

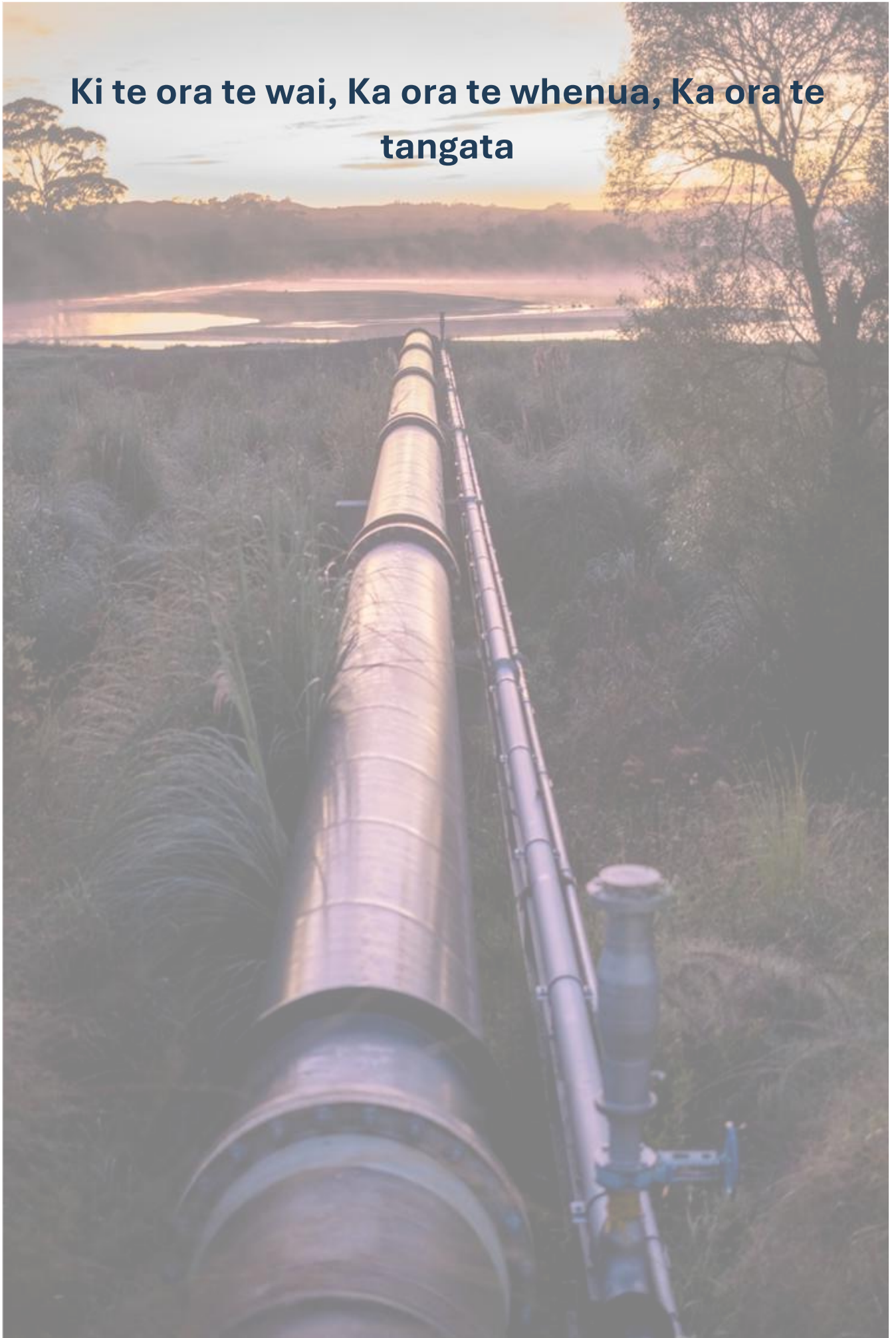
Watercare Services Limited

Motions Catchment Improvement Arboricultural Assessment of Effects

July 2025



**Ki te ora te wai, Ka ora te whenua, Ka ora te
tangata**



Document Control

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Executive Summary

An arboricultural assessment has been conducted for the proposed Motions Catchment Improvement Project. This assessment considers the potential impacts of the proposed works on trees within the project footprint, adopting a worst-case scenario approach. The footprint encompasses 18 shaft locations, associated Engineered Overflow Points (EOP) structures, and construction support areas. The evaluation primarily addresses impacts on trees situated within road corridors and public open spaces.

Key findings of this assessment include:

- **Construction Effects:** The majority of tunnelling occurs at depths exceeding 8 m, with negligible arboricultural impact expected. Where surface works interact with canopies or root zones, effects are generally assessed as minor to moderate.
- **Tree Protection:** The report recommends mitigation and monitoring measures, including pre-start meetings, monthly site audits, and supervision by a qualified arborist to ensure tree protection protocols are followed throughout the construction period.
- **Tree removal and canopy loss:** The project will require the removal of 32 individual trees and approximately 420 m² of densely vegetated canopy, resulting in a total canopy loss of 1,512 m².
- **Mitigation tree planting:** To offset the canopy loss, 88 replacement trees are proposed. The number has been determined using iTree Eco modelling, aligning with Auckland Council's goal of achieving 30% urban canopy cover. Where space is limited at the removal sites, replanting will occur within the same local board areas.

With the implementation of the recommended protection and mitigation measures, both the direct and indirect arboricultural impacts of the project can be effectively minimised and managed to minimal levels.

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1 Introduction

1.1 Watercare

Watercare Services Limited (Watercare) is a lifeline utility responsible for the planning, maintenance, and operation of wastewater services to communities in Auckland. Its activities and programmes are funded through user charges and borrowings. Watercare is required by the local authority, by the Local Government (Auckland Council) Act 2009, to be a minimum-cost, cost-efficient service provider.

Watercare collects wastewater from 1.7 million people's homes including trade waste from industry, through approximately 8,700 Km of pipelines. It pumps through 534 pump stations, treats approximately 410 million litres of wastewater daily through 18 treatment plants and disposes in environmentally responsible ways to protect the public health, the local environment and coasts and harbours.

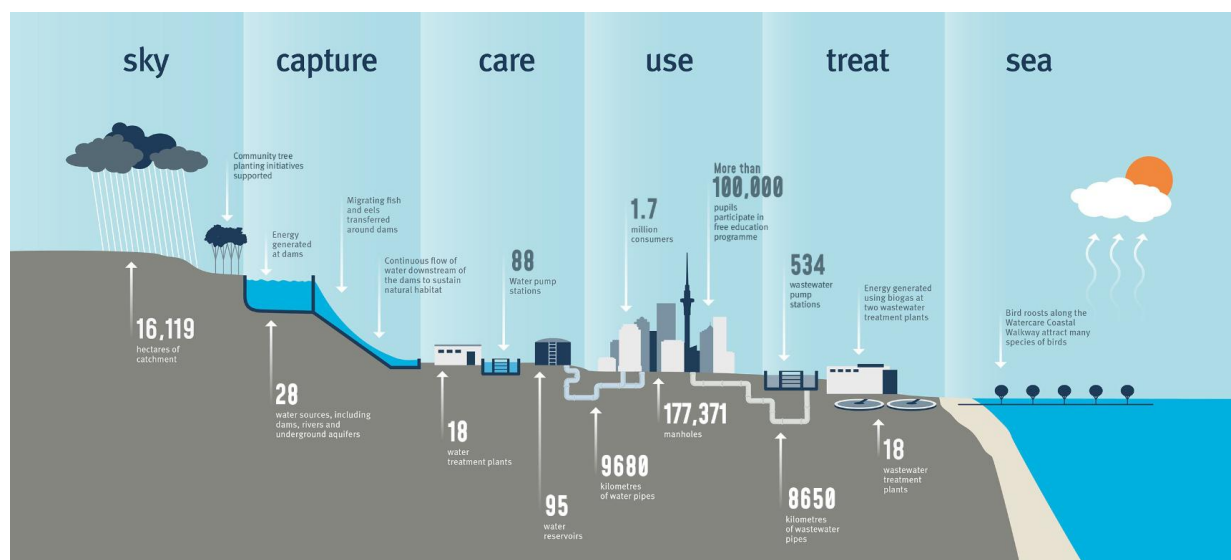


Figure 1: Overview of our assets and operations.

Watercare's activities are intrinsically linked to the health of people and the natural environment. Auckland's wastewater sources must be sufficient volume and reliability to improve the quality of beaches and waterways.

Watercare carries out significant work to upgrade and build infrastructure, to maintain levels of service and provide capacity for a fast-growing population. Watercare ensures Auckland and its people continue to enjoy dependable services by upgrading its assets, planning, building, and delivering new infrastructure in cost-efficient ways.

1.2 Project background and description

The Western Isthmus Water Quality Improvement Programme (WIWQIP) Motions Catchment Improvements Project (the Project) involves the construction of a new collector sewer approximately 3.2 kilometres in length from Canada Street in Auckland's Central Business District (CBD) to Western Springs Park in Western Springs. The collector sewer is proposed to be a diameter ranging from 2.4m up to 4.5m and will have three branch connections. Two branch connections will go under State Highway 16 connecting the Newton Catchment to Suffolk Reserve and connecting Arch Hill Scenic Reserve and southern parts of Grey Lynn to Nixon Park. The third branch connection will connect Suffolk Reserve to Basque Park. There will also be 16 Engineered Overflow Points (EOPs) and 16 local network connections. The Project will tie into the Central Interceptor at Western Springs Park.

The Project is part of the WIWQIP which aims to significantly reduce wastewater overflows into the Waitematā Harbour in order to improve stream and beach water quality across the City's Central Western Isthmus. The aim of the Project is to build a new pipeline to collect combined wastewater and stormwater flows from the Motions Catchment and convey these to the Central Interceptor at Point Erin Park, where they can then be safely conveyed to the Māngere Wastewater Treatment Plant. The WIWQIP is a joint initiative between Watercare and Auckland Council's Healthy Waters that was established in 2017 and has been identified in Watercare's Asset Management Plan 2021 – 2041 as a key programme to further protect the environment and provide clean harbours and waterways. At a high level, the three main goals of the WIWQIP are:

- To reduce risks to public health by alleviating uncontrolled discharges into local catchments;
- To remove the permanent health warning status of both Meola Reef and Cox's Bay; and
- To reduce intermittent beach closures in the area over the next 10 years.

The Project is a critical component of the wider WIWQIP which will enable Watercare to bring about considerable environmental benefits, reduce risks to public health and improve the amenity of the Motions catchment. For further detail regarding the proposed works and the Project's objectives, please refer to Section 4 of the Assessment of Effects on the Environment.

1.3 Purpose of this report

The purpose of this report is to support the resource consent application for the construction of a new collector sewer approximately 3.2 kilometres in length from Canada Street in Auckland's Central Business District (CBD) to Western Springs Park in Western Springs where the Project ties into the Central Interceptor. The Project also involves the construction of three branch connections and 16 Engineered Overflow Points (EOPs). The following reasons for consent pertaining to arboricultural matters have been identified:

Resource consent is sought as a restricted discretionary activity for the following reasons:

- Rule E26.4.3.1 (A88): Works will occur within the protected root zone of open space zone and street trees where roots greater than 80mm will likely be encountered, although at this stage the exact number of trees where roots greater than 80mm cannot be confirmed. Consent is sought for this matter on a precautionary basis.
- Rule E26.4.3.1 (A92): Works will involve the removal of street trees and open space zone trees that are greater than 4m in height and 400mm in girth at the following locations:
 - Trees 4-8 for Shaft 2 at (Suffolk Reserve).
 - Trees 10, 11, 15, 16 and 20 at Shaft 3 (Mostyn Street Reserve).
 - Tree 29 at Shaft 4 (Fourth Avenue car park).
 - Tree 42 at Shaft 6.
 - Trees 53, 56, 57 and 58 at Shaft 7.
 - One olive tree from Group 95 at Shaft 12.
 - Trees 90, 92 and partial removal of Group 93 for Shafts 13-15 at Arch Hill Scenic Reserve.

For all resource consent triggers, please refer to the Assessment of Environmental Effects (AEE) for further details.

2 Site and surrounding environment context

The Project runs from East and Canada Street in Auckland's Central Business District to a connection to the Central Interceptor within Western Springs Park. The Project's alignment traverses an urban environment, crossing beneath the Central Motorway Junction and following the southern side of State Highway 16.

The alignment includes three crossings beneath State Highway 16 and traverses various land parcels and zones, including road berms, and several areas of public open space such as Suffolk Park Reserve, Western Springs Park, Arch Hill Scenic Reserve, Mostyn Reserve, and Basque Park.

In terms of planning overlays and zones under the AUP, the following are present:

- Western Springs Park falls within a Significant Ecological Area (SEA) overlay (and Open Space zone);
- A Notable Tree overlay is present on one private property only at 23 Levonia Street;
- Other locations where vegetation may be affected generally fall within either Open Space zones or within legal road boundaries; and
- Portions of the project, specifically relating to Shafts 1, 5, 9 - 11, and 13 -15, extend into the Strategic Transport Corridor Zone (STCZ).

Given that the Project affects trees on roads and on public reserves, Tree Owner Approval from Council's Senior Urban Forest Specialist is a requirement for the works to proceed on roads, and a Land Owner Approval from Council's Land Advisory team is required for works in public reserves. This is outside of the Resource Consent/Resource Management Act process.

3 Site assessment and limitations

An initial site walkover was conducted with the project team at Fourth Ave Carpark and Basque Park on 21 May 2025. During this meeting, Watercare provided an overview of the Project, and preliminary discussions were held regarding the anticipated construction activities within the Project area.

Site visits were conducted on 22, 26 and 27 May 2025 to assess the trees located within the proposed Project footprint being each shaft site and the pipe alignment. During the inspection, tree species were identified, and trunk diameters were measured for those situated in close proximity to proposed open excavation zones. Tree height and the maximum radial crown spread were estimated to delineate the protected root zones in accordance with the AUP. Observations were also made on tree condition, including form, structural integrity, and overall vitality. Quantitative estimates of live crown volume were included to further support assessments of tree health. The arboricultural information is presented in the tree inventory in Appendix D.

The assessment was carried out as a ground-based Level 2 Visual Tree Assessment (VTA), which included the identification of any visually apparent tree risk features. Tree locations were recorded using a smartphone GPS, and all data were entered into a dedicated digital collection platform.

At certain shaft locations, dense tree canopy coverage compromised GPS accuracy, necessitating a higher level of spatial precision to support a reliable assessment of potential impacts. To address this, Babbage Consultants conducted a detailed tree location survey at Shafts 3, 6, 7a, 12, 12a, 13, and 14. This survey generated high-precision geospatial data for selected trees, enabling accurate comparisons with the defined Project footprint. In all other areas, the positional accuracy provided by smartphone GPS was deemed sufficient for assessment purposes.

In the case of public trees situated within areas where only tunnelling works are proposed beneath the root zone, a limited visual review was performed. With the proposed pipes being at significant depths and as no arboricultural effects are anticipated for these trees, detailed data collection was not undertaken.

Following the completion of the field inspection, a draft GIS-based tree plan and corresponding tree inventory table were developed and submitted to Watercare for review. This was accompanied by a preliminary assessment of potential arboricultural constraints.

4 Arboricultural assessment of effects

The extent of the proposed works for the Project can be separated into four aspects:

- The first aspect is the creation of eighteen shafts (main collector sewer and branch connections), which range in diameter between 3 m and 10 m. At these shaft sites, cranes and excavators of various sizes will be needed to construct them to depths of 5.9 m to 25.4 m. Overhead clearances and boom swing areas will be needed, resulting in canopy pruning during the course of the works. Some trees will require removal to establish the working areas, and excavations in the root zone of other trees will be required;
- The second aspect of the Project comprises tunnelling the new pipe at depths that exceed 9 m;

- The third aspect of the Project is for nineteen engineered overflow points (EOP) to connect into the Motions collector, at either the primary shaft locations or through secondary shafts. Eleven of these connections will require open-cut trenching, five are via horizontal directional drilling (HDD), and three are yet to be determined (for the purposes of this assessment, they have been assumed to involve open-cut trenching in order to represent a worst-case scenario); and
- The final aspect of the Project is the establishment of construction areas at sixteen of the shaft locations. No detail is available at present on the use of these sites, but it is expected to be the area required to undertake access to the works area, surface clearance and potentially storage of materials.

The establishment of two main Construction Support Areas (CSA's) at Western Springs Park and Suffolk Reserve is still being investigated. At Western Springs Park the existing CSA for the Central Interceptor will be used while Suffolk Park will use a hard surface area beneath the motorway overpass and within the Reserve.

With regard to an assessment of the effects, I will identify and assess the effects and propose any necessary avoidance or management options to lessen the effects via each shaft location and include the EOPs and construction areas.

A screenshot of the tree plan for each shaft site is included in sections 4.1 to 4.12 of this assessment for convenience and quick reference. While the content is the same, the reduced scale may limit legibility, so it is recommended to refer to the original tree plans for full detail and clarity in Appendix C.

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. Although such collateral impacts may occasionally lead to tree damage, they can be effectively managed through the implementation of recognised arboricultural best practices.

A key aspect of this approach is the appointment of a suitably qualified and experienced supervising arborist to oversee and support the works. The assessment of effects in this section is predicated on the recommendations provided in Section 6 of this report.

Mitigation measures are recommended in Section 6 of the assessment. With specific regard to mitigation planting, replacement numbers are calculated using iTree Eco (v6.0.35) which forecasts how tree canopy cover will grow over time. The calculations are based on canopy cover growth forecasts of 64 medium to large growing, 45-litre grade trees, which are typical for Auckland Council's urban planting. They also account for:

- Expected tree loss (attrition) in the first three years after planting
- The current amount of canopy in the Eden-Albert Local Board
- The current amount of canopy in the Waitemata Local Board
- The citywide goal of boosting canopy cover to 30%

For example, if the area currently has 20% canopy cover, the tree planting plans aim to create a net 10% increase to help meet that citywide 30% target.

4.1 Shaft 1 – Corner Canada & East Streets



Figure 2: The proposed location for Shaft 1.

Construction of Shaft 1, EOP and local wastewater connections (including new manhole construction) (Figure 2) are in the road corridor resulting in no effect on trees. Two tree groups referenced as 1 and 2 consist of approximately 12 trees in total growing behind cyclone wire fences and are within the STCZ on South Street and Canada Street; the trees not afforded protection under the AUP.

Minor uplift pruning to low overhanging branches in South Street may be necessary to provide clearance for vehicle / machinery that is required to access the proposed construction area.

All pruning that is required should be assessed by the supervising arborist. If pruning is confirmed as necessary, the works must be undertaken by a certified arborist, ensuring pruning is carried out in a manner that minimises impacts on tree structure and long-term health.

4.2 Shaft 2 and Construction Support Area (CSA) – Suffolk Reserve



Figure 3: The proposed location for Shaft 2.

Suffolk Reserve is a steeply sloping, grassed open space bounded by densely planted garden beds containing native vegetation. A Construction Support Area (CSA) is proposed on the eastern side of the shaft site, beneath the adjacent motorway overbridge. The CSA will make use of an existing asphalt access road and adjacent paved parking area.

Shaft 2 is proposed to be located at the northern boundary of Suffolk Reserve (Figure 3). Construction of this shaft will involve excavation to a depth of approximately 24.4 m and a footprint diameter of 10 m. Between the shaft location and the existing access road lies a garden bed supporting several established trees, including:

- Tree 7 – pūriri (*Vitex lucens*)
- Tree Group 5 – three hakea (*Hakea* spp.)
- Trees 4 and 6 – kohuhu (*Pittosporum tenuifolium*)

Surrounding the grassed area is Tree Group 8, which comprises a dense stand of juvenile and early mature trees averaging 5 m in height. Species include (but are not limited to) tī kōuka (*Cordyline australis*), kānuka (*Kunzea robusta*), karo (*Pittosporum crassifolium*), kapuka (*Griselinia littoralis*), and karamū (*Coprosma robusta*).

To enable shaft construction, removal of approximately 80 m² of vegetation from within Tree Group 8 will be required. Access to the shaft may necessitate the removal of a further 535 m² of canopy, potentially including Trees 4, 5, 6, 7, and additional trees from Group 8 (Figure 4) to provide suitable clearance for access. This represents a worst-case scenario, as alternative access may be feasible via the open grassed area accessible from Suffolk Street. If full clearance is required, the total tree removal would amount to approximately 615 m² of canopy cover, comprising primarily early mature vegetation

within road and open space zones. This also includes trees over 4 m in height, triggering a requirement for resource consent as a Restricted Discretionary Activity. Mitigation for this canopy loss is proposed through the replacement planting of 35 trees. Mitigation replacement planting for the Project is addressed below Section 4.14.

An EOP is also proposed within the grassed area of Suffolk Reserve. Installation will be via HDD with excavation of a drilling pit set within the open grass. Several trees from Tree Group 8 are located approximately 3 m from the EOP alignment. While their root protection zones may extend close to the drilling alignment, the works are sufficiently set back from the proposed drilling pit to avoid direct impact to their root zones resulting in a negligible impact on the trees.

To protect all retained vegetation during construction, temporary tree protection fencing must be erected to define no-go zones and avoid accidental encroachment into adjacent garden beds and planted areas. Provided construction activities remain confined to the defined shaft and access footprints, the potential for root disturbance or inadvertent damage to retained trees is assessed as negligible.

With effective implementation of tree protection measures and reinstatement planting following construction, the long-term arboricultural effects within Suffolk Reserve are expected to be minimal.



Figure 4: Vegetation removal (outlined in red) necessary to enable access and facilitate construction of Shaft 2.

4.3 Shaft 3 – Mostyn Street Reserve/Buchanan Street



Figure 5: The proposed location for Shaft 3.

Shaft 3 is proposed within the narrow road reserve at the terminus of Mostyn Street (Figure 5), with related network infrastructure works to occur within the similarly constrained road reserve at the end of Buchanan Street. Both locations are limited in available space but contain several mature trees. The proposed works include:

- Shaft excavation measuring 6 m in diameter and 17 m deep.
- EOP to be installed via open-trench adjacent to the shaft.
- A new waste-water manhole and new connection opposite Buchanan Street, linking to the existing network.
- Access/egress along the existing concrete path parallel to the cycleway.

Within the immediate vicinity of the shaft and EOP works, there are 12 established trees, including ti kouka (Trees 9 and 10), tōtara (Trees 11, 12, 14, 19, and 20), an English oak (Tree 17), and a large she-oak (Tree 16).

Tree 20 will require removal due to anticipated significant root zone disturbance resulting from shaft excavation. This tree is currently in good condition and there is no arboricultural reason, aside from construction impacts, that necessitates its removal.

Open trench construction of the EOP at Mostyn Street is proposed. Preliminary assessments indicate that it may be possible to avoid significant impacts on adjacent trees, though detailed design will need to confirm this.

A new wastewater manhole is proposed adjacent to the cycleway near the end of Buchanan Street, connecting to an existing manhole within the roadway. While the excavation method has not yet been confirmed, open trenching would significantly encroach into the root zones of Trees 10, 11, and 15, likely necessitating their removal. To avoid this outcome, trenchless installation methods would be preferable. However, feasibility from an engineering perspective is yet to be assessed and cannot be confirmed at this stage.

In a worst-case scenario, the works associated with Shaft 3 could require the removal of four healthy native trees (Trees 10, 11, 15, and 20), resulting in an estimated total canopy loss of approximately 149 m² (Figure 6). This includes trees over 4 m in height, triggering a requirement for resource consent as a Restricted Discretionary Activity. Mitigation for this loss will involve replacement planting of nine trees. Further details regarding replacement planting are outlined in Section 4.14.

Excavation for the shaft and EOP is anticipated to occur within 6 m of Tree 16. While this lies within its tree protection zone, it is outside the structural root zone, meaning extensive root severance is unlikely. The tree is in good health and is expected to tolerate limited root disturbance without long-term detriment.

Given the fixed location of the shaft, it is recommended that the construction footprint be minimised to the greatest extent practicable to limit further impact on surrounding vegetation. Due to the spatial constraints of the site, the entire area is considered a root protection zone. Accordingly, tree protection fencing and appropriate ground protection measures must be implemented, and all construction activities within the Mostyn and Buchanan Street corridors must proceed under arboricultural supervision.

Conservatively, the level of disturbance to the surrounding trees—primarily due to the use of the area for construction access—is expected to exceed 20% of the Protected Root Zone. This exceeds the permitted threshold and therefore triggers a requirement for resource consent as a Restricted Discretionary Activity. With regards to canopy pruning, minimal to no pruning is expected as overall the level of clearance is deemed adequate based on the details available.

The proposed plans show an access/egress route running parallel to the Northwestern cycleway, along which several trees are currently established. While specific details regarding the machinery or vehicles to be used have not been provided, any access through this area must be confined to the existing concrete path to prevent root zone disturbance from soil compaction or turf damage. Generally, the tree canopy provides an estimated clearance of approximately 4 m above ground level.



Figure 6: Vegetation removal (outlined in red) – tree 20 (left) and trees 10,11 and 15 (right).

4.4 Shaft 4 – Fourth Ave carpark

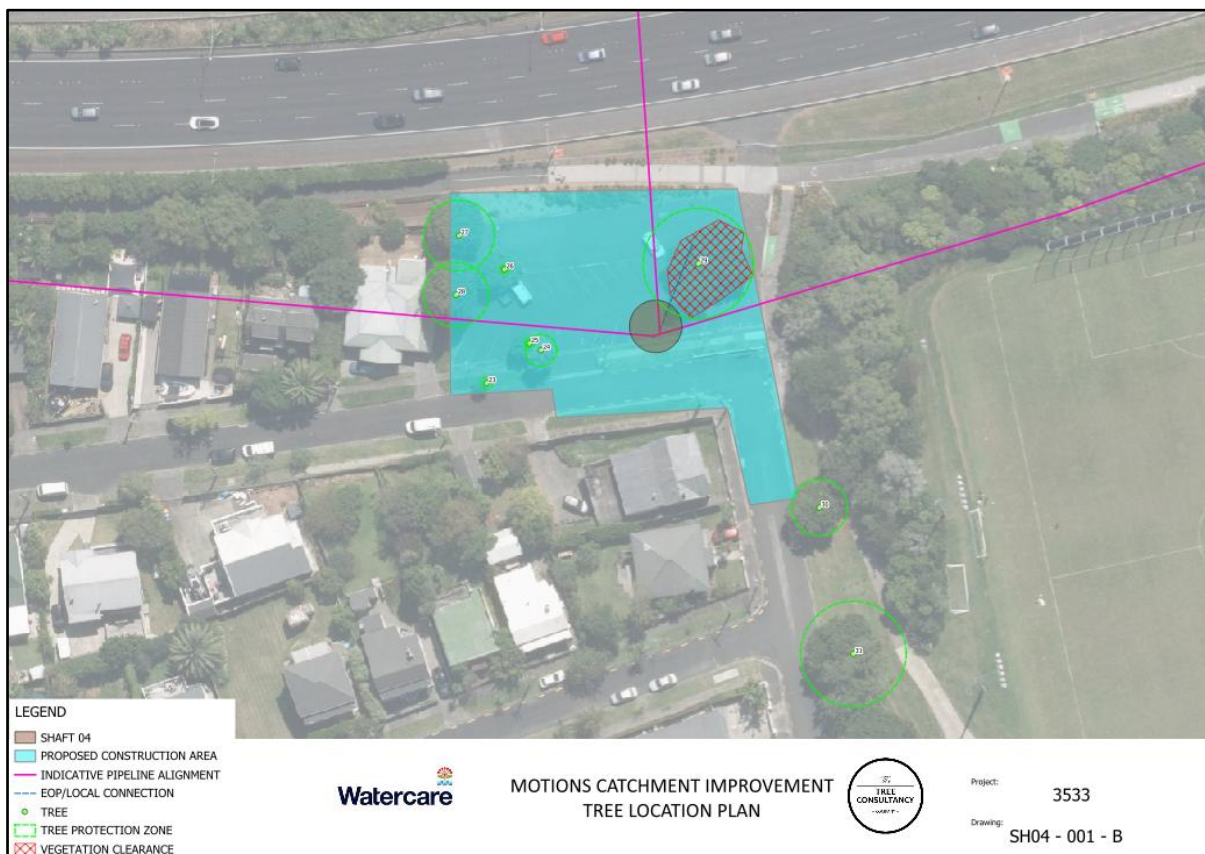


Figure 7: The proposed location for Shaft 4.

The proposed location for Shaft 4 will be within the eastern section of the Fourth Avenue car park, adjacent to Nixon Park (Figure 7). Eight trees are present in the car park, which is also proposed as the construction area. The vegetation is within an Open Space zone.

The shaft, with a diameter of 9 m and a depth of 21 m, along with an associated EOP to be installed via open trenching, will necessitate the removal of a Silk tree (Tree 29) (Figure 8). This tree is situated approximately 6 m from the shaft's edge, however, due to the size and reach of the machinery required for excavation, removal of this tree will be necessary. The tree is over 4 m in height, triggering a requirement for resource consent as a Restricted Discretionary Activity.

Mitigation for the loss of tree 29 will involve replacement planting of eight trees. Further details regarding replacement planting are outlined in Section 4.14.

Minor uplift pruning of other trees to accommodate vehicle access will be required but will remain within acceptable and permitted limits.

Excavation activities will be kept outside the root zones of all remaining trees. While the removal of a healthy tree is not ideal, it will allow construction works to proceed without impacting the remaining trees, which are all located at the western end of the car park.



Figure 8: Tree 29 will require removal for the construction of shaft 4 and the EOP.

4.5 Shaft 5 – Kingsland Avenue



Figure 9: The proposed location for Shaft 5.

A 3 m diameter shaft to a depth of 20 m is proposed to be excavated within the road reserve at the cul-de-sac of Kingsland Avenue, in conjunction with the installation of an EOP and a new local wastewater connection in Kingsland Avenue and Fourth Avenue (Figure 9).

A group of trees (Nos. 32 to 37) located at the end of the street within the STCZ will be retained, as the works are appropriately set back to avoid any impact. Another group of trees (Group 38) also within the STCZ, situated within a fenced area adjacent to a residential property and designated as a construction area, will remain unaffected. These trees are adequately protected by existing fencing and there is no canopy encroachment into the work area.

No other trees will be impacted by the proposed shaft or local connection works.

4.6 Shaft 6 – Finch Street



Figure 10: The proposed location for Shaft 6.

Shaft 6 is proposed to be located within the road reserve at the end of Finch Street (Figure 10). The construction will involve the excavation of a shaft approximately 6 m in diameter and 22.2 m deep, necessitating ground disturbance and tree removal within a confined area.

The construction of the shaft will necessitate the removal of one privet (tree 40) which is a pest species and a permitted activity under the AUP. Within the immediate area of the proposed shaft and associated EOP works, there are approximately ten established large she-oak (referenced as Tree Group 41 and 42) ranging from 12 -18 m in height. The location of the shaft is on the periphery of the tree protection zone of Tree Group 41, which are overall in good health. The clearance between the shaft and the trees is such that widespread root severance is highly unlikely. While excavation will have minimal disturbance the use of the area for construction exceeds 20% of their protected root zone, triggering a requirement for resource consent as a Restricted Discretionary Activity.

The EOP is to be installed via HDD however the location of the drilling pit is within the structural root zone one she-oak from Tree Group 42. The level of root severance for the pit could destabilise the tree therefore removal is required. The tree is over 4 m in height, triggering a requirement for resource consent as a Restricted Discretionary Activity. The remaining trees in the group are sufficiently setback to ensure root zone disturbance is kept to a minimum. All works associated with the shaft will require arboricultural supervision.



Figure 11: Vegetation removal (outlined in red) of Tree 40 (left) and tree 42 (right).

Mitigation for the loss of tree 40 and 42 (Figure 11) will involve replacement planting of six trees. Further details regarding replacement planting are outlined in Section 4.14.

4.7 Shaft 7 – Myrtle Street



Figure 12: The proposed location for Shaft 7.

Between Shaft 6 and Shaft 7, a notable tree is situated within the rear portion of the private property at 23 Levonia Street. At this location, the collector sewer will be tunnelled at an approximate depth of 20 m beneath the tree, resulting in no impact on the tree.

The proposed shaft at Myrtle Street (Figure 12) will involve excavation to a diameter of 9 m and a depth of 19 m. An EOP is planned for installation and whilst the construction method (either HDD or open trench), has yet to be determined I have assessed as an open-cut trench to provide given that it would involve the most disturbance.

The trees within the footprint of the shaft and EOP (identified as trees 53, 56, 57, and 58) form a hedge and are assessed to be in fair condition (Figure 13). All are approximately 5 m in height triggering a requirement for resource consent as a Restricted Discretionary Activity. Two juvenile karaka trees (trees 54 and 55) also require removal and are considered suitable for relocation. All trees at this location are road reserve trees. The total loss of canopy on site from the removal of these trees is 344m². Mitigation will involve replacement planting of nineteen trees. Further details regarding replacement planting are outlined in Section 4.14.

Several street trees (trees 43–47) and those within the adjacent grass reserve (trees 48–50) fall within the proposed construction area. However, sufficient space exists to allow construction to proceed with minimal impact on these trees, provided that appropriate tree protection measures, such as fencing and ground protection are implemented. All trees within the affected area are classified as road reserve trees.



Figure 13: Vegetation removal required for Shaft 7.

4.8 Shaft 7a – Ivanhoe Road

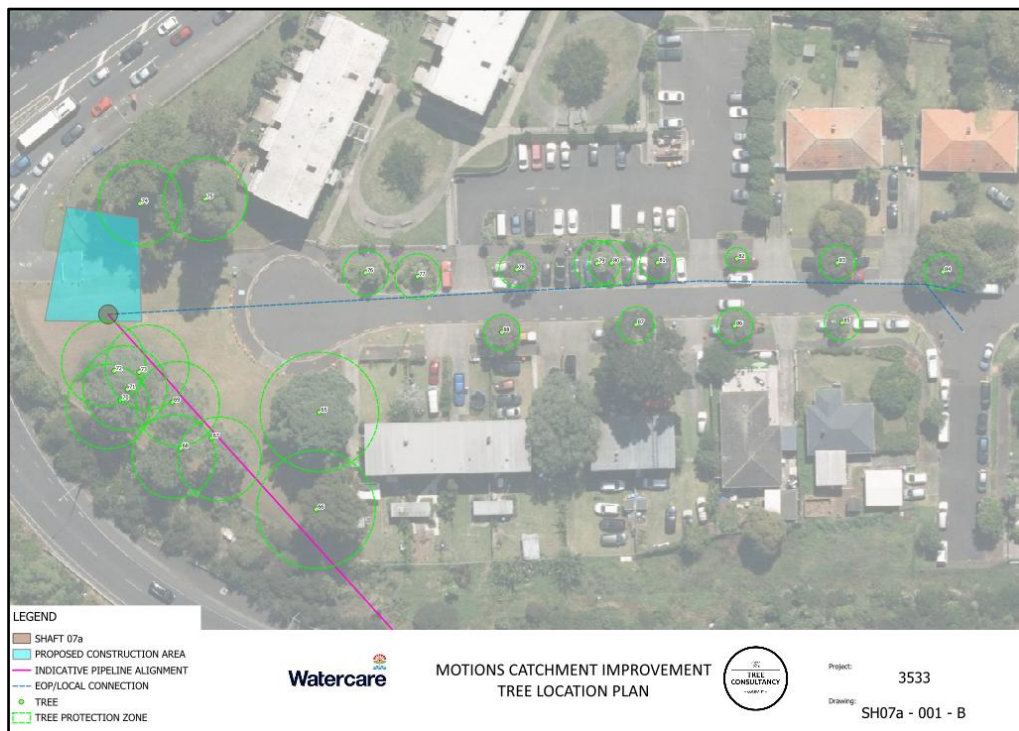


Figure 14: The proposed location for Shaft 7a.

Shaft 7a requires excavation of 3 m in diameter and a depth of 19.9 m within a grassed area adjacent to the cul-de-sac at Ivanhoe Road (Figure 14). This work will be undertaken in conjunction with the installation of EOP and a new local wastewater connection within the road reserve.

Several mature pine and cedar trees, approximately 15 m in height, are located near the proposed shaft site. The shaft and construction area are sufficiently clear of the trees where extensive root severance is not expected to occur and root disturbance is minimal to nil. Tree protection measures, including the installation of temporary tree protection fencing, should be implemented to ensure retained trees are safeguarded from inadvertent damage during construction activities.

Also located within the construction area for local connection to Shaft 7a are nine early mature pōhutukawa trees (78, 81 – 88), ranging from 4 to 7 m in height, growing in the grass berm along both sides of Ivanhoe Road. The proposed local wastewater connections will result in disturbance of greater than 20% of their protected root zone, triggering a requirement for resource consent as a Restricted Discretionary Activity. The existing roadway environment is not conducive to significant root development, and therefore the impact of excavation on the trees is expected to be minimal to nil. The canopies of most of the trees in the street extend over the roadway and open trenching methods are anticipated for pipe installation. As a result, care should be taken to avoid machinery contact with overhanging branches. Tree pruning is not considered necessary for this temporary work, and construction activities will be planned to work around the trees without issue. All works including operation of machinery around the trees should be discussed at the pre-start meeting to ensure damage to the trees is avoided.

4.9 Shaft 8 – Western Springs Park

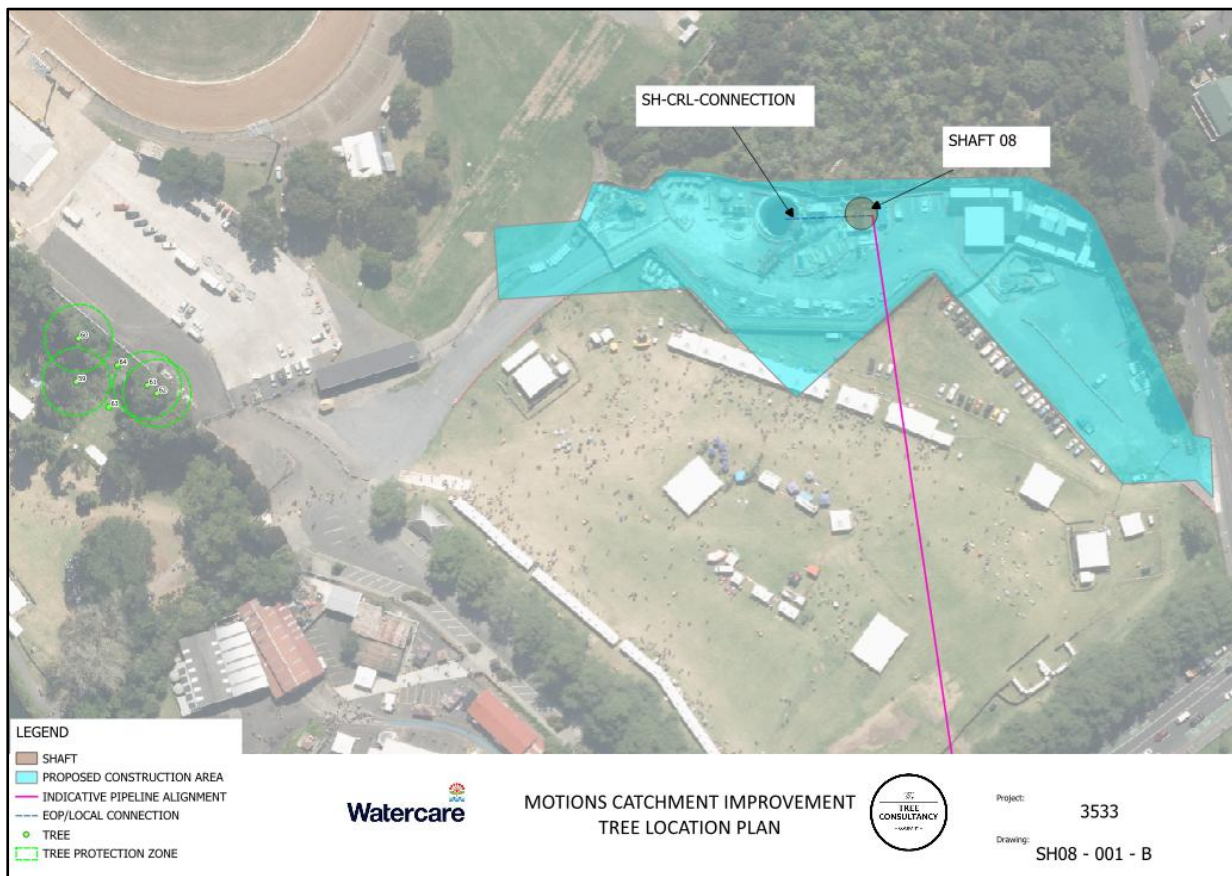


Figure 15: The proposed location for Shaft 8.

Proposed Shaft 8 will have a diameter of 9 m and a depth of 25.4 m. It is intended to connect to the Central Interceptor shaft, currently under construction, located approximately 10 m from Shaft 8 (Figure 15).

The site is also the proposed location of the second CSA and will make use of the construction area currently being used for the Central Interceptor. Therefore, there are no additional impacts expected on vegetation.

Due to ongoing construction activity, no trees were surveyed in or around the existing work area. No further vegetation surveys are anticipated, as no additional tree removal is expected at the site.

4.10 Shaft 9, 10, 11 – Newton Gully Branch Connection



Figure 16: The proposed location for Shafts 9, 10 and 11.

The pipeline crosses State Highway 16 from Shaft 2 to Shaft 11. Connection will be via a 4m x 4m pit to a depth of 18.5 m. Connections for a new 600mm diameter pipe to shafts 9 and 10 are via 2m x 4m pits to a depth of 9m and 5.9m respectively (Figure 16).

The nearest vegetation to these pits and open excavation areas is located within the STCZ and is fenced off, separate from the roadway where the proposed works are to occur. As a result, the potential impact on surrounding trees associated with construction at these three shaft locations is expected to be negligible to none.

4.11 Shaft 12, 12a – Basque Park Branch Connection

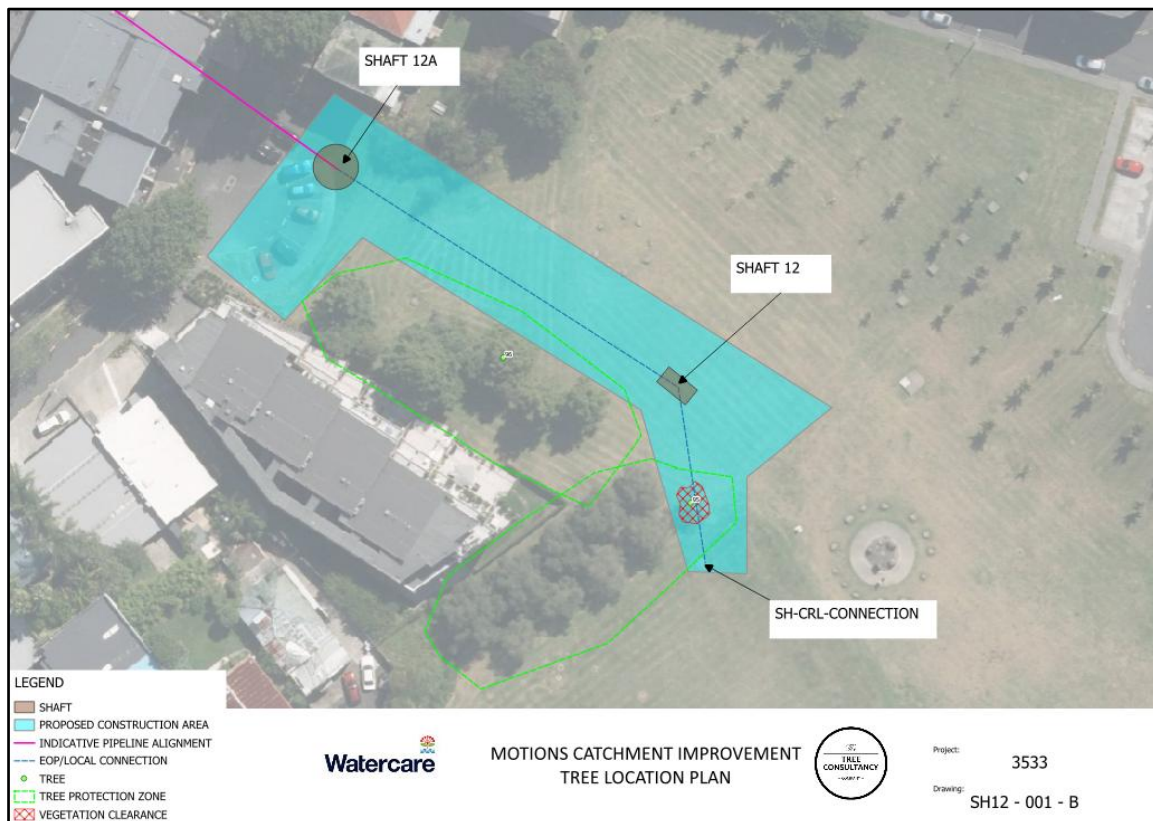


Figure 17: The proposed location for Shafts 12 and 12a.

The pipeline crosses State Highway 16 between Shaft 2 and Shaft 12a (Figure 17). The connection will be made via a 6 m diameter pit with a depth of 16.6 m. An additional connection to Shaft 12 for a new 600mm diameter pipe will be constructed using a 2m by 4m pit, extending to a depth of 7.7 m.

Two groups of trees have been identified on site and within Open Space zoned land. Tree Group 95 consists of ten olive trees which are near the proposed open trench between shaft 12 and the CRL connection. The open trench will require the removal of one olive tree from the group (Figure 18) - the Olive tree is over 4 m in height, triggering a requirement for resource consent as a Restricted Discretionary Activity. The tree represents a canopy cover of 20m² and will require one replacement tree as mitigation which can be replanted in the same location.

All other trees on site, including Tree Group 96 which comprises eleven cypress trees are sufficiently set back from shaft 12a to avoid any impact from construction. To prevent inadvertent damage, tree protection fencing should be installed around any trees or tree groups located in proximity to the works. This measure must be coordinated between the supervising arborist and the contractor prior to the commencement of construction activities on-site.



Figure 18: The removal of one olive tree (outlined in red) is required.

4.12 Shaft 13, 14, 15 – Arch Hill Scenic Reserve Connection

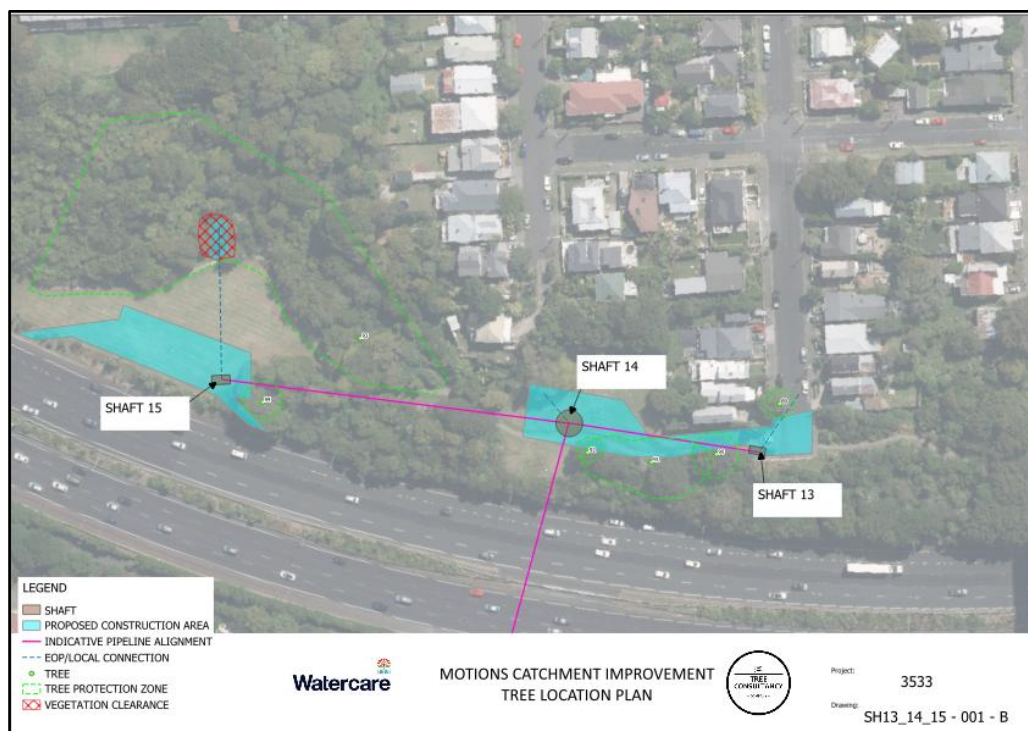


Figure 19: The proposed location for Shafts 13, 14 and 15.

The pipeline crosses State Highway 16 from shaft 4 to shaft 14. Connection will be via a 4m x 4m pit to a depth of 14.7 m. Connections for a new 600mm diameter pipe to shafts 13 and 15 are via 2m x 4m pits to a depth of 8.2m and 6m respectively (Figure 19).

Tree 89, located within the road reserve, is unlikely to be affected by the open-cut trenching required for the EOP, as the works are confined to the roadway where tree roots are not expected to be present.

All remaining trees surrounding the Project are within open space zoned land or the STCZ. Overall, there is adequate space available to establish construction zones and install the shafts without encroaching on the dripline of nearby trees, thereby minimising potential impacts on surrounding open space vegetation. An area of densely growing native vegetation growing throughout the site has been grouped as Tree Group 93. To enable the installation of a local pipeline connection the removal of 136 m² of native vegetation from within Tree Group 93 (Figure 20) will be required. The trees are within Open Space zoned land and include trees over 4 m in height, triggering a requirement for resource consent as a Restricted Discretionary Activity. Given the site's bushland context, the loss will be minimal and unlikely to be noticeable. Mitigation measures will include the on-site planting of eight replacement trees.

While some tree trimming will be necessary to facilitate site access and installation of the new pipeline within Arch Hill Reserve, the overall impact is anticipated to be low and within permitted levels. All pruning must however be assessed and agreed by the supervising arborist and undertaken by a qualified and skilled arboricultural contractor.



Figure 20: Vegetation removal (outlined in red) for a local pipeline connection in Arch Hill Reserve.

4.13 Sewer trunk main pipe construction

The proposed Motions Collector Sewer between the shafts passes at depth beneath numerous mature trees, which have not been individually identified in this assessment. The depth of the pipe is to have a minimum cover of 4.9 m in one location, but elsewhere, the minimum is 8 m, and on average, it will be much deeper, with depths exceeding 14 m. Given these depths, no roots from the trees along the alignment are expected to be encountered.

At the time of preparing this assessment, no specific information regarding dewatering was available. Although dewatering is not anticipated to pose a significant arboricultural concern, should it be required, suitable mitigation measures—such as mulching and, if necessary, supplementary irrigation—are expected to be sufficient to address any potential effects.

Overall, the effects on the trees along the alignment from tunnelling are therefore considered to be negligible.

4.14 Proposed mitigation planting

A total of 32 individual trees, ranging in height from 5 to 16 m and collectively contributing 1,092 m² of canopy cover, are scheduled for removal as part of the proposed project activities. Additionally, approximately 420 m² of canopy cover (including trees ranging from 5-8m in height) will be removed from densely vegetated areas—specifically within Tree Groups 8 and 93—where the number of individual trees cannot be accurately determined. To remediate the total canopy loss of 1512 m², a total of 88 replacement trees is being recommended. Please refer to Table 1 below for details on each shaft site, including the associated canopy loss and the required mitigation planting.

As discussed in section 3, replacement numbers are calculated using iTree Eco (v6.0.35), which forecasts how tree canopy cover will grow over time. The calculations are based on planting medium to large 45-litre grade trees, which are typical for Auckland Council's urban planting. They also account for:

- Expected tree loss (attrition) in the first three years after planting
- The current amount of canopy in the Eden-Albert Local Board
- The current amount of canopy in the Waitemata Local Board
- The citywide goal of boosting canopy cover to 30%

For example, if the area currently has 20% canopy cover, the tree planting plans aim to create a net 10% increase to help meet that citywide 30% target.

Trees deliver a range of ecosystem services—such as air purification, carbon sequestration, temperature moderation, and stormwater management—that offer benefits at a city-wide scale. As such, replanting efforts need not be restricted to the original site or a single location. In fact, greater societal benefits would be achieved through widespread planting. Where individual project sites lack sufficient space to accommodate the number of trees required to achieve canopy cover remediation, it will be necessary to plant elsewhere nearby, in the same local board area (e.g., the surrounding streets and nearby parks and reserves).

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.

Shaft No.	Tree No.	Qty of trees	Height (m)	Age class	Zone	m2 canopy removal	Replacement tree no.
2	4	1	6	Mature	ROAD/OS	28	2
2	Group 5	3	5	Mature	ROAD/OS	234	13
2	6	1	6	Mature	ROAD/OS	28	2
2	7	1	12	Mature	ROAD/OS	41	2
2	Group 8	100+	5	Mature	ROAD/OS	*284	16
3	10	1	6	Mature	ROAD	12	1
3	11	1	8	Early mature	ROAD	29	2
3	15	1	9	Mature	OS	79	4
3	20	1	7	Mature	ROAD	29	2
4	29	1	10	Mature	OS	147	8
6	Group 40	2	7	Mature	ROAD	64	4
6	Group 42	3	16	Mature	ROAD	*37	2
7	Group 53	6	5	Mature	ROAD	168	9
7	54	1	2	Juvenile	ROAD	4	Suitable to transplant
7	55	1	2	Juvenile	ROAD	5	Suitable to transplant
7	56	1	5	Mature	ROAD	28	2
7	Group 57	4	5	Mature	ROAD	112	6
7	Group 58	4	5	Mature	ROAD	27	2
12	Group 95	10	5	Mature	OS	*20	1
15	Group 93	50	8	Mature	OS	*136	8
* (partial removal of group) OS – Open Space Zoned land							

Table 1: Canopy cover removal for each shaft location and the relevant replacement tree planting numbers.

5 Statutory assessment

A planning assessment of the Project is outside the scope of this report and has been provided by the AEE. The following rules are applicable to this Project in relation to trees in Open Space and Road zoned land:

- 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 54 and 55 are less than these dimensions, and their removal is a permitted activity.
- Trees 4, 5, 6, 7, 8, 10, 11, 15, 20, 29, 40, 42, 53, 56, 57, 58, 93 and 95 exceed these dimensions, therefore triggering the requirement to obtain resource consent as a Restricted Discretionary Activity.
- The Project also seeks allowances to undertake pruning of trees to allow for greater overhead clearance to construct, and/ or provide access to the shafts. 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, the expected pruning will comply with the permitted standards.
- Works within the protected root zone of the remaining trees inspected are proposed to occur. The encroachment into the Auckland Unitary Plan defined root zone does not exceed 20%, and in most instances, clearances are sufficient where roots greater than 80 mm in diameter are unlikely to be encountered. It however cannot be ruled out that the occasional root greater than 80mm in diameter may be encountered where its removal will have minimal effects on tree health. The Project, therefore, seeks consent to undertake works in the root zone of trees that does not comply with the permitted standards set out at E26.4.5.2, as a Restricted Discretionary Activity.
- A Notable tree overlay is present within the rear portion of the private property at 23 Levonia Street. The permitted standards allow for trenchless methods at a depth greater than 1 m below ground level. The collector sewer will be tunnelled at an approximate depth of 20 m beneath the tree and is therefore a Permitted Activity.

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) as a Restricted Discretionary Activity

(A86) Works within the protected root zone by trenchless methods at a depth greater than 1 m below ground level, as a Permitted Activity

(A88) Works within the protected root zone not otherwise provided for, as a Restricted Discretionary 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 Discretionary Activity

6 Conclusion and recommendations

6.1 Conclusions

The proposed Project involves a complex and large-scale programme of works that will result in a range of arboricultural effects. The works involve the construction of eighteen shafts; deep tunnelling activities; the installation of nineteen engineered overflow points; and the establishment of construction areas at sixteen locations. Additionally, two main Construction Support Areas are proposed at Western Springs Park and Suffolk Reserve, with the former making use of existing infrastructure and the latter utilising a hardstand area under the motorway.

From an arboricultural perspective, the Project will result in a combination of direct and indirect effects on trees within road corridors and public open space. These include:

- Works within the protected root zones and canopy pruning of trees, primarily in the road corridor and open space areas, which are assessed as having minor or negligible adverse effects;
- Tunnelling beneath numerous street trees, which is expected to have negligible arboricultural impact due to the depth of the works; and
- The removal of thirty-two trees, representing approximately 1,092 m² of canopy cover, along with an additional 420 m² of early-mature, densely growing vegetation.

To mitigate the loss of canopy cover, replanting of eighty-eight trees in the Albert-Eden and Waitemātā Local Board areas is proposed. Coordination with Auckland Council's Parks and Community Facilities department will be necessary to determine suitable planting locations and species, as part of the Tree Owner Approval application process.

To mitigate the direct and indirect effects of the works on trees the following recommendations must be implemented to ensure the impacts of the Project can be managed to minimal levels.

6.2 Recommendations

It is recommended that a suitably qualified and experienced on-site supervisory arborist (the 'supervising arborist') be engaged for the works associated with the 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.

It is recommended that the tree protection methodology in Appendix A be adhered to at all times during the physical works.

It is recommended that prior to commencing work, there must be a pre-start meeting on site with the nominated supervising arborist and the contractor responsible for carrying out the work. During this meeting, the parties are to finalise the agreed tree protection methodologies to be undertaken and confirm when arboricultural supervision will be necessary.

It is recommended that site access routes (e.g., for machinery etc.) be determined and agreed upon between the contractors and the appointed supervising arborist prior to works commencing.

It is recommended that the supervising arborist conduct a site audit once a month, this site audit is to ensure that the tree protection methodologies are being adhered to. Should it become evident during the site audit that tree protection methodologies are not being adhered to, it is the supervising arborist's responsibility to advise which aspects of the tree protection methodology need to be rectified.

It is recommended that temporary tree protection fencing should be installed in consultation with the supervising arborist. The fence should be constructed in accordance with specifications TP-01 and TP-02 in Appendix B. The fence must remain in place for the duration of construction activities at each location 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, and Tree Protection Zone, must be done under supervision and in coordination with the supervising arborist.

It is recommended that 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).

Author



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Arboricultural Consultant

Appendix A – Tree Protection Methodology

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.

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

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.

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 Parks & Community Facilities regional arborist specialist 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
- Tree pruning
- 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

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

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.

If, during the course of the works, machinery or vehicle access / manoeuvring is required in or around the root zone of any of the trees, then those areas are to be covered with a protective overlay sufficient to protect the ground from being muddied, compacted, churned up or otherwise disturbed (for example

‘Track Mats’, or a layer of mulch or sand/SAP7 overlaid if necessary, with a raft of wired planks, plywood or similar) (see detail TP-04).

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

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 then these areas shall first be explored using hand tools only to check for the presence of such roots.

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).

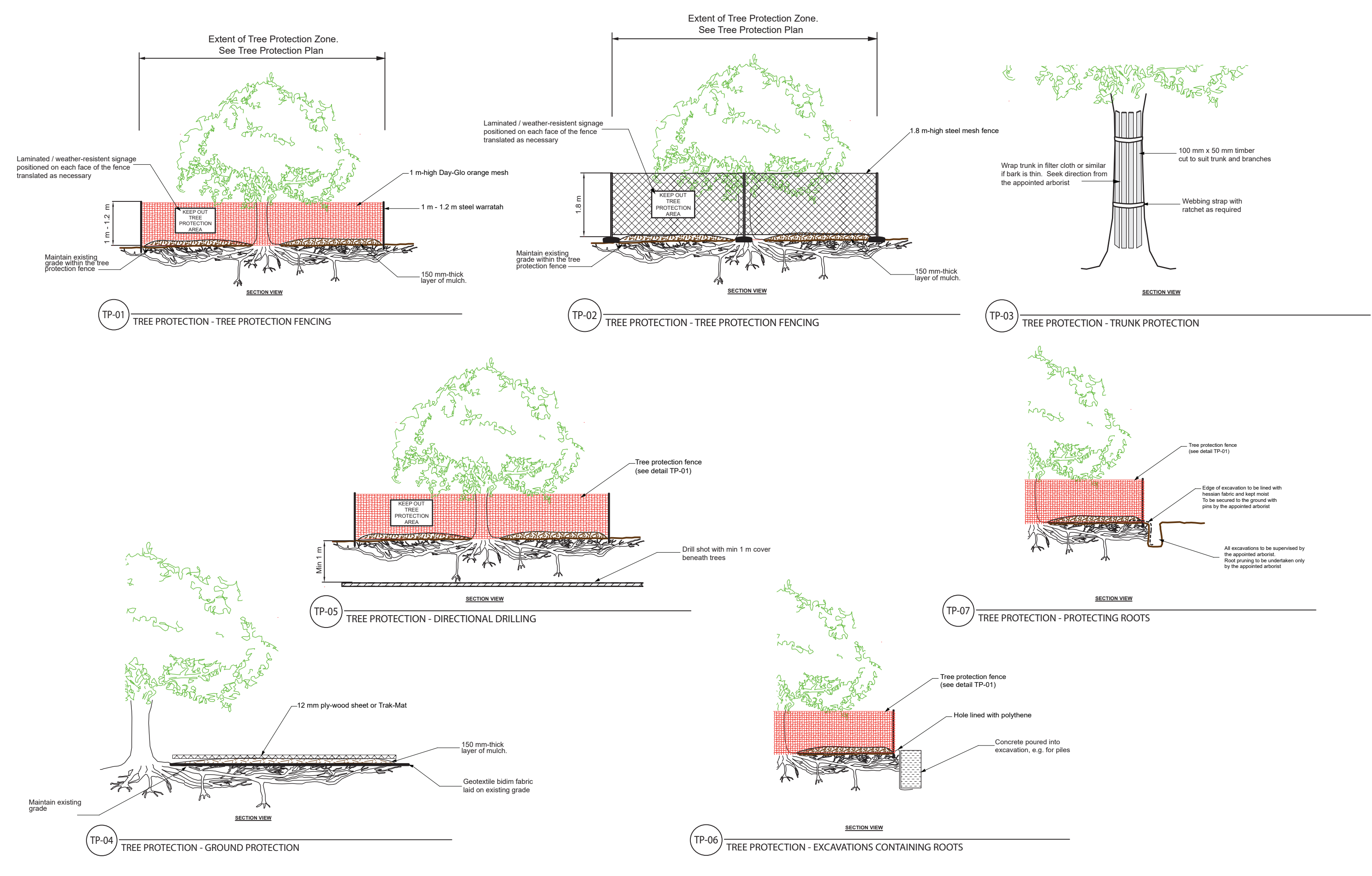
The cutting, breaking, and lifting of any concrete and / or asphalt in and around the root zone of the trees shall be done so in conjunction with the supervising arborist through a careful combination of machine and hand operated equipment. Ideally, the concrete / asphalt will first be cracked or broken 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

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.

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 Detail



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



Drawing		TTCC- TP- 2020
Revision	001	Date 14-08-2020

Appendix C – TTCC Tree Plans



LEGEND

- SHAFT 01
- INDICATIVE PIPELINE ALIGNMENT
- EOP/LOCAL CONNECTION
- PROPOSED CONSTRUCTION AREA
- TREE
- TREE PROTECTION ZONE



MOTIONS CATCHMENT IMPROVEMENT
TREE LOCATION PLAN



Project: 3533
Drawing: SH01 - 001 - B



POTENTIAL CONSTRUCTION ACCESS

LEGEND

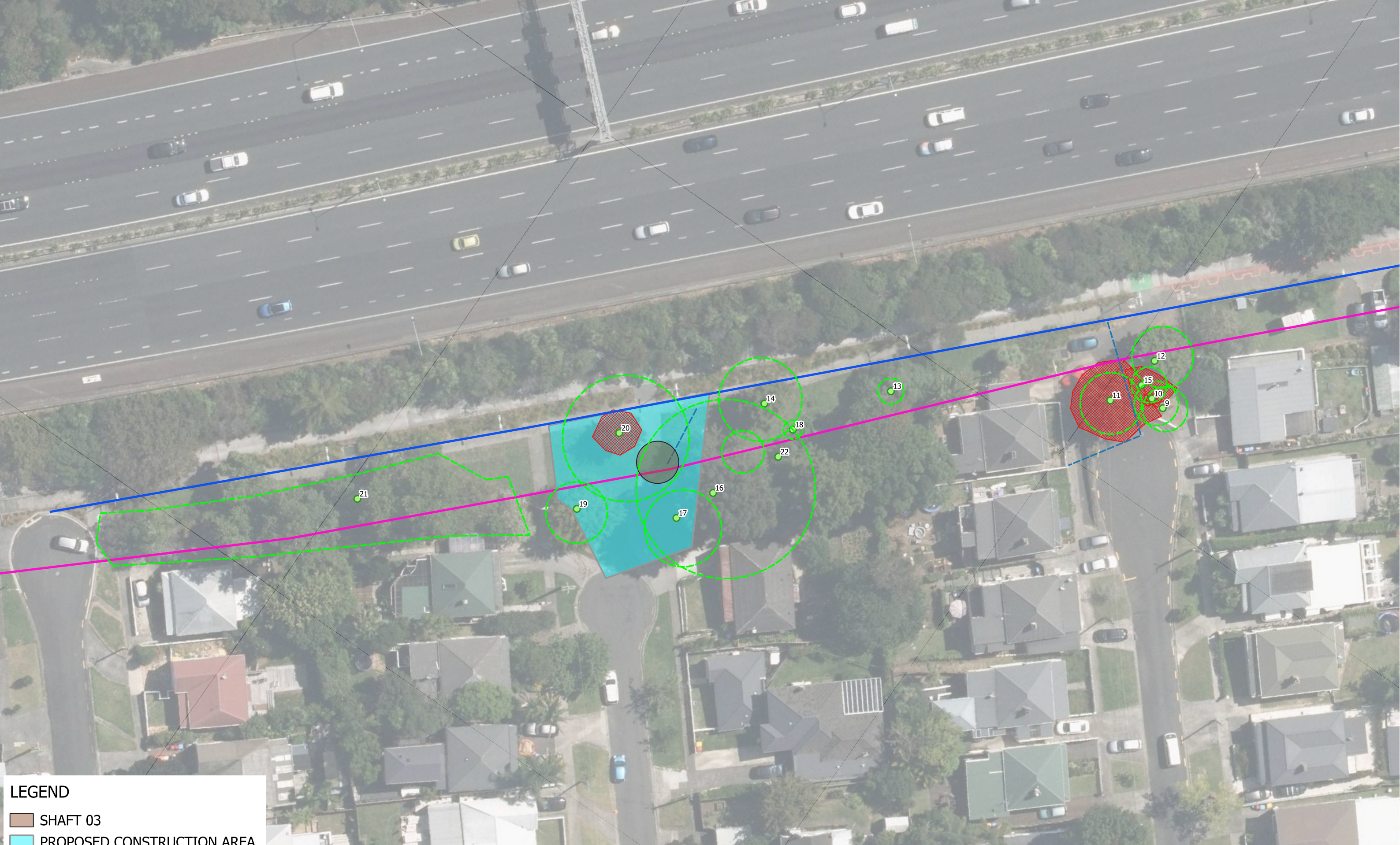
- SHAFT 02
- PROPOSED CONSTRUCTION AREA
- INDICATIVE PIPELINE ALIGNMENT
- EOP
- TREE
- TREE PROTECTION ZONE
- VEGETATION CLEARANCE



MOTIONS CATCHMENT IMPROVEMENT
TREE LOCATION PLAN



Project: 3533
Drawing: SH02 - 001 - B



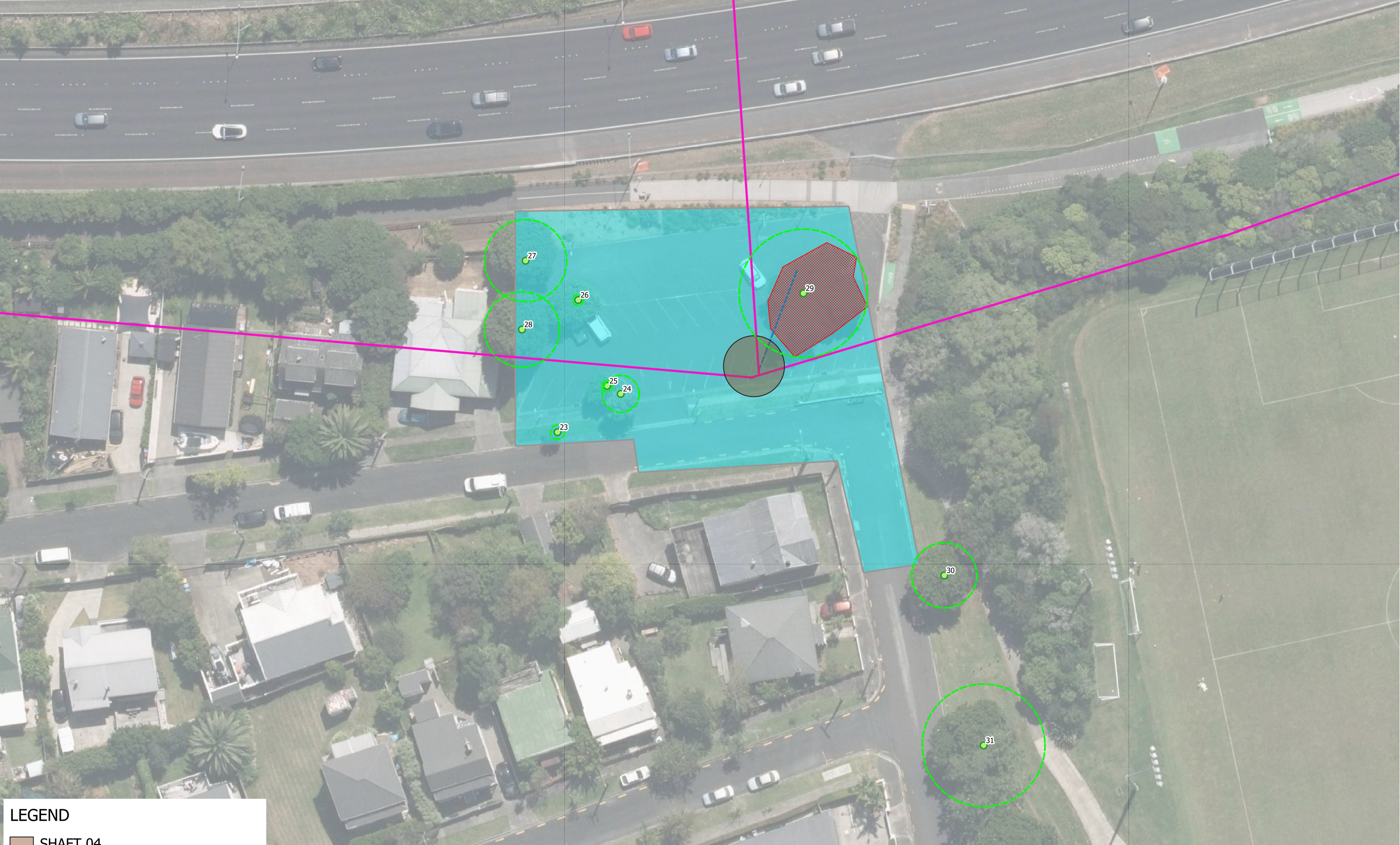
- LEGEND**
- SHAFT 03
 - PROPOSED CONSTRUCTION AREA
 - INDICATIVE PIPELINE ALIGNMENT
 - EOP/LOCAL CONNECTION
 - ACCESS_EGRESS
 - TREE
 - TREE PROTECTION ZONE
 - VEGETATION CLEARANCE



MOTIONS CATCHMENT IMPROVEMENT
TREE LOCATION PLAN



Project: 3533
Drawing: SH03 - 001 - B



LEGEND

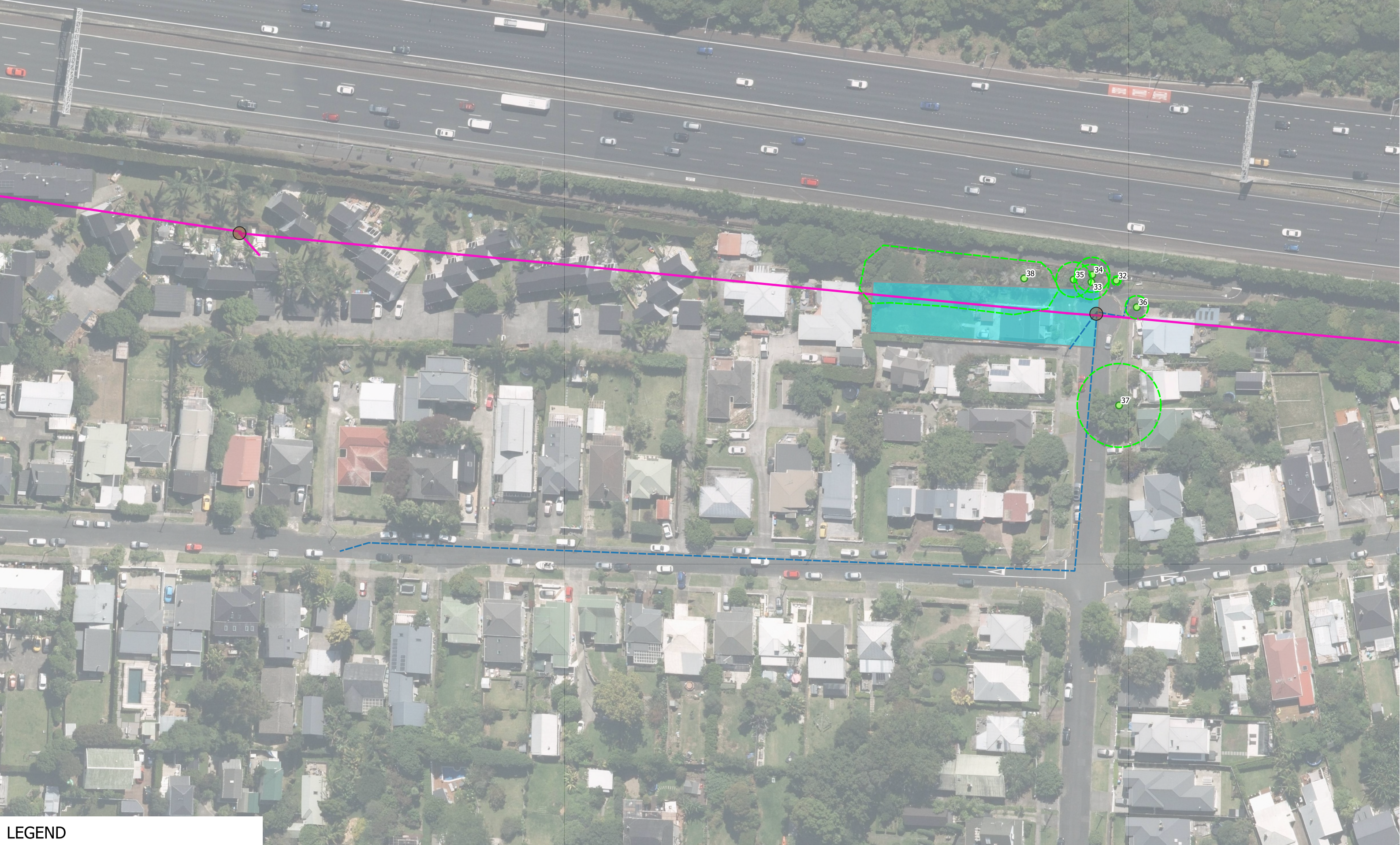
- SHAFT 04
- PROPOSED CONSTRUCTION AREA
- INDICATIVE PIPELINE ALIGNMENT
- EOP/LOCAL CONNECTION
- TREE
- TREE PROTECTION ZONE
- VEGETATION CLEARANCE



MOTIONS CATCHMENT IMPROVEMENT
TREE LOCATION PLAN



Project: 3533
Drawing: SH04 - 001 - B



- LEGEND
- SHAFT 05
 - PROPOSED CONSTRUCTION AREA
 - INDICATIVE PIPELINE ALIGNMENT
 - EOP/LOCAL CONNECTION
 - TREE
 - TREE PROTECTION ZONE



MOTIONS CATCHMENT IMPROVEMENT
TREE LOCATION PLAN



Project: 3533
Drawing: SH05 - 001 - B



LEGEND

- SHAFT 06
- PROPOSED CONSTRUCTION AREA
- INDICATIVE PIPELINE ALIGNMENT
- EOP/LOCAL CONNECTION
- TREE
- TREE PROTECTION ZONE
- VEGETATION CLEARANCE



MOTIONS CATCHMENT IMPROVEMENT
TREE LOCATION PLAN



Project: 3533
Drawing: SH06 - 001 - B



LEGEND

- SHAFT 07
- PROPOSED CONSTRUCTION AREA
- INDICATIVE PIPELINE ALIGNMENT
- EOP/LOCAL CONNECTION
- TREE
- TREE PROTECTION ZONE
- VEGETATION CLEARANCE
- NOTABLE TREE (AUP)



MOTIONS CATCHMENT IMPROVEMENT
TREE LOCATION PLAN



Project: 3533
Drawing: SH07 - 001 - B