oak trees to the northeast of the shaft location (trees 32 and 33). Figure 5 shows the two construction areas, with the main site being the area in orange.

Figure 5 – Construction areas

5.2 Access to the main construction area will be through the park entrance off Sarsfield Street, where two mature street elm trees are located (Trees 44 and 45). Both trees have canopies that hang low over the road and entranceway. Pruning to improve overhead canopy clearance for vehicle movement along the road and into the park entrance will be required. This pruning can be categorised as routine maintenance and may involve the pruning of limbs greater than 100 mm in diameter. The resulting effects from tree pruning are expected to be minimal.

5.3 From the entrance off Sarsfield Street, the contractors will access the grass area through the footprint of tree 38, a recently planted pūriri. It is a juvenile tree that has not reached the dimensions where resource consent will be required for its removal or alteration. As the tree is establishing well, it is proposed to relocate it to a different position within the park. When undertaken in accordance with accepted practices and standards and correctly maintained for two years, a successful tree relocation will almost certainly occur.

5.4 The proposed contractor's yard will occupy a small area of the macrocarpa (Tree 3), pōhutukawa tree group (Tree group 31, Figure 6) and the two oak trees' (Trees 32 and 33) root zone area, and this could be utilised for temporary site offices, dewatering tanks and the Tally Hut and ventilation extraction. Filling or excavation may occur within this area to create a level construction yard. The shaft will be constructed outside of the root zone of this tree group. The area of the root zone, which may be impacted by the establishment of the temporary construction yard, is very small in comparison to the overall root zone area that is within a wide and expansive grassed area. Given the large undisturbed root zone area outside of the contractor's yard and the small proportion of the tree roots that will be disturbed, even with no controls on root loss in the contractor's yard to construct the shaft and other works for establishment, biological effects on tree health associated with the construction area's establishment and shaft construction are expected to be minimal, or perhaps negligible.

Figure 6 – Trees 30 and 31

Point Erin Tunnel and subsurface ancillary infrastructure

5.5 The proposed Point Erin Tunnel leading to the shaft passes at depth beneath numerous mature trees along the southern boundary abutting Sarsfield Street. Through the entire length of the Point Erin Tunnel, the pipe is to have a minimum cover of 15 m, but will on average, be much deeper. At this depth, no roots from the trees within Point Erin Park are expected to be encountered. Effects on the trees in Point Erin Park, and along the alignment, from tunnelling are therefore considered to be negligible.

5.6 A second connection pipe is required between the chamber in the southwestern corner of the site and the shaft. Similarly, the pipe will be tunnelled beneath the mature trees at depth (i.e. several meters). As with the main CI tunnelling works, the effects on the trees to construct the connecting pipe will be negligible.

Southwestern construction area

5.7 The proposed chamber and associated plant room are required to be constructed in the southwestern corner of Point Erin Park. This is due to the requirement to connect to the pipework that runs in a north-to-south direction in this area. Installing the chamber in this area is unavoidable and results in effects on trees.

5.8 Trees 16 and 17 are mature pōhutukawa trees that stand at approximately 13 m in height. Tree 16 has quite an upright form, with the exception of one limb on the southern side that has failed in the past. Sections of the failed limb are touching the ground, where it is almost certain new roots have developed, resulting in the ability for the branch to continue to grow. This is a common occurrence with mature pōhutukawa and is referred to as the walking stage of its lifecycle.

5.9 Tree 16 is on the eastern edge of the southwestern construction area (Figure 5, yellow area), where a retaining wall is expected to be constructed to form a level platform for construction works. Cumulatively, the wall construction, disturbance to roots through severance and the changes in soil levels, and pruning to provide clearance for the work area are expected to compromise the health and longevity of the tree.

5.10 Tree 17 is the second and more southern mature pōhutukawa tree of the two. It also has a scaffold branch that has failed to the ground and continued to grow. The branch is on the eastern canopy side and is not impacted by the proposed works. The tree is, however, some 18m from the Curran Street boundary and on the periphery of the extent of the works boundary. Given the nature of the chamber earthworks and overall construction, significant root disturbance will occur, to a point where retention of the tree is not viable. Additional impacts will also occur due to the requirement for significant pruning to cut the canopy back to allow for machinery access and use (i.e. crane to lift materials for construction).

5.11 I have been advised by Watercare that although consent will be sought for the removal of trees 16 and 17, every effort practicable will be made to seek retention during construction. A suitably qualified and experienced supervisory arborist will be engaged for the construction works and guide the principal contractor through working around the trees as much as practicably possible. While it is recommended that all efforts be made to prune the tree so that it can be retained, the overall disturbance to the trees means retention is untenable, and removal is required.

5.12 The Project team has explored options for the Point Erin Park works layout, however, the main driving factor for siting the chamber in this location, is the ability to connect to the existing pipework infrastructure. The currently presented design enables the retention of a semi-mature lime tree (no work occurring in the root zone).

5.13 To access the southwestern corner of the site, and to avoid significant earthworks within the park to form construction accessways, an entrance is required to pass near trees 42 (willow myrtle) and tree 43 (brush cherry). The willow myrtle has a historical tear wound on the roadside and has an overall poor branch structure. The brush cherry is arboriculturally insignificant, and removal can be adequately mitigated with replacement planting. The removal of these two trees ensures many of the trees in the southern section of the reserve are undisturbed by the works if an alternative, longer access through the park was required.

5.14 The southwestern construction area is also within the footprint of seven juvenile karaka, totara, kowhai, and tairere trees, which were planted within the last twelve months (according to google earth historical images). They do not reach the dimensions where resource consent is required for removal or alteration. In the instance of these seven non-protection trees, replanting new trees is a more cost-effective approach that will ultimately result in the same-sized trees elsewhere in the reserve or immediate area.

Additional tree removal

5.15 Other tree removal is proposed for the Project, and this comprises tree 12 (tulip tree), and trees 15 and 18 (both Syzygium). Trees 12 and 15 are not directly impacted by the works however they are in sufficiently poor condition, and in the case of the Syzygium trees, are structurally poor due to the presence of fungal fruiting bodies and other tree risk features. Tree 18 is within the footprint of the

works. Their removal is proposed as part of the project, as there is an opportunity to undertake replacement planting of better quality trees, that have a better long-term future.

Figure 7 - Tree 15 (for removal) and 41 (for retention)

Proposed mitigation

5.14 To mitigate the proposed tree removals, pruning, and works within root zones, it is recommended that standard CI project practices and tree protection measures set out in **Appendix A** continue to be followed, including:

5.17 All tree removal and pruning be undertaken by a suitably qualified and experienced arboricultural contractor, with all work carried out in accordance with current accepted arboricultural techniques (e.g., Arb Australia and NZ Arb Minimum Industry Standard MIS308).

5.18 Engagement of a suitably qualified and experienced on-site supervisory arborist (the 'supervising arborist') continues on this Project. The role of the supervising arborist is to supervise and coordinate all works and activities within the root zone of trees, and to liaise with the principal contractor around works that are required to protect the retained trees. All works must be undertaken in a fashion that ensures effects on the retained trees are minimal.

5.19 Construction yard site fencing should be positioned, where practicable, in such a manner that it serves the purpose of temporary tree protection fencing during the construction works. An indicative temporary tree protection fencing is provided in TTCC drawing 2499_001_A, and should be constructed in accordance with the specification TP-02 in **Appendix A**. The fence must remain in place for the duration of the Project. The protective fence may only be removed / relocated, closer to retained trees, at the direction of the appointed supervising arborist. Any site activity which needs to take place within the fence must be done under supervision and in coordination with the supervising arborist.

5.20 For mitigation planting, I have used the trees' DBH measurements and modelling from i-Tree to make some inferences about ecosystem services (Nowak & Crane, 2000, The i-Tree Development Team, 2020). The i-Tree software quantifies ecosystem services provided by trees based on input dimensions, known species characteristics and growth rates. Using this tool, it is possible to forecast how a tree will perform over time and specifically how much carbon it is expected to sequester. With reference to the removal of trees, the remedial planting needs to account for lost future benefits since all benefits up to

the date of removal have already been received (Nowak & Aevermann, 2019). That is, the replanting needs to account for the future carbon sequestration of the trees being removed.

5.21 We used the dimensions of all trees being removed and forecasted the carbon sequestration values for 28 years. A value of 28 years was chosen because a goal has been set for carbon neutrality by the Climate Change Response (Zero-Carbon) Amendment Act (2019) by 2050 and because this was a realistic lifespan for the trees. Therefore, the remedial planting needs to account for this carbon 'footprint' if carbon neutrality is to be achieved.

5.22 Using the same tool and with known dimensions of 45 L-grade nursery trees, the benefits of these nursery trees are forecast in the same way. To ensure there is no deficit in atmospheric carbon sequestration to the year 2050, at least thirty-eight exotic or forty-nine native trees are required to be planted. Liaison with Parks and Community Facilities department at Auckland Council will be required to confirm the location and individual species that are to be planted.

6. Statutory assessment

6.1 A planning assessment of the Project is outside the scope of this report and will be carried out separately from this assessment. The following rules are applicable to this Project in relation to trees in the Open Space zone:

E26 – Infrastructure

Activity Table E26.4.3.1
(A84) Tree trimming or alteration that does not comply with Standard E26.4.5.1 (Trees in streets and open space zones) or Standard E26.4.5.3 (Notable trees), as a Restricted Discretional Activity
(A87) Works within the protected root zone that comply with Standard E26.4.5.2, as a Permitted Activity
(A91) Tree alteration or removal of any tree less than 4 m in height and/or less than 400 mm in girth, as a Permitted Activity
(A92) Tree alteration or removal of any tree greater than 4 m in height and/or greater than 400 mm in girth, as a Restricted Discretional Activity

6.2 The removal of trees less than 4m in height, or with a trunk girth less than 400mm, is a permitted activity under table E26.4.3.1. Trees 19 to 25 and tree 38 are all young trees that are less than these dimensions, and their removal is, therefore, permitted. Trees 1, 2, 12, 15, 16, 17, 18, 42 and 43 exceed these dimensions, therefore triggering the requirement to obtain resource consent as a Restricted Discretionary Activity.

6.3 The Project also seeks allowances to undertake pruning of trees, in particular Trees 44 and 45 (elms at the park entrance off Sarsfield Street). The permitted standards pertaining to pruning are set out at E26.4.5.1 (1), and allow for the pruning of branches up to a diameter of 100 mm, provided no more than 30% of the live growth is removed, the works conform with arboricultural practice and standards and the natural shape, form and branch habit of the tree must be retained. In this instance, branches greater than 100 mm are likely to pruned, therefore, consent is sought to undertake tree pruning that does not comply with the standard.

6.4 Works within the protected root zone of Tree 3, 31 and 32 are proposed to occur. The encroachment into the Auckland Unitary Plan defined root zone does not exceed 20%, and clearances are sufficient where roots greater than 80 mm in diameter are highly unlikely to be encountered. The Protect, therefore, comforms with the permitted standards set out at E26.4.5.2.

6.5 Given open space trees are to be removed, Tree Owner Approval from Council's Senior Urban Forest Specialist is a requirement for the works to proceed. This is outside of the Resource Consent/Resource Management Act process, however, engagement with the relevant council staff member has already commenced, and the project team will continue to do so.

7. Conclusions and recommendations

7.1 The Project is to extend the CI wastewater tunnel from Tawariki Street to Point Erin Park, and to construct a shaft, chamber, plant room, vent and associated contractor's yard within Point Erin Park. In summary the Project will involve the following:

- Works within the root zone of tree 3 (macrocarpa), tree group 31 (pōhutukawa) and trees 32 and 33 (English oaks), considered to have minor or negligible effects
- Tunnelling beneath trees in Point Erin Park (associated with the Point Erin Tunnel and ancillary infrastructure), considered to have negligible effects
- Removal of eight trees as a permitted activity
- Removal of nine trees which exceed the permitted activity size for removal. Of these, five trees are directly within the Project footprint in Point Erin Park, with a further four trees being recommended for removal due to their poor condition. Following their removal, there is an opportunity to plant new specimen trees.

7.2 Of the five trees needing to be removed to construct the new infrastructure, trees 16 and 17 are arboriculturally the most significant. They are two mature pōhutukawa that have no obvious tree risk features that would warrant intervention. The design team has explored options for their retention, however, due to the positioning of existing infrastructure and the requirement to connect into this, there are no other feasible options to site it elsewhere. The overall design has minimised and configured footprints, and it is the most arboriculturally sensitive available.

7.3 The four additional trees recommended for removal are overall in poor condition (or with obvious tree risk features that warrants intervention given their proximity to the construction site and potential for increased occupancy of people and property in that area), and there is an opportunity to undertake replacement planting of better quality trees. Regarding replacement planting, at least thirty-eight exotic or forty-nine native trees are required to ensure there is no deficit in the atmospheric carbon sequestration the removed trees are capable of obtaining by the year 2050. Beyond 2050, there will be a net benefit in annual sequestration rates.

7.4 In line with standard CI project practices, it is recommended that all tree removal and pruning is undertaken by a suitably qualified and experienced arboricultural contractor, with all work carried out in accordance with current accepted arboricultural techniques (e.g., Arb Australia and NZ Arb Minimum Industry Standard MIS308).

7.5 It is recommended that the Project continues to engage a suitably qualified and experienced on-site supervisory arborist (the 'supervising arborist') for these works in Pt Erin Park. The role of the supervising arborist is to supervise and coordinate all works and activities within the root zone of trees.

7.6 It is recommended that the tree protection measures set out in Appendix A are followed. These measures are also all standard Tree Owner Approval conditions.

Please contact the author for further information.

Sean McBride

Director

Bibliography

Nowak DJ, Aevermann T, 2019. Tree compensation rates: Compensating for the loss of future tree values. *Urban Forestry & Urban Greening* **41**, 93-103.

Nowak DJ, Crane DE, 2000. The Urban Forest Effects (UFORE) model: quantifying urban forest structure and functions. In: Hansen M, Burk T, eds. St. Paul, MN, USA: U.S. Dept. of Agriculture, Forest Service, North Central Forest Experiment Station, 714-20. (Integrated tools for natural resources inventories in the 21st century.)

The I-Tree Development Team, 2020. *i-Tree Eco V. V.6.35* USA: USDA Forest Service.

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 supervising arborist. Any amendments to the tree protection methodology shall require prior written approval from the supervising arborist. (see 3).

Pre-start

3. The consent holder 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 consent holder is to arrange a site meeting with the supervising arborist, council's monitoring officer, council's urban forest specialsit 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
    - Site access and transportation of materials
    - Temporary storage areas for materials
    - Silt and sediment controls
    - Excavations in the root zones of 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

Ground protection

6. 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 supervising 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.

7. If, during the course of the works, machinery or vehicle access / manoeuvring is required in or around the permeable / exposed 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).

8. 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

9. 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 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 hand tools only to check for the presence of such roots.

10. 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).

Tree pruning

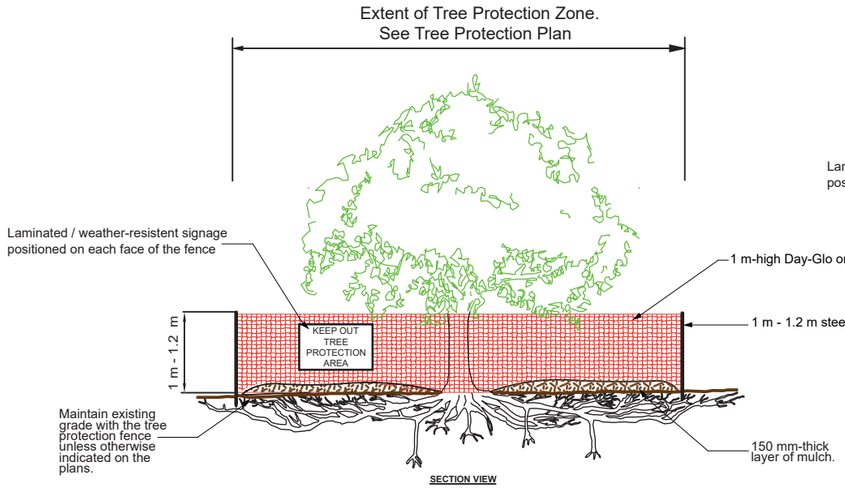
11. All tree pruning is to be confirmed to the satisfaction of the works arborist, after liaison with the contractors represented around the extent of clearance required and practiacal options that may be available to retain large limbs. All pruning is to be undertaken by a suitably experienced arboricultural contractor, with the work conforming to best industry practice, such as Arb Australia and NZ Arb Minimum Industry Standard MIS308.

Protecting and pruning roots

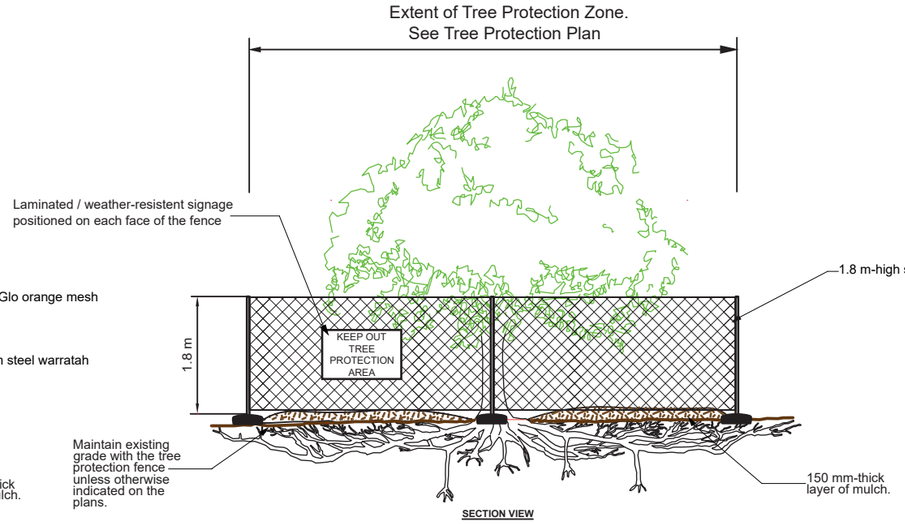
12. Every effort shall be made to avoid root severance from all trees by exploring on-site alternatives to construction / engineering, i.e., adjusting finished levels and basecourse depths etc. Where root severance is unavoidable, the severance of any root is to be carried out by the supervising arborist, 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.

13. 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



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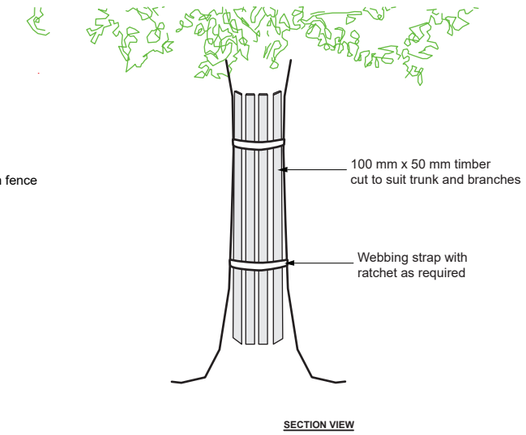
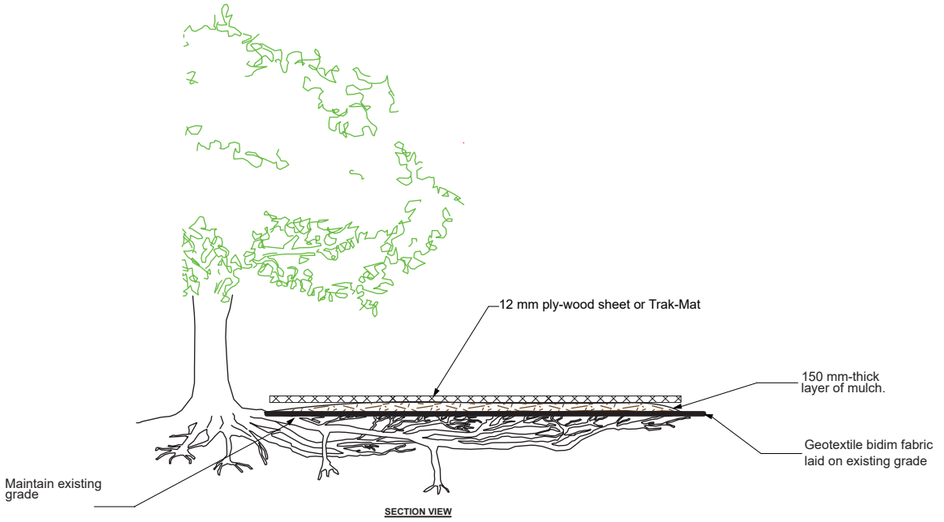
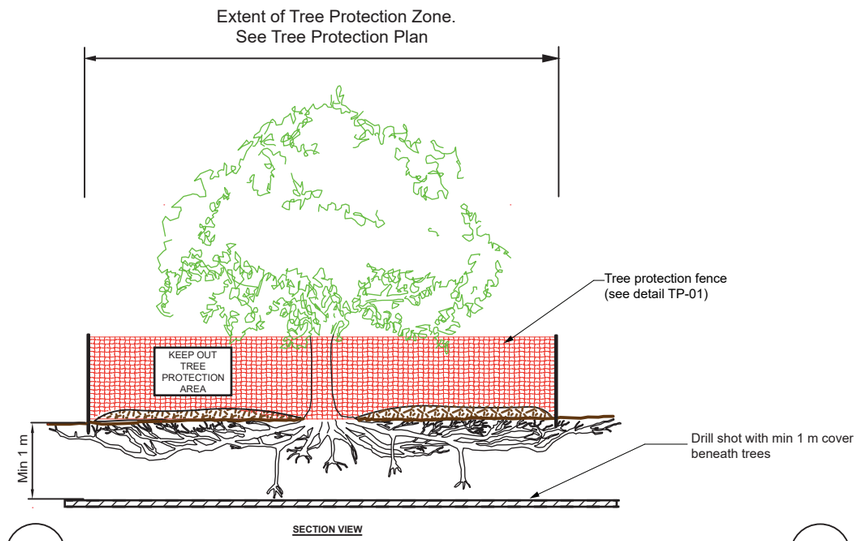


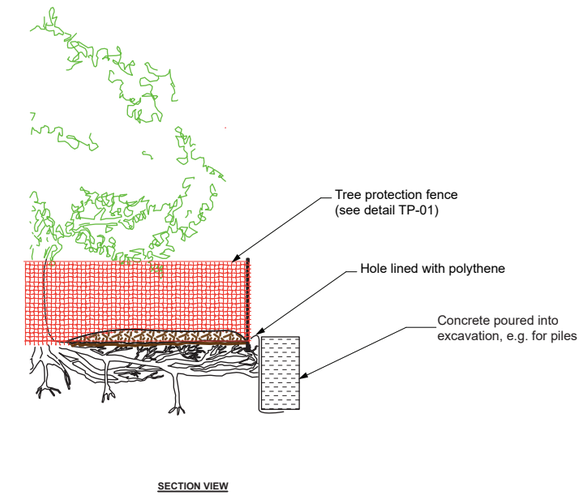
TP-03 TREE PROTECTION - TRUNK PROTECTION



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 2499-001-B

	Watercare	Appendix C - Point Erin Park Tree Plan	The TREE CONSULTANCY – COMPANY –	Project No. 2499 Drawing: 2499_001_B Rev: B Date: 23/12/2022

Appendix D – Tree inventory

Appendix D - Point Erin Reserve
Tree Inventory

Tree number	Number of trees	Species / Common name	Height (m)	DBH (cm)	AUP root zone radius (m)	Structural root zone radius (m) (Coder, 1996)	Tree protection zone radius (m) AC 12x)	Overall vitality	Branch structure	Form	Age class	Number exotic trees req'd	Number native trees req'd	Arboricultural comments and observations	Proposal	Protected
1	1	Grevillea robusta / Silky oak	14	75.8	7	2.9	9.1	Poor	Fair	Fair	Post-mature	6	9	Dieback occurring. Looks like retrenchment pruning has occurred over the years. Top previously removed. Located directly adjacent to the footpath. Basal lawn mower damage	Remove	Yes
2	1	Populus nigra 'Italica' / Lombardy poplar	21	95.2	11	3.3	11.4	Fair	Fair	Fair	Post-mature	6	8	Dieback of central stems. Large basal and surface root has extensive wood decay visible. Weighted towards tree 1. Base needs to be tapped with a nylon mallet.	Remove	Yes
3	1	Cupressus macrocarpa / Monterey cypress	20	212.6	15.7	5.2	15.0	Good	Poor	Fair	Post-mature	-	-	Two low limbs heading in a northerly direction for approx 16m. Old cracks possible in branch union. Seems wood decay present along limbs, with adaptive growth formed either side. Tension side of rootplate SE aspect has extensive wood decay, spanning some 2.9m basal circumference. Decay runs up stem	Retain	Yes
4	1	Syzygium smithii / Monkey apple	10	50.6	6.5	2.3	6.1	Good	Fair	Fair	Mature	-	-	Old flush cut on SE trunk aspect, approx 1m agl. Wood decay down to base. Gum hanger in tree	Retain	Yes
5	1	Platanus x acerifolia / London plane	18	51.2	12	2.4	6.1	Good	Good	Fair	Early mature	-	-	Gum limb hung up in crown. Canopy suppressed by adjacent trees	Retain	Yes
6	1	Syzygium smithii / Monkey apple	12	83.4	6	3.1	10.0	Fair	Fair	Fair	Mature	-	-	Upright form. Fungal bracket on southern trunk side, some 1.5m agl. One dead central leader. Girth measured at base	Retain	Yes
7	1	Quercus robur / English oak	18	69.4	11	2.8	8.3	Fair	Fair	Fair	Mature	-	-	Twiggy dieback present in canopy, which is light suppressed. One large dead limb on SE canopy aspect	Retain	Yes
8	1	Metrosideros excelsa / Pōhutukawa	15	130.5	11	4.0	15.0	Good	Fair	Fair	Mature	-	-	Canopy weighted in a northerly direction. Phototropic due to surrounding vegetation. Girth measured at base.	Retain	Yes
9	1	Vitex lucens / Pūriri	12	59.4	8	2.6	7.1	Fair	Good	Fair	Mature	-	-	Moderate twiggy deadwood in canopy. Phototropic	Retain	Yes
10	1	Platanus x acerifolia / London plane	18	67.5	12	2.8	8.1	Good	Good	Good	Mature	-	-	Overall a good tree	Retain	Yes
11	1	Metrosideros excelsa / Pōhutukawa	10	45.1	5	2.2	5.4	Good	Fair	Fair	Early mature	-	-	Recent failure of southern limb. Snapped at the union. Tree health appears good	Retain	Yes
12	1	Liriodendron tulipifera / Tulip tree	15	59.2	9	2.6	7.1	Fair	Fair	Fair	Early mature	5	7	Several upper limbs have died off. Moderate deadwood present	Remove	Yes
13	1	Vitex lucens / Pūriri	10	61.4	6	2.6	7.4	Fair	Good	Fair	Mature	-	-	Phototropic. Twiggy deadwood present in patches of the crown	Retain	Yes
14	1	Vitex lucens / Pūriri	8	53.8	8	2.4	6.5	Fair	Good	Good	Mature	-	-	Twiggy deadwood present	Retain	Yes
15	1	Syzygium australe / Australian brush cherry	12	128.1	7	3.9	15.0	Fair	Compromised	Fair	Mature	3	3	Fungal bracket on western trunk edge, 1.5m agl. Second bracket on southern stem 4m agl. Old separation on western trunk edge, between main union. Recommend remove	Remove	Yes

16	1	Metrosideros excelsa / Pōhutukawa	13	109.5	12	3.6	13.1	Good	Fair	Fair	Post-mature	9	13	Southern stem has failed, and started 'walking process'. Will continue to grow. Footpath has been renewed recently	Remove	Yes
17	1	Metrosideros excelsa / Pōhutukawa	13	109.5	12	3.6	13.1	Good	Fair	Fair	Post-mature	9	13	Eastern stem has failed, and started 'walking process'. Will continue to grow. Footpath has been renewed recently.	Remove	Yes
18	1	Syzygium australe / Australian brush cherry	14	56.0	7	2.5	6.7	Good	Poor	Fair	Mature	6	8	Fungal bracket on north face, near base of trunk. Canopy weighted towards south	Remove	Yes
19	1	Podocarpus totara / Tōtara	2	1.6	1	0.3	0.3	Good	Good	Good	Juvenile	1	1	Recently planted	Remove	No
20	1	Podocarpus totara / Tōtara	2	1.6	1	0.3	0.3	Good	Good	Good	Juvenile	1	1	Recently planted	Remove	No
21	1	Podocarpus totara / Tōtara	2	1.6	1	0.3	0.3	Good	Good	Good	Juvenile	1	1	Recently planted	Remove	No
22	1	Corynocarpus laevigatus / Karaka	2	1.6	1	0.3	0.3	Good	Good	Good	Juvenile	1	1	Recently planted	Remove	No
23	1	Corynocarpus laevigatus / Karaka	2	1.6	1	0.3	0.3	Good	Good	Good	Juvenile	1	1	Recently planted	Remove	No
24	1	Sophora microphylla / Kowhai	2	1.6	1	0.3	0.3	Good	Good	Good	Juvenile	1	1	Recently planted	Remove	No
25	1	Corynocarpus laevigatus / Karaka	2	1.6	1	0.3	0.3	Good	Good	Good	Juvenile	1	1	Recently planted	Remove	No
26	1	Beilschmiedia tarairi / Taraire	2	1.6	1	0.3	0.3	Good	Good	Good	Juvenile	-	-	Recently planted	Retain	No
27	1	Beilschmiedia tarairi / Taraire	2	1.6	1	0.3	0.3	Good	Good	Good	Juvenile	-	-	Recently planted	Retain	No
28	1	Metrosideros excelsa / Pōhutukawa	10	77.7	6	3.0	9.3	Good	Good	Fair	Early mature	-	-	Looks like an adjacent tree has previously been removed, due to canopy form	Retain	Yes
29	1	Eucalyptus sp. / Gum tree	12	48.4	7	2.3	5.8	Good	Good	Good	Early mature	-	-	Good and well formed eucalyptus	Retain	Yes
30	1	Metrosideros excelsa / Pōhutukawa	8	118.7	9	3.8	14.2	Fair	Fair	Good	Early mature	-	-	Slight thinning of the canopy	Retain	Yes
31	10	Metrosideros excelsa / Pōhutukawa	10	75.1	8	2.9	9.0	Good	Good	Good	Early mature	-	-	Eight trees form the southern edge of the group. Measured largest trunk for root zone projections	Retain	Yes
32	1	Quercus robur / English oak	12	92.3	9	3.3	11.1	Fair	Fair	Fair	Post-mature	-	-	Previous tear wounds and tree shows signs of cambial dieback. Treat as a heritage specimen	Retain	Yes
33	1	Quercus robur / English oak	18	114.6	12	3.7	13.8	Fair	Fair	Fair	Post-mature	-	-	Previous tear wounds and tree shows signs of cambial dieback. Treat as a heritage specimen	Retain	Yes
34	1	Vitex lucens / Pūriri	2	1.6	1	0.3	0.3	Good	Good	Good	Juvenile	-	-	Recently planted	Retain	No
35	1	Vitex lucens / Pūriri	2	1.6	1	0.3	0.3	Good	Good	Good	Juvenile	-	-	Recently planted	Retain	No
36	1	Vitex lucens / Pūriri	2	1.6	1	0.3	0.3	Good	Good	Good	Juvenile	-	-	Recently planted	Retain	No
37	1	Vitex lucens / Pūriri	2	1.6	1	0.3	0.3	Good	Good	Good	Juvenile	-	-	Recently planted	Retain	No
38	1	Vitex lucens / Pūriri	2	1.6	1	0.3	0.3	Good	Good	Good	Juvenile	-	-	Recently planted	Relocate	No
39	1	Metrosideros excelsa / Pōhutukawa	2	1.6	1	0.3	0.3	Good	Good	Good	Juvenile	-	-	Recently planted	Retain	No
40	1	Metrosideros excelsa / Pōhutukawa	2	1.6	1	0.3	0.3	Good	Good	Good	Juvenile	-	-	Recently planted	Retain	No
41	1	Tilia cordata / Lime	12.5	58.3	5	2.5	7.0	Good	Good	Good	Mature	-	-	Close to existing path	Retain	No
42	1	Agonis flexuosa / Willow myrtle	7.5	82.5	5	3.1	9.9	Good	Poor	Fair	Mature	5	6	Old tearout out on road side. Recent kerb works have occurred	Remove	Yes
43	1	Syzygium australe / Australian brush cherry	4.5	14.3	2.5	1.2	1.7	Good	Good	Good	Early mature	4	5	Query protection. Could be in strategic transport zone	Remove	Yes
44	1	Ulmus sp/ Elm	18	93.3	15	3.29	11.2	Good	Good	Good	Mature	-	-	Pruning required over entrance to the park	Prune	Yes
45	1	Ulmus sp/ Elm	18	102.2	15	3.46	12.3	Good	Good	Good	Mature	-	-	Pruning required over entrance to the park	Prune	Yes