



Arboricultural Assessment - Northern Interceptor Project: Notices of Requirement

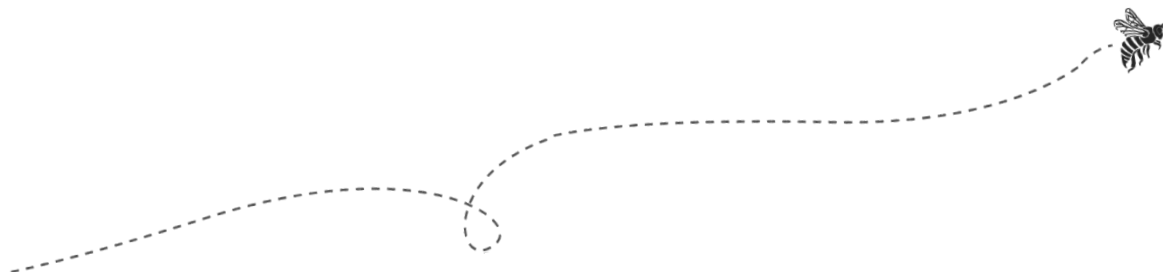
8 August 2016

Revision 4

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Client:	Watercare
Project:	Northern Interceptor
GSNZ Ref.:	M13787/2
Proposed:	Construction, operation and maintenance of Watercare's proposed Northern Interceptor



EXECUTIVE SUMMARY

The Northern Interceptor alignment has implications for trees along the route and has the potential to adversely affect the arboricultural qualities of the following sites in Waitakere and North Shore:

- Lowtherhurst Reserve, Massey
- Manutewhau Reserve, Massey
- St Margaret's Park, West Harbour
- The Eastern Abutment of the Greenhithe Bridge, Greenhithe
- North Wainoni Park, Greenhithe
- North Shore Memorial Park, Schnapper Rock
- Wharepapa Reserve, Schnapper Rock
- North Shore Golf Course, Albany
- Rosedale Park, Rosedale

Trees exist in other locations along the proposed designation route; however these are relatively insignificant at present.

Due to trees being part of the constantly changing environment, the effects on trees within the timeframe of this project is subject to change. An approach that seeks to avoid and mitigate site-specific tree conflicts at the time of finalised design and construction is paramount to a successful outcome in relation to arboricultural matters.

Proactive management of trees within and adjacent to the designated works corridor will reduce the potential arboricultural effects that will result from pruning of trees that grow across the proposed designation.

Subject to the implementation of site-specific tree protection and mitigation measures, the Northern Interceptor will have minor impacts on the treed environment within the proposed alignment.

Arborist: Craig Webb
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1 PREAMBLE

GreensceneNZ Limited has been commissioned by Watercare Services Limited (Watercare) to assess the potential arboricultural land use effects related to the construction, operation and maintenance of Watercare's proposed Northern Interceptor (the Project).

This report has been compiled with reference to the site plans prepared by MWH (2016) that were provided to *GreensceneNZ Limited* for the purpose of preparing this Arboricultural Assessment.

This report presents information regarding the arboricultural characteristics and of the area that will be affected by the Project. The report includes:

- Information relating to existing trees that are potentially affected by the Project;
- A discussion of potential adverse effects on the natural environment;
- Recommendations and mitigating measures that aim to minimise the impact of the proposed works on trees within the project area that are to be retained; and
- Recommendations for replanting that will mitigate adverse environmental effects on the trees within the Project area.

2 PROJECT DESCRIPTION

The Project comprises a new wastewater pipeline that will divert flows from the existing Swanson, Whenuapai and Massey branch sewers at the existing storage tank located at The Concourse, Henderson to the Hobsonville Pump Station. Along its length the pipeline will connect flows originating from the North West Transformation Area (including Red Hills, Massey North, Kumeu, Riverhead, Huapai and Whenuapai). These flows are then transferred north, to the Rosedale Wastewater Treatment Plant (WWTP).

The project and a detailed construction methodology are described in detail in the Northern Interceptor Assessment of Effects on the Environment (AEE), prepared by MWH New Zealand Limited.

Northern Interceptor requires designation under the Resource Management Act 1991 (RMA). This technical report provides specialist input for the AEE which supports the Notices of Requirement (NoR) for designations, these being NoR – NI (Waitakere) and NoR – NI (North Shore).

The works within NoR - NI (Waitakere) will transfer wastewater flows from the Concourse Storage Tank to Hobsonville Road, where it will connect with an earlier Phase of the Northern Interceptor Project. These works will divert flows from the Whenuapai, Massey and Swanson branch sewers away from the Western Interceptor to the Hobsonville PS and from there to the Rosedale WWTP.

The works within NoR - NI (North Shore) will transfer wastewater flows from the eastern abutment of the Greenhithe Bridge, below the Upper Waitemata Harbour, to the Rosedale WWTP, and include the construction of pump stations, pipeline, and associated structures. Construction will be staged in response to growth in the area.

In summary, the Project works included within NoR – NI (Waitakere) and NoR – NI (North Shore) will comprise of the following elements:

- A new Pump Station at the Concourse Storage Tank site which will divert flow north away from the Western Interceptor;
- A new Booster Pump Station at Wainoni Park to accommodate additional flows from the Northwest Transformation Area;
- A new Intermediate Pump Station at Wainoni Park North to accommodate further growth in the Northwest Transformation Area, and the diverted flows from the Concourse (Swanson and Waitakere);
- Installation of a wastewater pipe from the Concourse Storage Tank to Hobsonville Road;
- Installation of a wastewater pipe from the Eastern Abutment of the Greenhithe Bridge, Greenhithe, to the Rosedale WWTP;
- Duplication of the rising main section of wastewater pipe from the Intermediate Pump Station at Wainoni Park North to the Rosedale WWTP;
- Associated structures at connection points, including access shafts, drop shafts, flow control structures, etc.; and
- Installation of a pipe bridge at Manutewhau Reserve, West Harbour.

This report provides the following:

- A description of the environmental baseline for the particular receiving environment(s) potentially affected by the Project [Section 3];
- Description of specific aspects of the Project in relation to the subject area being investigated;
- Description of the investigations undertaken to assess arboricultural effects and assessment of the proposed works within this technical field;
- Recommended mitigation and management measures and resultant post mitigation assessment of effects;
- An assessment of the actual or potential effects on the environment (construction, operation and maintenance). This includes the identification of activities that could result in potential adverse effects and, in turn, identifying design refinements or construction methodologies that could avoid, remedy or mitigate such effects;

- Conclusions [Section 8].

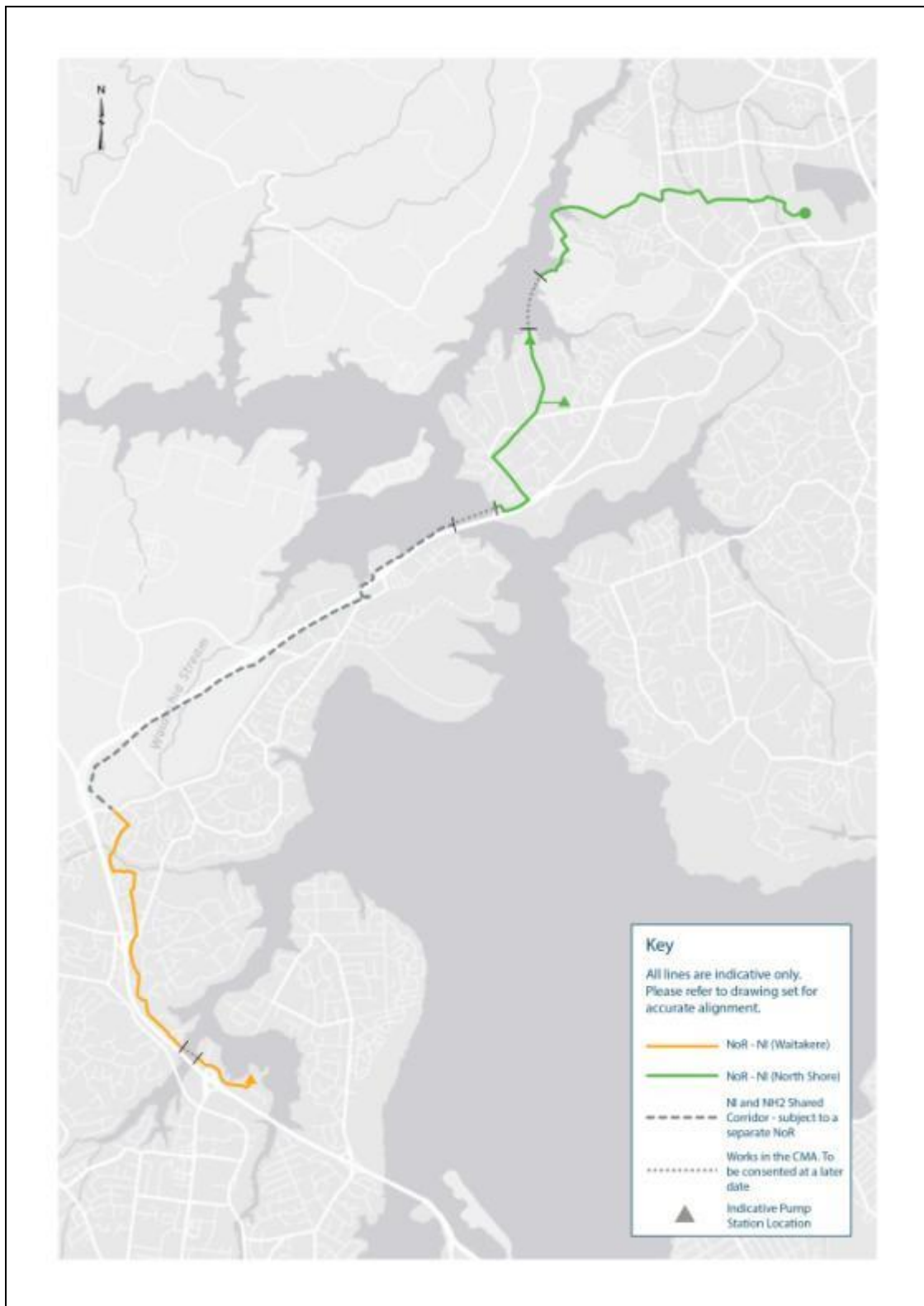


Figure 1 - Overview of the alignment of NI

Arboricultural Final (updated)

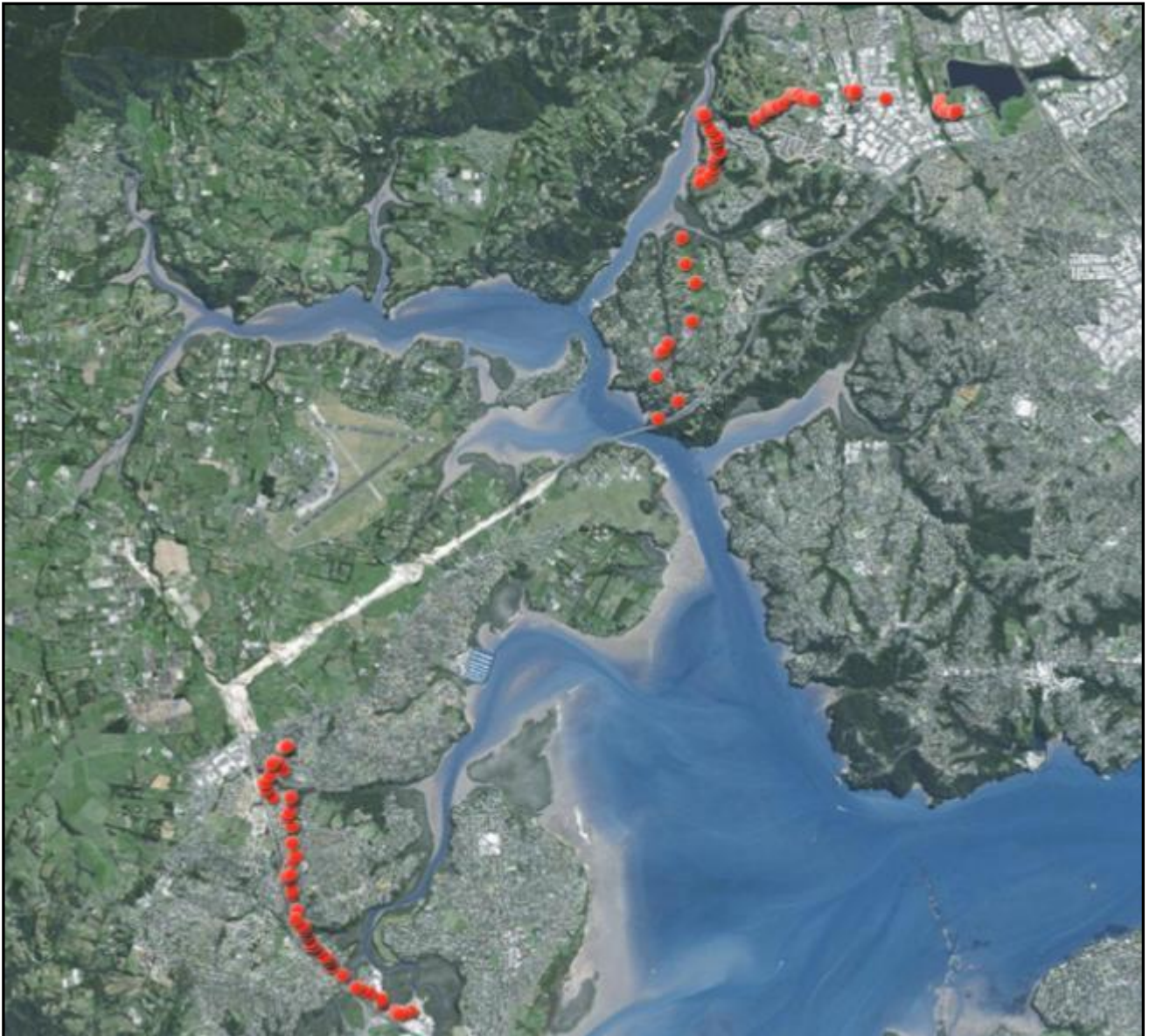


Figure 2 - Aerial view of the project area and surrounds indicating the location of the proposed works by tree location cluster. Aerial image obtained from Auckland Council GIS.

3 ENVIRONMENTAL BASELINE

Site inspections to carry out the assessment of existing trees within the project area were undertaken in January 2016. The tree details in this report provide a snapshot in time of the trees that exist at the present time from which the baseline of the treed environment can be established.

Due to the changing nature of the tree resource over time, the tree details serve to provide a benchmark from which the future treed environment can be estimated. In consideration of approximate growth rates and anticipated tree removals that may occur from time to time, the changing nature of the tree resource at the time of construction of the wastewater pipeline and associated infrastructure can be estimated.

4 METHODOLOGY

This report describes the arboricultural effects of the proposed pipe alignment. The assessment of the route was completed during site inspections along the entire route that involved recording details of trees within or overhanging the proposed NI corridor that are potentially affected by the proposal, depending on detailed design. The project has been described in sections according to the geographic locations and works methodology for distinct sections of the project in accordance with the main AEE.

Section 5 of this report describes each work section under subheadings that describe: the Existing Environment, the Proposed Works, the Arboricultural Effects and Mitigation Measures.

The existing environment is described in terms of the tree and vegetation types present in the relevant works areas and where appropriate a list of the main species (native and exotic) present within the site has been provided.

A schedule that lists all trees or groups of trees identified during the route inspection has been compiled and is provided in Appendix A: Tree Schedule.

The 'Tree Schedule' includes details of the identified trees/groups within or adjacent to the NI corridor, including: the reference number assigned to them, the species, age class, and general comments relating to the condition of each. The 'Tree Location Plans' establish the approximate location of the tree or tree group.

5 ARBORICULTURAL ASSESSMENT

The alignment of the Northern Interceptor passes through a wide range of environments, from industrial property, major transport routes and commercial streets to stream side gullies, public parks/open spaces and estuarine habitats. The proposed works, involving both open-cut trenching and trenchless technologies, impact on trees that are located within the private and public realm. Where trees are affected, measures that avoid, remedy and mitigate the adverse effects on the natural environment are a necessary component of the project.

Due to the varied nature of the environments along the proposed corridor, the protection status of trees and vegetation varies significantly. The protection status of trees is subject to change over time as the operative District Plans (Waitakere and North Shore) are phased out and replaced by the Proposed Auckland Unitary Plan (PAUP). Generally speaking, trees that are present on roads and reserves will continue to be protected under the PAUP whereas trees on private property will cease to be protected. Trees on private property may be protected where within a Significant Ecological Area (SEA) or if listed as scheduled trees. The SEA values are canvassed in the ecological assessment. There are currently no scheduled trees deemed to be affected by the proposal.

The following sections set out the proposed route and provide comments relating to the arboricultural issues that are encountered in sections of the Project that have potentially significant relevant arboricultural issues. Areas outside of those detailed below are considered to have no particular arboricultural issues and can be dealt with through standard arboricultural practices.

The route of the proposed wastewater pipeline is described below in order of geographic location from west to east.

5.1 Lowtherhurst Reserve

NoR (Waitakere) Designation Plan: Sheet 3 of 6

5.1.1 Existing Environment

The area (highlighted in green in Figure 3) comprises of a native bush area growing on both sides of a stream/tributary that runs through Lowtherhurst Reserve. The largest, most significant trees consist of rewarewa (*Knightia excelsa*) and towai (*Weinmannia silvicola*). Many seedlings from both species were also observed.

As well as a significant number of native trees and shrubs 6 x redwood (*Sequoia sempervirens*) are growing at the end of Redwood Drive

5.1.2 Proposed Works

At this location the concept design proposes to install the pipeline via trenching across a small tributary in Lowtherhurst reserve and into the end of Redwood Drive.

5.1.3 Arboricultural Effects

- Tree removal
- Works within the dripline/rootzone
- Associated pruning

5.1.4 Mitigation Measures

- Pruning to allow access
- Removal of exotic weed species
- Replacement planting and enhancement
- Tree protection methodologies

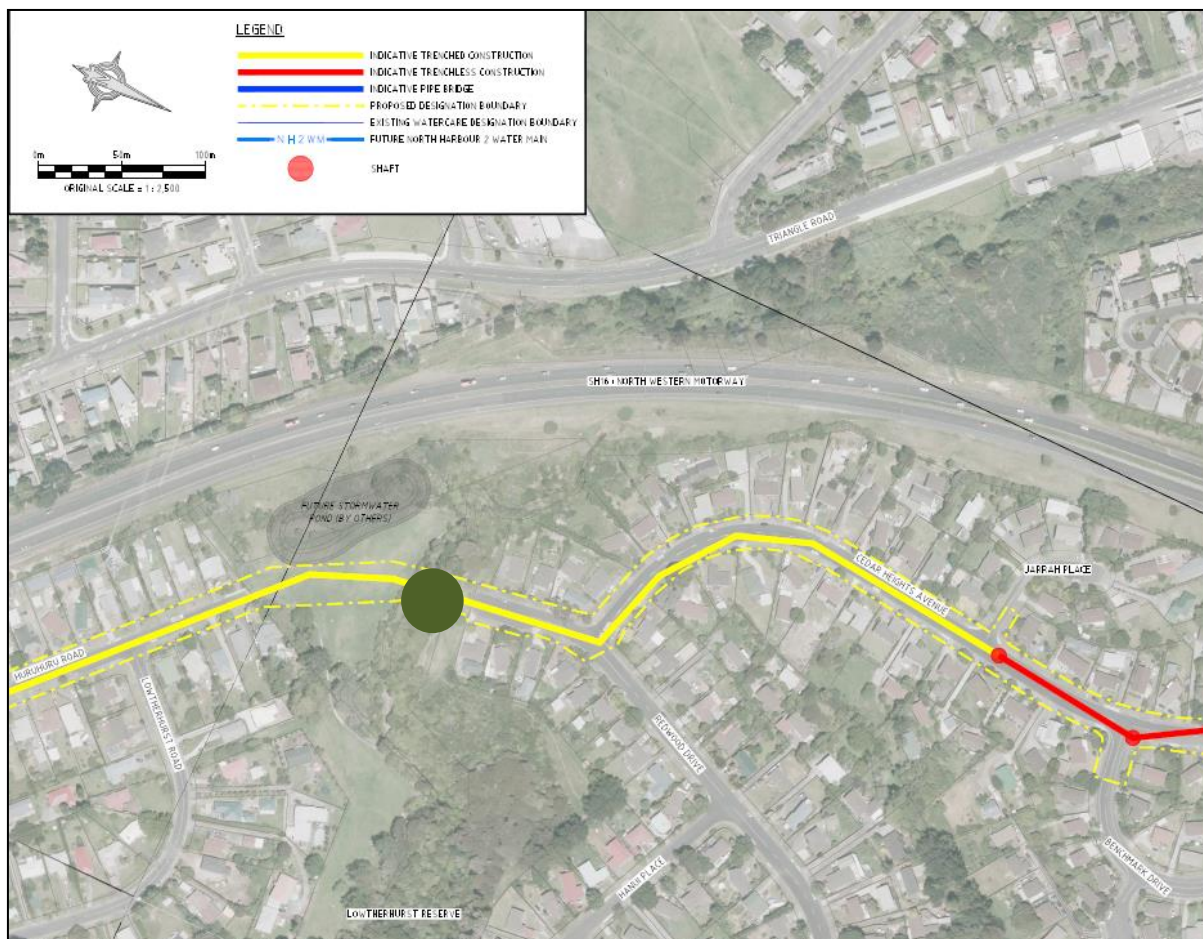


Figure 3 – Lowtherhurst Reserve

5.2 Manutewhau Reserve

NoR (Waitakere) Designation Plan: Sheet 5 of 6

5.2.1 Existing Environment

The area (highlighted in green in Figure 4) comprises of a native bush area with few exotic weed species growing on both sides of a stream/tributary. The largest most significant trees consist of towai (*Weinmannia silvicola*). Although the works boundary seems to be on the edge of these trees potential disturbance is probable. Another important component to this area is the presence of a large number of native tree ferns ponga, (*Cyathea dealbata*), mamaku, (*Cyathea medullaris*) and wheki, (*Dicksonia squarrosa*).

5.2.2 Proposed Works

At this location the concept design proposes to cross the stream in Manutewhau Reserve with a pipe bridge into Holmes Drive.

5.2.3 Arboricultural Effects

- Tree removal
- Works within the dripline/root zone

5.2.4 Mitigation Measures

- Pruning to allow access
- Removal of exotic weed species
- Replacement planting and enhancement
- Tree protection methodologies

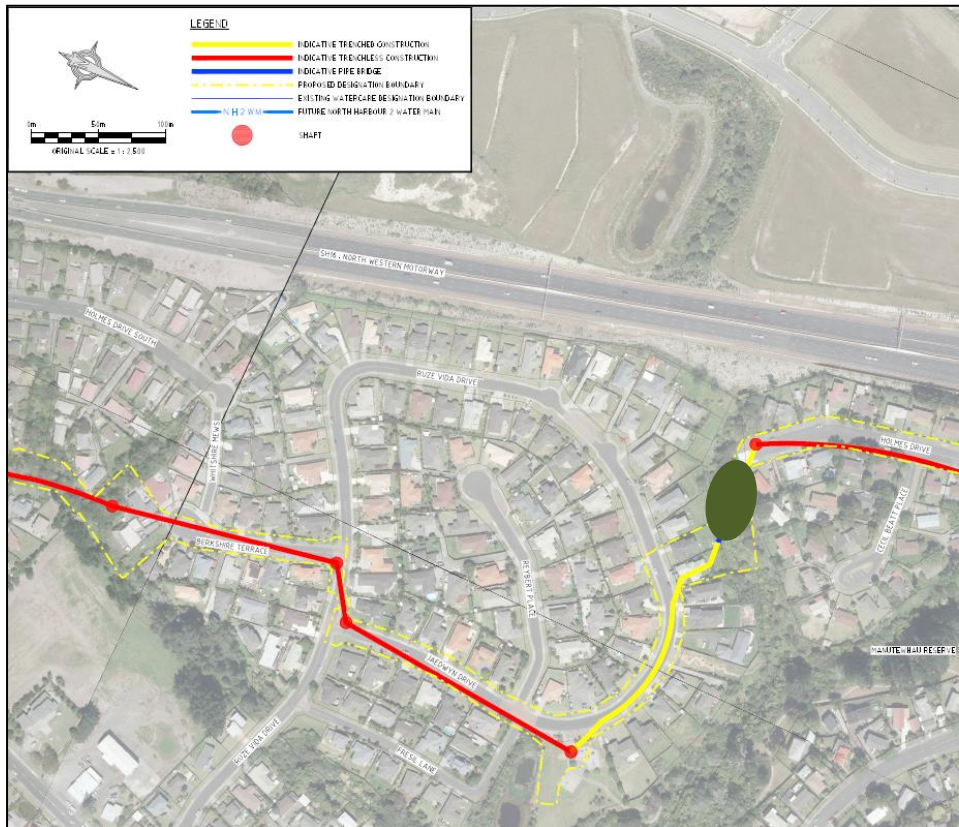


Figure 4 - Manutewhau Reserve

5.3 St Margaret's Park

NoR (Waitakere) Designation Plan: Sheet 6 of 6

5.3.1 Existing Environment

The areas (highlighted in green in Figure 5) comprises of mainly stand alone specimen trees with small native seedlings and shrubs. As well as excavations of manholes access to the park will be in most cases within the dripline of trees, although at this stage, the access route is yet to be confirmed.

5.3.2 Proposed Works

At two locations within St Margaret's Park six metre diameter shafts may require excavation.

5.3.3 Arboricultural Effects

- Tree removal
- Works within the dripline/root zone

5.3.4 Mitigation Measures

- Pruning to allow access
- Removal of exotic weed species
- Replacement planting and enhancement
- Tree protection methodologies
- Ground/root protection



Figure 5 - St Margaret's Park

5.4 The Eastern Abutment of the Greenhithe Bridge

NoR (North Shore) Designation Plan: Sheet 1 of 10

5.4.1 Existing Environment

The area (highlighted in yellow dashed lines/proposed designated boundary in Figure 6) comprises of a diverse native bush area consisting of regenerating podocarp-broad leaf forest, specimen trees and exotic weed species. The north eastern boundary of the designation comprises of the most significant native vegetation from the edge of the Eastern Abutment of the Greenhithe Bridge to the coastline and westward around the coastline to Greenhithe Bridge. Open trench construction through the reserve should be avoided.

5.4.2 Proposed Works

At this location the concept design indicates that the pipeline will surface within the private property at No.15 The Knoll and a break pressure chamber will require construction.

The large designation boundary at present to accommodate flexibility around preferred construction methodology to cross the Waitemata Harbour also includes the Eastern Abutment of the Greenhithe Bridge.

5.4.3 Arboricultural Effects

- Tree removal
- Works within the dripline/root zone

5.4.4 Mitigation Measures

- Pruning to allow access
- Removal of exotic weed species
- Replacement planting and enhancement
- Tree protection methodologies

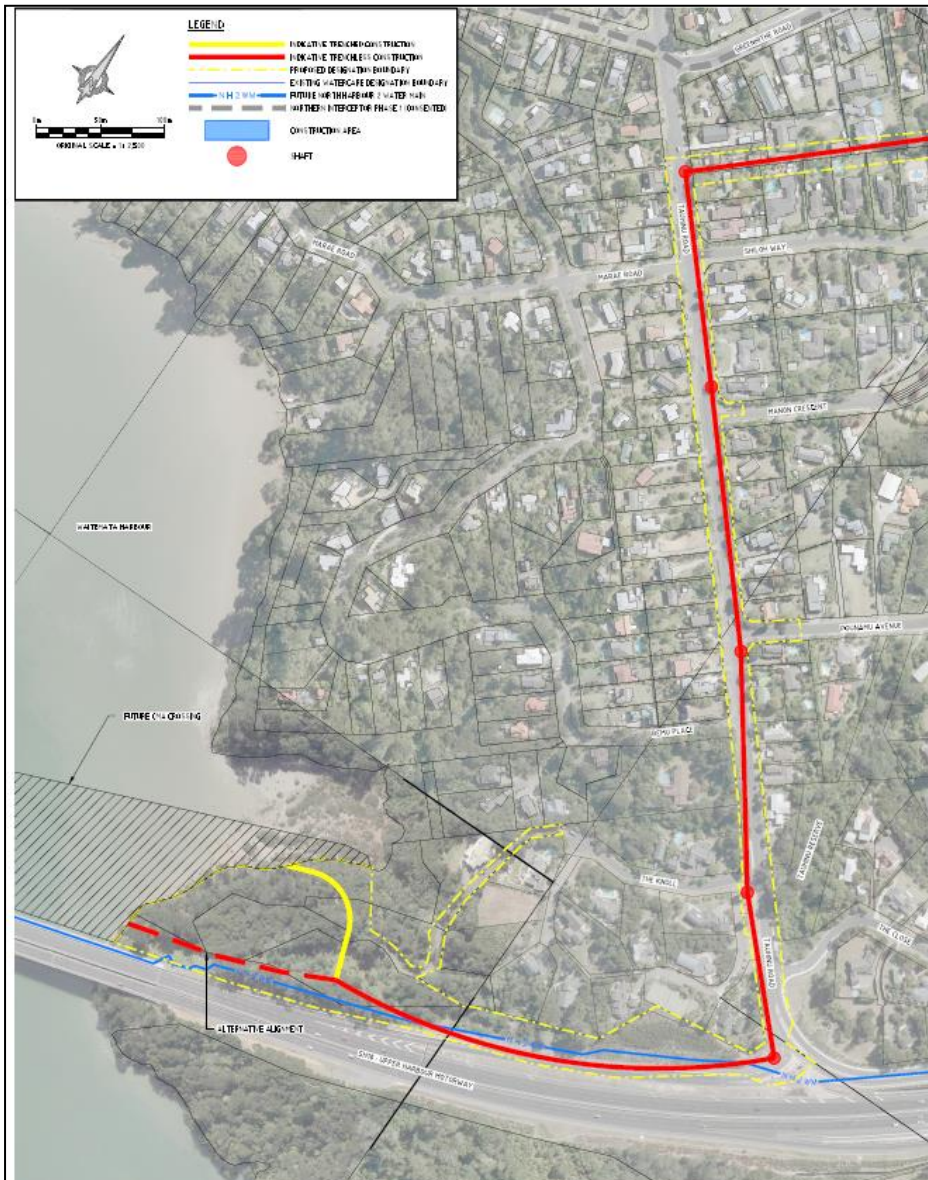


Figure 6 – The Eastern abutment of the Greenhithe Bridge

5.5 North Wainoni Park

NoR (North Shore) Designation Plan: Sheet 4 of 10

5.5.1 Existing Environment

The area (highlighted in yellow dashed lines/proposed designated boundary/construction boundary in Figure 7) comprises of primarily planted specimen trees as rows of hedges, regenerating native trees and exotic weed species. The most significant specimen trees within the proposed designated boundary consist of English Oak (*Quercus robur*) and

Monterey cypress (*Cupressus macrocarpa*). In order to form the site compound and construct the pump station it is proposed that multiple trees will require removal.

5.5.2 Proposed Works

At this location the concept design indicates that a pump station will likely be constructed. The exact location and layout are to be confirmed. The concept design indicates the pump station will be approx 6 metres high, 25 metres long and 18 metres wide with a depth of 15 metres.

5.5.3 Arboricultural Effects

- Tree removal
- Works within the dripline/root zone

5.5.4 Mitigation Measures

- Pruning to allow access
- Removal of exotic weed species
- Replacement planting and enhancement
- Tree protection methodologies

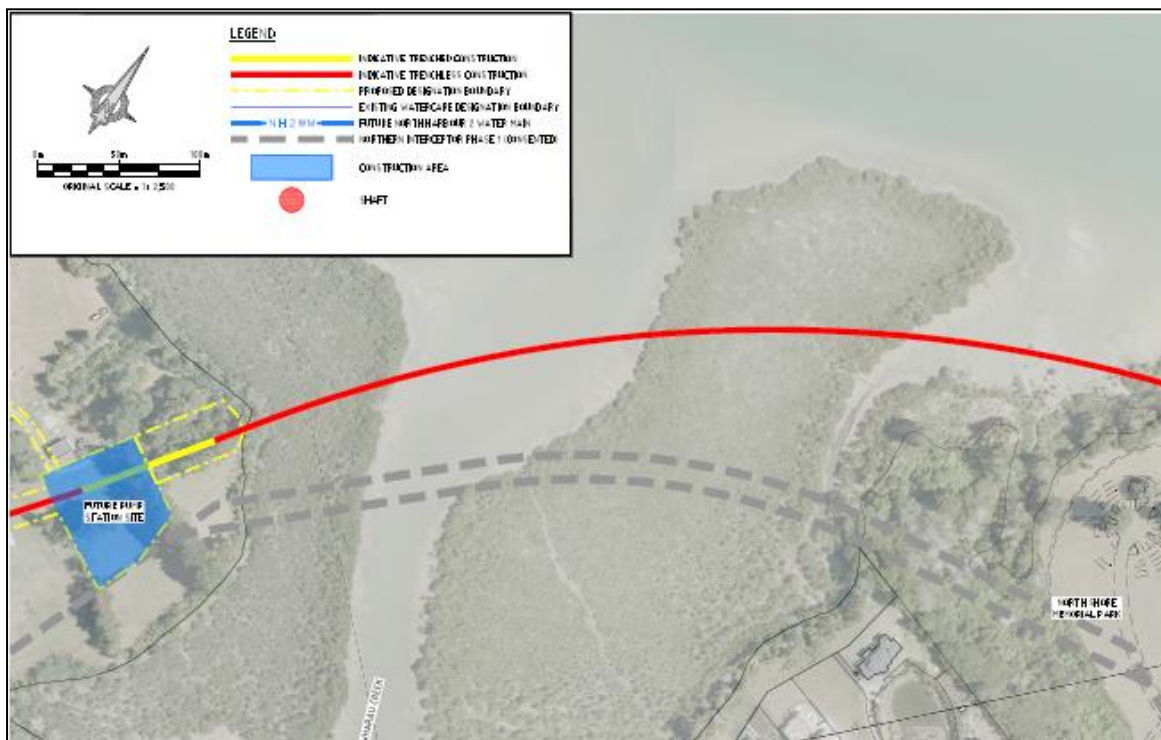


Figure 7 - North Wainoni Park

5.6 North Shore Memorial Park

NoR (North Shore) Designation Plan: Sheet 5 of 10

5.6.1 Existing Environment

The area (highlighted in yellow dashed lines/proposed designated boundary in Figure 8) comprises of primarily planted specimen trees as uniform rows along roads, regenerating native trees and exotic weed species along coastal fringes and pond. The vegetation along the coastal fringe should remain mostly unaffected by the proposed works. The trees that potentially will be most affected by the works are the trees along road and footpath edges (highlighted in green in Figure 8). Of most concern are the group of 22 Pin oaks (*Quercus palustris*) and group of 18 London Plane (*Platanus x acerifolia*). At present trees restrict the works corridor. Finalised site access and construction methodology details should be developed with a view to avoiding removal of trees and minimising pruning, where possible.

5.6.2 Proposed Works

At this location the pipe enters the North Shore Memorial Park from Lucas Creek. The concept design indicates that the pipe will be installed by trenched technologies under future and existing roads and paths toward Schnapper Rock Road.

5.6.3 Arboricultural Effects

- Tree removal
- Works within the dripline/root zone

5.6.4 Mitigation Measures

- Pruning to allow access
- Removal of exotic weed species
- Replacement planting and enhancement
- Tree protection methodologies

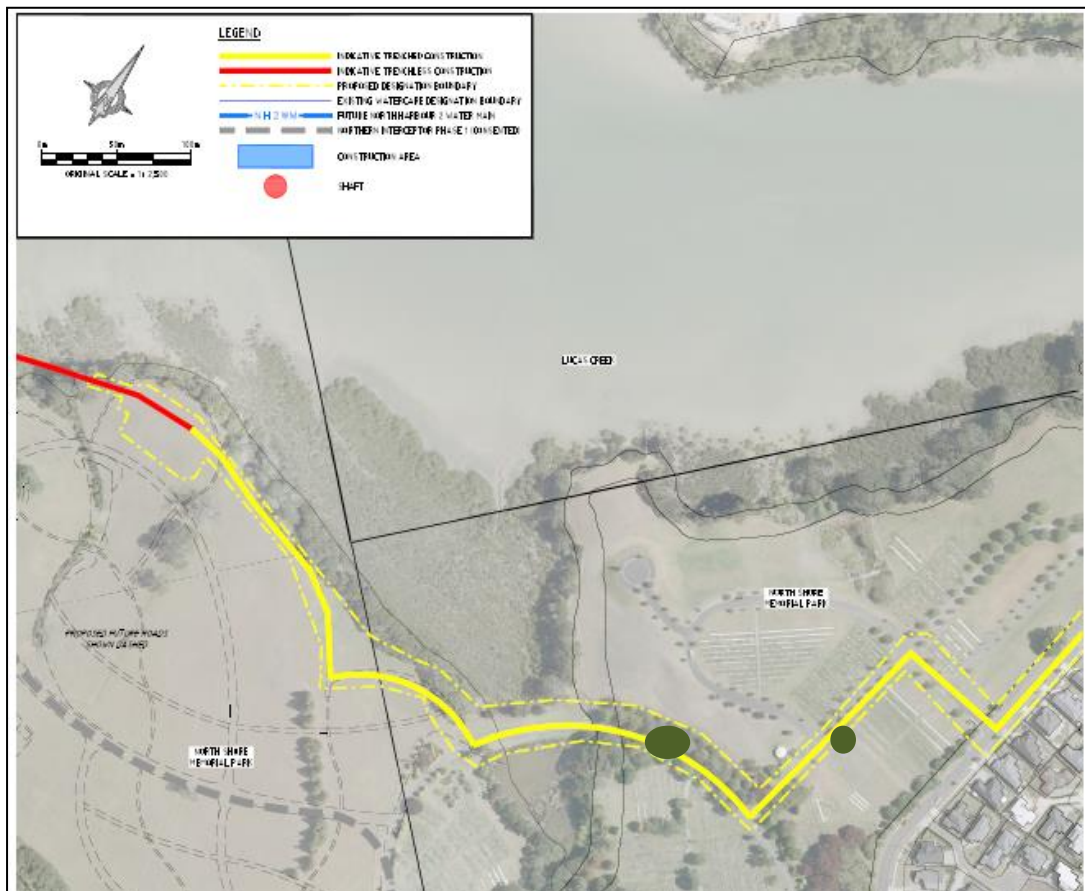


Figure 8 - North Shore Memorial Park

5.7 Wharepapa Reserve

NoR (North Shore) Designation Plan: Sheet 6 of 10

5.7.1 Existing Environment

The area (highlighted in yellow dashed lines/proposed designated boundary in Figure 9) comprises of primarily planted specimen trees along Schnapper Rock Road, Wharepapa reserve and mixed regenerating native trees along the coastal edge.

The trees that potentially will be most affected by the proposed works (highlighted in green) are along Schnapper Rock Road and at the entrance to Wharepapa reserve. At present trees restrict the works corridor. Finalised site access and construction methodology details should be developed with a view to avoiding removal of trees and minimising pruning, where possible.

The native vegetation should remain relatively unaffected along the coastal edge but bridge construction/crossing into the North Shore Golf Club needs to be confirmed.

Arboricultural Final (updated)

5.7.2 Proposed Works

At this location the pipe exits the North Shore Memorial Park and follows Schnapper Rock Road into Wharepapa Reserve where it is proposed to install the pipeline by trenchless technologies into the North Shore Golf Course.

5.7.3 Arboricultural Effects

- Tree removal
- Works within the dripline/root zone

5.7.4 Mitigation Measures

- Pruning to allow access
- Removal of exotic weed species
- Replacement planting and enhancement
- Tree protection methodologies

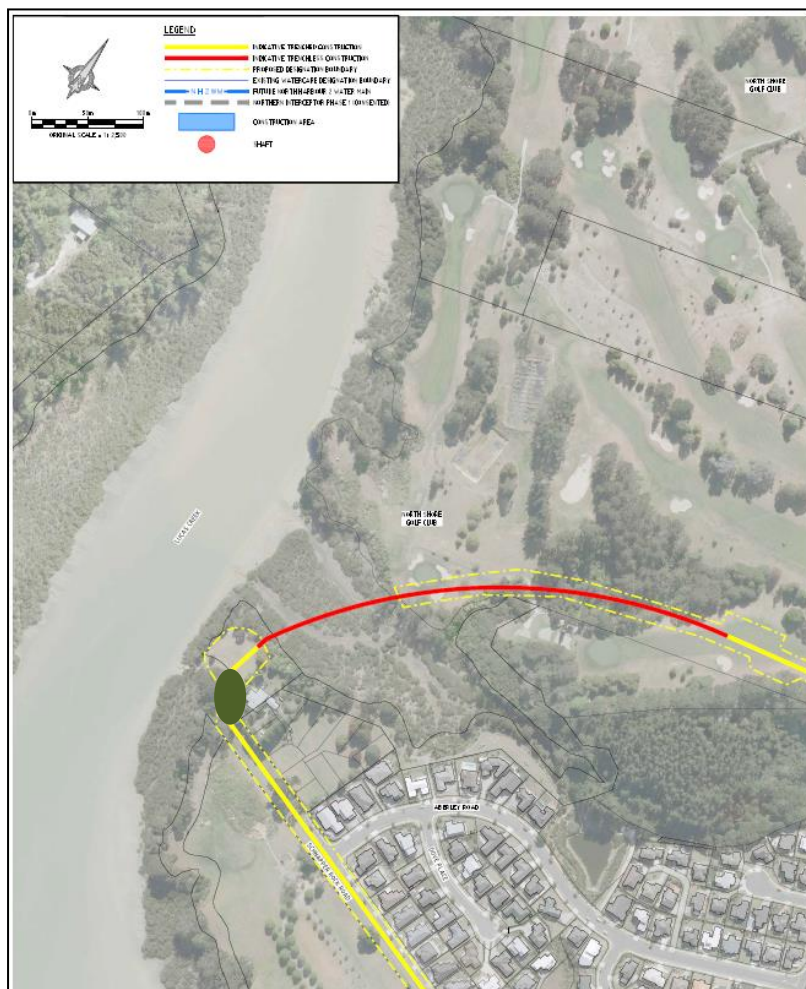


Figure 9 - Wharepapa Reserve

Arboricultural Final (updated)

5.8 North Shore Golf Course

NoR (North Shore) Designation Plan: Sheet 7 of 10

5.8.1 Existing Environment

The areas (highlighted in green in Figure 10) comprise mainly stand-alone mature specimen trees. At present trees restrict the works corridor. Finalised site access and construction methodology details should be developed with a view to avoiding removal of trees and minimising pruning, where possible.

The crossing and construction methodologies from Wharepapa need to be confirmed to assess affects. At present multiple trees are being removed along the southern boundary of the NSGC.

5.8.2 Proposed Works

At this location the pipe surfaces from Wharepapa Reserve and follows the southern boundary of the North Shore Golf Course along private access to Appleby Road. The pipe is to be installed by trenching.

5.8.3 Arboricultural Effects

- Tree removal
- Works within the dripline/root zone

5.8.4 Mitigation Measures

- Pruning to allow access
- Removal of exotic weed species
- Replacement planting and enhancement
- Tree protection methodologies

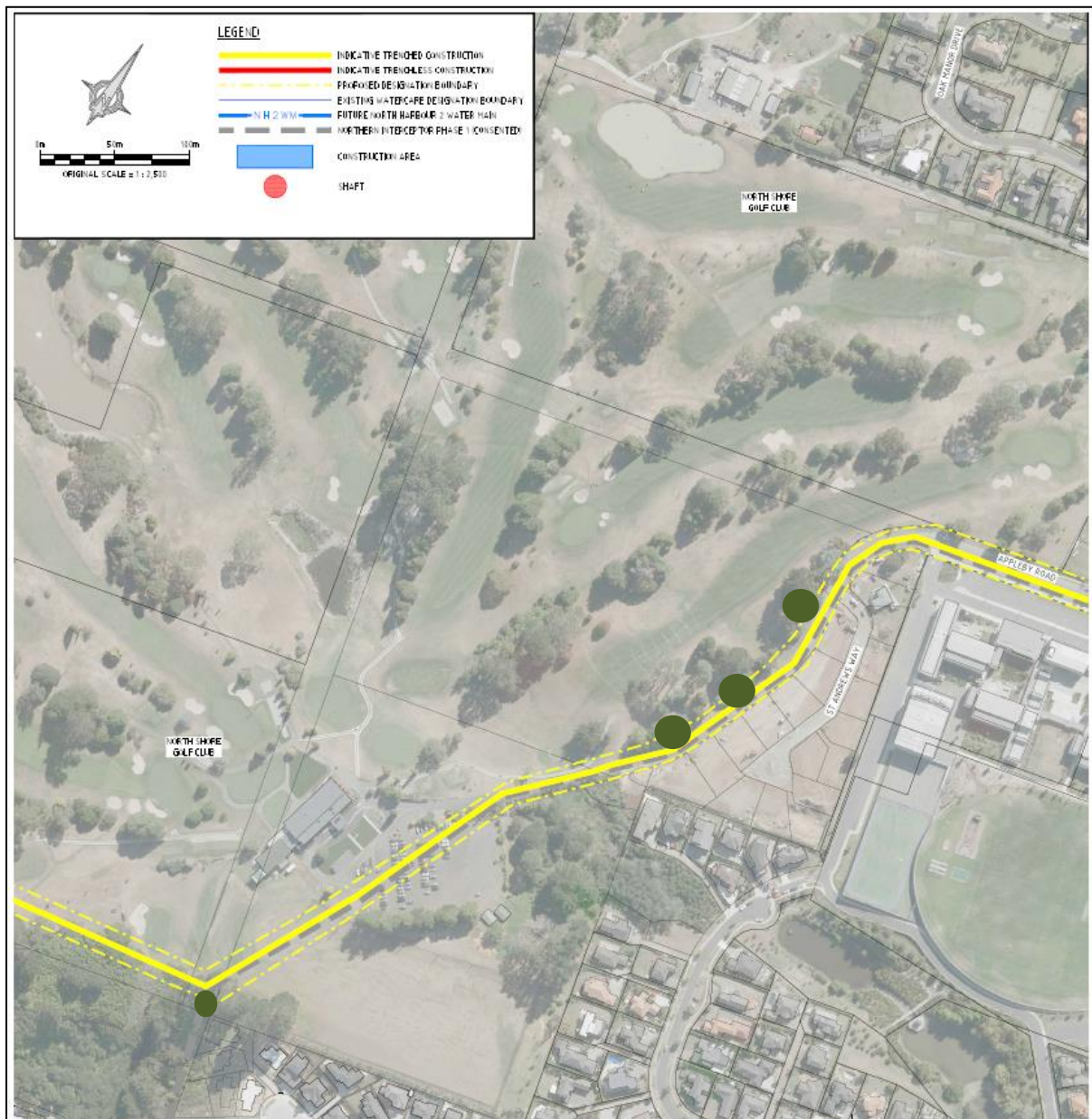


Figure 10 - North Shore Golf Course

5.9 Rosedale Park

NoR (North Shore) Designation Plan: Sheet 10 of 10

5.9.1 Existing Environment

The areas (highlighted in green in Figure 11) comprise mainly stand alone mature specimen trees and groups of trees. At present trees restrict the works corridor. Finalised site access and construction methodology details should be developed with a view to avoiding removal of trees and minimising pruning, where possible.

Arboricultural Final (updated)

5.9.2 Proposed Works

At this location the design indicates that the pipe will be installed by trenched technology through Jack Hinton Drive and into Rosedale WWTP.

5.9.3 Arboricultural Effects

- Tree removal
- Works within the dripline/root zone
- Associated pruning

5.9.4 Mitigation Measures

- Pruning to allow access
- Removal of exotic weed species
- Replacement planting and enhancement
- Tree protection methodologies

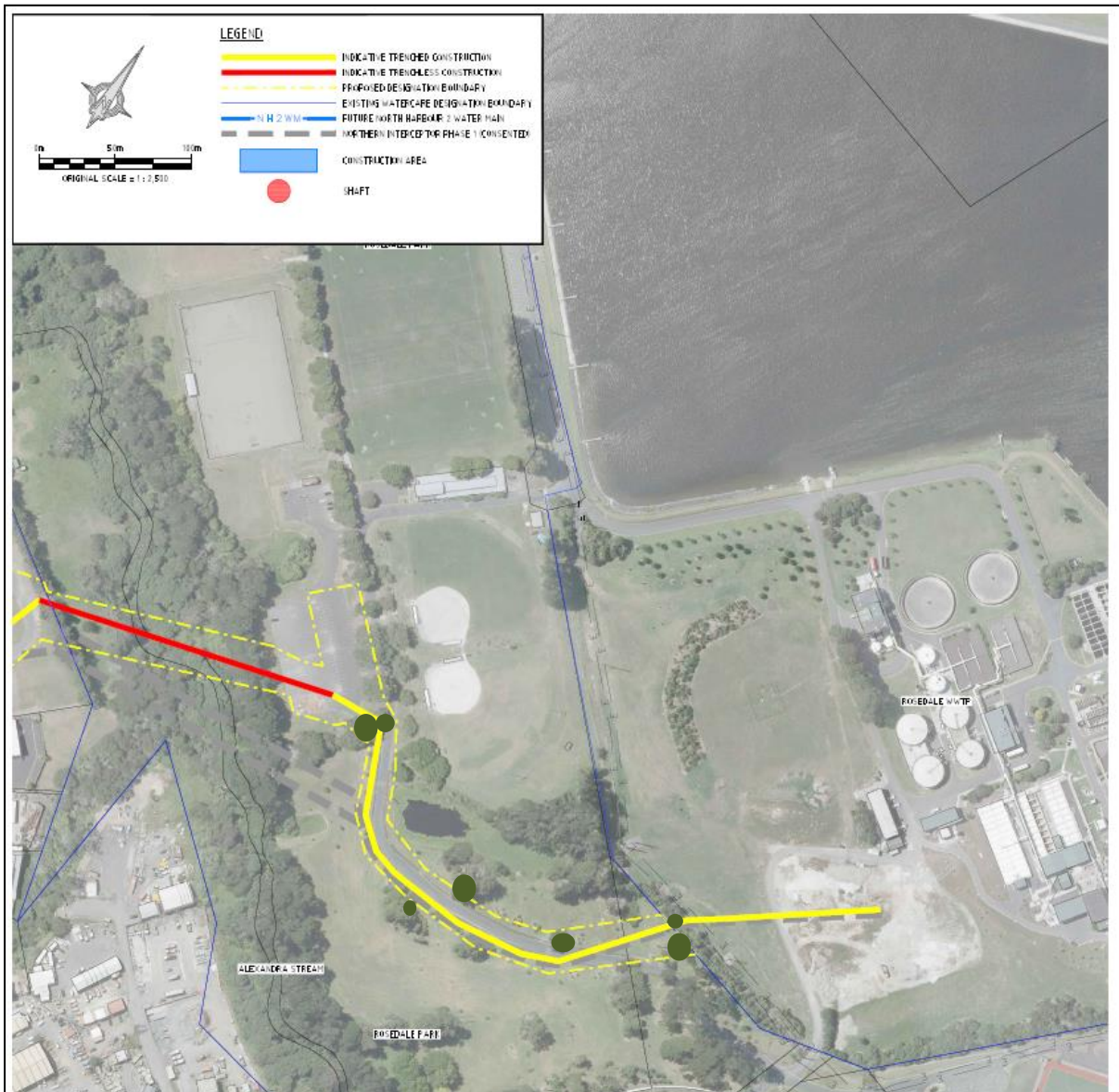


Figure 11 - Rosedale Park

6 MITIGATION MEASURES

Due to the changing nature of the tree resource within the project area, the precise effects on each tree and stand of trees is unable to be established at this time. The project therefore requires a protocol-based approach to tree and vegetation management to reflect the state of trees and vegetation at the time of construction. This will require that Watercare and their contractors confirm construction methodologies in consultation with an arborist at the time of final design and construction with a view to avoiding and mitigating adverse effects on trees.

Where existing vegetation is to be removed, it is proposed that this will be replaced by planting of large grade native trees and quality specimen trees. Where the vegetation being removed is part of a continuous area of vegetation replanting should be done so the existing natural environment is replicated or enhanced. This will require removal and control of weed species as well as tree planting/revegetation. The Replacement Planting Protocol in Appendix C of this report sets out measures that will assist to develop mitigation measures that are suitable to mitigate the scale of effects generated by tree removal.

Where existing stand-alone trees are required to be removed these will be replaced in consultation with the asset manager or land owner for the site, as necessary. Where larger trees (exceeding 4m in height) are required to be removed, these should, with the agreement of the land-owner be replaced with 2 replacement trees.

Provided that the works occur in accordance with tree protection measures that are suitable for the scale of the pipe installation operations and site specific works are designed to prevent harm to the trees adjacent to the route, damage to the above ground portions of the trees can be avoided.

Protection of trees will need to include protection of their growing environment, which will require the permeable rootzone areas of trees to be protected from soil compaction, and contamination from activities associated with the works. The Tree Protection Methodology in Appendix B of this report sets out measures that are suitable to minimise effects on trees that are to be retained.

Where trees are within or in close proximity to the designated corridor for the Northern Interceptor, consideration should be given to pro-active management of trees to maintain a clear corridor, so as to minimise the effects of pruning when the pipeline is under construction. Regular minor pruning of the trees that may in future conflict with construction vehicles and machinery movement would significantly reduce the conflict that will result from branches growing unchecked across the designated construction corridor.

7 ENVIRONMENTAL EFFECTS

With the implementation of protocols to identify and avoid significant adverse effects on trees and vegetation and specific mitigation measures, the overall effects of the proposal can be considered to be no more than minor.

Activities that could result in potential adverse effects on trees, requiring their removal or alteration, can be developed on a site-specific basis, so as to allow identification of design refinements and/or construction methodologies that could avoid, remedy or mitigate such effects.

It is anticipated that trees presently growing within and adjacent to the proposed designations for the Northern Interceptor will have a significantly greater crown spread over and through the construction corridor at the time of construction. The effects on trees during construction may be significantly reduced by pro-active management of the tree canopy.

Once constructed, the operation and maintenance of the Northern Interceptor is not considered to have adverse effects on trees.

8 CONCLUSIONS

Subject to the implementation of site-specific tree protection and mitigation measures, the Northern Interceptor will have minor impacts on the treed environment within the proposed alignment.

APPENDIX A: TREE SCHEDULE

Tree/ Group No.	Species	Age class	Comments
1	2 x pohutukawa (<i>Metrosideros excelsa</i>), totara (<i>Podocarpus totara</i>), oak (<i>Quercus sp.</i>), cypress shelterbelt (<i>Cypress sp.</i>), 2 x water gum (<i>Tristaniopsis laurina</i>)	Juvenile to early-mature	One of the pohutukawa has a sparse crown with deadwood throughout the canopy. Line of dead/dying cypress along the north-eastern boundary of the site.
2	16 x pohutukawa (<i>Metrosideros kermadecensis</i> 'Variegata')	Juvenile	Growing within berm adjacent to private property line.
3	ash (<i>Fraxinus sp.</i>)	Mature	Multi-leader specimen with included unions. Good foliar health.
4	3 x pohutukawa (<i>Metrosideros excelsa</i>)	Juvenile	Small specimens in good health.
5	2 x Persian silk tree (<i>Albizia julibrissin</i>)	Juvenile	Specimens in good health
6	gum (<i>Eucalyptus sp.</i>)	Juvenile	Fair to poor specimen approximately 8m tall.
7	3 x ti kouka (<i>Cordyline australis</i>)	Juvenile to early-mature	One of the ti kouka is mostly dead.
8	pohutukawa (<i>Metrosideros excelsa</i>)	Juvenile	Fair form and health.
9	2 x phoenix palm (<i>Phoenix canariensis</i>)*	Early-mature	Good health.
10	Mixed native: kowhai (<i>Sophora microphylla</i>), pseudopanax (<i>Pseudopanax spp.</i>), mapou (<i>Myrsine australis</i>), kanuka (<i>Kunzea ericoides</i>), flax (<i>Phormium tenax</i>), tarata (<i>Pittosporum eugenioides</i>), hebe (<i>Hebe sp.</i>)	Juvenile	Mostly good condition group of mixed native growing on both sides of property line.
11	Cedar (<i>Cedrus sp.</i>)	Mature	Poor health and form, tree currently within Fulton Hogan works area.
12	Mixed native: karamu (<i>Coprosma robusta</i>), shiny karamu (<i>Coprosma lucida</i>), taupata (<i>Coprosma repens</i>), mapou (<i>Myrsine australis</i>), kumarahou (<i>Pomaderris kumarahou</i>), mahoe (<i>Melicytus ramiflorus</i>), houhere (<i>Hoheria populnea</i>), ponga (<i>Cyathea dealbata</i>), ti kouka (<i>Cordyline australis</i>), harakeke (<i>Phormium tenax</i>) Exotic : Monterey pine (<i>Pinus radiata</i>), Chinese privet (<i>Ligustrum sinense</i> *), tree privet (<i>Ligustrum lucidum</i> *), black wattle (<i>Acacia mearnsii</i>), bush wattle (<i>Paraserianthes lophantha</i> *), gorse (<i>Ulex europaeus</i> *), woolly nightshade (<i>Solanum mauritianum</i> *), blackberry (<i>Rubus fruticosus</i> *), shiny tea tree (<i>Leptospermum nitidum</i> 'Copper Sheen'), elderberry (<i>Sambucus nigra</i>)	Juvenile to mature	Re-vegetation of mixed native with some weeds present. Good - Fair condition. * - denotes listed plant pest species

APPENDIX A: TREE SCHEDULE

Tree/ Group No.	Species	Age class	Comments
13	<p>Mixed Native: ti kouka (<i>Cordyline australis</i>), karamu (<i>Coprosma robusta</i>), mapou (<i>Myrsine australis</i>), toe toe (<i>Austroderia sp.</i>), kanuka (<i>Kunzea ericoides</i>), manuka (<i>Leptospermum scoparium var.scoparium</i>), mahoe (<i>Melicytus ramiflorus</i>), houhere (<i>Hoheria populnea</i>), koromiko (<i>Veronica stricta</i>), harakeke (<i>Phormium tenax</i>), hangehange (<i>Geniostoma ligustrifolium var.ligustrifolium</i>), kowhai (<i>Sophora microphylla</i>), akeake (<i>Dodonaea viscosa</i>), ponga (<i>Cyathea dealbata</i>)</p> <p>Exotic: Chinese privet (<i>Ligustrum sinense</i>*), tree privet (<i>Ligustrum lucidum</i>*), black wattle (<i>Acacia mearnsii</i>), bush wattle (<i>Paraserianthes lophantha</i>*), gorse (<i>Ulex europaeus</i>*), woolly nightshade (<i>Solanum mauritianum</i>*)</p>	Recently planted to juvenile	Re-vegetation of mixed native with some weeds present. Good - Fair condition.
14	tarata (<i>Pittosporum eugenioides</i>)	Juvenile	Poor condition street tree.
15	2 x gum (<i>Eucalyptus sp.</i>)	Early-mature to mature	Fair condition.
16	<p>Mixed Native: mahoe (<i>Melicytus ramiflorus</i>), houhere (<i>Hoheria populnea</i>), harakeke (<i>Phormium tenax</i>), karamu (<i>Coprosma robusta</i>), manuka (<i>Leptospermum scoparium var.scoparium</i>)</p> <p>Exotic: English oak (<i>Quercus robur</i>), queen palm (<i>Syagrus romanzoffiana</i>)*</p>	Juvenile	Group of mixed native and exotic trees growing on both sides of property line.
17	Coral tree (<i>Erythrina sp.</i>), 3 x callistemon (<i>Callistemon sp.</i>)	Juvenile to early-mature	Coral tree has been heavily pruned for overhead powerlines.
18	harakeke (<i>Phormium tenax</i>), karamu (<i>Coprosma robusta</i>), oleander (<i>Nerium oleander</i>), Chinese privet (<i>Ligustrum sinense</i> *)	Juvenile	Unmanaged vegetation growing in the road reserve
19	7 x pear tree (<i>Pyrus sp.</i>), 1 x tarata (<i>Pittosporum eugenioides</i>)	Juvenile	Pear street trees growing in berm adjacent to property line. Good condition and form.
20	Picea (<i>Picea sp.</i>)	Juvenile	Street tree growing in berm adjacent to property line. Good condition and form. Good form and health.
21	bull bay (<i>Magnolia grandiflora</i>), 3 x yucca (<i>Yucca sp.</i>), Japanese maple (<i>Acer palmatum</i>)	Juvenile	Fair - poor condition. Growing in berm adjacent to property line.
22	pear tree (<i>Pyrus sp.</i>), cherry tree (<i>Prunus sp.</i>), bull bay (<i>Magnolia grandiflora</i>), silver birch (<i>Betula pendula</i>)	Juvenile to early-mature	Good - fair condition. Growing in berm adjacent to property line. Birch suppressed by bull bay and is overhanging the road.

APPENDIX A: TREE SCHEDULE

Tree/ Group No.	Species	Age class	Comments
23	<p>Mixed Native: ti kouka (<i>Cordyline australis</i>), houhere (<i>Hoheria populnea</i>), karamu (<i>Coprosma robusta</i>), tarata (<i>Pittosporum eugenioides</i>)</p> <p>Exotic: callistemon (<i>Callistemon sp.</i>), yucca (<i>Yucca sp.</i>)</p>	Juvenile	Good condition vegetation and trees in berm adjacent to property line.
24	American Sweet Gum (<i>Liquidambar styraciflua</i>)	Mature	Good condition
25	<p>Mixed Native: ti kouka (<i>Cordyline australis</i>), karamu (<i>Coprosma robusta</i>), taupata (<i>Coprosma repens</i>), (<i>Coprosma rhamnoides</i>), Kohuhu (<i>Pittosporum tenuifolium</i>), mapou (<i>Myrsine australis</i>), kawakawa (<i>Piper excelsum</i> subsp. <i>excelsum</i>), kanuka (<i>Kunzea ericoides</i>), mahoe (<i>Melicytus ramiflorus</i>), pigeon wood (<i>Hedycarya arborea</i>), Mingimingi (<i>Leucopogon fasciculatus</i>), hangehange (<i>Geniostoma ligustrifolium</i> var. <i>ligustrifolium</i>), Five-finger (<i>Pseudopanax arboreus</i>), ponga (<i>Cyathea dealbata</i>), rewarewa (<i>Knightia excelsa</i>), towai (<i>Weinmannia silvicola</i>)</p>	Mature	Excellent native bush area growing on both sides of a stream. Largest most significant trees being rewarewa (<i>Knightia excelsa</i>) and towai (<i>Weinmannia silvicola</i>). Many seedlings from both species observed. Micro-tunnelling recommended.
26	6 x redwood (<i>Sequoia sempervirens</i>)	Juvenile to early-mature	3 x juvenile trees and 3 x early mature trees.
27	2 x Washingtonian palm (<i>Washingtonia robusta</i>)	Mature	Good condition. Berm adjacent to property line
28	gum (<i>Eucalyptus sp.</i>)	Mature	Fair condition. Berm adjacent to property line. Overhanging the road.
29	melaleuca (<i>Melaleuca sp.</i>)	Early-mature	Fair condition. Berm adjacent to property line.
30	1 x redwood (<i>Sequoia sempervirens</i>), 2 x Chinese windmill palm (<i>Trachycarpus fortunei</i>)	Juvenile	Potentially self propagated Chinese windmill palm.
31	gum (<i>Eucalyptus sp.</i>)	Mature	Overhanging the road.
32	12 x titoki (<i>Alectryon excelsus</i>)	Recently planted to juvenile	Street trees. Fair - poor condition.
33	3 x titoki (<i>Alectryon excelsus</i>), pohutukawa (<i>Metrosideros excelsa</i>), shiny tea tree (<i>Leptospermum nitidum</i> 'Copper Sheen')	Juvenile	Berm adjacent to property line on both sides of the road. Near proposed pit location. No conflicts with micro-tunnel pit.
34	2 x lilly pilly (<i>Syzygium smithii</i> *), silky oak (<i>Grevillea robusta</i>)	Early-mature	Private silky oak. Lilly pilly in berm adjacent to property line. No conflicts with micro-tunnel pit.
35	London plane (<i>Platanus x acerifolia</i>)	Early-mature	Private tree overhangs road reserve to the kerb-line.

APPENDIX A: TREE SCHEDULE

Tree/ Group No.	Species	Age class	Comments
36	2 x blue atlas cedar (<i>Cedrus atlantica</i> 'Glauca')	Juvenile	Trees growing near or in site access for micro-tunnel pit 4. Potential access issues in regards to trees. The northern most tree has significant trunk wounds with decay.
37	2 x pear tree (<i>Pyrus</i> sp.)	Recently planted	Trees growing near proposed micro-tunnel pit.
38	2 x Monterey pine (<i>Pinus radiata</i>), 2 x gum (<i>Eucalyptus</i> sp.), 2 x American sweet gum (<i>Liquidambar styraciflua</i>), swamp cypress (<i>Taxodium distichum</i>)	Mature	Trees growing within 78 Cedar Heights Avenue (reserve at present).
39	3 x Lombardy poplar (<i>Populus nigra</i>)	Early-mature	Trees growing within private property overhanging 78 Cedar Heights Avenue (reserve at present).
40	2 x Monterey cypress (<i>Cupressus macrocarpa</i>), 2 x black wattle (<i>Acacia mearnsii</i>), 2 x kanuka (<i>Kunzea robusta</i>)	Juvenile to mature	Near potential access for micro-tunnel pit 5. No conflicts foreseen.
41	Mixed native: ti kouka (<i>Cordyline australis</i>), kanuka (<i>Kunzea ericoides</i>), karamu (<i>Coprosma robusta</i>), totara (<i>Podocarpus totara</i>), karo (<i>Pittosporum crassifolium</i>), mapou (<i>Myrsine australis</i>), kohuhu (<i>Pittosporum tenuifolium</i>), houhere (<i>Hoheria populnea</i>)	Recently planted to juvenile	Near potential access for micro-tunnel pit 5. No conflicts foreseen. Small exotic weeds also present.
42	Mixed native: kanuka (<i>Kunzea ericoides</i>), karamu (<i>Coprosma robusta</i>), taupata (<i>Coprosma repens</i>), Ponga (<i>Cyathea dealbata</i>) Exotic: banana Passion fruit (<i>Passiflora mollissima</i> *), blackberry (<i>Rubus fruticosus</i> *), convolvulus (<i>Convolvulus</i> sp.*), montbretia (<i>Crocsmia x crocosmiiflora</i> *), Chinese privet (<i>Ligustrum sinense</i> *)	Juvenile to early-mature	No issues foreseen.
43	2 x Lombardy poplar (<i>Populus nigra</i>), 3 x Monterey pine (<i>Pinus radiata</i>)	Juvenile	Micro-tunnel pit should be located in gap in tree line. Many exotic weed species along tributary.
44	tarata (<i>Pittosporum eugenioides</i>), queen palm (<i>Syagrus romanzoffiana</i>), kohuhu (<i>Pittosporum tenuifolium</i>)	Juvenile	Private trees and vegetation on both sides of currently vacant land.
45	2 x bead tree (<i>Melia azedarach</i>)	Juvenile to early-mature	bead street trees. 1 x bead tree overhanging the road.
46	2 x bead tree (<i>Melia azedarach</i>)	Juvenile	Street trees. Bead tree nearest the corner is in poor condition with poor form
47	Mixed native: kowhai (<i>Sophora microphylla</i>), kohuhu (<i>Pittosporum tenuifolium</i>), tarata (<i>Pittosporum eugenioides</i>), karo (<i>Pittosporum crassifolium</i>), houhere (<i>Hoheria populnea</i>), mahoe (<i>Melicytus ramiflorus</i>)	Juvenile	Good condition native trees. The kowhai is overhanging the road.

APPENDIX A: TREE SCHEDULE

Tree/ Group No.	Species	Age class	Comments
48	kahikatea (<i>Dacrycarpus dacrydioides</i>)	Juvenile	Good specimen. Approximately 3m from footpath.
49	5 x ti kouka (<i>Cordyline australis</i>)	Juvenile	Good specimens. Adjacent to footpath near car parking area
50	<p>Mixed Native: ti kouka (<i>Cordyline australis</i>), kanuka (<i>Kunzea ericoides</i>), karamu (<i>Coprosma robusta</i>), totara (<i>Podocarpus totara</i>), karo (<i>Pittosporum crassifolium</i>), kohuhu (<i>Pittosporum tenuifolium</i>), hangehange (<i>Geniostoma ligustrifolium var. ligustrifolium</i>), totara (<i>Podocarpus totara</i>), mapou (<i>Myrsine australis</i>), mahoe (<i>Meliccytus ramiflorus</i>), kanuka (<i>Kunzea ericoides</i>), towai (<i>Weinmannia silvicola</i>), ponga (<i>Cyathea dealbata</i>), mamaku (<i>Cyathea medullaris</i>), wheki (<i>Dicksonia squarrosa</i>)</p> <p>Exotic: Chinese privet (<i>Ligustrum sinense</i>*), tree privet (<i>Ligustrum lucidum</i>*), brush wattle (<i>Paraserianthes lophantha</i>*)</p>	Juvenile to early-mature	Native bush area with few exotic weed species. Largest most significant trees consist of towai and tree ferns
51	London plane (<i>Platanus x acerifolia</i>), atlas cedar (<i>Cedrus atlantica</i>), silky oak (<i>Grevillea robusta</i>)	Early-mature	Overhanging from private property to kerb line
52	2 x ash (<i>Fraxinus</i> sp.), pepper tree (<i>Schinus</i> sp.)	Mature	Overhanging from private property to kerb line
53	1 x gum (<i>Eucalyptus</i> sp.), 1 x pohutukawa (<i>Metrosideros excelsa</i>)	Early-mature	Dead wood in gum canopy. Good condition pohutukawa. Large berm area adjacent to property line.
54	American sweet gum (<i>Liquidambar styraciflua</i>)	Mature	Good health. Multiple co-dominant leaders with included unions. Overhanging the road.
55	Cook pine (<i>Araucaria columnaris</i>)	Early-mature	Good specimen. Road is within half the height of the tree
56	4 x gum (<i>Eucalyptus</i> sp.), 2 x ash (<i>Fraxinus</i> sp.), 1 x pin oak (<i>Quercus palustris</i>)	Early-mature to mature	Potential site access for micro-tunnel pit 16. Ground protection or a temporary road would be required to avoid soil compaction and root system disturbance of group. Large mature gum.
57	Mexican weeping pine (<i>Pinus patula</i>)	Mature	Preferred potential site access for micro-tunnel pit 16. Ground protection or a temporary road would be required to avoid soil compaction and root system disturbance of group. Leaning specimen.
58	ti kouka (<i>Cordyline australis</i>), Japanese cedar 'Elegans' (<i>Cryptomeria japonica</i> 'Elegans'), karamu (<i>Coprosma robusta</i>) taupata (<i>Coprosma repens</i>)	Juvenile	Group located near proposed micro-tunnel pit location. No issues.
59	London plane (<i>Platanus x acerifolia</i>), Japanese cedar 'Elegans' (<i>Cryptomeria japonica</i> 'Elegans'), karamu (<i>Coprosma robusta</i>), taupata (<i>Coprosma repens</i>)	Juvenile to mature	Mature London plane. The tree overhangs the proposed micro-tunnel pit 16 location. Minor pruning, protection fencing and ground protection may be required.

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Tree/ Group No.	Species	Age class	Comments
60	2 x Lombardy poplar (<i>Populus nigra</i>)	Juvenile	Micro-tunnel pit 16 to excavated in or near drip line of group.
61	2 x pin oak (<i>Quercus palustris</i>), 1 x ash (<i>Fraxinus sp.</i>)	Juvenile	Micro-tunnel pit 17 within drip line of group. Potential issues depending on exact location and tree growth. Situate pit as far from trees as possible
62	2 x gum (<i>Eucalyptus sp.</i>)	Mature	Micro-tunnel pit 17 within drip line of group. Potential issues depending on exact location. Situate pit as far from trees as possible.
63	pin oak (<i>Quercus palustris</i>)	Mature	Potential site access for micro-tunnel pit 17. Ground protection or a temporary road would be required to avoid soil compaction and root system disturbance.
64	totara (<i>Podocarpus totara</i>)	Juvenile	Potential site access for micro-tunnel pit 17. Ground protection or a temporary road would be required to avoid soil compaction and root system disturbance.
65	2 x gum (<i>Eucalyptus sp.</i>)	Mature	Potential site access for micro-tunnel pit 17. Ground protection or a temporary road would be required to avoid soil compaction and root system disturbance
66	pin oak (<i>Quercus palustris</i>)	Mature	Potential site access for micro-tunnel pit 17. Ground protection or a temporary road would be required to avoid soil compaction and root system disturbance.
67	2 x pin oak (<i>Quercus palustris</i>), 2 x silver birch (<i>Betula pendula</i>), 1 x puriri (<i>Vitex lucens</i>)	Juvenile	Potential site access for micro-tunnel pit 17. Ground protection or a temporary road would be required to avoid soil compaction and root system disturbance of group. Bollards would need to be removed within drip line of oaks. Crown lifting may be required to provide site access.

APPENDIX A: TREE SCHEDULE

Tree/ Group No.	Species	Age class	Comments
68	<p>Mixed native: karamu (<i>Coprosma robusta</i>), shiny karamu (<i>Coprosma lucida</i>), (<i>Coprosma macrocarpa</i> subsp. <i>minor</i>), (<i>Coprosma spathulata</i> subsp. <i>spathulata</i>), (<i>Coprosma rhamnoides</i>), mapou (<i>Myrsine australis</i>), kumarahou (<i>Pomaderris kumarahou</i>), tauhinu (<i>Pomaderris amoena</i>), akeprio (<i>Olearia furfuracea</i>), hangehange (<i>Geniostoma ligustrifolium</i> var. <i>ligustrifolium</i>), hebe (<i>Hebe macrocarpa</i> var. <i>macrocarpa</i>), mingimingi (<i>Leucopogon fasciculatus</i>), prickly mingimingi (<i>Leptecophylla juniperina</i> subsp. <i>Juniperina</i>), kanuka (<i>Kunzea ericoides</i>), manuka (<i>Leptospermum scoparium</i> var. <i>scoparium</i>), kohuhu (<i>Pittosporum tenuifolium</i>), kawakawa (<i>Piper excelsum</i> subsp. <i>excelsum</i>), mahoe (<i>Melicytus ramiflorus</i>), white maire (<i>Nestegis lanceolata</i>), maire taiki (<i>Mida salicifolia</i>), pigeonwood (<i>Hedycarya arborea</i>), five-finger (<i>Pseudopanax arboreus</i>), houpara (<i>Pseudopanax lessonii</i>), kowhai (<i>Sophora microphylla</i>), coastal kowhai (<i>Sophora chathamica</i>), salt marsh ribbon wood (<i>Plagianthus divaricatus</i>), manawa (<i>Avicennia marina</i> subsp. <i>australasica</i>), pohutukawa (<i>Metrosideros excelsa</i>), tanekaha (<i>Phyllocladus trichomanoides</i>), totara (<i>Podocarpus totara</i>), nikau (<i>Rhopalostylis sapida</i>), ponga (<i>Cyathea dealbata</i>), ti kouka (<i>Cordyline australis</i>), harakeke (<i>Phormium tenax</i>)</p> <p>Exotic: (<i>Elaeagnus reflexa</i>*), (<i>Cotoneaster</i> sp.*), bone seed (<i>Chrysanthemoides monilifera</i>*), willow-leaved hakea (<i>Hakea salicifolia</i>*), prickly hakea (<i>Hakea sericea</i>*), black wattle (<i>Acacia mearnsii</i>), bush wattle (<i>Paraserianthes lophantha</i>*), Sydney golden wattle (<i>Acacia longifolia</i> subsp. <i>longifolia</i>), woolly nightshade (<i>Solanum mauritianum</i>*), Monterey pine (<i>Pinus radiata</i>), atlas cedar (<i>Cedrus atlantica</i>), lily pilly (<i>Syzygium smithii</i>*), gorse (<i>Ulex europaeus</i>*), pampas grass (<i>Cortaderia</i> sp.), kahili ginger (<i>Hedychium gardnerianum</i>*), climbing asparagus (<i>Asparagus scandens</i>*)</p>	Juvenile to mature	Very diverse range of native vegetation within the Eastern Abutment of the Greenhithe Bridge and surrounding private property. Exotic weed species also present. Trenching technologies should be avoided within the reserve.
69	phoenix palm (<i>Phoenix canariensis</i>) *	Mature	Potentially in close proximity to micro-tunnel pit.
70	silky oak (<i>Grevillea robusta</i>)	Mature	Overhanging potential micro-tunnel pit/work site from private property.
71	3 x ash (<i>Fraxinus</i> sp.)	Recently planted	Potentially in close proximity to micro-tunnel pit.
72	cypress shelterbelt (<i>Cypress</i> sp.)	Mature	Potentially in close proximity to micro-tunnel pit.
73	<p>Mixed native: ti kouka (<i>Cordyline australis</i>), tanekaha (<i>Phyllocladus trichomanoides</i>), kohuhu (<i>Pittosporum tenuifolium</i>), Bird catcher (<i>Pisonia brunoniana</i>), karamu (<i>Coprosma robusta</i>)</p>	Juvenile	Planted native species potentially in close proximity to micro-tunnel pit. Exotic weed species also present within area.

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Tree/ Group No.	Species	Age class	Comments
74	Lombardy poplar (<i>Populus nigra</i>)	Mature	Group of trees potentially in close proximity to micro-tunnel pit. Within Wainoni Park South.
75	ash (<i>Fraxinus</i> sp.), London plane (<i>Platanus x acerifolia</i>)	Recently planted	Group of trees potentially in close proximity to micro-tunnel pit and recent native plantings. Within Wainoni Park North.
76	Lombardy poplar (<i>Populus nigra</i>)	Mature	Group of trees potentially in close proximity to micro-tunnel pit and recent native plantings (especially access). Within Wainoni Park North.
77	<p>Mixed native: karamu (<i>Coprosma robusta</i>), shiny karamu (<i>Coprosma lucida</i>), mapou (<i>Myrsine australis</i>), Pohutukawa (<i>Metrosideros excelsa</i>)</p> <p>Exotic: bush wattle (<i>Paraserianthes lophantha</i>*), black locust (<i>Robinia pseudoacacia</i>), Chinese privet (<i>Ligustrum sinense</i>*), tree privet (<i>Ligustrum lucidum</i>*), tree of heaven (<i>Ailanthus altissima</i>), Monterey cypress (<i>Cupressus macrocarpa</i>), Monterey pine (<i>Pinus radiata</i>), ash (<i>Fraxinus</i> sp.), pin oak (<i>Quercus palustris</i>), English Oak (<i>Quercus robur</i>), London plane (<i>Platanus x acerifolia</i>), Lombardy poplar (<i>Populus nigra</i>)</p>	Juvenile to mature	Group of large planted exotic specimen trees forming shelter belts and regenerating native vegetation around coastal edge
78	<p>Mixed Native: ti kouka (<i>Cordyline australis</i>), Harakeke (<i>Phormium tenax</i>), kanuka (<i>Kunzea ericoides</i>), mingimingi (<i>Leucopogon fasciculatus</i>), karamu (<i>Coprosma robusta</i>), shiny karamu (<i>Coprosma lucida</i>), karo (<i>Pittosporum crassifolium</i>), Kohuhu (<i>Pittosporum tenuifolium</i>), five-finger (<i>Pseudopanax arboreus</i>), houpara (<i>Pseudopanax lessonii</i>), hangehange (<i>Geniostoma ligustrifolium</i> var. <i>ligustrifolium</i>), mapou (<i>Myrsine australis</i>), mahoe (<i>Meliccytus ramiflorus</i>), totara (<i>Podocarpus totara</i>), ponga (<i>Cyathea dealbata</i>)</p> <p>Exotic: Chinese privet (<i>Ligustrum sinense</i>*), tree privet (<i>Ligustrum lucidum</i>*), bush wattle (<i>Paraserianthes lophantha</i>*), black wattle (<i>Acacia mearnsii</i>), gorse (<i>Ulex europaeus</i>*)</p>	Juvenile to mature	Mix of regenerating native bush with multiple exotic weed species following edge of coastline/ estuarine system within the North Shore Cemetery. This area will be in close proximity to trench line but should be relatively unaffected
79	3 x Monterey pine (<i>Pinus radiata</i>)	Mature	Trees are in poor health
80	Japanese cedar shelter belt (<i>Cryptomeria japonica</i>)	Mature	On edge of proposed work zone
81	2 x pohutukawa (<i>Metrosideros excelsa</i>)	Juvenile	Within proposed work boundary
82	<p>Mixed Native: kanuka (<i>Kunzea ericoides</i>), mapou (<i>Myrsine australis</i>), mahoe (<i>Meliccytus ramiflorus</i>)</p>	Juvenile	Within proposed work boundary

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Tree/ Group No.	Species	Age class	Comments
83	Mexican weeping pine (<i>Pinus patula</i>), Monterey pine (<i>Pinus radiata</i>), 3 x London plane (<i>Platanus x acerifolia</i>), 2 x bull bay (<i>Magnolia grandiflora</i>), Queensland box (<i>Lophostemon confertus</i>), 2 x titoki (<i>Alectryon excelsus</i>), silky oak (<i>Grevillea robusta</i>), kowhai (<i>Sophora chathamica</i>)	Mature	Within proposed work boundary growing next to road
84	22 x pin oak (<i>Quercus palustris</i>)	Mature	Within proposed work boundary growing next to road, multiple low hanging branches over road.
85	bull bay (<i>Magnolia grandiflora</i>), American sweet gum (<i>Liquidambar styraciflua</i>), 2 x ash (<i>Fraxinus sp.</i>)	Mature	Within proposed work boundary growing on the north-western side of road
86	atlas cedar (<i>Cedrus atlantica</i>), 2 x bead tree (<i>Melia azedarach</i>), 2 x Mexican weeping pine (<i>Pinus patula</i>)	Mature	Within proposed work boundary growing on the south-eastern side of road
87	18 x London plane (<i>Platanus x acerifolia</i>)	Juvenile	Along road side within proposed work boundary
88	5 x oak (<i>Quercus robur</i>)	Juvenile to mature	Along road side within proposed work boundary
89	4 x pohutukawa (<i>Metrosideros excelsa</i>)	Juvenile to mature	Growing within road reserve at entrance to cemetery
90	2 x Monterey cypress (<i>Cupressus macrocarpa</i>)	Mature	Growing within road reserve branches overhanging road.
91	5 x American sweet gum (<i>Liquidambar styraciflua</i>)	Mature	Growing within road reserve
92	Monterey cypress (<i>Cupressus macrocarpa</i>), pohutukawa (<i>Metrosideros excelsa</i>)	Mature	Growing within road reserve and cemetery. Branches from cypress overhanging road.
93	Rimu (<i>Dacrydium cupressinum</i>), Pohutukawa (<i>Metrosideros excelsa</i>)	Juvenile to mature	Growing within private property. Pohutukawa overhangs work zone.
94	Mixed Native: ti kouka (<i>Cordyline australis</i>), harakeke (<i>Phormium tenax</i>), nikau (<i>Rhopalostylis sapida</i>), kanuka (<i>Kunzea ericoides</i>), mingimingi (<i>Leucopogan fasciculatus</i>), prickly mingimingi (<i>Leptecophylla juniperina subsp. Juniperina</i>), karamu (<i>Coprosma robusta</i>), akeprio (<i>Olearia furfuracea</i>), kowhai (<i>Sophora microphylla</i>), hebe (<i>Hebe sp.</i>), houpara (<i>Pseudopanax lessonii</i>), mapou (<i>Myrsine australis</i>), mahoe (<i>Melicytus ramiflorus</i>), Pohutukawa (<i>Metrosideros excelsa</i>), totara (<i>Podocarpus totara</i>), tarata (<i>Pittosporum eugenioides</i>), ponga (<i>Cyathea dealbata</i>)	Juvenile to mature	Regenerating native trees and shrubs within Wharepapa Reserve on the coastal edge and some planted native specimen trees.
95	2 x bead tree (<i>Melia azedarach</i>), 3 x ash (<i>Fraxinus sp.</i>), Monterey pine (<i>Pinus radiata</i>), 3 x pin oak (<i>Quercus palustris</i>), holm oak (<i>Quercus ilex</i>), 2 x cherry tree (<i>Prunus sp.</i>), copper beech (<i>Fagus sylvatica 'Purpurea'</i>), Japanese cedar elegans (<i>Cryptomeria japonica 'Elegans'</i>), Michelia (<i>Michelia sp.</i>), glory bush (<i>Tibouchina urvilleana</i>)	Juvenile to mature	Planted specimen growing within Wharepapa Reserve. Large Monterey pine may cause issues with site access. Some invasive weeds present.

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Tree/ Group No.	Species	Age class	Comments
96	Monterey pine (<i>Pinus radiata</i>)	Mature	Stand of large mature trees growing on edge of North Shore Golf Club.
97	Monterey cypress (<i>Cupressus macrocarpa</i>)	Mature	Stand of large mature trees forming shelter belt on edge of club car park
98	totara (<i>Podocarpus totara</i>)	Juvenile to mature	Stand alone specimen within works zone
99	kauri (<i>Agathis australis</i>), harakeke (<i>Phormium tenax</i>)	Juvenile	Single specimen planted within planter in car park surrounded by harakeke
100	Italian cypress (<i>Cupressus sempervirens</i>)	Mature	Single specimen planted within planter in car park.
101	river birch (<i>Betula nigra</i>), (<i>Rhododendron sp.</i>), tarata (<i>Pittosporum eugenioides</i>), ash (<i>Fraxinus sp.</i>)	Juvenile to mature	Planted specimen trees emerging through garden of native and exotic plants
102	gum (<i>Eucalyptus sp.</i>)	Mature	Poor health and form.
103	kanuka (<i>Kunzea ericoides</i>), ti kouka (<i>Cordyline australis</i>), harakeke (<i>Phormium tenax</i>), taupata (<i>Coprosma repens</i>), nikau (<i>Rhopalostylis sapida</i>), karaka (<i>Corynocarpus laevigatus</i>), karamu (<i>Coprosma robusta</i>)	Juvenile to mature	Regenerating and planted native vegetation.
104	2 x Monterey pine (<i>Pinus radiata</i>)	Mature	On edge of proposed work zone
105	3 x lily pilly (<i>Syzygium smithii</i> *), 2 x oak (<i>Quercus robur</i>), Monterey cypress (<i>Cupressus macrocarpa</i>), Japanese cedar (<i>Cryptomeria japonica</i>), Italian cypress (<i>Cupressus sempervirens</i>), callistemon (<i>Callistemon sp.</i>), melaleuca (<i>Melaleuca sp.</i>)	Mature	Various exotic specimen trees growing along the eastern side of golf course road.
106	2 x Japanese cedar (<i>Cryptomeria japonica</i>), 4 x she oak (<i>Casuarina cunninghamiana</i>), cypress (<i>Cypress sp.</i>), Italian cypress (<i>Cupressus sempervirens</i>), silver dollar (<i>Eucalyptus cinerea</i>)	Mature	Various exotic specimen trees growing along the eastern side near entrance to golf club/Appleby Road
107	2 x totara (<i>Podocarpus totara</i>), 1 x puriri (<i>Vitex lucens</i>)	Juvenile to mature	Native specimen trees on edge of road reserve and golf course
108	karaka (<i>Corynocarpus laevigatus</i>)	Juvenile	Street tree within proposed work zone
109	gum (<i>Eucalyptus sp.</i>), water gum (<i>Tristaniopsis laurina</i>), Queensland box (<i>Lophostemon confertus</i>)	Mature	Various exotic specimen trees on edge of road reserve and golf course
110	Queensland box (<i>Lophostemon confertus</i>), lily pilly (<i>Syzygium smithii</i> *)	Mature	Various exotic specimen trees on edge of road reserve and golf course
111	8 x pin oak (<i>Quercus palustris</i>)	Early-mature	Street trees growing along the southern side of Appleby Road outside Albany Junior High School.
112	4 x bull bay (<i>Magnolia grandiflora</i>)	Early-mature	Group of street trees growing outside No.2 Appleby Road

APPENDIX A: TREE SCHEDULE

Tree/ Group No.	Species	Age class	Comments
113	6 x cherry tree (<i>Prunus sp.</i>)	Early-mature	Group of street trees growing on the corner of Albany Highway
114	3 x pin oak (<i>Quercus palustris</i>), 4 x pohutukawa (<i>Metrosideros excelsa</i>)	Mature	Specimen trees growing between road reserve and private property
115	6 x pin oak (<i>Quercus palustris</i>), 3 x pohutukawa (<i>Metrosideros excelsa</i>)	Mature	Specimen trees growing between road reserve and private property
116	bull bay (<i>Magnolia grandiflora</i>), bead tree (<i>Melia azedarach</i>)	Early-mature	Specimen trees growing within private property
117	pin oak (<i>Quercus palustris</i>), pohutukawa (<i>Metrosideros excelsa</i>), bull bay (<i>Magnolia grandiflora</i>), Queensland box (<i>Lophostemon confertus</i>), American sweet gum (<i>Liquidambar styraciflua</i>) maidenhair tree (<i>Ginkgo biloba</i>)	Juvenile to mature	Multiple various specimen trees growing within private property and road reserve within proposed work zone from the corner of William Pickering Drive along Piermark Drive to the corner of Bush Road.
118	Monterey cypress (<i>Cupressus macrocarpa</i>)	Mature	Large mature trees forming shelter belt around Rosedale Park car park. Pruning may be required for park access
119	she oak (<i>Casuarina cunninghamiana</i>), American sweet gum (<i>Liquidambar styraciflua</i>)	Early-mature	Group of trees to the east side of Rosedale Park car park entrance
120	5 x American sweet gum (<i>Liquidambar styraciflua</i>)	Early-mature	Growing on western side of Rosedale Park Road within works zone
121	ti kouka (<i>Cordyline australis</i>)	Mature	Growing on western side of Rosedale Park Road within works zone
122	3 x Monterey cypress (<i>Cupressus macrocarpa</i>)	Mature	Growing on the eastern and western side of Rosedale Park Road within works zone
123	(<i>Michelia sp.</i>)	Early-mature	14 groups of 2-5 planted trees growing on the eastern and western side of Rosedale Park Road within works zone
124	ash (<i>Fraxinus sp.</i>)	Mature	Low hanging branches over trench line and road may require pruning.
125	Monterey cypress (<i>Cupressus macrocarpa</i>)	Mature	Multiple trees forming shelter belt.
126	Monterey pine (<i>Pinus radiata</i>)	Mature	Multiple large mature trees scattered within proposed work zone. Some low hanging branches.
127	Mixed native: ti kouka (<i>Cordyline australis</i>), karo (<i>Pittosporum crassifolium</i>), tarata (<i>Pittosporum eugenioides</i>), karaka (<i>Corynocarpus laevigatus</i>), puriri (<i>Vitex lucens</i>), totara (<i>Podocarpus totara</i>), puka (<i>Meryta sinclairii</i>), ngaio (<i>Myoporum laetum</i>), kahikatea (<i>Dacrydium dacrydioides</i>)	Early-mature	Various native trees growing within the Rosedale Waste Water Treatment Plant forming shelter belt.

APPENDIX B: TREE LOCATION PLANS



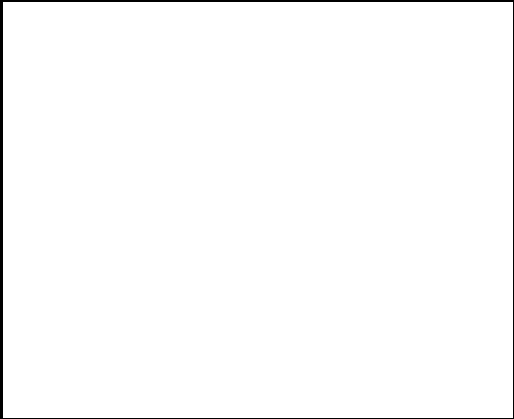
Northern Interceptor

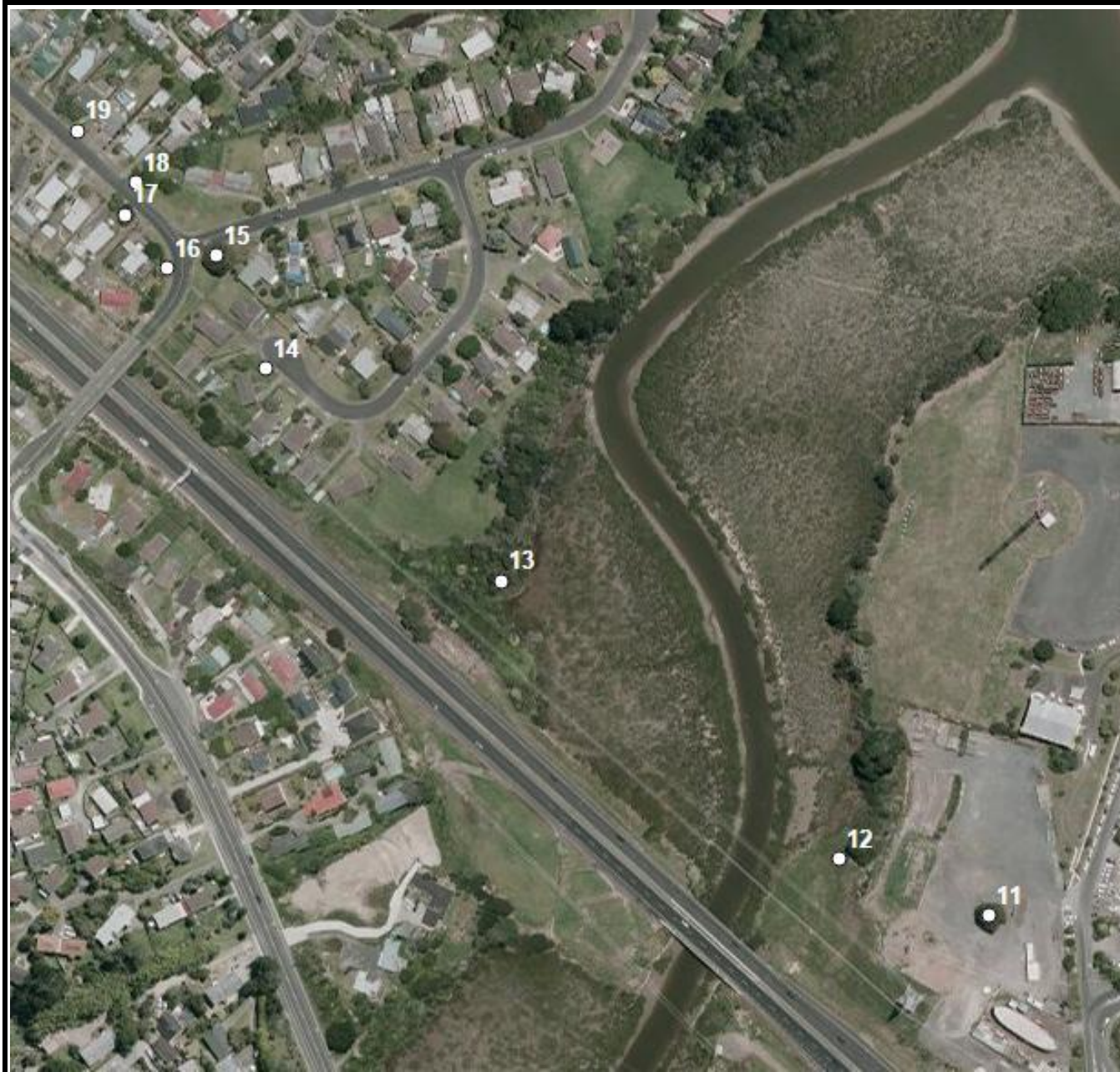
The Concourse to Selwood Drive

TREE INVENTORY PLAN 1



GSNZ job No.:	M13787
Client:	Watercare
Arborist:	Jack Warden
Reviewed by:	Craig Webb
Date:	8/08/16





Northern Interceptor

Selwood Drive to Huruhuru

TREE INVENTORY PLAN 2



Legend: Tree/group Number ○

GSNZ job No.

M13787

Client:

Watercare

Arborist:

Jack Warden

Reviewed by:

Craig Webb

Date:

8/08/16



Northern Interceptor

Huruhuru Road to Cedar Heights Avenue

TREE INVENTORY PLAN 3



Legend: Tree/group Number ○

GSNZ job No.	M13787
Client:	Watercare
Arborist:	Jack Warden
Reviewed by:	Craig Webb
Date:	8/08/16



Northern Interceptor

Cedar Heights Avenue to Holmes Reserve

TREE INVENTORY PLAN 4



Legend: Tree/group Number ○

GSNZ job No.	M13787
Client:	Watercare
Arborist:	Jack Warden
Reviewed by:	Craig Webb
Date:	8/08/16



Northern Interceptor

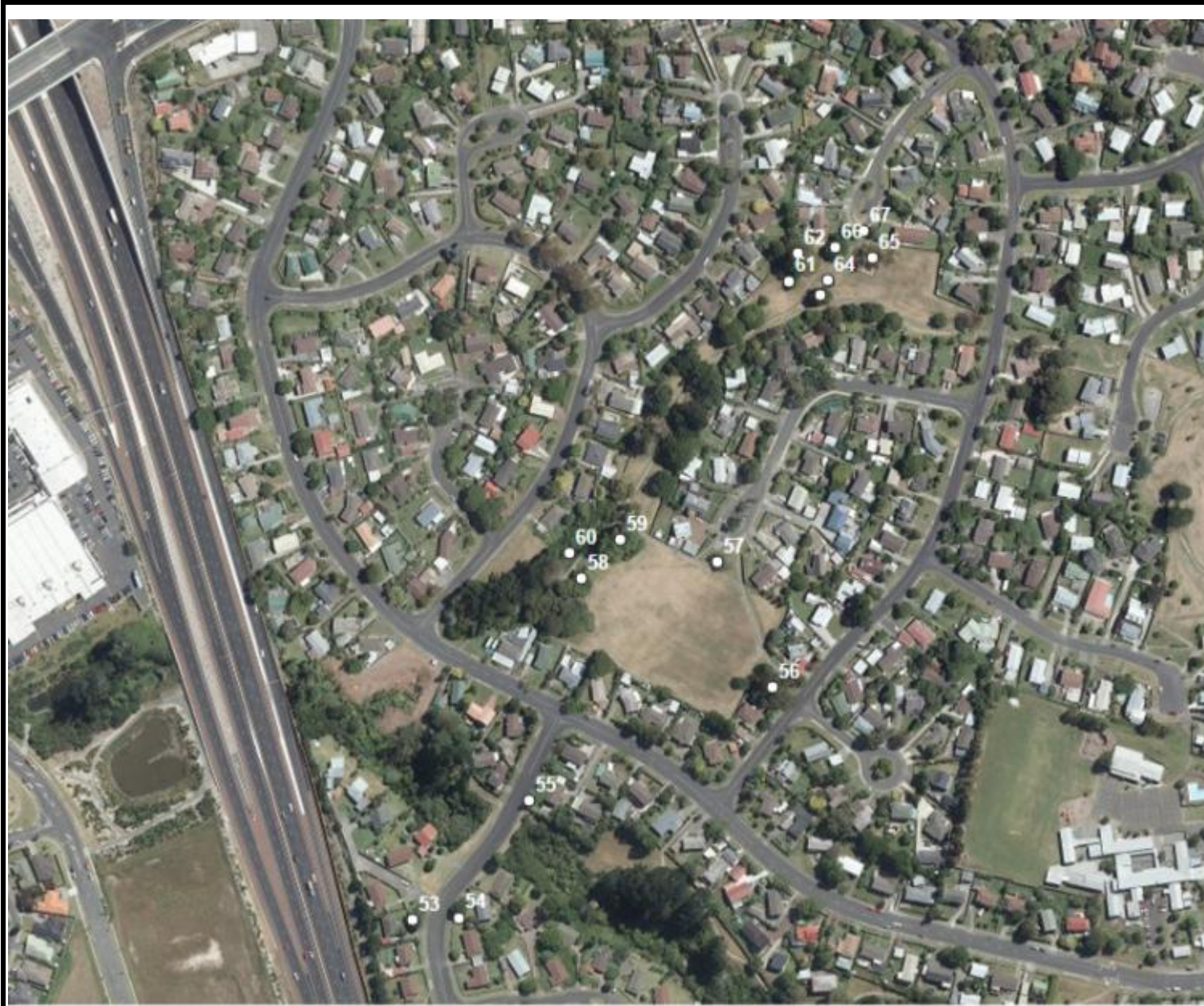
Holmes Reserve to Holmes Drive

TREE INVENTORY PLAN 5



Legend: Tree/group Number ○

GSNZ job No.	M13787
Client:	Watercare
Arborist:	Jack Warden
Reviewed by:	Craig Webb
Date:	8/08/16



Northern Interceptor

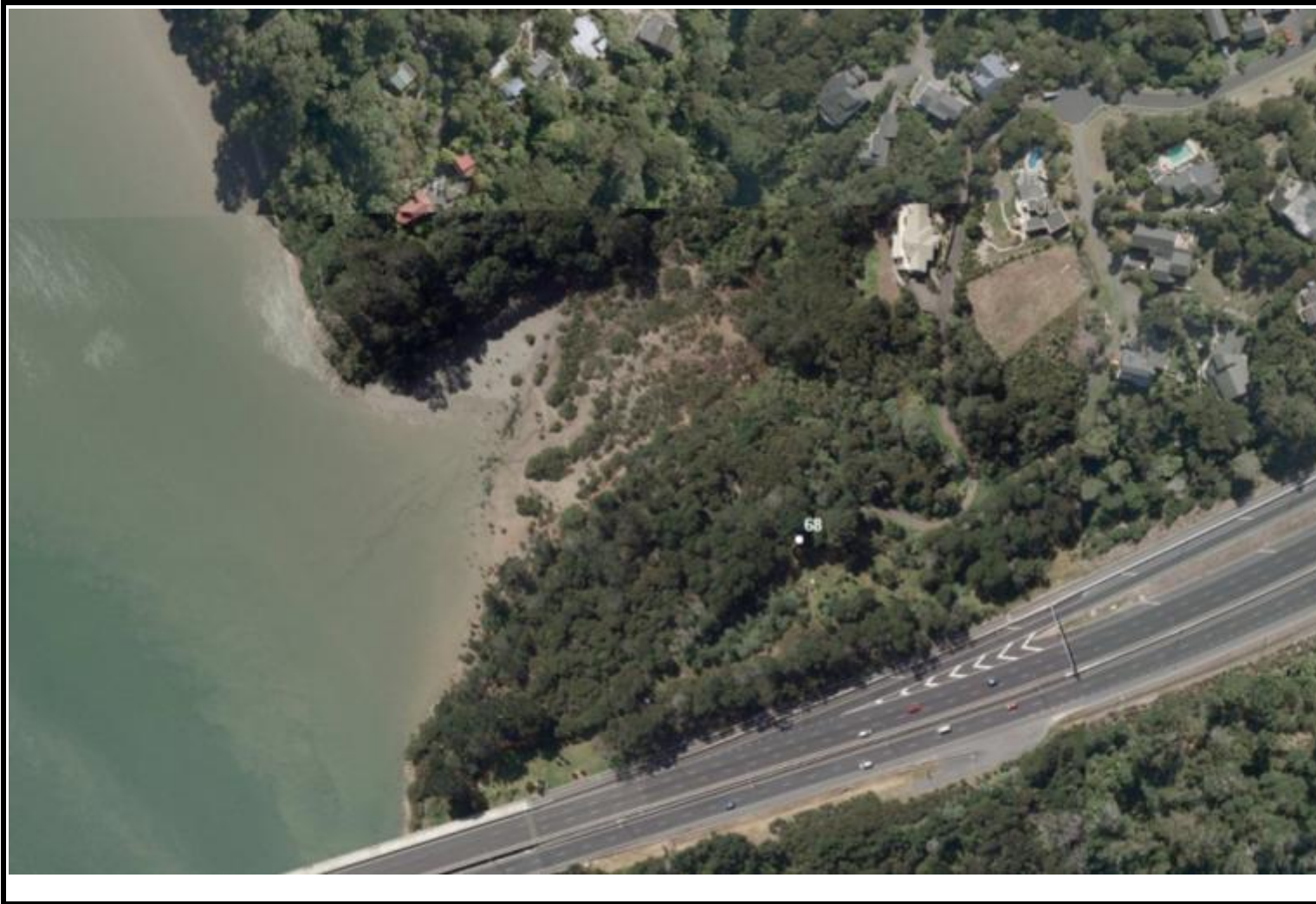
Holmes Drive to Hobsonville Road

TREE INVENTORY PLAN 6



Legend: Tree/group Number ○

GSNZ job No.	M13787
Client:	Watercare
Arborist:	Jack Warden
Reviewed by:	Craig Webb
Date:	8/08/16



Northern Interceptor

The Eastern Abutment of the Greenhithe Bridge to Collins Park

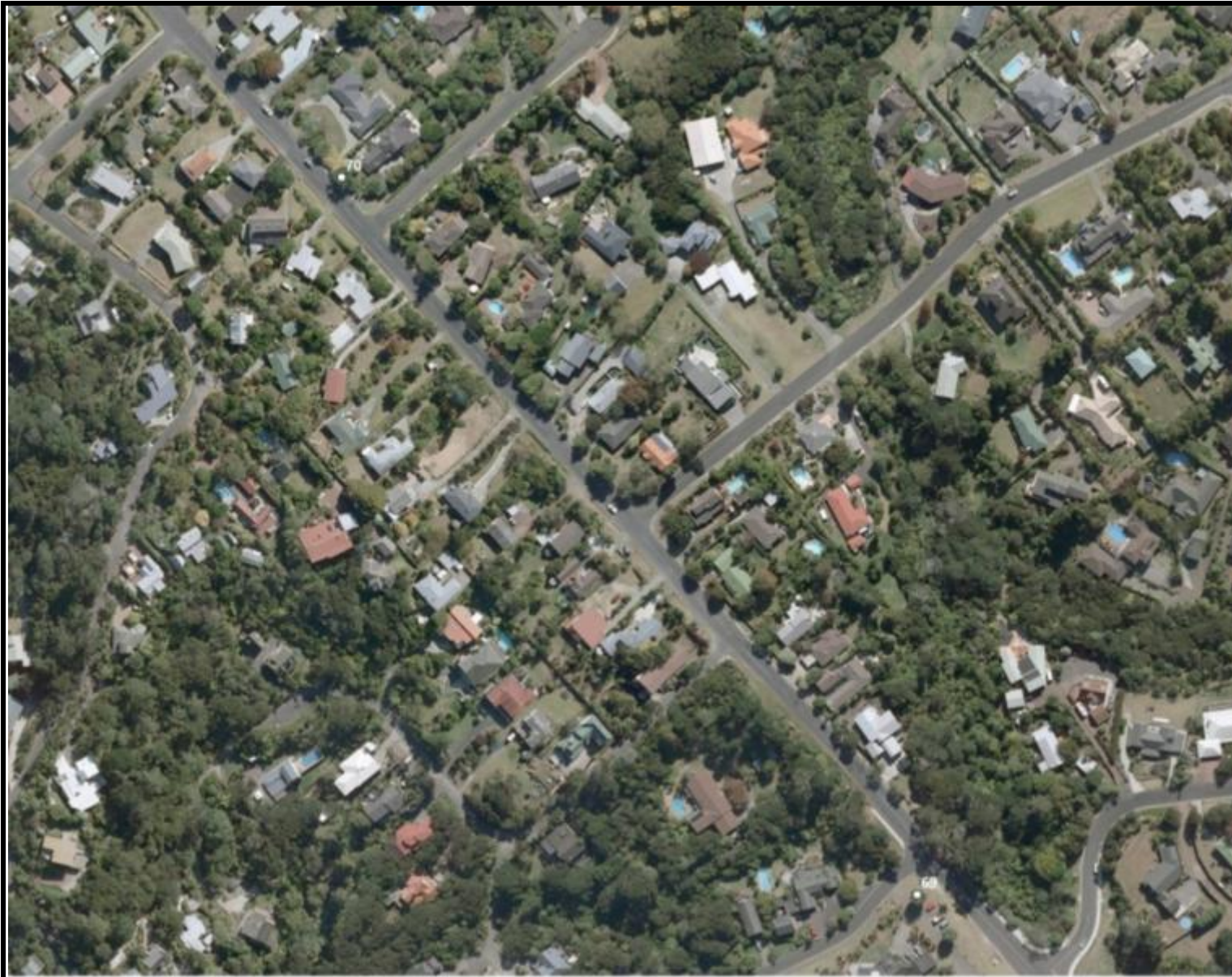
TREE INVENTORY PLAN 7



Legend: Tree/group Number ○

GSNZ job No.	M13787
Client:	Watercare
Arborist:	Jack Warden
Reviewed by:	Craig Webb
Date:	8/08/16





Northern Interceptor

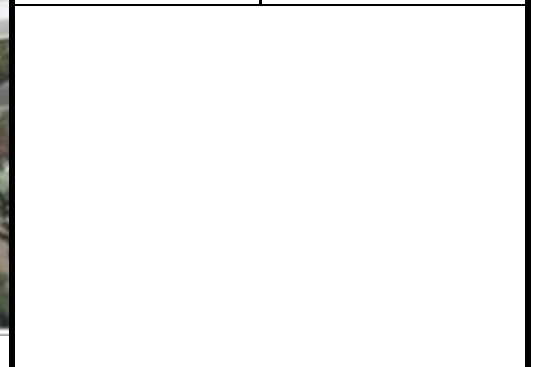
The Eastern Abutment of the Greenhithe
Bridge to Collins Park

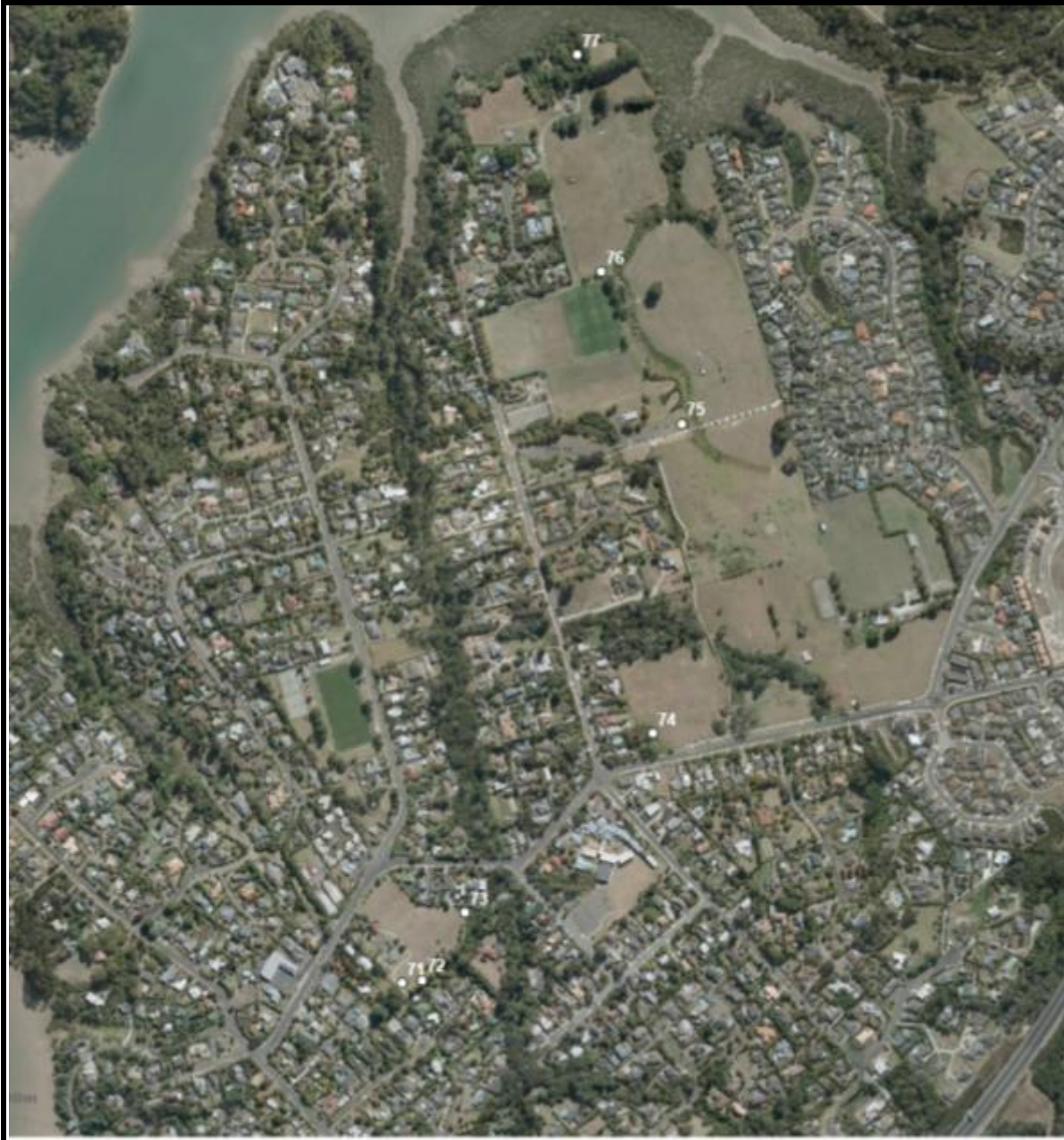
TREE INVENTORY PLAN 8



Legend: Tree/group Number ○

GSNZ job No.	M13787
Client:	Watercare
Arborist:	Jack Warden
Reviewed by:	Craig Webb
Date:	8/08/16





Northern Interceptor

The Eastern Abutment of the Greenhithe Bridge to Collins Park to South Wainoni Park to North Wainoni Park

TREE INVENTORY PLAN 9



Legend: Tree/group Number ○

GSNZ job No.	M13787
Client:	Watercare
Arborist:	Jack Warden
Reviewed by:	Craig Webb
Date:	8/08/16



Northern Interceptor

North Shore Memorial Park to Schnapper Rock Road

TREE INVENTORY PLAN 10



Legend: Tree/group Number ○

GSNZ job No.	M13787
Client:	Watercare
Arborist:	Jack Warden
Reviewed by:	Craig Webb
Date:	8/08/16



Northern Interceptor

North Shore Golf Course to Appleby Road

TREE INVENTORY PLAN 11



Legend: Tree/group Number ○

GSNZ job No.	M13787
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Client:	Watercare
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Arborist:	Jack Warden
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Reviewed by:	Craig Webb
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Date:	8/08/16
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Northern Interceptor

Appleby Road to William Pickering Road

TREE INVENTORY PLAN 12



Legend: Tree/group Number ○

GSNZ job No. M13787

Client: Watercare

Arborist: Jack Warden

Reviewed by: Craig Webb

Date: 8/08/16



Northern Interceptor

William Pickering Drive to Bush Road

TREE INVENTORY PLAN 13



Legend: Tree/group Number ○

Job No.:	M13787
Client:	Watercare
Arborist:	Jack Warden
Reviewed by:	Craig Webb
Date:	8/08/16



Northern Interceptor

Bush Road to Rosedale WWTP

TREE INVENTORY PLAN 14



Legend: Tree/group Number ○

Job No.:	M13787
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Client:	Watercare
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Arborist:	Jack Warden
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Reviewed by:	Craig Webb
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Date:	8/08/16
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APPENDIX C - REPLACEMENT PLANTING PROTOCOL

Where continuous areas of vegetation are removed the cleared areas should be re-vegetated in accordance with the following parameters:

The re-vegetation should take place within the first planting season (typically May to September) following the completion of the construction activities.

Plant species to be used should be appropriate to the area, chosen for site-specific conditions and where possible will be eco-sourced.

The use of cultivars, varieties, and hybrids is inappropriate in natural areas.

Plants should be an equal mix of grade sizes between root trainer and PB 12, and will be spaced no greater than one metre apart or as appropriate to the grade, species type and specific location within the site being planted.

Where possible the planted areas should have a 100mm deep layer of well-composted organic mulch spread evenly over them. This mulch layer is to be maintained until canopy closure or for a minimum of two years from planting whichever is the greater.

The planted areas should be kept weed free until canopy closure or for a minimum of two years from planting whichever is the greater.

The selected plants should be of good quality nursery stock and maintained to the satisfaction of Council for a period of two years from the date of planting. Any of the replacement plants that die within this period should be replaced and maintained as per the stated conditions.

Where stand-alone trees greater than 4m in height are removed replacement trees should be established on a two-for-one basis. The species, size and location of the replacement trees should be determined in consultation with the asset manager or property owner responsible for the site.

Where trees or vegetation is removed from Council-owned and managed land the appointed arborist will record the species and size of all trees/plants that are required to be removed and provide these details to Council's Arboriculture and Landscape Advisor. The recorded numbers and species should form the basis of the replacement planting scheme.

The extent, location, species selection and plant grades for the replacement planting scheme should be suitable for the future access and maintenance requirements of the site and to the satisfaction of Council.

The planting should be implemented within the planting season immediately following the completion of the works.

The planted areas should be maintained in accordance with correct arboricultural/horticultural practices, including watering, mulching, weeding and replacement of plants that fail to establish for two years following planting.

Where required, site-specific planting plans should be provided to show the details of areas that are required to be replanted, including (but not limited to), plant species selection, ground preparation, weed control measures, planting methodologies and maintenance.

APPENDIX D - TREE PROTECTION METHODOLOGY

The following arboricultural construction methodologies relate to all works associated with the installation of the Northern Interceptor. The provisions of this Tree Protection Methodology apply to all works and work related activities when within the dripline of trees to be protected. Trees to be protected include trees that are protected by applicable District plans and other trees of merit that are to be retained.

All trees that are to be retained growing in close proximity to the proposed works are to be protected in a manner that ensures that the effects of the works on the surrounding trees are no more than minor, unless specific permission is received in writing in the form of a land owner consent. This is to be achieved by compliance with the following tree protection construction methodologies:

Appointed Arborist

An Arborist (Appointed Arborist) should be employed to monitor, supervise and/or direct all works within close proximity to all protected trees, for the duration of the Northern Interceptor installation works.

The Appointed Arborist should mark out site-specific areas where arboricultural supervision, monitoring and/or direction are required. This should occur prior to works commencing on individual work sites.

Induction

Prior to commencement of any works within close proximity to protected trees on each specific site, a meeting (induction) is to be convened. At each site-specific induction, the Appointed Arborist should explain the resource consent conditions, tree protection measures and associated matters to all contractors, sub-contractors and supervisory staff. The induction meetings may be attended by appropriate Auckland Council staff.

The induction meeting may also be attended by the Council's Arborist. The consent holder should give Council's Arborist's five working days prior notice of the intended date of the meeting.

The consent holder should ensure that all contractors, sub-contractors and work site supervisory staff who are carrying out any works within the dripline of any protected tree covered by this consent are advised of the Conditions of Consent and act in accordance with the conditions.

A copy of the resource consent and this report should be available at all times on the work site.

Tree Protection Fences

Where appropriate, protective fencing (consisting of a 1.8 metre high pole mesh fencing or protective water filled barriers or acceptable equivalent) should be erected and positioned between the line of works and all permeable areas within close proximity to protected trees so as to restrict access to/storage on such areas. The protective fencing should be erected prior to any works occurring in close proximity to any protected tree. The Appointed Arborist will determine the need for protective fencing installation and, if required, its position and composition.

Excavation

The principle method of excavation within close proximity to protected trees is to be by way of machine excavation. Hand-digging, probing and exploratory excavation will be carried out where specified by the appointed arborist.

The Appointed Arborist is to determine the excavation methodology to be used when working in close proximity to protected trees covered by this consent.

All excavation machinery is to operate from outside the dripline of protected trees unless the machinery can operate from and remain fully on top of existing impermeable hard surfaces (e.g. carriageway) or temporary surfaces specified by the appointed arborist to prevent soil compaction.

When undertaking excavation works within close proximity to protected trees, the machine excavator should be fitted with a straight blade bucket (unless use of an alternative bucket i.e. toothed bucket is agreed to by the Appointed Arborist). Machine excavation will only take place within close proximity to protected trees under the supervision and direction of the Appointed Arborist.

When undertaking excavation works within close proximity to protected trees, the canopies, trunks and roots should be protected from damage. The Appointed Arborist should monitor, direct and/or supervise these tree protection measures.

Tree Pruning

Where pruning of tree branches is required, consultation with the Council's Parks Arborist (when concerning protected Council street trees) or the owner of the land on which the tree is located should be undertaken before such pruning works are carried out. Any required tree pruning should be carried out in accordance with correct arboricultural practices by a competent arboricultural contractor.

Materials/Equipment

In respect to the position, operation, delivery and/or storage of vehicles, machinery, equipment, spoil and/or materials (and all associated activities/items) within close proximity to protected trees, the following restrictions will apply:

No vehicles, machinery, equipment, spoil and/or materials should be positioned, operated, delivered, stored, wheeled or driven within close proximity to protected trees unless it can be kept within the bounds of an existing impermeable hard surface (e.g. vehicle crossing, carriageway, footpath, base course and/or acceptable alternative) and does not conflict with any above ground portion of any protected tree.

Where site constraints require storage or movement of vehicles, machinery, equipment, spoil and/or materials within the rootzone of trees and this is unavoidable, the ground surface should be protected prior to this activity. The ground protection measures should be specified by the appointed arborist and designed to prevent any contamination or compaction of the soil.

No vehicles, machinery, equipment, spoil and/or materials are to be placed or temporarily stored against the trunk or branches of any protected tree.

Root removal

Tree root removal associated with any excavation within close proximity to any protected tree is to be undertaken in the following manner:

Where roots are required to be removed, necessary only to complete the proposed works, these should be cleanly cut back to the edge of excavations using a sharp implement such as a handsaw
Arboricultural Final (updated)

or secateurs. All retained roots and cut ends of tree roots should be protected from drying out by a covering of hessian (or acceptable alternative) that is to be kept damp until the excavated area can be backfilled.

All root pruning as detailed above is to be undertaken either by the Appointed Arborist or under the guidance and direction of the Appointed Arborist.

Reinstatement

The installation of emulsion, bitumen, Rugasol and all other manufactured products which can cause harm to trees should be undertaken in a manner that ensures that no direct spray or spray drift comes in contact with any portion of any protected tree. The Appointed Arborist is to advise on how works using such products are to be undertaken when in close proximity to any protected tree.

Any washing off of products as referenced above should be undertaken in a manner that ensures that no water or resulting slurry comes in contact with any portion of any protected tree.

Tree Removal

Any permitted removal of trees should be carried out in accordance with acceptable arboricultural standards and practice by a suitably qualified and experienced Arborist in a manner that avoids damage to adjacent protected vegetation where possible. The removal of vegetation should only be undertaken following pre-commencement walk through with Council's Arborist to confirm the trees that are to be removed. Trees that are to be removed should be clearly marked with spray paint. Trees that are to be retained should be marked by a ribbon around their trunks or hazard tape to demarcate the area.