Appendix A Assessment of Alternatives

Appendix G

Private Properties directly affected by the Designation

Assessment of Alternatives

Project title and description

Northern Interceptor Wastewater Project

prepared for Watercare by:

MWH® now part of Stantec

2016 WINNER
SUSTAINABILITY REPORTING AWARDS

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Watercare Services Limited

Northern Interceptor - Assessment of Alternatives

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1 Introduction and Project Background

Section 171(1)(b) of the Resource Management Act 1991 ("RMA") requires that; when making a recommendation on a Notice of Requirement ("NoR"), a territorial authority shall consider whether adequate regard has been given to alternative sites, routes or methods of undertaking the work if the requiring authority does not have an interest in the land sufficient for undertaking the work, or it is likely that the work will have a significant adverse effect on the environment.

With regards to the Northern Interceptor Project, Watercare (the Requiring Authority) does not have sufficient interest in the land for undertaking the work and as such, an assessment of whether adequate consideration has been given to alternative sites, routes and methods of undertaking the work is required.

The purpose of this report is to document the development of alternatives and the process used to assess and compare options to identify the preferred solution – the proposed Northern Interceptor – in order to provide the information necessary to inform an assessment under Section 171(1)(b).

The following flow diagram provides a summary of the process undertaken to consider alternative options for the Northern Interceptor Project:

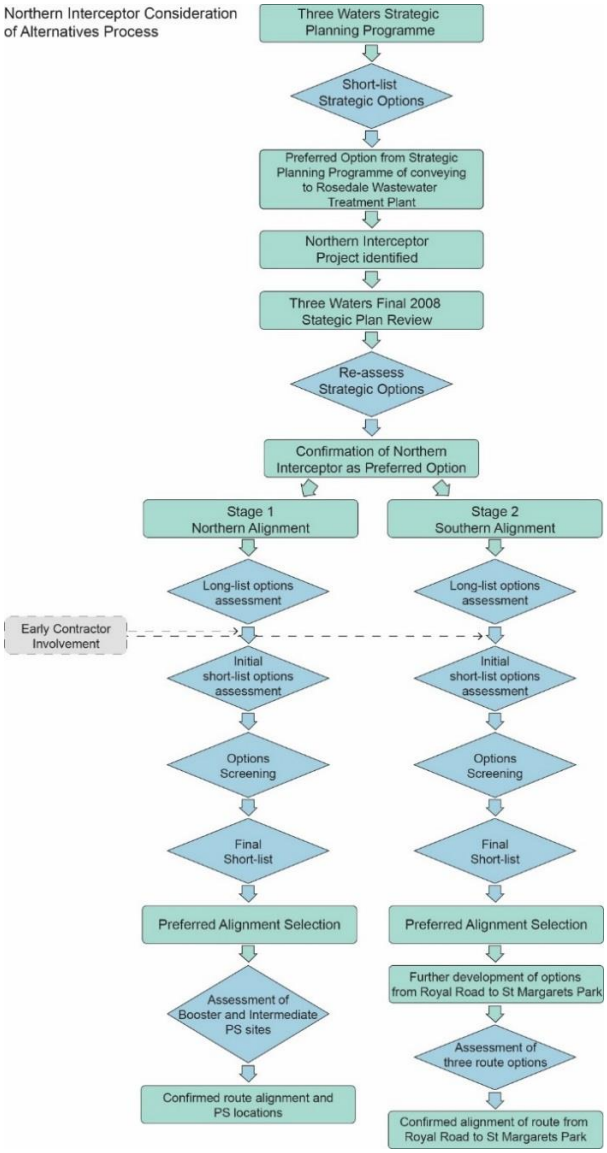


Figure 1-1: Northern Interceptor Consideration of Alternatives Process

1.1 Issues

Prior to the amalgamation of the legacy Auckland Councils in 2010, the former Waitakere City Council ("WCC") identified that the north western area of the city had insufficient zoned land to meet the demands of projected growth within the area. To address the situation, the Northern Strategic Growth Area ("NorSGA") project was initiated in partnership with land developers with the intention of delivering new employment and housing opportunities in the area. Three plan changes were made operative to facilitate the anticipated growth.

Post Auckland Council amalgamation, ownership of the NorSGA project (renamed the North West Transformation Area) transferred to Council. Council largely adopted the growth vision for this area in its Auckland Plan, and identified Auckland's North West as one of the eight priority areas for growth and development within the Auckland region. Stage 1 of the development is currently underway. This stage entails 435 hectares consisting of Hobsonville Point, Hobsonville Corridor, and Westgate/Massey North. As such, the Northern Waitakere area, including the North West Transformation Area ("NWTA") is subject to significant growth pressure.

Growth forecasts indicate that population in the Northern Waitakere area will increase from 75,000 to over 200,000 people within the next 50 years. Proposed land use zoning as part of the Proposed Auckland Unitary Plan ("PAUP") suggests that growth could exceed these figures. Watercare's assessment of the latest development plans provided by Auckland Council shows that ultimate (complete build out) growth in these areas will result in an estimated total population of 350,000 people by 2070.

The requirement to respond to the needs of the Northern Waitakere area, inclusive of the North West Transformation Area ("NWTA"), Kumeu, Huapai, Riverhead ("KHR"), Northern Waitakere catchments and South Rodney areas, is well established. These areas are collectively referred to as the "Service Catchment" in this Report (see Figure 1 below). To summarise, the key wastewater issues relevant to the Service Catchment include:

1. Growth forecasts indicate that population in the Service Catchment area will increase from 75,000 to potentially over 300,000 people within the next 50 years;
2. At present, local infrastructure (e.g. household and local wastewater pipes) is at capacity which overloads the network, causing public health and environmental issues which need to be addressed;
3. Major components of Auckland's wastewater infrastructure are near or at capacity in Central Auckland, some of which cannot be maintained because they flow full for significant periods of time. Flows from the Service Catchment add to this issue, as it presently utilises this conveyance system;
4. The risk of wastewater overflows is increasing over time due to capacity and growth issues;
5. At projected population growth rates, the Mangere Wastewater Treatment Plant ("WWTP") which presently treats all wastewater flows within the Service Area Catchment is expected to reach its capacity in about 2027. It is anticipated that any further urban growth within the Service Catchment will likely need to be directed and treated elsewhere;
6. The present wastewater conveyance and capacity is a constraint on residential growth in Auckland, as the number of households it can service is finite.

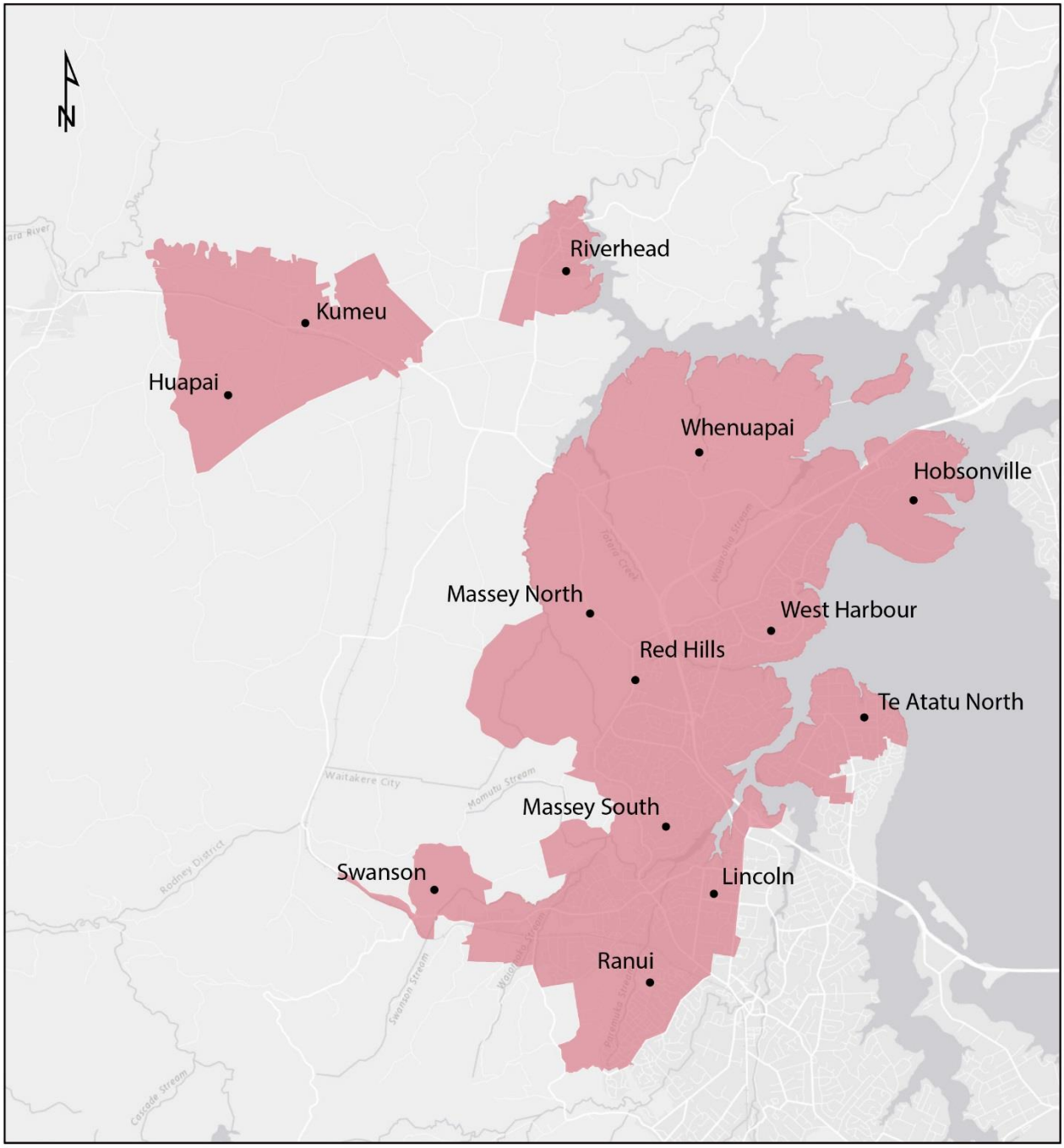


Figure 1-2: Northern Interceptor Service Catchment (Shaded Red)

1.2 Watercare's Strategic Intent

In accordance with the Local Government Act 2002 ("LGA") Watercare is required to develop and to be consistent with a Statement of Intent. The Watercare Strategic Intent 2015 – 2018 outlines four strategic priorities – these priorities reflect the organisation's focus on (amongst other things) continuing to consistently deliver reliable, affordable, high quality, sustainable wastewater services. The four strategic priorities are as follows:

- **Customer Focus** – Putting customers at the heart of our business by aligning processes, people and systems to deliver exceptional performance at minimum cost;
- **Business Excellence** - We deliver positive customer outcomes by being a commercially-savvy, performance-based organisation that prioritises the development and well-being of our people and the long-term resilience of our assets;
- **Financial Responsibility** – We are a financially responsible and efficient business, balancing our long-term financial obligations with our requirement to be a minimum cost provider; and
- **Fully Sustainable** - As custodians of the environment, we effectively manage and minimise the impact of our operations on the environment and embed sustainability into all aspects of our business.

1.3 Project Objectives

The project objectives are derived from the issues outlined above, and Watercare's Strategic Intent. The Project Objectives are as follows:

- To provide additional capacity in the wastewater network for growth and development in North West Auckland in a manner that:
    a. Protects public health;
    b. Is consistent with Watercare's Strategic priority of being a minimum cost service provider;
    c. Avoids, remedies or mitigates adverse environmental, cultural and social effects to the greatest extent practicable; and
    d. Provides for flexibility of construction staging to recognise the uncertainties of projected growth.
- To provide statutory protection for the Northern Interceptor and to enable its future construction, operation and maintenance.

2 Consideration of Alternatives

2.1 Background

In response to the issues summarised above at Section 1.2, Watercare has undertaken a number of studies to:

- Understand the network capacity and performance of wastewater infrastructure within the Service Catchment; and
- To investigate the potential options for responding to the issues that the Service Catchment currently faces and can expect to face in the future.

Subsequently, a proposed solution to the wastewater needs of the Service Catchment has been in development since at least 2008. Over this period of time a wide variety of alternative options have been considered and summarised through numerous reports.

The following sections of this Report provide further details of the processes of considering alternative options to address the issues outlined above in Section 1.2.

2.1.1 Three Waters Strategic Planning Programme (2008)

The Three Waters Strategic Planning Programme was a Watercare-led initiative that investigated ways to deliver the future water supply, wastewater and stormwater services in the Auckland region. The primary drivers behind this programme, as identified by Watercare, were the need to service growth, to deliver specified levels of service, and to meet their requirements as a service provider under various legislation (e.g. the LGA).

The outcome of this programme was the development of the *Three Waters Final 2008 Strategic Plan* which provided an overview of the investigations undertaken by that Project Team. The Plan covered potential long-term strategies and options to address urgent and developing wastewater issues, which was identified as the most pressing three waters issue facing the region.

In identifying a long-term solution to addressing the region's trunk wastewater issues for the next 50 years, the following options assessment and process was undertaken:

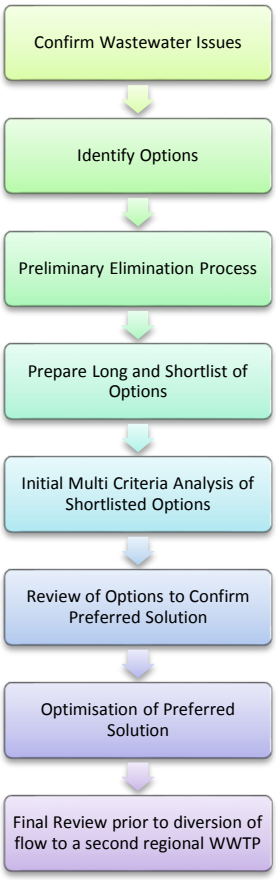
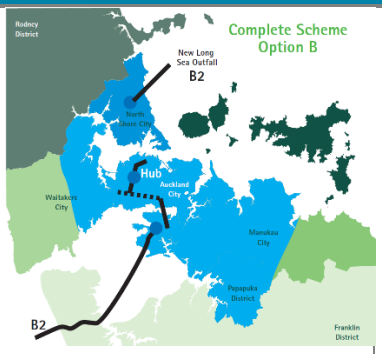
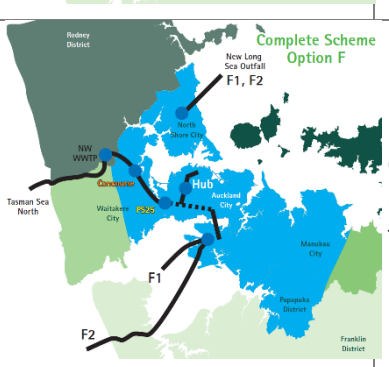
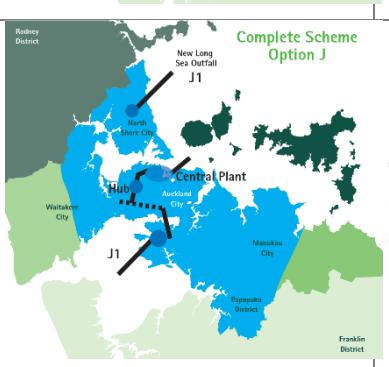
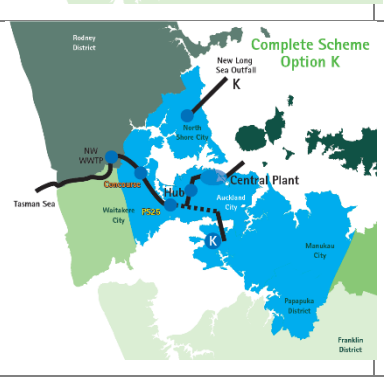


Figure 2-1: Process to identify a Long-Term Solution to Auckland's Wastewater Needs

In developing long-term solutions, Watercare undertook a series of investigations to identify an appropriate approach to managing wastewater in the Auckland region. These initial investigations focussed on the strategic use of existing, and the potential need for new, regional treatment plant facilities. From this, 14 potential options were shortlisted, which can be categorised into four broad scenarios, which utilise either existing or new regional treatment plan facilities. The four broad scenarios were as follows:

Table 2-1: Broad Scenarios to Address Growth in the Auckland Region

Scenario	Description
Scenario 1	 Combination of utilising existing North Eastern (Rosedale) and the existing South Western (Mangere) WWTP sites.
Scenario 2	 Combination of utilising the existing North Eastern (Rosedale), new North Western (Taupaki) WWTP and the existing South Western (Mangere) WWTP.
Scenario 3	 Combination of utilising the existing North Eastern (Rosedale), a new Central WWTP and the existing South Western (Mangere) WWTP.
Scenario 4	 Combination of utilising the existing North Eastern (Rosedale), a new North Western (Taupaki), new Central treatment facility and the existing South Western (Mangere) WWTP.

Once the 14 shortlist options were identified, four specialist groups were organised to assess the options against social, cultural and environmental criteria as well as legal, technical, risk and timing issues.

A separate process was used to consider economic well-being, whereby detailed estimates were prepared and internally and externally peer reviewed. All options were scored against the economic goals by the Project Team and then peer reviewed.

The following conclusions were drawn from the evaluation process:

- Estimated whole of life costs for all options were within 15% of the average and hence were all within the bounds of estimating accuracy. Consequently, whole of life costs could not be used as a reliable basis for differentiating between options;
- When options were compared on the basis of scores from the specialist social, cultural and environmental groups, most Options were broadly comparable;
- Most options were broadly comparable on legal, technical, risk and timing grounds, as all option assessed were technically feasible and the cost estimates provided for differences; and
- If the ability to proceed without undue delay were to become important, Option E, a sub-option of Scenario 1 would have advantages over other sub-options and would leave the greatest flexibility for the future as it would build on existing plants, leaving other opportunities open.

Overall, Option E (a derivative of Scenario 1), which comprised a combination of utilising a North Eastern (Rosedale) and South Western (Mangere) WWTP was favoured by the Project Team for the following reasons:

- Not considered to result in a significant increase in effects, if any, compared to existing consented limits with respect to discharges;
- Considered to have lowest adverse effects on communities overall;
- Deemed to best addresses cultural issues, of the options available;
- Maximises benefits of existing resources and investment at Rosedale and the associated outfall;
- Requires less energy to pump wastewater to the treatment plant unless a new north west site is chosen; and
- Considered to have the lowest overall construction risk.

2.1.2 Three Waters Strategy Review

Between 2013 and 2014, Watercare undertook further work to:

- Review and develop the broad approaches to the Three Waters Strategy shortlist options with regards to the Service Catchment; and
- Summarise the development of these options, and identify the preferred solution.

In giving further consideration to the shortlist options, key Project Drivers were identified by the Project Team (Consultants and Watercare staff). These Project Drivers were utilised to identify and assess alternative options and are described below:

- **Future growth estimates** - Growth forecasts indicate that population in the Service Catchment will increase from 75,000 to over 350,000 people within the next 50 years.
- **The conveyance capacity** - There are capacity constraints within the existing network, and the growth proposed by Auckland Council ("Council") in northwest Auckland will result in wastewater flows exceeding the system capacity.
- **The treatment capacity and consents** - The key findings of the *Three Waters Final Strategic Plan* relating to the treatment capacity were:
    - The Rosedale WWTP should be developed as a second regional wastewater treatment facility; and

- Given the imposed volume limits and remaining available capacity at the Mangere WWTP, Watercare identified the need to transfer some of the projected growth within the Mangere WWTP service area to an alternate location for treatment. Rosedale WWTP has the ability to receive flows transferred from the Mangere WWTP service area, and to service projected growth in southern Auckland (e.g. Papakura).

- **Level of service** – To meet the requirements of Watercare's regional network discharge consent, which requires no more than two dry weather overflows per annum unless an alternate has been determined through a Best Practicable Option ("BPO") process.

2.1.2.1 Option Identification

Having regard to the Project Drivers and further analysis undertaken, the strategic review focussed on five broad options.

2.1.2.2 Option 1 – Do Nothing

This option provides no additional wastewater conveyance or treatment capacity for the Service Catchment and would constrain urban development. This option would not meet targets for wastewater overflows, nor Watercare's Statement of Intent. Therefore, this option was not considered further.

2.1.2.3 Option 2 – Mangere WWTP

This option is an extension and expansion of the existing wastewater infrastructure to increase the transfer capacity through the Whenuapai trunk wastewater network and the upper sections of the Western Interceptor. This option would be intended to connect the Western Interceptor to the proposed Central Interceptor to convey all flows to the Mangere WWTP.

Option 2 requires the following infrastructure upgrades:

- A new pipeline from the Hobsonville Pump Station ("PS") to the Western PS – both to address the capacity issues in the Whenuapai Branch sewer (outlined in section 4 of this report) and to convey flows from the Service Catchment;
- Capacity upgrade for the Western PS;
- A new pipeline from the Western PS to the proposed Central Interceptor, connecting at the St George PS – to address capacity issues in the Western Interceptor;
- Additional capacity allocation in the proposed Central Interceptor;
- Mangere WWTP upgrades.

2.1.2.4 Option 3 – Rosedale and Mangere WWTPs

This option includes a new Northern Interceptor to collect wastewater flows from the Service Catchment and would transfer these across the Upper Waitemata Harbour to the Rosedale WWTP. This would be combined with upgrades to the upper sections of the Western Interceptor to convey the projected increased flows from the northwest Auckland to Mangere WWTP via the proposed Central Interceptor.

Option 3 requires the following infrastructure upgrades:

- A new Northern Interceptor pipeline from the Hobsonville PS to the Rosedale WWTP;
- Rosedale WWTP upgrades to service growth;
- Capacity upgrade for the Western PS;
- A new pipeline from the Western PS to the proposed Central Interceptor, connecting at the St George PS – to address capacity issues in the Western Interceptor;

- Additional capacity allocation in the proposed Central Interceptor;
- Mangere WWTP upgrades to service growth.

2.1.2.5 Option 4 – Rosedale WWTP

This option seeks to limit flows in the Whenuapai Branch sewer and the upper sections of the Western Interceptor to current design capacities by constructing a new Northern Interceptor to collect all wastewater flows from the Service Catchment, and transfer these across the Upper Waitemata Harbour to Rosedale WWTP.

Option 4 requires the following infrastructure upgrades:

- A new Northern Interceptor pipeline from the Concourse Storage Tank to the Rosedale WWTP;
- Rosedale WWTP upgrades to service growth.

2.1.2.6 Option 5 – North Western Regional WWTP

This option was originally considered under the *Three Waters Final Strategic Plan*. The concept was to construct a new North Western Regional WWTP and associated conveyance system to service wastewater needs for the Service Catchment. The proposed WWTP would discharge treated wastewater to the Tasman Sea via a long gravity outfall.

This option requires the following infrastructure upgrades:

- A new North Western WWTP providing partial biological nutrient removal with similar treated wastewater standards to Rosedale WWTP;
- A gravity treated wastewater outfall to the west coast comprising tunnel and pipeline sections with overall length of approximately 15km;
- Tasman long sea outfall.

2.1.2.7 Analysis of Options

These options were assessed against qualitative (technical, operational, risk, environmental, social and cultural) and quantitative (economic) criteria to identify a preferred solution. The assessment criteria and attributes are described in the table below:

Table 2-2: Final Assessment Criteria for Northern Interceptor

Assessment criteria	Assessment attributes
Technical	Reliability, flexibility, constructability and opportunities for additional benefits
Operational	Safety, complexity, maintenance, odour and corrosion, long-term resilience
Risk	Watercare risk management framework in accordance with AS/NZS ISO 31000:2009
Environmental/Social/Cultural	Impacts/effects of construction and long-term operations on the environment, community and cultural well being
Economic	Capital and long-term operational costs in the form of a net present value (“NPV”)

The analysis of the five options for the Northern Interceptor Project against the criteria listed above is contained in Table 2-3 below.

Table 2-3: Final Assessment of Northern Interceptor Options Against Assessment Criteria

Assessment Criteria	Option 1 – Do Nothing	Option 2 – All flows to Mangere WWTP	Option 3 – Flows to Mangere and Rosedale WWTP	Option 4 – All flows to Rosedale WWTP	Option 5 – New Northwestern WWTP
Meets Watercare's key drivers	No	Yes	Yes	Yes	Yes
Technical	No technical issues	This option is not as flexible as options 3 and 4 in terms of capacity upgrade/construction requirements. It is technically feasible and constructible.	Similar technical issues to Option 2 in terms of wastewater conveyance to Mangere WWTP. Additional technical complexities in terms of conveying wastewater to Rosedale WWTP which are similar to Option 4, but considered feasible and constructible.	Offers the most flexibility of all options in terms of the ability to stage infrastructure over time. Similar to Options 2 and 3 in terms of other technical issues around constructability and feasibility.	Of all options which adequately meet Watercare's drivers this one presents the greatest technical challenges in terms of feasibility and constructability. The treated wastewater outfall to the Tasman Sea presents a significant technical challenge and is not flexible in terms of staging.
Operational	Overflow response requirements will increase over time	Issues in terms of odour and corrosion resulting from conveying septic wastewater long distances. Impacts on operational requirements for odour treatment, ventilation and operations of the proposed Central Interceptor.	Similar operational issues to Options 2 and 4, including risk of corrosion and odour control requirements.	Similar operational issues to Options 2 and 3 in terms of managing odour and corrosion issues. Will require pumping stations with high heads.	Significant operational requirements in terms of running a new treatment plant.
Risk	High risk of increasing overflows resulting from growth	Primary risks include risk of corrosion and odour problems, and risk of exceeding existing Mangere WWTP	Lower risks than Option 2 due to distribution of wastewater between Mangere and Rosedale WWTPs.	This option is considered to have the lowest risk in terms of the ability to achieve all project drivers within the constraints of	Risks are higher than Options 2 through 4 including treatment plant performance and construction of a new long sea outfall.

Assessment Criteria	Option 1 – Do Nothing	Option 2 – All flows to Mangere WWTP	Option 3 – Flows to Mangere and Rosedale WWTP	Option 4 – All flows to Rosedale WWTP	Option 5 – New Northwestern WWTP
	and development.	consent limits in terms of allowable flows and discharge volume.		existing treatment plant consents given available capacity at the Rosedale WWTP and utilisation of the new long sea outfall.	
Environmental **Social** **Cultural**	Significant in terms of the effects of increasing overflows.	Significant effects due to long distances of construction which include working in residential areas. Effects associated with conveyance of wastewater to Mangere WWTP in terms of existing consent limits and discharge to the Manukau Harbour.	Less effects than Option 2 in terms of reduced flows to the Mangere WWTP, but wider area of effects due to construction through a longer corridor.	The environmental, social and cultural effects are lower than Options 2, 3 and 5 given the use of the Rosedale WWTP long sea outfall and the smaller amount of area impacted by construction.	Significant effects including construction requirements and placement of an additional permanent wastewater treatment facility.
Economic – 50yr NPV (2014 analysis)	Does not meet drivers	$372M	$389M	$363M	$1B

Consideration of whether the option met the Project Drivers (discussed in Section 2.1.2 above) and strategic intent was also undertaken.

2.1.2.8 The Preferred Option

On the basis of the assessment process described in Section 2.1.2.7, Option 4 – Rosedale WWTP was identified as the preferred option for the Service Catchment. To facilitate Option 4, the construction of a new pipeline from the Concourse Storage Tank to the Rosedale WWTP is required.

This Option, referred to as the Northern Interceptor, was selected as the preferred option for the following reasons:

- On a technical basis it provides the most potential flexibility of all options in terms of the potential to stage construction;
- The option provides the additional benefit of more efficiently utilising the existing capacity of the Rosedale WWTP and the consequential reduction in flows and loads to the Mangere WWTP;
- Operationally it is similar to Options 2 and 3, but it has lower operational complexities than Option 5;
- It has the lowest overall risk in terms of treatment requirements given the available capacity at the Rosedale WWTP and the ability to utilise the long ocean outfall;
- The option results in lower environmental, social and cultural effects than Options 2, 3 and 5 given the use of the Rosedale WWTP and the smaller area of construction effects; and
- It has the lowest overall estimated cost in terms of the projected 50-year NPV.

3 Consideration of Alternatives

The consideration of alternative options for the Northern Interceptor Project has adopted the ACRE (Area, Corridor, Route, Easement) methodology for route evaluation and consideration of opportunities and constraints:

- **The Area** – Is identified at Figure 1-1 above as the Service Catchment.
- **The Corridor** – Is identified at Figure 3-1 below as being a route from the Concourse Storage Tank to the Rosedale WWTP.
- **The Route** – Is identified at Figure 4-11 for the Northern alignment (Option 9) and Figure 5-10 for the Southern alignment (Option 8).
- **The Easement** – Is identified as the designation corridor being sought through the three NoRs relevant to the Project.

The Area and the "High Level" Corridor (Concourse Storage Tank to the Rosedale WWTP) have been identified through previous processes discussed in Section 2 above.

As such, this Report focuses on the refinement of the Corridor, and the subsequent identification of the Route and Easement.

The specific objectives of the Corridor, Route and Easement selection process, and consideration of alternatives were:

To identify an optimal wastewater management response to the issues outlined above at Section 1.2 in a manner:

a) Consistent with Watercare's strategic objectives; and

b) Consistent with Section 171(1)(b) of the RMA

In assessing each of the ACRE stages a number of analytical processes, such as Multi-Criteria Analysis ("MCA") have been utilised to narrow the consideration of alternatives from a longlist through a shortlist to a preferred option.

3.1 Ability to Stage the Project

In considering alternative options for the Project, significant emphasis was placed on the ability of an option to stage works. As discussed in Section 2, the Service Catchment is anticipated to increase in population from 75,000 to 350,000 over the next 50 years. However, there is considerable uncertainty as to how this growth will manifest itself in that time. Further, it is important that wastewater infrastructure is sized in a manner that ensures that the system operates efficiently and cost-effectively.

Due to the sensitivity and variability in population models (discussed above), it is difficult to predict how to cater for populations and business/industrial growth in 2070, while maintaining serviceability until that time. For example, to provide infrastructure capacity today to service a 50 year planning horizon would be inefficient, as it would require large capital investment to create new infrastructure to service an 'ultimate' projected population that would go underutilised for an unknown amount of time as growth occurs, creating redundant infrastructure capacity.

Other issues such as septicity and providing the appropriate level of service can arise when infrastructure is not designed or sized appropriately. As such, a key design parameter in the design of the Northern Interceptor has been the ability to stage the construction so as to adequately respond to actual population growth, rather than build an oversized pipeline sized based on conservative population projections. By enabling the staging of the pipeline the Project potentially gains:

- Flexibility to respond in design and delivery to actual future demand;
- Further ability to utilise existing design life in current assets; and
- The ability to defer large capital expenditure until the community has grown to support it.

This also allows capital costs to be spread over a number of years, and to be responsive to actual population growth.

3.2 The High Level Corridor

As noted above, the preferred option is the Northern Interceptor option ("the Project"). The key aspect of the Project comprises the construction of a new pipeline from the Concourse Storage Tank to the Rosedale WWTP. These are considered to be the two "fixed end points" for the Project.

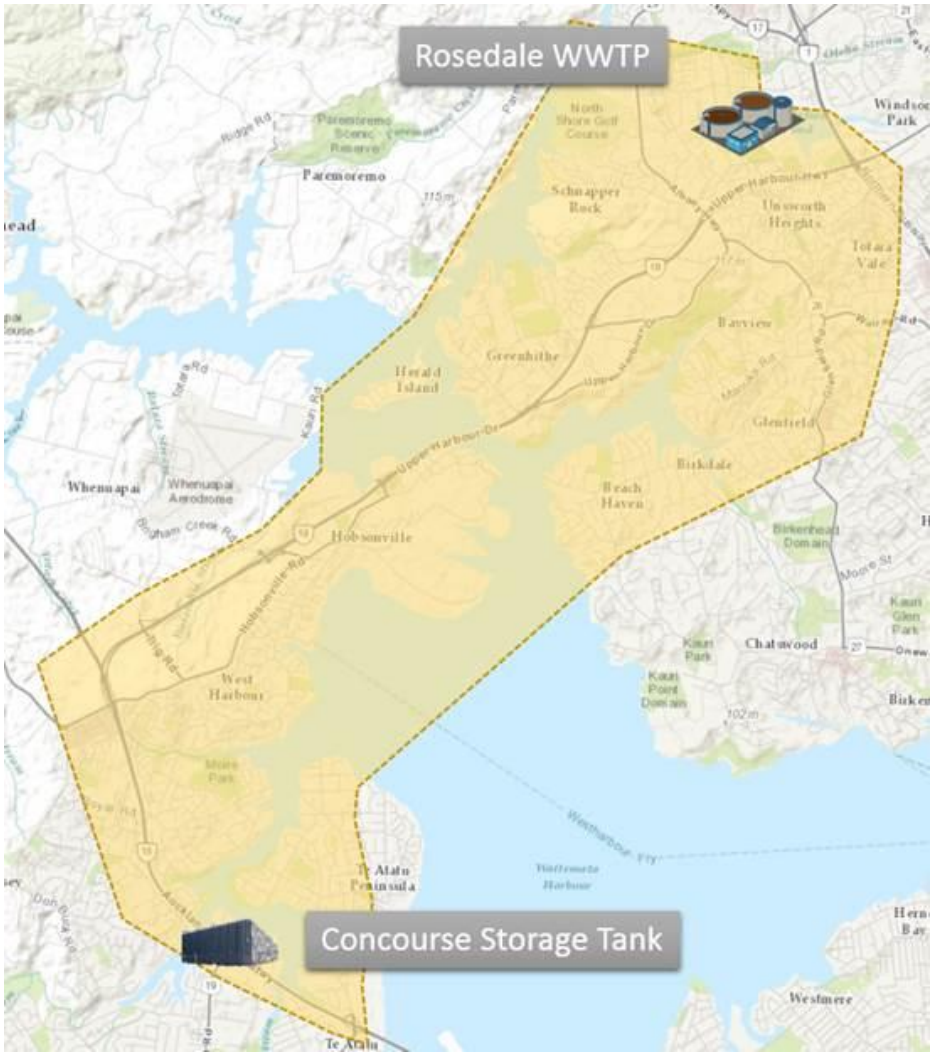


Figure 3-1: High Level Route Envelope adopted for the Northern Interceptors

These two fixed end points are considered significant in the context of the consideration of alternatives associated with the Corridor, Route and Easement of the Project as they are critical and existing components of the Project.

As such, the adoption of the Project as the preferred option inherently means the adoption of the two fixed end points and subsequently any further consideration of alternatives is limited to getting from one of these points to the other

Once the high level Corridor was identified (being the Concourse Storage Tank to the Rosedale WWTP) consideration was given to refine this Corridor.

Initial Corridor investigations considered the feasibility of a direct tunnel option from the Concourse Storage Tank to the Rosedale WWTP.

Benefits of this approach were identified as being:

a) Certainty for developers within the Service Catchment that capacity would be available once constructed as this approach would provide “full NI” capacity from the outset.

b) Limited adverse environmental effects given the depth of the pipeline.

Dis-benefits of this approach were identified as being:

a) Would take a considerable amount of time to construct and subsequently to become operational (anticipated to be no earlier than 2025) and as such existing issues within the Service Catchment network would remain until that time. In addition, constraints on growth within the Service Catchment would remain and likely exacerbate;

b) Would require a significant and inhibitive capital expenditure without the ability to defer costs; and

c) Does not provide any flexibility with regards to construction staging to match increases in wastewater flows.

It was considered that there were significant constraints associated with this approach, in particular the prohibitive capital investment required, the lack of flexibility and the likely timeframes to complete the works. Overall, it was concluded that the dis-benefits outweighed the benefits and subsequently further thought was given to potential staging options. In other words, whether there was a need for, or significant advantage of, identifying more than one Corridor stage.

Through this analysis a staged approach was considered the most practical with the ability to first connect Hobsonville PS to Rosedale WWTP and subsequently extend the NI to also connect with the Concourse Storage Tank.

In light of the above, further consideration of the alternative Corridor alignment was undertaken in two stages; Stage 1 being from the Hobsonville PS to the Rosedale WWTP, and Stage 2 from the Concourse Storage Tank to the Hobsonville PS.

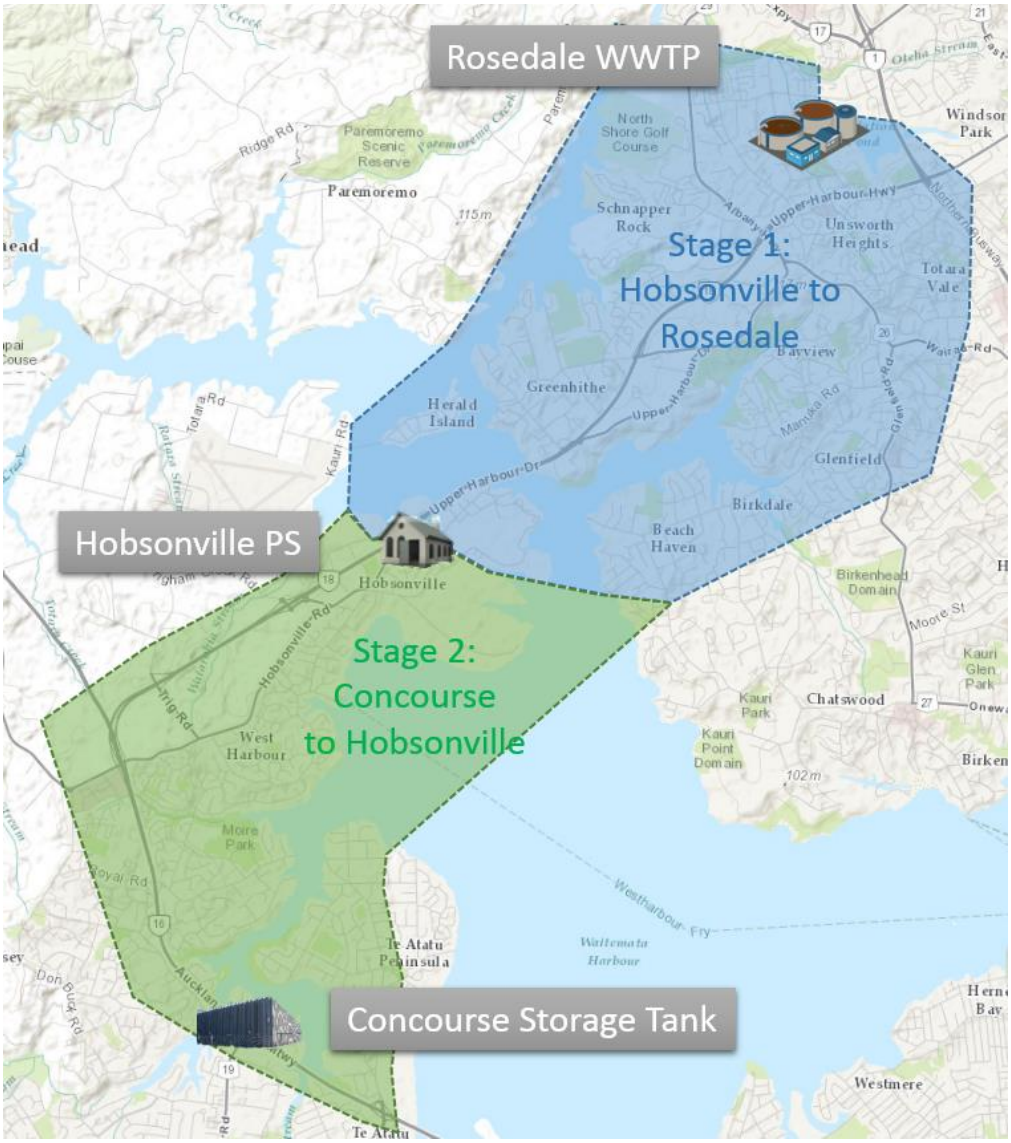


Figure 3-2: Northern and Southern Corridors (Stage 1 and Stage 2), and Fixed Points (Concourse Storage Tank, Hobsonville PS and Rosedale WWTP)

3.3 Broad Concepts

In developing longlist options for each of the two Corridor stages, three broad conceptual approaches to route selection were developed. The purpose of this approach was to ensure flexibility in route selection as the Project progresses and further information becomes available. The three broad conceptual approaches are as follows:

1. Maximise the use of road corridors within the urban environment to facilitate ease of construction and future maintenance of the assets and minimise significant adverse effects on sensitive receiving environments (e.g. private properties, significant ecological areas and the coastal marine area);
2. Minimise the use of road corridors and urbanised areas to minimise disruption to people and communities
3. Adopt the use of deep tunnels for gravity sections which limits impacts on communities and the environment to locations where shafts are situated;

4 Northern Corridor Development: Hobsonville to Rosedale

Figure 4-1: illustrates the options assessment process undertaken for Hobsonville to Rosedale Corridor (Stage 1) of the Project.

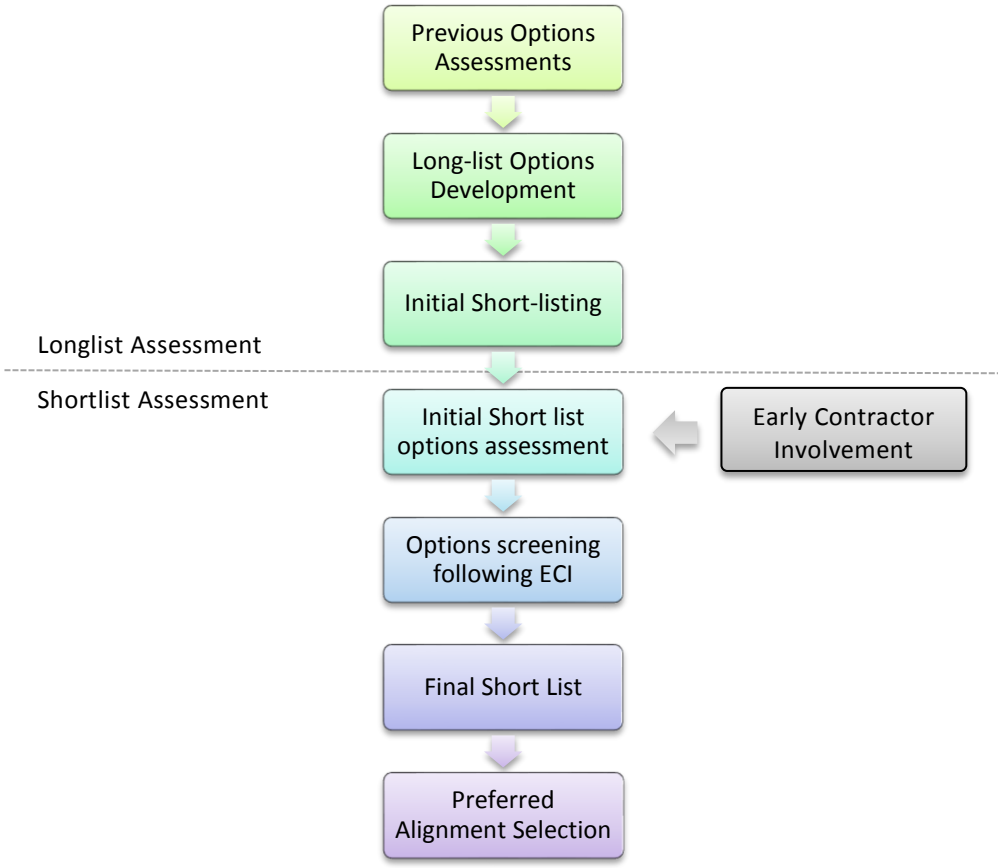


Figure 4-1: Stage 1 Options Assessment Process

A brief summary of the key activities for each stage of the assessment is provided below:

- **Previous Options Assessments** – A review of the previous option development work was undertaken. The preferred options of this previous analysis were identified and considered through the longlist process.
- **Longlist Options Development** – Consistent with the 3 broad concepts described above, 11 longlist options were identified to provide a range of alternative routes for the Project. The longlist options were developed with indicative cost estimates produced, and considered risks and opportunities.
- **Initial Shortlisting** - The longlist options were reviewed by the Project Team and evaluated in a multi-disciplinary workshop using a high level MCA.
- **Initial Shortlist Options Development** – Once the shortlist was identified, further analysis of the options was undertaken including Early Contractor Involvement ("ECI"). This was done to get early advice and involvement from a contractor into the construction methods, risks, costs,

physical impacts of construction works associated with the options, and optimisation of delivering the Project.

- **Options Screening** - A comparison of initial shortlist options after the further analysis was carried out by the Project Team. This screening exercise utilised the additional design development materials, updated cost estimates, contractor's ECI buildability and optimisation inputs and the risk assessments for the options. This produced a final shortlist of options to be adopted.
- **Final Shortlist** - The options on the final shortlist were further developed in order to facilitate a more detailed MCA assessment and updated cost estimates in order to select the preferred option.
- **Preferred Alignment Selection** –Evaluation of the final shortlist of options in a multi-disciplinary workshop using a more detailed MCA, and the selection of the preferred option (route alignment).

4.1 Development of Longlist Options

As noted above, prior to the development of the longlist options for Stage 1 of the Project, two fixed points were identified (Hobsonville PS and Rosedale WWTP). As such, a Corridor envelope was established using these fixed points as a start and end point. The corridor considered for the development of the longlist is illustrated below:

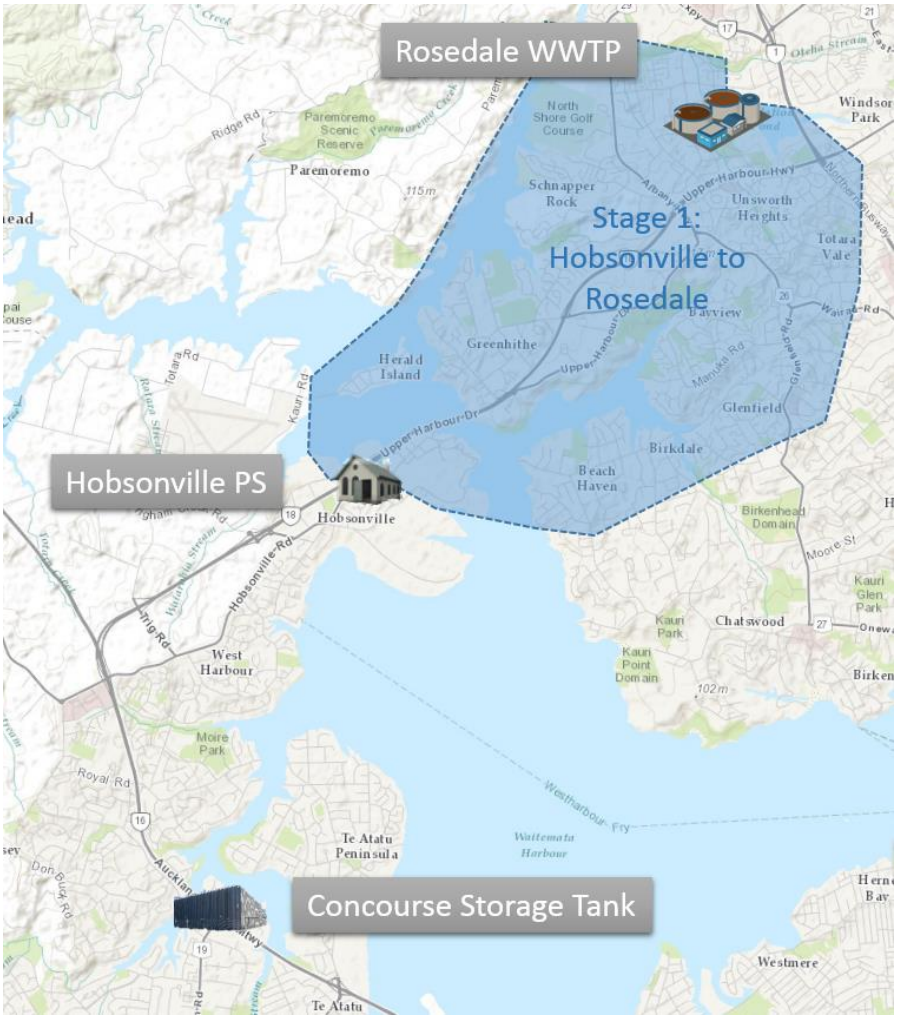


Figure 4-2: Route Envelope Adopted for Development of Longlist

Within this route envelope and adopting the broad concepts described above at 3.3, the following longlist options were identified.

4.1.1 Option 1 – Upper Harbour Drive

This option is based on the broad concept of maximising the use of roads and urban environments (Figure 4-3). From a construction perspective, the need for a crossing of the Coastal Marine Area ("CMA") at the Upper Waitemata Harbour was considered to be the most challenging aspect of this option.

For the purpose of longlist development, it is assumed that the crossing of the Harbour would be constructed by Horizontal Directional Drilling ("HDD") into the flatter coastal area north of the existing bridge as this would reduce HDD length to around 600m but would increase the overall rising main route by approximately 200m. However, early analysis also determined that a crossing to the north of the bridge would also be a preferred option for marine trenching if this technique is preferred. Construction along Upper Harbour Drive would be by micro-tunnelling. As this road runs up along the main ridgeline the micro-tunnelling needs to be very deep under this option.

This option would require new pump stations to be constructed at the Rosedale WWTP and the Concourse Storage Tank.

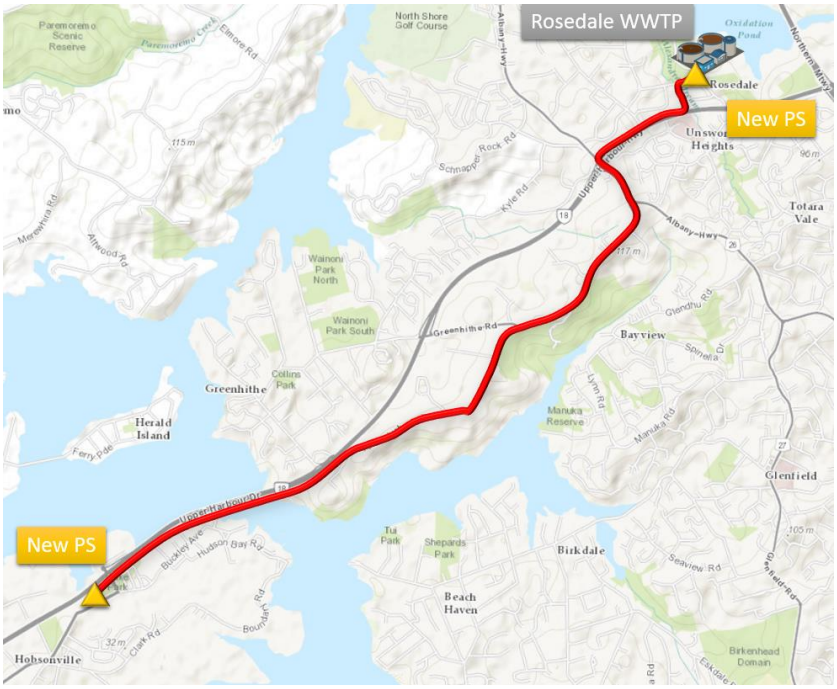


Figure 4-3: Option 1 – Upper Harbour Drive

4.1.2 Option 2 – Beach Haven Road

This option is based on the broad concept of maximising the use of roads and urban environments (Figure 4-4). This option was developed as a predominantly gravity sewer alignment on an easterly approach to Rosedale from Hobsonville. Preliminary investigations suggest that the main challenge with this alignment is likely to be the harbour crossing which is anticipated to require deep micro-tunnelling and thus increase the overall gravity sewer depth and pumping head requirements compared to other options.

For the purpose of longlist development it was assumed that the crossing of the Harbour would be constructed by marine trenching, and micro-tunnelling would be utilised along Beach Haven Road and Glenfield Road. This option would require new pump stations to be constructed near Glenfield Road and at the existing Hobsonville PS site.

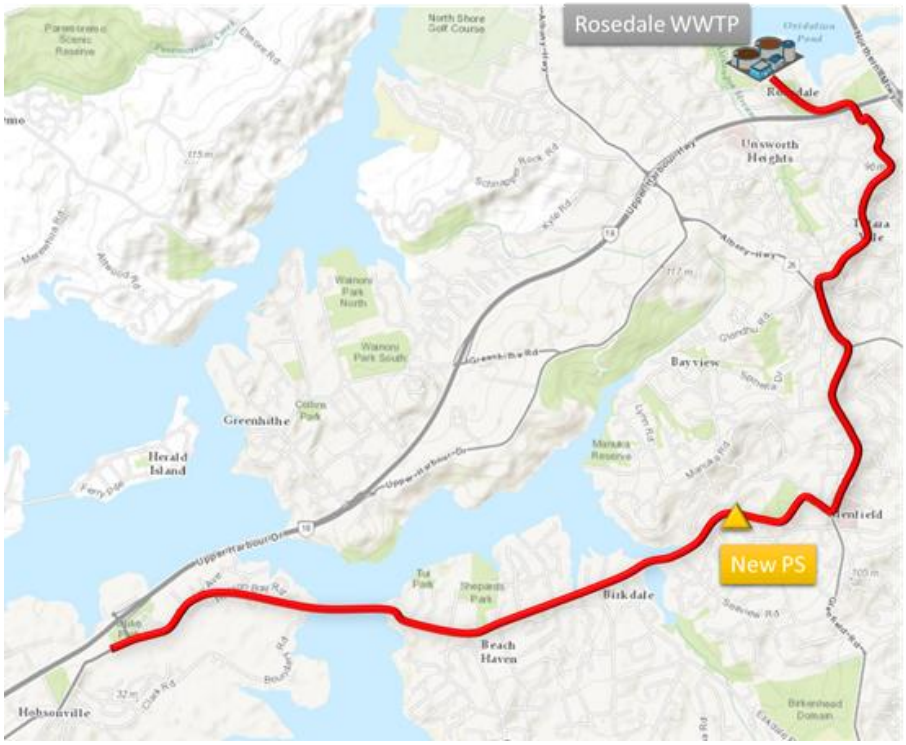


Figure 4-4: Option 2 – Beach Haven Road

4.1.3 Option 3 – Upper Harbour Highway

This option is based on the broad concept of maximising the use of roads and urban environments, and is the most direct road based alignment (Figure 4-5). From a construction perspective, the need for a crossing of the CMA and the deep gravity section along Upper Harbour Highway, were considered to be the most challenge aspects of this option.

For the purpose of longlist development it is assumed that the crossing of the Harbour would be constructed by HDD into the flatter coastal area north of the existing bridge as this would reduce HDD length to around 400m but would increase the overall rising main route by approximately 200m. However, early analysis also determined that a crossing to the north of the bridge would also be a preferred option for marine trenching if this technique is preferred.

With respect to the gravity main, it is assumed that this would be constructed by micro-tunnelling from a break pressure chamber north of the Upper Harbour Bridge to the Rosedale WWTP. This tunnel would be very deep in places (over 50m in parts), and would require micro-tunnel shafts every 250m due to the depth and jacking forces required.

This option would require new pump stations to be constructed at the existing Hobsonville PS site and the Rosedale WWTP.

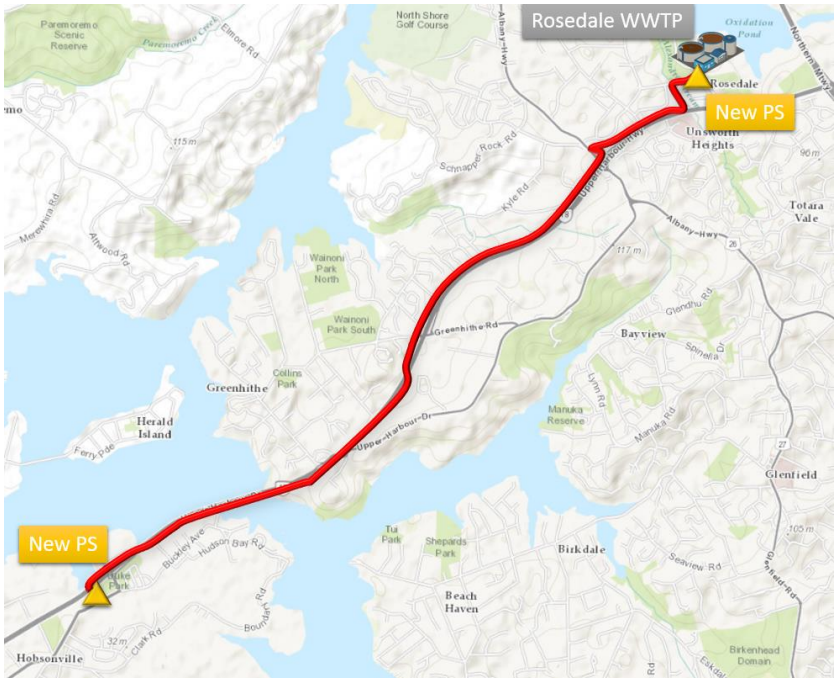


Figure 4-5: Option 3 – Upper Harbour Highway

4.1.4 Option 4 – Kyle Road

This option is based on the broad concept of maximising the use of roads and urban environments (Figure 4-6). This option is a predominantly gravity sewer alignment on a westerly approach. From a construction perspective, the need for two crossings of the CMA, the potential need to reclaim land, and the need to micro-tunnel along the existing North Harbour Water Main were considered to be the most challenging aspects of this option.

For the purpose of longlist development it is assumed that the crossing of the Harbour would be constructed by HDD. Early analysis of marine crossing options noted that a crossing in the shallow area of the harbour (across to Herald Island) may be viable to construct by marine trenching, but the channel between Herald Island and the North Shore is deep, making trenching in this area less viable.

This option would require new pump stations to be constructed at the existing Hobsonville PS site and midway along the route.

Figure 4-6: Option 4 – Kyle Road

4.1.5 Option 5 – Lucas Creek – Rising Main and Gravity Sewer

This option is based on the broad concept of avoiding the use of roads and urban environments (Figure 4-7). This option was developed to avoid the higher ridgelines to the south and east of Rosedale by cutting across to Lucas Creek and approach Rosedale from the west. From a construction perspective, the depth of micro-tunnelling through Rosedale's industrial area, the large extent of pipeline within the CMA (including Coastal Protection and Significant Ecological Areas) were considered to be the most challenging aspects of this option.

For the purpose of longlist development, it was assumed that a combination of marine trenching and HDD would be used to construct the rising main components of the pipeline within the marine areas from the north side of Herald Island up to Lucas Creek, and that micro-tunnelling would be used to install the gravity section of the pipeline to the Rosedale WWTP due to the construction depths required (over 50m) in some locations.

This option would require new pump stations to be constructed at the existing Hobsonville PS site and the Rosedale WWTP.

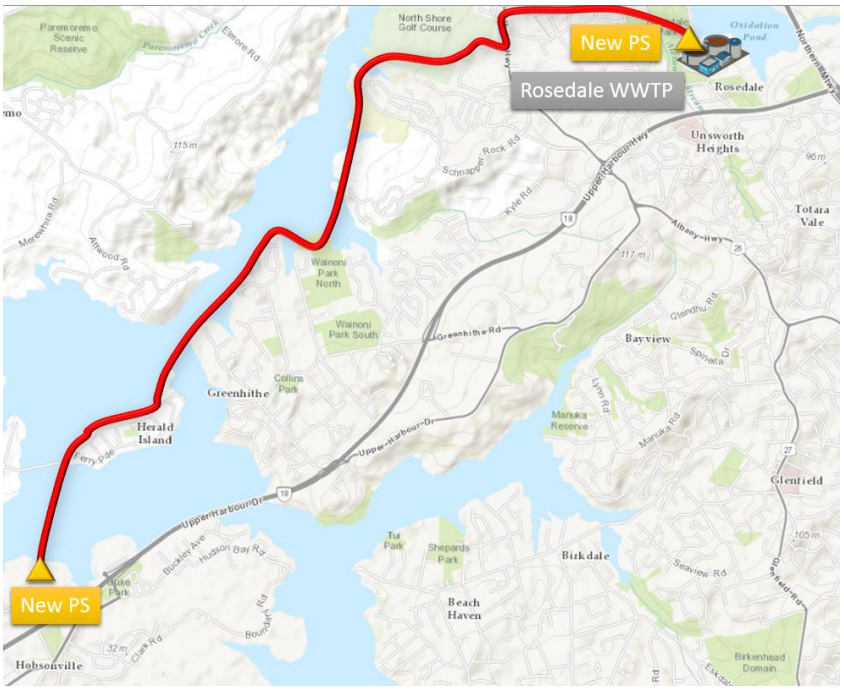


Figure 4-7: Option 5 – Lucas Creek – Rising Main and Gravity Sewer

4.1.6 Option 6 – Lucas Creek – Rising Main only

This option is based on the broad concept of avoiding the use of roads and urban environments (Figure 4-8). This option is a variation on the route above (Lucas Creek) and has been developed as entirely rising mains with no gravity sewer to minimise pipeline construction depths. From a construction perspective, the large extent of pipeline within the CMA (including Coastal Protection and Significant Ecological Areas), the odour risks due to significant retention time, and the potential impact on sites of significance along the route were identified as the most challenging aspects of this option.

For the purpose of longlist development, it was assumed that the pipeline would be constructed by open trenching techniques for both the land-based and marine crossing components. Early analysis indicated that HDD was a viable option for the marine crossing as an alternative.

This option would require new pump stations to be constructed at the existing Hobsonville PS site and midway along the route.

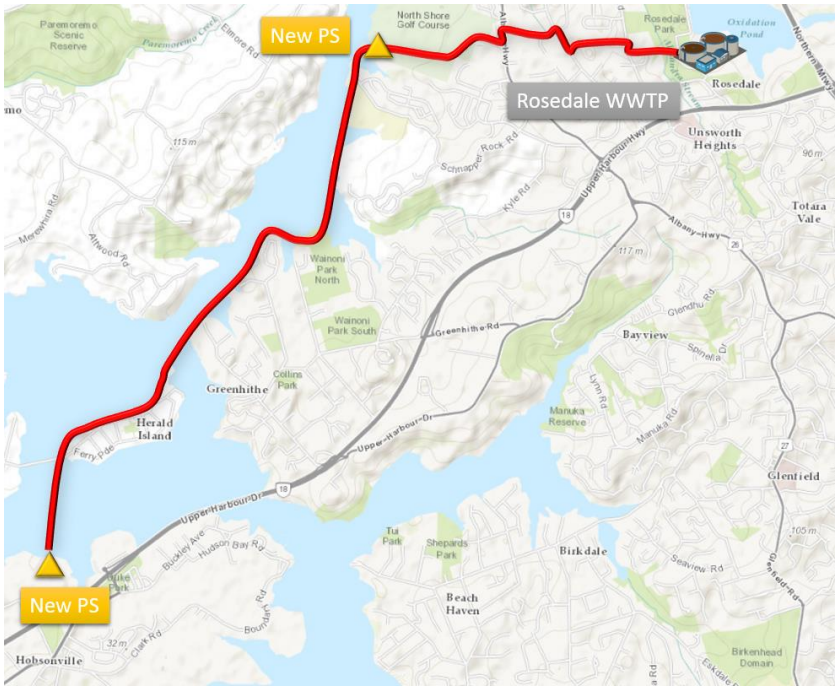


Figure 4-8: Option 6 – Lucas Creek – Rising Main Only

4.1.7 Option 7 – Deep Tunnel – Western Alignment

This option is based on the broad concept of maximising the use of deep tunnels and constitutes the use of a deep gravity tunnel direct from Hobsonville to Rosedale WWTP across the Greenhithe peninsula (Figure 4-9). From a construction perspective, the depth of the tunnel was considered to be the most challenging aspect of this option.

The western alignment was selected to maintain clearance from the Upper Harbour Highway bridge and to provide a number of suitable open space options for the location of tunnel shafts.

For the purpose of longlist development, it was assumed that the pipeline would be installed by a Tunnel Boring Machine ("TBM"). However, uncertainty with respect to changes in Health and Safety Legislation and the future requirements for additional access shafts was identified as potential risk.

This option would require a new pump station to be constructed at the Rosedale WWTP.

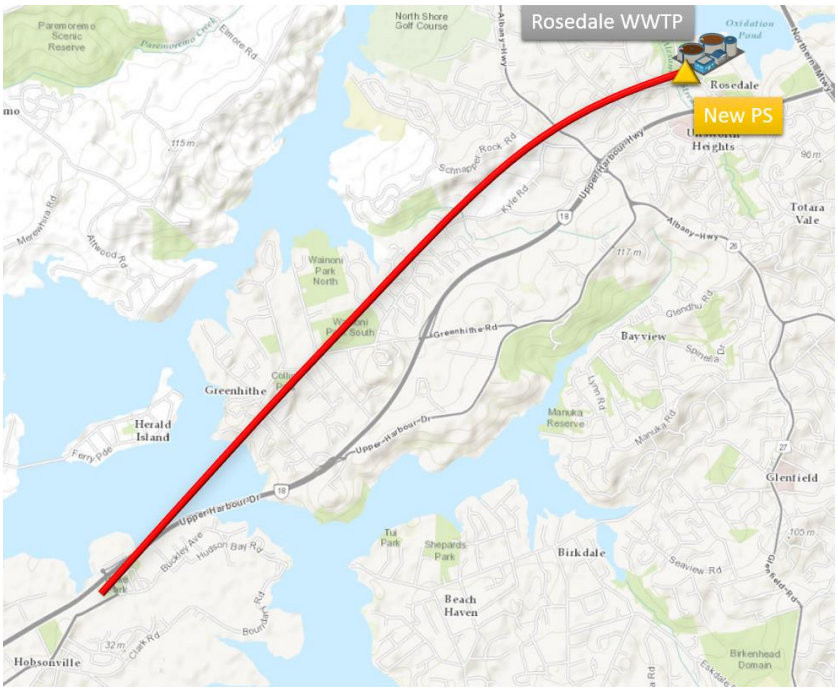


Figure 4-9: Option 7 – Deep Tunnel – Western Alignment

4.1.8 Option 8 – Deep Tunnel – Eastern Alignment

This option is based on the broad concept of maximising the use of deep tunnel and was developed as a deep gravity tunnel direct from Hobsonville to Rosedale WWTP through Beach Haven and then north up to Rosedale (Figure 4-10). From a construction perspective the depth of the tunnel, which would require tunnel shafts of between 30 to 100m, was considered to be the most challenging aspect of this option.

The eastern alignment was selected to maintain clearance from the Upper Harbour Highway Bridge and to provide a number of suitable open space options for the location of tunnel shafts. It also passes adjacent to the main wastewater pumping station at Kahika providing the opportunity to incorporate a large proportion of the lower North Shore into the scheme.

As with the option above, for the purpose of longlist development, it was assumed that the pipeline would be installed by a TBM. However, uncertainty with respect to changes in Health and Safety legislation and the future requirements for additional access shafts was identified as potential risks.

This option would require a new pump station to be constructed at the Rosedale WWTP.

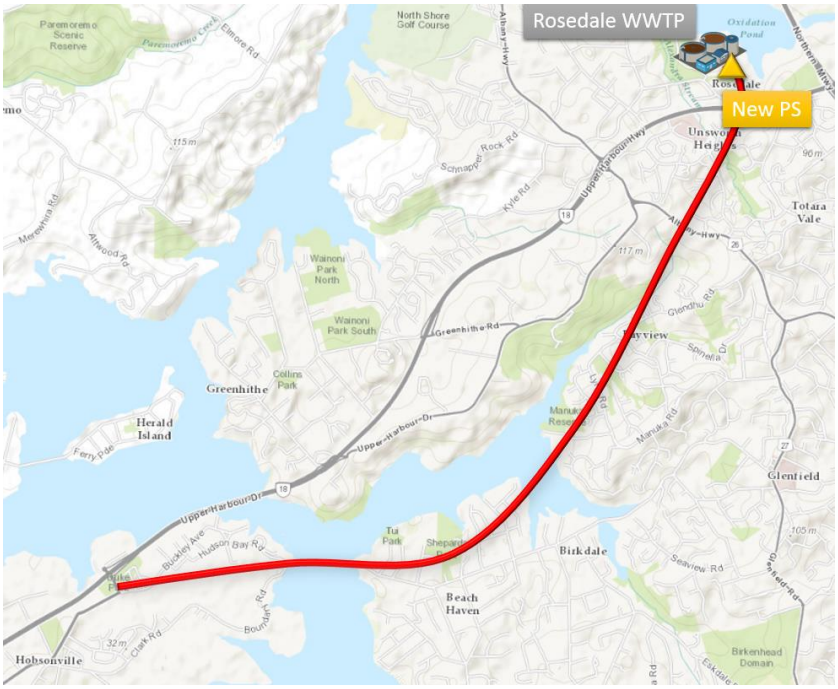


Figure 4-10: Option 8 – Deep Tunnel – Eastern Alignment

4.1.9 Option 9 – Tauhinu Road

This option is based on the broad concept of maximising the use of roads and urban environments, and combines sections from other routes (Figure 4-11). This option was developed to avoid the higher ridgelines to the south and east of Rosedale by cutting across to the upper section of Lucas Creek and approach Rosedale from the west.

From a construction perspective, the need for a crossing of the CMA was considered to be the most challenging aspect of this option. As with Option 1, for the purpose of longlist development it is assumed that the crossing of the Upper Waitemata Harbour would be constructed by HDD into the flatter coastal area north of the existing bridge.

This option would require new pump stations to be constructed at the existing Hobsonville PS site and midway along the route.

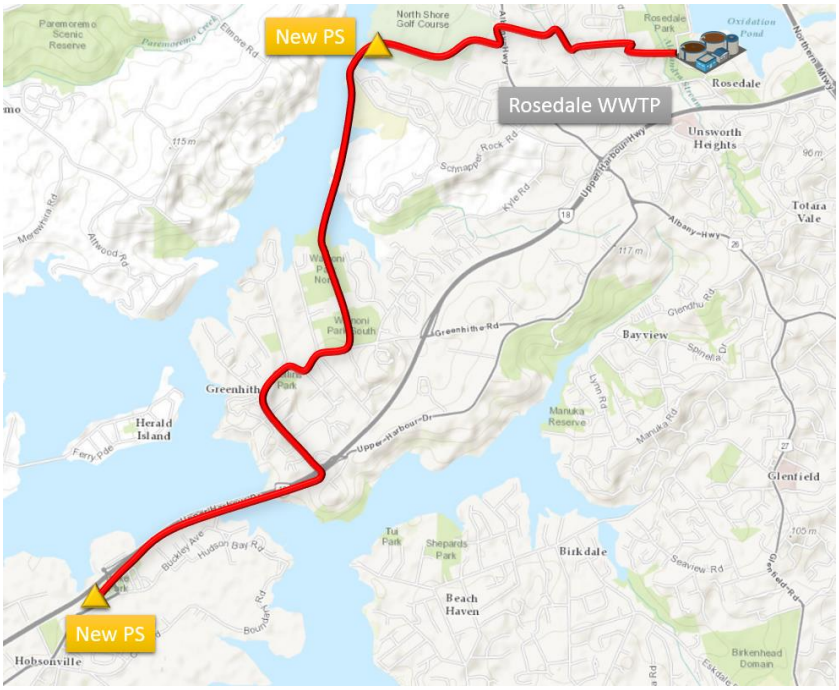


Figure 4-11: Option 9 – Tauhinu Road

4.1.10 Option 10 – Beach Haven Road – Coastal and Deep Tunnel Option

This option is based on the broad concept of avoiding the use of roads and urban environments, as well as on the broad concept of maximising the use of deep tunnels (Figure 4-12). This option was developed to maximise marine pipeline construction along an easterly approach route to Rosedale WWTP with the same alignment as proposed for option 8. Due to the height of the ridgeline along the Albany Highway a tunnel connection to the Rosedale WWTP is proposed.

For the purpose of longlist development, it is assumed that the marine crossing would be construction by marine trenching. However, due to the tidal nature of Sunset Bay (with mudflats at low tide), construction of the rising mains from Hobsonville may be feasible by HDD or trenching through the Hobsonville Point area around the top of the point.

This option would require new pump stations to be constructed at the existing Hobsonville PS site and Rosedale WWTP.

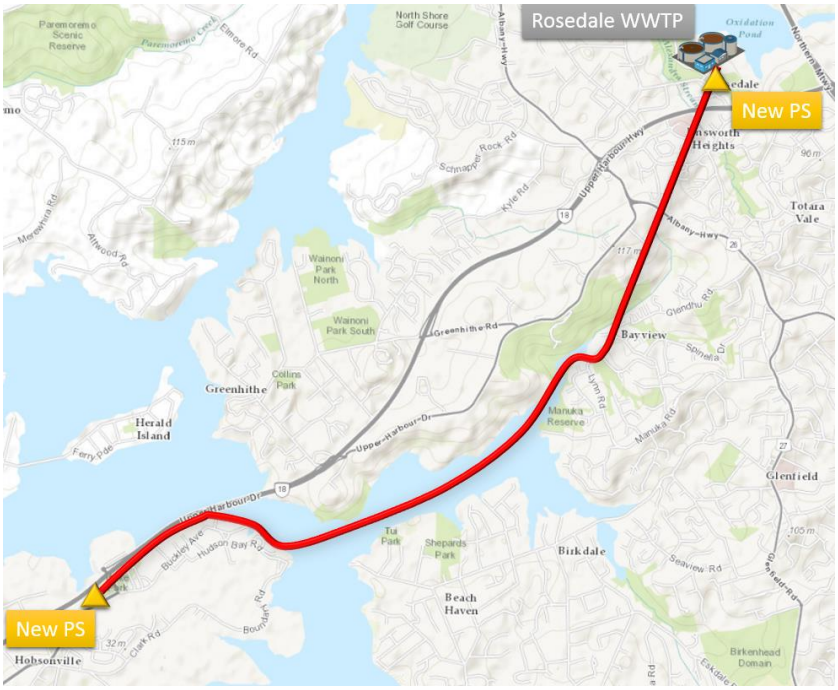


Figure 4-12: Option 11 – Beach Haven – Coastal and Deep Tunnel Option

4.1.11 Option 11 – Shallow Tunnel – Eastern Alignment

This option is based on the broad concept of maximising the use of deep tunnels, and also on the broad concept of avoiding the use of roads and urban environments (Figure 4-13: Option 12 – Shallow Tunnel – Eastern Alignment). This option was developed as a shallow tunnel option to Rosedale following an easterly alignment. The alignment provides for a new pumping station at Hobsonville with rising main to Kahika, connecting to a 3m diameter tunnel section from Kahika to Rosedale and a new pump station at Rosedale to lift flows into the WWTP.

From a construction perspective, the need to avoid existing deep gullies where the pipeline is shallow as well as the need for a crossing of the CMA, were identified as the most challenging aspects of this option.

For the purpose of longlist development it was assumed that the pipeline would be installed by a TBM. However, uncertainty with respect to changes in Health and Safety Legislation and the future requirements for additional access shafts was identified as potential risk.

This option would require new pump stations to be constructed at the existing Hobsonville PS site and Rosedale WWTP.

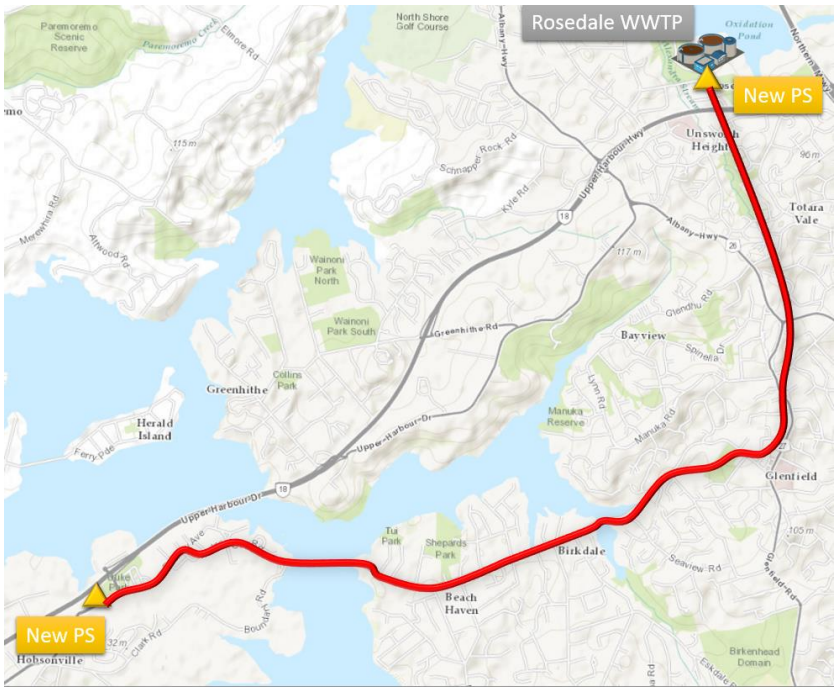


Figure 4-13: Option 12 – Shallow Tunnel – Eastern Alignment

4.2 Qualitative Risk Analysis

Upon identification of the longlist options, consideration was given to qualitative risk factors associated with each Option.

Given the concept design stage of the Project at this point, it was acknowledged that there was varying degrees of uncertainty/risk associated with the cost and non-cost attributes of the Options that could influence the consideration of alternatives process. It was determined that an awareness of the degrees uncertainty/risk was necessary in determining preferred Options. Once identified, the potential uncertainty/risk was rated and subsequently considered along with cost and non-cost attributes.

The outcomes of the uncertainty/risk analysis is summarised in the following table:

Table 4-1: Northern Alignment (Stage 1) Issues and Qualitative Risk Ratings

Option	Route	Issues Identified	Qualitative Risk Rating
1	Upper Harbour Drive	• Potential clashes with proposed route for North Harbour Watermain No.2. • Difficulty of crossing Upper Harbour Highway to get across to Upper Harbour Drive. • Depth of micro-tunnelling is at the limit of the technology and large number of very deep shafts will be required along Upper Harbour Drive	V HIGH
2	Beach Haven Road	• Micro-tunnelling risk under the Upper Harbour – uncertain ground conditions and depth to competent material. • Construction through highly trafficked areas around Beach Haven and Glenfield Road and micro-tunnelling depth close to the limit of the technology in one section	HIGH
3	Upper Harbour Highway	• NZTA conditions for construction alongside the Highway and impacts on traffic during a long construction period. • Location of existing Highway culverts may drive micro-tunnelling deeper. Depth already close to the limit of the technology in one section. • Highway fill embankments have reinforcement.	HIGH
4	Kyle Road	• Existing North Harbour Watermain is located along Kyle Road and could be damaged during construction affecting the entire North Shore. • Construction along southern coastal foreshore of Herald Island likely to be contentious.	MEDIUM
5	Lucas Creek (rising main and gravity sewer)	• Construction along northern coastal foreshore of Herald Island and through the CMA in Lucas Creek likely to be contentious. • Uncertainty associated with marine construction work.	MEDIUM

Option	Route	Issues Identified	Qualitative Risk Rating
		• Access to pipelines for future maintenance and risk of any leakage not being identified quickly.	
6	Lucas Creek (rising main only)	• Construction along northern coastal foreshore of Herald Island and through the CMA in Lucas Creek likely to be contentious. • Uncertainty associated with marine construction work. • Access to pipelines for future maintenance and risk of any leakage not being identified quickly.	HIGH
7	Deep Tunnel (western alignment)	• Very deep tunnel with shafts up to 100m deep. • No geotechnical information at this stage. • Uncertainty about tunnel depth required under the Upper Harbour. • Costs based on 3m dia TBM. Impact of new mining regulations might require this to be increased.	HIGH
8	Deep Tunnel (eastern alignment)	• Very deep tunnel with shafts up to 100m deep. • No geotechnical information at this stage. • Uncertainty about tunnel depth required under the Upper Harbour. • Costs based on 3m dia TBM. Impact of new mining regulations might require this to be increased.	HIGH
9	Tauhinu Road, Greenhithe	• Upper Harbour crossing – uncertain geology and long HDD at limit of the technology. May require marine trenching.	MEDIUM
10	Beach Haven (coastal and tunnel)	• Rising main through long reach of marine and coastal environment maybe contentious. • Costs based on 3m dia TBM. Impact of new mining regulations might require this to be increased. • No geotechnical information at this stage. • Tunnel length of 2.9km without intermediate shaft which would cost extra $15-20M depending on location.	HIGH
11	Shallow Tunnel (eastern alignment)	• Multiple large diameter rising mains through Hobsonville Point and Beach Haven will significantly affect the local communities and traffic and will be contentious. • Very long HDD crossing of the Upper Harbour which is at the limit of the technology and may need to be marine trenching. • Impacts to the operation of the Hobsonville Ferry service.	VERY HIGH

Option	Route	Issues Identified	Qualitative Risk Rating
		• Costs based on 3m dia TBM. Impact of new mining regulations might require this to be increased. • Tunnel length of 3.8km without intermediate shaft which would cost in the order of an additional $10M. • No geotechnical information at this stage.	

4.3 Multi-Criteria Analysis

Once the 11 longlist options were identified, criteria were developed by the Project Team to enable the assessment of the longlist options against an MCA process. The following table outlines the criteria and sub-criteria adopted for the MCA process:

Table 4-2: MCA Criteria and Sub-Criteria

Criteria	Operational	Technical	Environmental	Staging
Sub-Criteria	**Safety:** ability for Watercare staff to operate and maintain the works in a safe manner, includes issues such as confined spaces, working at heights, gas accumulation, accessibility etc.	**Reliability:** whether the option provides for a reliable technology with prior application and proof of performance in NZ	**Cultural/heritage:** impacts on areas of cultural or heritage significance	**Ability to be staged**
	Complexity: degree of difficulty and interdependency of the operation of the works	**Flexibility:** adaptable to change/adjustment to suit future requirements	**Natural Environment:** impacts on areas of environmental significance such as native flora and fauna, CMAs	
	Maintenance: overall requirements and frequency of maintenance activities, degree of difficulty, impacts on system performance during maintenance etc.	**Constructability:** ease of construction, availability of local contractors, need for specialist equipment or techniques	**Community:** impact on community groups and local interests through construction and ongoing operation of new assets	
	Odour/Corrosion: septicity and odour generation, noxious gases, accelerated corrosion rates due to sulphide attack	**Opportunity/benefit:** provides additional benefits beyond the base requirements for the project	**Landowners/property:** impact on individual property owners during construction and ongoing operation	

The MCA process was undertaken within a workshop Project Team. Through the MCA process:

- The workshop participants assessed each longlist option against each of the sub criteria. For each sub criteria a score of 1 - 5 was awarded based on the professional judgement of the collective workshop group. A score of 1 indicates a high risk associated with the criteria (i.e. the option will potentially fail to meet requirements), a score of 5 would indicate a low risk associated with the criteria (i.e. the option is considered reliable);
- Each criteria was weighted evenly; and
- Each longlist option was given a preliminary capital cost estimate and NPV. The capital cost estimates were developed using Watercare Unit Rate Cost Models and estimating data from the Central Interceptor and Associated Works project and the NPV determined by adding the estimated operational power costs over a 50 year period. Other operational costs were considered to be sufficiently similar for each option that they could be excluded from the analysis at this stage.

The following table summarises the northern alignment longlist options, their relative MCA score, capital cost and NPV cost. The full assessment, and comments on select criterion, is contained in Appendix A of this Report.

Table 4-3: Northern Alignment (Stage 1) Longlist Options

Ref	Route	Description	Capital Cost	Capital Cost Rank	NPV (50 year) [1]	NPV Rank	MCA Score	MCA Rank
1	Upper Harbour Drive	This option was developed as the most straightforward road based alignment outside of the motorway corridor.	$253M	5	$271M	5	2.5	9
2	Beach Haven Road	This option is a predominantly gravity sewer alignment on an easterly approach	$284M	9	$301M	8	2.56	7
3	Upper Harbour Highway	This route is the most direct road based alignment.	$246M	4	$266M	4	2.31	11
4	Kyle Road	This options is a predominantly gravity sewer alignment on a westerly approach.	$273M	8	$301M	8	2.51	8
5	Lucas Creek (rising main and gravity sewer)	This option was developed to avoid the higher ridgelines to the south and east of Rosedale by cutting across to Lucas Creek and approach Rosedale from the west.	$296M	10	$314M	10	2.38	10
6	Lucas Creek (rising main only)	This option is a variation on the route above (Lucas Creek) and has been developed as entirely rising mains with no gravity sewer to minimise pipeline construction depths.	$230M	2	$251M	2	2.88	6
7	Deep Tunnel (western alignment)	This option was developed as a deep gravity tunnel direct from	$270M	7	$284M	6	3.56	2

1

Ref	Route	Description	Capital Cost	Capital Cost Rank	NPV (50 year) [1]	NPV Rank	MCA Score	MCA Rank
		Hobsonville to Rosedale WWTP across the Greenhithe peninsula.						
8	Deep Tunnel (eastern alignment)	This option was developed as a deep gravity tunnel direct from Hobsonville to Rosedale WWTP through Beach Haven and then north up to Rosedale.	$323M	11	$338M	11	3.94	1
9	Tauhinu Road, Greenhithe	This option combines sections from other routes.	$210M	1	$234M	1	2.94	4
10	Beach Haven (coastal and tunnel)	This option was developed to maximise marine pipeline construction along an easterly approach route to Rosedale WWTP with the same alignment as proposed for option 8. Due to the height of the ridgeline along the Albany Highway a tunnel connection to the Rosedale WWTP is proposed.	$268M	6	$287M	7	2.94	4
11	Shallow Tunnel (eastern alignment)	This option was developed as a shallow tunnel option to Rosedale following an easterly alignment.	$235M	3	$252M	3	3.06	3

4.4 Identification of Shortlist Options

In comparing the MCA outcomes, capital costs and qualitative risk of each of the longlist options, the following table was developed for comparison:

Table 4-4: Summary of Outcomes Northern Alignment (Stage 1)

Option	Description	Capital Cost	Capital Cost Rank	NPV (50 year)	NPV Rank	MCA Score	MCA Rank	Qualitative Risk
1	Upper Harbour Drive	$253M	5	$271M	5	2.5	9	V HIGH
2	Beach Haven Road	$284M	9	$301M	8	2.56	7	HIGH
3	Upper Harbour Highway	$246M	4	$266M	4	2.31	11	HIGH
4	Kyle Road	$273M	8	$301M	8	2.51	8	MEDIUM
5	Lucas Creek (rising main and gravity sewer)	$296M	10	$314M	10	2.38	10	MEDIUM
6	Lucas Creek (rising main only)	$230M	2	$251M	2	2.88	6	HIGH
7	Deep Tunnel (western alignment)	$270M	7	$284M	6	3.56	2	HIGH
8	Deep Tunnel (eastern alignment)	$289M	11	$338M	11	3.94	1	HIGH
9	Tauhinu Road, Greenhithe	$210M	1	$234M	1	2.94	4	MEDIUM
10	Beach Haven (coastal and tunnel)	$268M	6	$287M	7	2.94	4	HIGH
11	Shallow Tunnel (eastern alignment)	$235M	3	$252M	3	3.06	3	VERY HIGH

Following on from the MCA process, capital cost analysis and the Qualitative Risk Assessment, a shortlist (northern shortlist) of 4 options were identified. These are shown in Table 4-5. The full assessment, and comments on select criterion, is contained in Appendix A of this Report.

Table 4-5: Shortlisted Options for the Northern Corridor (Stage 1)

Option	Description	Capital Cost	Capital Cost Rank	NPV (50 year)	NPV Rank	MCA Score	MCA Rank	Qualitative Risk
8	Deep Tunnel (eastern alignment)	$289M	11	$338M	11	3.56	1	HIGH
9	Tauhinu Road, Greenhithe	$210M	1	$234M	1	2.94	4	MEDIUM
6	Lucas Creek (rising main only)	$230M	2	$251M	2	2.88	6	HIGH
3	Upper Harbour Highway	$246M	4	$266M	4	2.31	11	HIGH

The shortlisted options were selected on the following basis:

- Option 8 was taken forward because it has the highest overall MCA score of all options. It has the ability to be staged with the section from Hobsonville to the Kahika PS being constructed first. Ultimately this option will enable the Kahika Pump Station to be decommissioned and provides the opportunity to relieve a number of trunk sewers on the lower North Shore. Being a deep tunnel it was assessed as having a high level of risk;
- Option 9 was selected as it has the lowest overall capital and NPV cost and ability to stage the work through construction of one rising main initially. It has the highest MCA score of the options that maximise the use of road corridors and open green space and the highest MCA score of all the options which do not include a deep tunnel. It was assessed as having a medium level of risk;
- Option 6 was selected as it has the second lowest overall capital and NPV cost and ability to stage the work through construction of one rising main initially. It has the highest MCA score of options that maximise the use of the coastal and marine environment and the second highest MCA score of all the options which do not include a deep tunnel. It was assessed as having a high level of risk;
- Option 3 was retained for ongoing project consistency and comparative purposes. On balance of costs, MCA score and risks it was considered to be the preferred option out of Options 1, 2 and 3 which were the three original route options identified as part of the initial work for the Northern Interceptor undertaken by Watercare; and
- The shortlisted options provide a representative range of alternative alignments and pipeline types (gravity v. pumped and tunnel v. pipeline) and as such are considered to align with the concept of retaining flexibility in terms of the broad conceptual options.

Table 4-6 summarises the reasons behind discarding the longlist options.

Table 4-6: Discarded Northern Alignment (Stage 1) Longlist Options

Option	Description	Reasons for discarding the option
1	Upper Harbour Drive	One of the three potential options (Options 1, 2 and 3) that could be carried forward for ongoing comparative purposes. Very high risk associated with the depth of the micro-tunnelling work offset the differences in MCA score and NPV costs compared to Option 3
2	Beach Haven Road	One of the three potential options (Options 1, 2 and 3) that could be carried forward for ongoing comparative purposes. Option 2 has a 13% higher NPV cost but only 11% higher MCA score than Option 3 with a similar qualitative risk
4	Kyle Road	This option maximises the use of road corridors and open space but offers no advantage over Option 9 which has a lower NPV cost and a higher MCA score
5	Lucas Creek Rising Main and Gravity Sewer	This option maximises the use of the coastal and marine environment and has a lower qualitative risk than Option 6 but has a significantly higher NPV cost and lower MCA score than Option 6
7	Deep Tunnel (Western Alignment)	Whilst this deep tunnel option has a 7% lower NPV cost than the preferred deep tunnel option (Option 8), it has an 11% lower MCA score with a similar qualitative risk
10	Beach Haven (coastal and tunnel)	This option was a combination of deep tunnel and shallow pipeline maximising the use of the coastal and

Option	Description	Reasons for discarding the option
		marine environments. This option has a 6% lower NPV cost but a 34% lower MCA score than the preferred deep tunnel Option 8 and a 14% higher NPV cost and only 2% higher MCA score than the preferred coastal and marine Option 6
11	Shallow Tunnel (eastern alignment)	This option maximises the use of road corridors and open space but has a 8% higher NPV cost with only a 4% higher MCA score and a substantially higher qualitative risk than the preferred Option 9

The four shortlisted options were then taken forward for further development and ECI to allow further refinement of the shortlist and subsequently selection of a preferred option. The outcome of this shortlist assessment process is outlined below.

4.4.1 Shortlist Options

Once the preferred shortlist options were identified, further more detailed analysis was undertaken to identify the preferred option. The following figure summarises the shortlist investigation process.

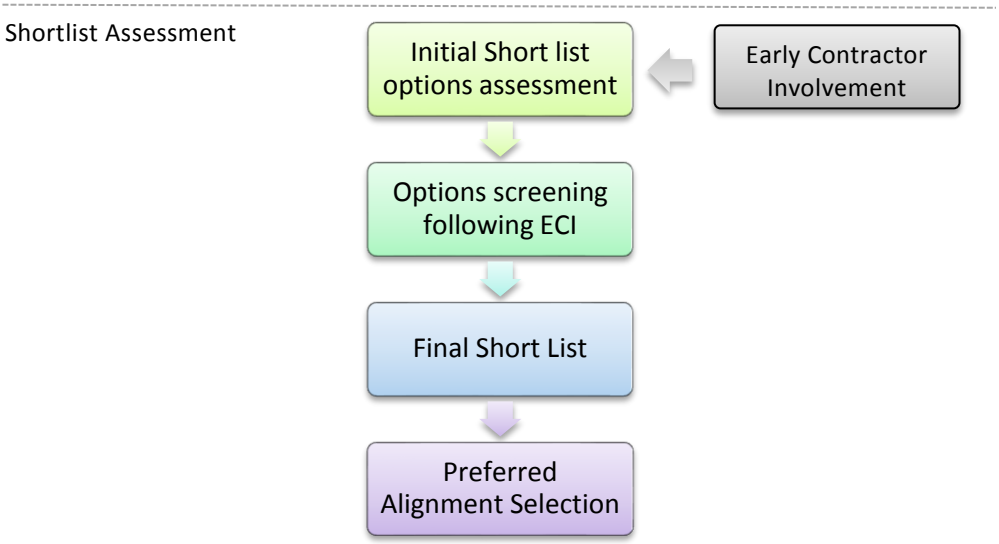


Figure 4-14: Shortlist Development Process

4.4.1.1 Initial Shortlist Option Assessment and ECI Input

The shortlisted options identified through the longlist MCA process were further developed in order to select a preferred route. This development process included:

- Further consideration of forecast growth rates and a review of overall option sizing;
- Preliminary siting of main components;
- Review of alignments for access and constructability; and
- Updating of cost estimates.

Following this further refinement process ECI was sought. The purpose of the ECI was to seek contractor advice on construction methods, potential risks and estimated capital costs. The ECI comprised:

- Briefing/preliminary workshop to review the project; and
- A further workshop to discuss potential methodologies and costs.

These two processes resulted in some modifications to the shortlist options and the identification of advantages and disadvantages of each option. The following table summarises the modifications to the shortlist options and the advantages and disadvantages of each shortlist option that developed from the further detailed investigations and ECI inputs.

Table 4-7: Summary of Modifications Advantages and Disadvantages of Northern Alignment (Stage 1) Shortlist Options

Shortlist option	Finding of further investigations and ECI input	Modifications to the option	Advantages	Disadvantages
Option 3 - Upper Harbour Highway	• Risks with proposed HDD length. Likely that special equipment will need to be imported. • Working within the highway corridor would require the installation of entry and exit gates through the highway barrier systems to facilitate access. It is understood that the highway fill embankments may include reinforcement; HDD and micro-tunnelling would not be suitable through reinforced embankments and therefore the pipeline would need to be outside of any embankments or clearly pass underneath. • Proposed shaft depths will be very costly in terms of time and money.	• Alignment adjustments along the upper harbour highway to facilitate micro-tunnel shaft locations • Increased spacing between jacking pits (shaft locations) • Revised alignment at the northern end through the commercial area and into Rosedale WWTP to reduce depth of pipework, suit construction and the proposed NZTA works at Rosedale WWTP • Development of the proposed Hobsonville pumping station site arrangement.	• Provision of storage prior to Rosedale WWTP, allowing for both flow management and emergency storage • Limited length of rising main, which would suggest reduced septicity in the wastewater flows received at Rosedale WWTP • It is the option with the least number of potentially affected stakeholders • It is the option with the lowest expected impact on the community from environmental, social, cultural and economic viewpoints.	• Limited staging potential resulting in high up-front expenditure • Deep gravity sewer section within highway corridor resulting in highly restricted access • Gravity sewer on very flat grade to limit depth of terminal pumping station at Rosedale WWTP • Challenging HDD section across the Upper Harbour.
Option 6 - Lucas Creek (rising main only)	• Either open trenching or directional drilling could be used for the Hobsonville to Herald Island section of rising main. Trenching would provide better grade control and two different methods for the construction were proposed,	• The pipeline across Herald Island has been relocated to the northern road alignment rather than foreshore due to private moorings and the presence of relatively hard material along the	• Lower capital cost than Option 3 • The alignment is suited to installing a small diameter start-up pipeline	• A longer length of rising main is required compared with other options, which increases potential septicity and odour risks at the booster pumping station site

Shortlist option	Finding of further investigations and ECI input	Modifications to the option	Advantages	Disadvantages
	one of which offered a lower cost method but with potential for significant environmental impacts. • For the rising main on the north of Herald Island it would be possible to trench along the foreshore, however there are a number of small jetties that would need to be removed or the pipeline alignment moved further from the shore to avoid these. Construction within the existing roadway would offer easier construction and have a lower cost than construction in the foreshore. • A directional drilled pipe is a practical option for the main channel crossing. Trenching this crossing would only be possible if the channel floor is East Coast Bays Formation (ECBF) material. If the channel floor is ECBF then a pipe could be laid straight on the channel floor, weighted down and covered with rock armouring. • Construction along Lucas creek could be trenched, as much of the foreshore appears to be ECBF. Alternatively, directional drilling could be undertaken	shoreline which would slow open cut construction. • Potential for construction using long HDD lengths rather than marine trenching along Lucas Creek to reduce environmental impacts. Landing sites for each length of HDD pipeline would be required which would be used for locating permanent air valves.	• Some potential for staging • Shallow pipe depths facilitate both construction and ongoing maintenance • Offers the ability to service some of the Greenhithe area via injection of flows into the rising main.	and at Rosedale WWTP • There are numerous potentially affected stakeholders • Construction is proposed through potentially sensitive park and coastal areas • Challenging construction within a marine environment.

Shortlist option	Finding of further investigations and ECI input	Modifications to the option	Advantages	Disadvantages
	working from points near the foreshore.			
Option 8 - Deep Tunnel (eastern alignment)	• The tunnel would be constructed by an earth pressure balance (EPB) TBM installing concrete segments. A finished tunnel size of at least 3.5m has been proposed. A minimum installation grade of 1 in 1000 can be achieved. • There is no potential for staging development of the tunnel to match flow progression. • Construction of the tunnel would not be weather dependant.	• Preferred construction and permanent access shaft locations were identified • Depth of the inlet pumping station at Rosedale WWTP was determined to be at least 80 m due to the depth of tunnel for the harbour crossing.	• The deep tunnel would minimise impacts on the community and environment • Gravity flow would reduce the risk of septicity and odours at Rosedale • Ease of operation • A deep tunnel provides emergency and balancing storage for Rosedale WWTP • Construction would not be weather dependent.	• Deep sections of tunnel with restrictive access for maintenance • High capital cost • Little ability to stage works effectively.
Option 9 - Tauhinu Road, Greenhithe	• Risks with proposed HDD length. Likely that special equipment will need to be imported. • Construction along Lucas creek could be trenched, as much of the foreshore appears to be ECBF. Alternatively, directional drilling could be undertaken working from points near the foreshore. • This option would require less construction activity in the	• Adjustments to the rising main alignment on the northern side of the upper harbour crossing with the break pressure tank being moved from Tauhinu Road back to chainage 2350m (i.e. same location as proposed for Option 3) • A deeper gravity sewer proposed along Tauhinu Road in place of the previously proposed twin rising mains to reduce the overall pumping lift required at	• Lower capital cost than Option 3 • The alignment is suited to installing a small diameter start-up pipeline • Some potential for staging • Shallow pipe depths facilitate both construction and ongoing maintenance	• A longer length of rising main is required compared with other options, which increases potential septicity and odour risks • There are numerous potentially affected stakeholders • Construction is proposed through

Shortlist option	Finding of further investigations and ECI input	Modifications to the option	Advantages	Disadvantages
	coastal environment than option 3.	Hobsonville and avoid having a long falling section of rising main • micro-tunnelling is proposed through Wainoni Park • Minor alignment adjustments through the commercial area to suit recent property developments • Addition of a pipe bridge across a deep gully in Rosedale Park which could include a public footbridge • Addition of a balancing tank at the inlet of Rosedale WWTP to reduce inlet works impacts from stop-start pumping flows • Development of the proposed Hobsonville pumping station site arrangement.	• Offers the ability to service some of the Greenhithe area via the gravity sewer section or injection into the rising main.	potentially sensitive park and coastal areas • Challenging HDD section across the Upper Harbour.

4.5 Comparative Costs

Preliminary capital cost estimates for the shortlist options were further developed from a range of sources including the Watercare Unit Cost database, escalated tender prices from the South West Interceptor and the Kohimarama Storage Tank and additional cost information provided by Fletchers and McConnell Dowell.

The median capital cost estimates are shown in the table below. In summary:

- Option 9 has the lowest estimated capital cost; and
- Option 8 has the highest estimated capital cost.

Table 4-8: Comparative Cost Summary – Estimated Costs

Costs	Option 8	Option 9	Option 6	Option 3
Median Capital Costs Estimate $M	$292	$199	$208	$229

4.6 Initial Screening Process

Following on from the above process, further comparison of the four shortlist options was carried out by the Project Team. This screening exercise utilised the additional design development materials, updated cost estimates, contractor's ECI inputs and the earlier Qualitative Risk Assessments for the options. The Project Team concluded that:

- The estimated capital costs used in the shortlisting process were reasonable and are generally in line with the ECI estimates;
- There remains uncertainty in the forecast growth rates for the Service Catchment due to the potential impacts of the PAUP and the development of Special Housing Areas ("SHA") and as such the ability to stage the Northern Interceptor works is of significant importance;
- The MCA score for Option 8 is 34% higher than for the lowest cost Option 9 but the capital cost is 46% higher and the Qualitative risk is higher. Being a full length tunnel, Option 8 cannot be effectively staged as was evidenced with the discarding of Option 11. Therefore, Option 8 is not a preferred option;
- Options 6 and 9 both approach Rosedale WWTP from the west and with the further design development now have quite similar costs. Option 9 still has a slightly lower cost and has a higher MCA score and lower overall risk. Therefore Option 6 is not a preferred option; and
- With regards to Option 3, through the ECI engagement process it was identified that this option may have significantly lower capital cost than initially estimated. One Contractor estimated the capital cost to be in the range of $50m less than the cost identified in Table 4-8 above. As such it was determined that Option 3 should be further developed alongside the most favoured route alignment Option 9.

Therefore Options 3 and 9 were selected as the alignments for further design development and MCA assessment.

4.7 Preferred Option Selection

The preferred option was selected comparing the shortlist options through the use of an MCA tool and comparing preliminary capital costs.

The MCA criteria were evenly weighted and the MCA scores were discussed and agreed at a workshop attended by the MWH Project team and wider Watercare participants. Each assessment point was given a score from 1 to 5, with the lower scores representing better outcomes. These scores were then averaged to give a total MCA score for each option. The MCA framework is as follows:

Table 4-9: MCA Criteria and Basis of Assessment (Northern Alignment, Stage 1)

Assessment Framework		Basis for Assessment
Functionality	Baseline requirements	Options consistent with the Three Waters Strategy, particularly the future utilisation of treatment capacity Rosedale vs Mangere, providing for increasing network capacity to **service** growth the North West Transformation Area ("NWTA"), Kumeu, Huapai, Riverhead ("KHR"), Northern Waitakere catchments and South Rodney areas
		Capacity to **support** growth and development in the North West Transformation Area ("NWTA"), Kumeu, Huapai, Riverhead ("KHR"), Northern Waitakere catchments and South Rodney areas
	Additional requirements	Ability to intercept catchments and allow the decommissioning of local pump stations
		Ability to delay or replace local and wastewater network upgrades
		Provide benefit or alignment with other utilities or public services

Assessment Framework		Basis for Assessment
Operational & Maintenance		Site location and space available for on-going operational and maintenance access requirements (e.g. at shaft sites)
		Site appropriately buffered from surrounding community
		Provides for future operational flexibility (e.g. how easy will it be to deal with a significant increase in flow)
Constructability		Potential for construction risks that may hold up, stop or adversely affect construction time
		Ability for construction techniques to be delivered by a number of Contractors allowing competitive tenders to be obtained
		Potential for construction risks that result in significant cost overruns
Assessment of Environmental Effects	Environmental	Potential construction impacts on coastal and freshwater quality
		Potential construction effects on terrestrial ecosystems. Sites located in close proximity to SEA-Land and/or riparian margins will have a greater impact on habitats, flora fauna
		Potential effects on protected trees during construction
		Potential construction effects on landscape/neutral character values, and their ability to be mitigated
		Potential construction on coastal ecosystems. Construction activities that are near to the CMA and/or are within the CMA (e.g. marine trenching) will have a greater impact on coastal ecosystems
		Sensitivity of ecosystems from operational overflow discharges. Assume dilution and dispersion is better at the head of creeks in the CMA
	Social	Distance from site to arterial road for operational and maintenance purposes
		Likelihood of adverse effects on local roads resulting from construction activities
		Operational effects on residential properties with line of sight of permanent structures e.g. pump stations). This includes effects relating to visual amenity, noise, and odour
		Impact to neighbouring properties within 200m of construction sites resulting from construction activity (visual, dust noise, odour, traffic)
		Short-term impact on community facilities resulting from construction activities (e.g. reduced access to community facilities (e.g. Beach, sports club, community hall, playground, etc.)
		Proximity of construction activities to sensitive community facilities (e.g. School, play centre, medical facility) located on likely construction traffic route

Assessment Framework		Basis for Assessment
		Extent to which construction works will reduce access to parks and reserves when considering the ability to operate parks/reserves 'as usual' during construction, and the amount of reserve required for construction activities. This considers the sensitivity of the users of the reserve (e.g. North Shore Memorial Park and mourners)
		Effects arising from potential operational odour discharges (e.g. at break pressure chamber sites and pump station sties)
		Impact to neighbouring properties from operation and maintenance activity (includes visual, dust, noise, odour, traffic) and risk of operational failures
		Number of properties above the centreline of the pipeline
	Cultural	Potential impacts waahi tapu sites identified in District Plan and impact on heritage and traditional sites for Mana Whenua
		Effects on mauri of waterbodies through wastewater overflows
		Impact on cemetery (as an urupā)
	Economic	Excavations in alluvium with risk of settlement of sensitive structures
		Number of private property purchases required to facilitate the construction of the pipeline
		Potential for short-term business disruption during construction
		Disruption to existing services and utility providers
		Energy use required for operating the facility (pump stations sties)

The results of the MCA assessment are summarised in Table 4-10 below. As noted above, lower scores represent the better outcome and scores that are within 0.3 of each other are considered to score equally. Whilst the options have different impacts associated with each of the criteria, overall the total scores are almost the same for each.

Table 4-10: MCA Score Summary (Northern Alignment, Stage 1)

MCA Criteria		Option 3	Option 9
Functionality		2.9	2.4
O&M		3.0	2.0
Constructability		3.2	2.7
Assessment of Environmental Effects	Environmental	2.2	2.8
	Social	2.1	3.3
	Cultural	2.0	3.0

MCA Criteria		Option 3	Option 9
	Economic	2.8	3.4
	TOTAL	2.6	2.8

4.8 Final Shortlist Development

The two options on the final shortlist were developed in further detail in order to facilitate a more detailed MCA assessment taking into account the impacts during construction and ongoing operation of the assets. The development process included:

- Identification of location of key services and assets that may influence the design;
- Detailed inspection of full pipe route, with particular attention for location of key assets such as pump stations, shafts and receiving pits;
- Identification of initial locations for micro-tunnelling shafts and for establishment of HDD equipment;
- Meeting with ECI contractors to further discuss constructability issues and construction rates;
- Preparing full alignment plan and sections for both options;
- Using a multi-criteria analysis to assess non-cost option attributes; and
- Refinement of cost estimates based on alignment modifications and revised construction rates.

Preliminary capital cost estimates for the options were further developed and then compared as part of the selection process. The comparative assessment of the cost estimates found:

- Option 9 has the ability to initially defer approximately $50M of works whilst for option 3 this is approximately $23M;
- Based on the higher cost range the differences in capital cost estimates become more significant with option 3 ($320M) being circa $35M higher than option 9 ($285M); and
- Operating costs for the options are not substantially different. Chemical dosing costs for all options are expected to be similar. Power costs for option 3 are approximately 25% lower than for option 9 due to the lower overall pump head required. On an NPV basis, the overall difference in power costs is expected to be less than $3M in total through to 2060.

4.8.1 Preferred Option

The MCA scores and cost estimates for the options were compared and a preferred option agreed by the Project team. The comparison concluded that there are negligible differences in the MCA scores for the non-price attributes. However there is a significant difference between the capital costs with Option 9 - Tauhinu Road, Greenhithe, offering a lower capital cost and greater potential for staging of works compared to Option 3 –Upper Harbour Highway (Table 4-11).

Therefore Option 9 is preferred in comparison with Option 3 alignment for the Hobsonville to Rosedale WWTP works.

Table 4-11 below, provides a summary of the results.

Table 4-11: Summary of MCA Scores and Cost Estimates (Northern Alignment Options)

Option	Description	Capital Cost	MCA Score	Overall MCA Rank
Option 3	Upper Harbour highway	$246.5M - $252.8M	2.6	1
Option 9	Tauhinu Road – Base Option	$231.0m	2.8	2

5 Southern Corridor Development: Concourse to Hobsonville

Figure 5-1: illustrates the options assessment process undertaken for Concourse to Hobsonville (Stage 2) of the Project. This assessment process is slightly different to that undertaken for Stage 1 in that a second round of ECI inputs was not required. The Contractor inputs from Stage 1 which included advice on constructability issues and costs were able to be directly applied during the longlist options development and initial shortlisting as such it should be noted that whilst ECI is not identified in the following flowchart, it was undertaken through Stage 1 and is directly relevant to and has informed Stage 2.

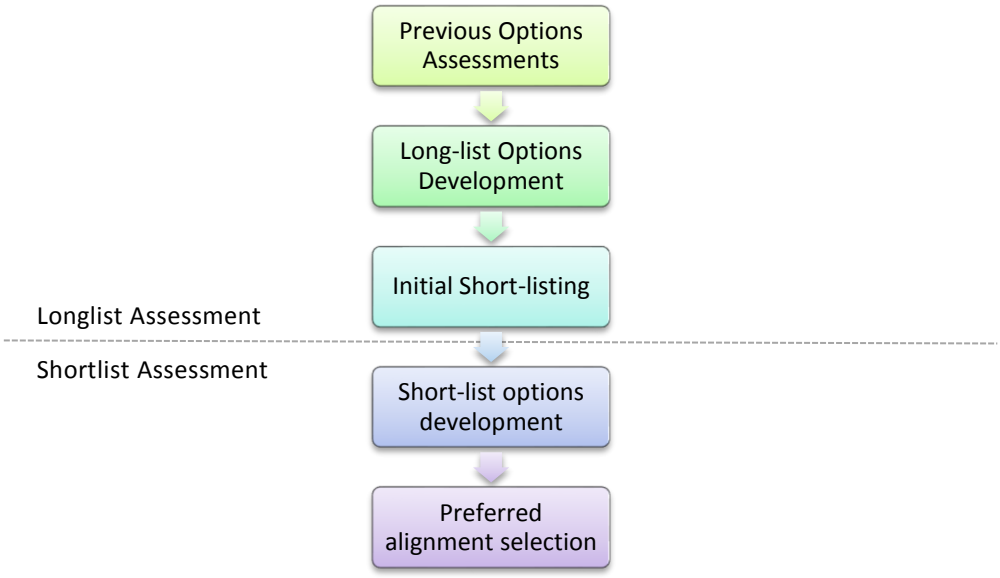


Figure 5-1: Stage 2 Options Assessment Process

A brief summary of the key activities for each stage of the options assessment is provided below:

- **Previous Options Assessments** – A review of the previous option development work undertaken by Watercare was undertaken. The preferred options of this previous analysis were identified and taken forward for consideration through the longlist process.
- **Longlist Options Development** –13 longlist alternative routes were developed with indicative cost estimates produced and risks and opportunities associated with their implementation.
- **Initial Shortlisting** - The longlist options were reviewed by the Project Team and evaluated in a multi-disciplinary workshop using a high level MCA.
- **Initial Shortlist Options Development** – The options on the initial shortlist were further developed through a review of overall sizing, siting of main components, development of overall route alignments and longitudinal sections, assessment of likely construction methods, major risks and estimated capital costs using cost data developed for the longlist supported with construction rates supplied through the Early Contractor Involvement ("ECI") process.
- **Shortlist options development** - The options on the initial shortlist were further developed through a review of overall sizing, siting of main components, review of alignments, and through discussions with Contractors on construction methods, major risks and estimated capital costs.

- **Preferred Alignment Selection** - Selection of the preferred option was carried out at a MCA workshop. The options were assessed using a more detailed project-specific MCA tool with additional consideration of the estimated option costs.

5.1 Development of Longlist Options

As noted previously, prior to the development of the longlist options for Stage 2 of the Project, two fixed points were identified (Concourse Storage Tank and Hobsonville PS). As such, a route envelope was established using these fixed points as a start and end point. The corridor considered for the development of the longlist is illustrated below:

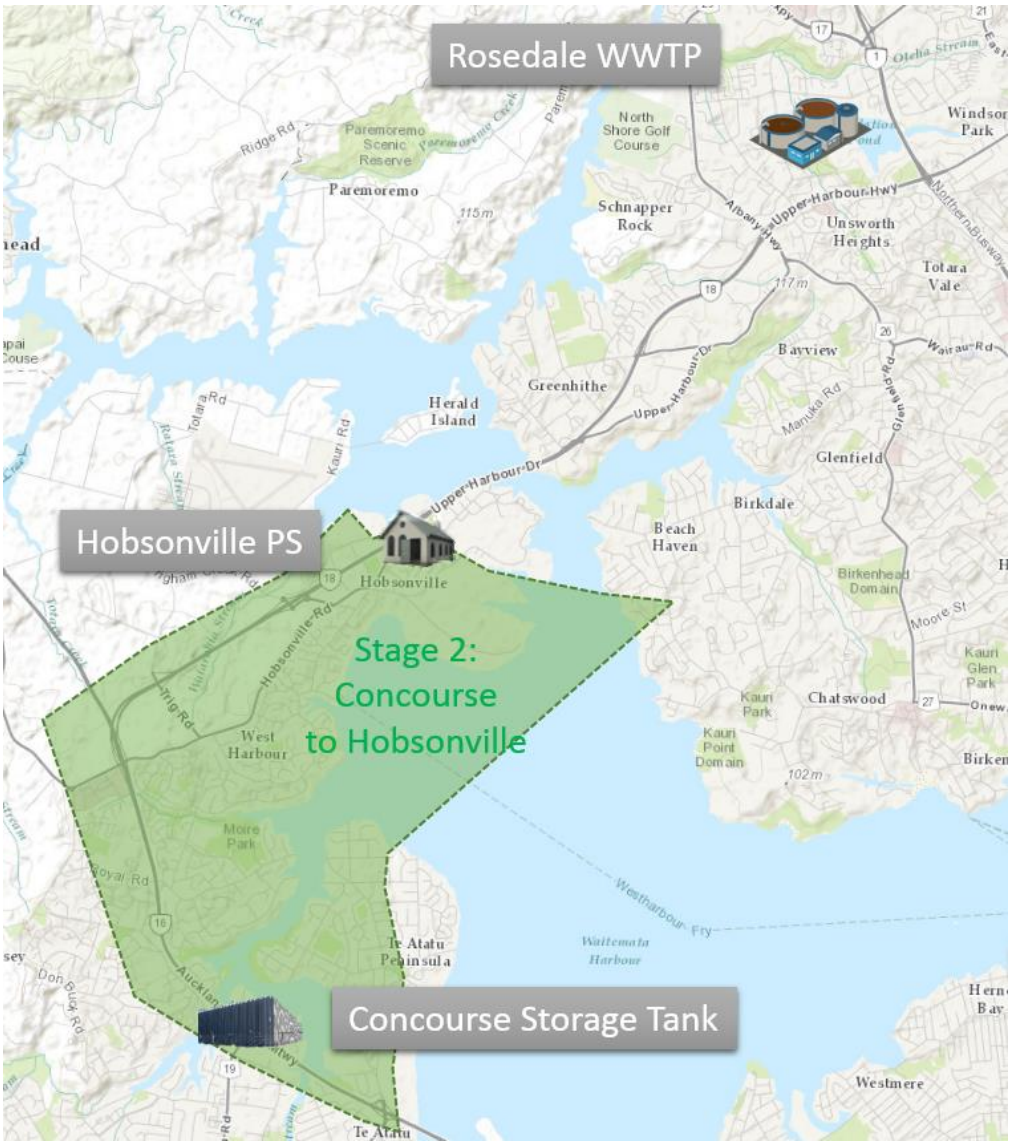


Figure 5-2: Route Envelope Adopted for Development of Longlist

Within this Corridor and adopting the broad concepts described above at Section 3.3, the following longlist options were identified.

5.1.1 Option 1 – Te Atatu Road

This option is based on the broad concepts of maximising the use of roads and urban environments for the first component of works (to Luckens Point), an on the broad concept of avoiding urban environments for the second component, from Luckens Point to Limeburners Bay (Figure 5-3). This option is considered to be the most straightforward alignment for the Concourse to Hobsonville section of the project.

From a construction perspective, the need for a crossing of the CMA over long distances, the potential impacts on the coastal environment, and the poor ground conditions near the existing marina were considered to be the most challenging aspects of this option.

For the purposes of this option it is assumed that the rising main from Concourse will cross Henderson Creek using HDD through to KunWoo Park/Rutherford College, and then be trenched along Toru Street and Te Atatu Road. The crossing of the harbour and the alignment through to Hobsonville PS will be micro-tunnelled. At 500m long the crossing of the harbour is seen as the greatest challenge and may require some additional micro-tunnel shafts to be constructed within the marine environment. This option would require a new pump station to be constructed at the existing Concourse Storage Tank site.

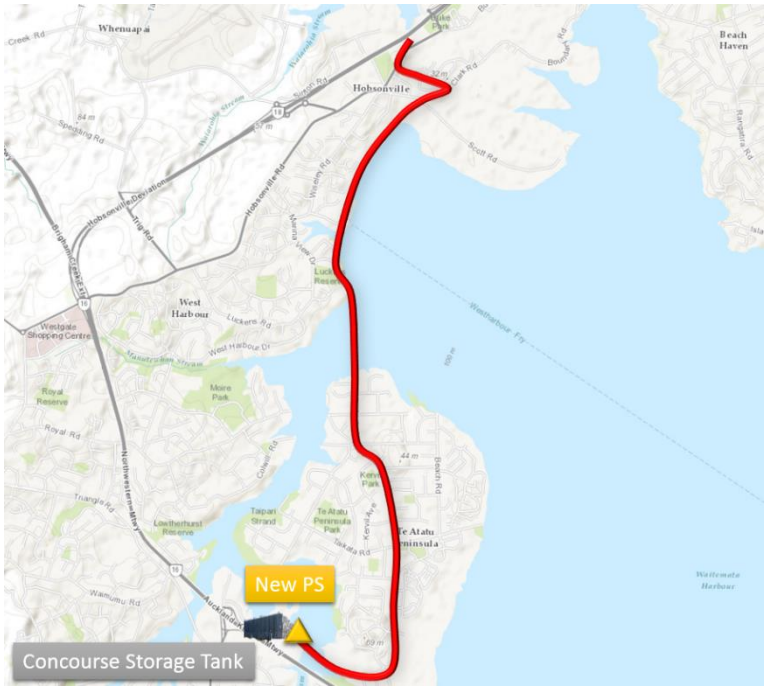


Figure 5-3: Option 1 – Te Atatu Road

5.1.2 Option 2 – Te Atatu Road – Avoiding Difficult Coastal Areas

This option is based on the broad concept of maximising the use of roads and urban environments, and was developed as a variation to Option 1 (Figure 5-4). In this option, the route has been altered to minimise the overall length of the harbour crossing section and to avoid construction in the potentially difficult coastal areas.

The overall construction techniques are the same as for Option 1, however, from a construction perspective, the deep sections of micro-tunnelling around Lukens Road and Marina View Drive and the need to set up construction activities on the reef off Orukuwai Point, were considered to be the most challenging aspects of this option.

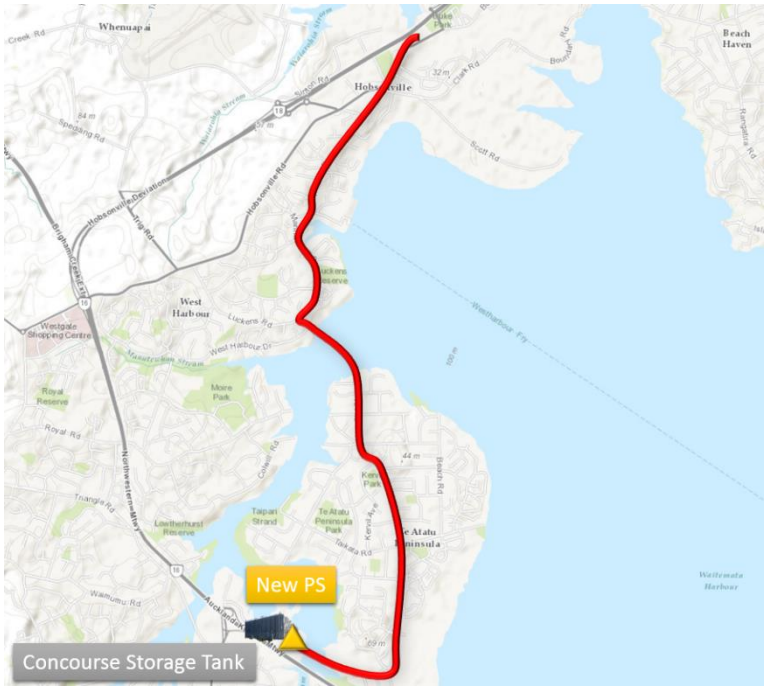


Figure 5-4: Option 2 – Te Atatu Road (Avoiding Difficult Coastal Areas)

5.1.3 Option 3 - Te Atatu Road – Avoiding Difficult Coastal Areas and the Use of Deep Tunnels

This option is based on the broad concept of maximising the use of roads and urban environments, and maximising the use of deep tunnels (Figure 5-5Figure 5-5:). This option was developed as a variation to Option 2, and uses the same overall construction approach as Options 1 and 2 but seeks to avoid the need for the deepest micro-tunnelling shaft (on Luckens Road) by tunnelling under private property from the West Harbour esplanade reserve to Luckens Road.

This option would also require a new pump station to be constructed at the existing Concourse Storage Tank site.

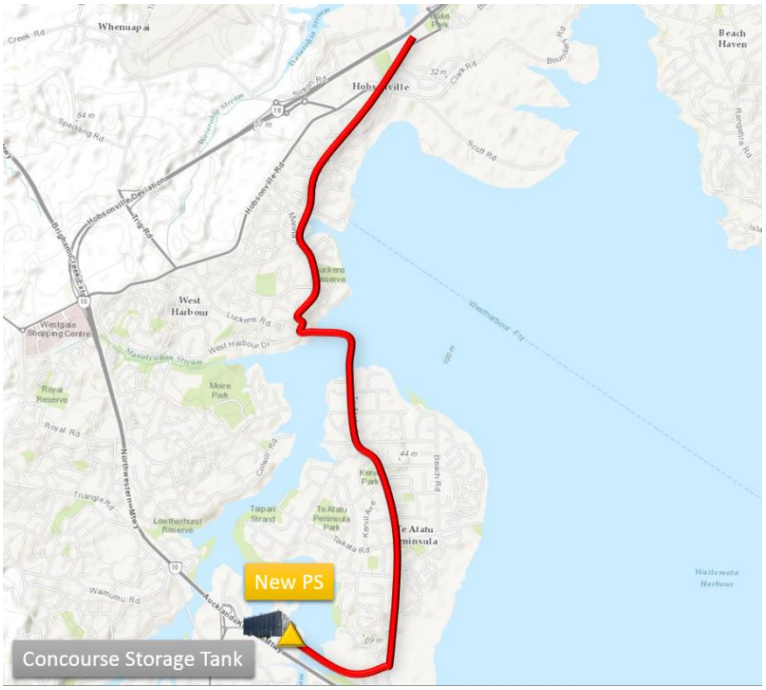


Figure 5-5: Option 3 – Te Atatu Road – Avoiding Difficult Coastal Areas and the use of Deep Tunnels

5.1.4 Option 4 - Te Atatu Road – Avoiding Difficult Coastal Areas and the Use of Deep Tunnels with Alternate Harbour Crossing

Similar to Option 3, this option is based on the broad concept of maximising the use of roads and urban environments, and maximising the use of deep tunnels (Figure 5-6). This option was also developed as a variation to Option 2, and seeks to avoid the need for a deep tunnelling shaft (on Luckens Road) by tunnelling under private property from the West Harbour esplanade reserve to Luckens Road, and altering the location of the marine crossing. This alignment is more direct than Options 2 and 3 but passes under a larger number of private properties.

This option would also require a new pump station to be constructed at the existing Concourse Storage Tank site.

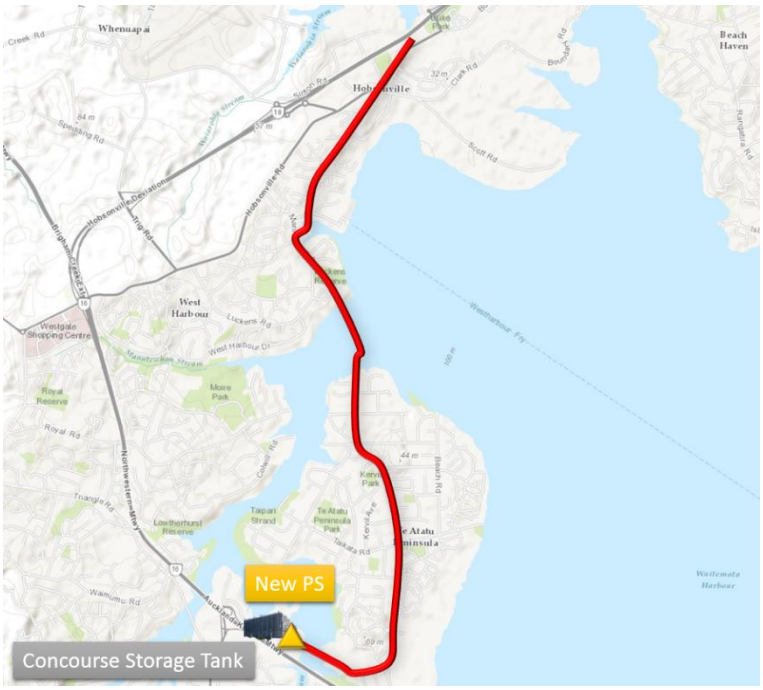


Figure 5-6: Option 4 – Te Atatu Road – Avoiding Difficult Coastal Areas and the Use of Deep Tunnels with Alternative Harbour Crossing

5.1.5 Option 5 – Matipo Road

This option is based on the broad concepts of maximising the use of roads and urban environments for the first component of works (to Te Atatu Road), an on the broad concept of avoiding urban environments for the second component (to the esplanade reserve near Scott Road) (Figure 5-7). For the purposes of longlist development it is assumed that the initial gravity section from Concourse under Henderson Creek and through the Te Atatu peninsula will be constructed by micro-tunnelling. The rising main across the harbour through to Scott Road will be constructed using a combination of marine trenching and HDD and the remaining gravity section from Scott Road to Hobsonville PS will be constructed by micro-tunnelling.

From a construction perspective, the following elements of this option were considered to be the most challenging aspects:

- Finding a satisfactory site to locate the new pump station at the top of the Te Atatu peninsula;
- The limited area available to set up a HDD landing site on the northern end of the crossing (near Scott Road);
- The need to construct the pipe under private properties;
- The construction and environmental risks associated with long HDD drives; and
- The need to set up construction activities on the reef off Orukuwai Point.

For the purpose of longlist development it is assumed that the marine crossing would be constructed by HDD. This option would require a new pump station to be constructed at the Te Atatu peninsula rather than at Concourse.

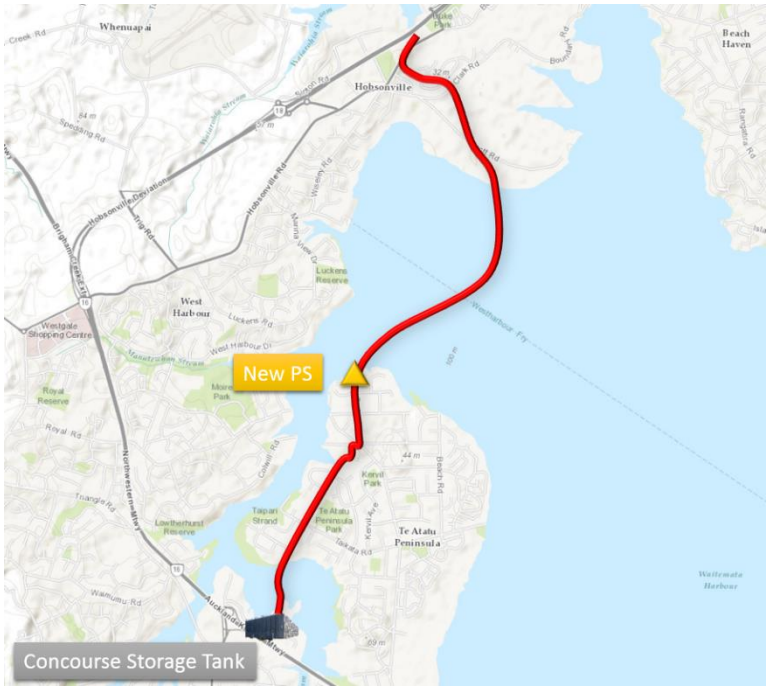


Figure 5-7: Option 5 – Matipo Road

5.1.6 Option 6 – Matipo Road – Alternate Pipeline Alignment

This option is based on the broad concept of maximising the use of roads and urban environments (Figure 5-8). It has a similar configuration as Option 5 with a gravity section from Concourse to new pumping station to be located Te Atatu point; a rising main section under the harbour through to a break pressure tank, and a second gravity section through to Hobsonville PS.

The alignment and construction approach for Option 6 is the same as for Option 5 through to Te Atatu point. The rising main across the harbour through to Luckens Reserve will be constructed using HDD and then by open trenching through to a break pressure chamber to be located in Wiseley Road. The remaining gravity section to Hobsonville PS will be constructed by micro-tunnelling.

This option comprises of a shorter marine crossing, with a landing point at Luckens Point. From a construction perspective, the following elements of this option were considered to be the most challenging aspects:

- Finding a satisfactory site to locate the new pump station at the top of the Te Atatu peninsula;
- The limited area available to set up a HDD landing site on the northern end of the crossing (at the coastal end of Luckens Reserve); and
- The construction and environmental risks associated with long HDD drives;

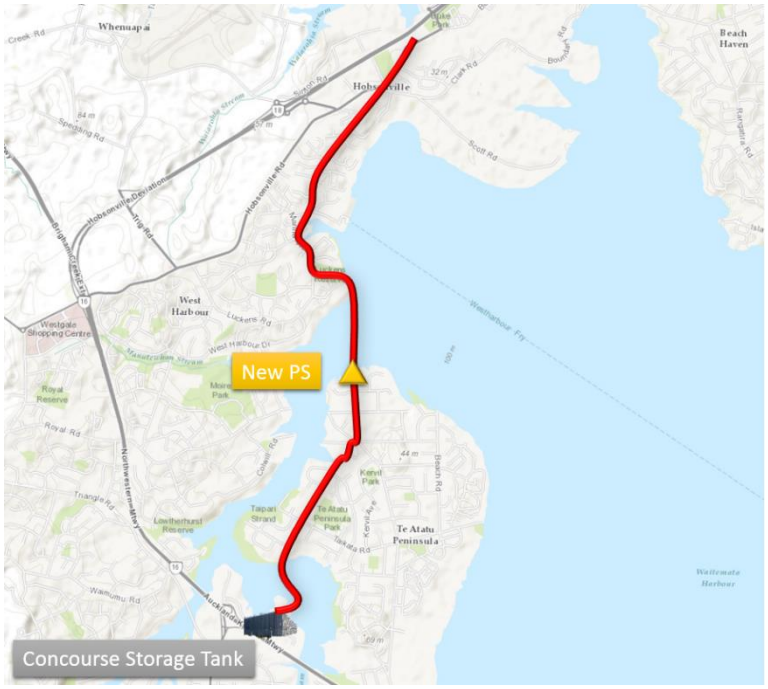


Figure 5-8: Option 6 – Matipo Road – Alternative Pipeline Alignment

5.1.7 Option 7 – Henderson Creek

Option 7 considers an alternate route from the Concourse Storage Tank, to a new pumping station at Te Atatu point (Figure 5-9). From here the route alignment could follow either route Option 5 or 6 to Hobsonville PS and for the purposes of this longlist assessment route Option 6 has been adopted. This option is based on the broad concept of avoiding urban environments for the first component of the route from Concourse to Te Atatu point and maximising the use of roads and urban environments for the second component.

The section of gravity pipeline along Hendersons Creek would be constructed by micro-tunnelling but will require a number of shafts to be constructed within the coastal reserve.

From a construction perspective, the need for multiple crossings of Henderson Creek, the associated environmental and cultural impacts, and the potentially long drive lengths, were considered to be the most challenging aspects of this option.

This option would also require a new pump station to be constructed at the Te Atatu Peninsula.

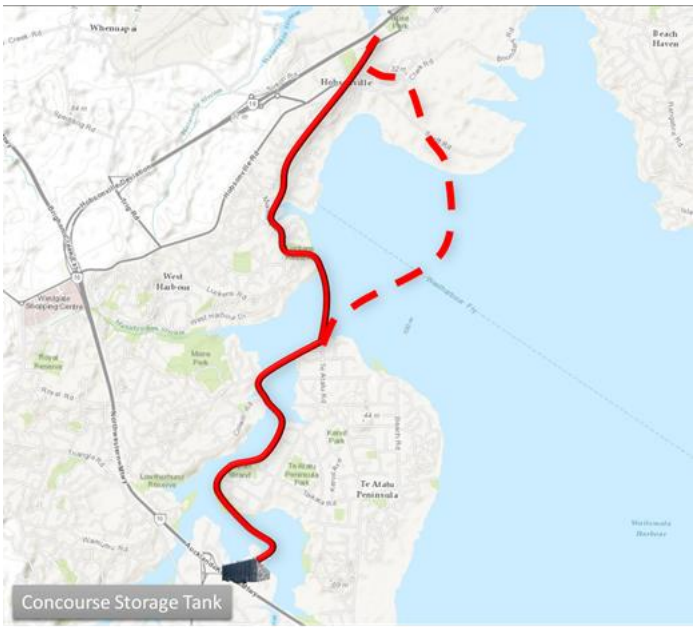


Figure 5-9: Option 7 – Henderson Creek

5.1.8 Option 8 – North Western Motorway

This option is based on the broad concept of maximising the use of roads and urban environments, and follows the alignment of the North Western Motorway (Figure 5-10).

For the purposes of this option it was assumed that the rising main from Concourse will cross Henderson Creek using HDD and run alongside the motorway (but not in the motorway corridor) to a break pressure chamber at around RL35m where it will change to gravity sewer constructed by micro-tunnelling.

From a construction perspective, the need to build the pipeline in or alongside the motorway corridor, the need for a marine crossing, the relatively deep micro-tunnel and shafts (35m+ in some locations to cross under ridgelines at Royal Road, Fred Taylor Drive and Trig Road) and the high static pumping head, were considered to be the most challenging aspects of this option.

This option would require a new pump station to be constructed at the existing Concourse Storage Tank site.

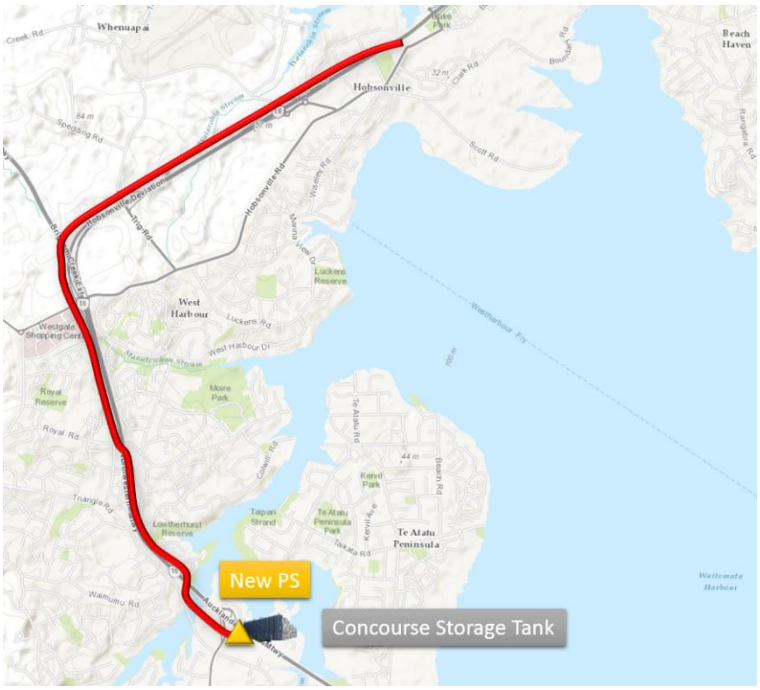


Figure 5-10: Option 8 – North Western Motorway

5.1.9 Option 9 – Gloria Road

This option combines two broad concepts: that of maximising the use of roads and urban environments, and avoiding urban environments. Option 9 considers an alternate route from the Concourse Storage Tank, to a new pumping station at Te Atatu point (Figure 5-11). From here the route alignment either follows route Option 5 or 6 to Hobsonville PS, and for the purposes of this longlist assessment route Option 6 has been adopted. This option is based on the broad concept of maximising the use of roads and urban environments.

The section of gravity pipeline from Concourse to Te-Atatu point would be constructed by micro-tunnelling. A tunnel drive of 400m is proposed under Henderson Creek through to Gloria Park.

From a construction perspective, the long micro-tunnel drive lengths, the limited area available for construction activities, and the need to micro-tunnel under private property immediately to the north of the Concourse storage tank were considered to be the most challenging aspects of this option.

This option would also require a new pump station to be constructed at the Te Atatu Peninsula.

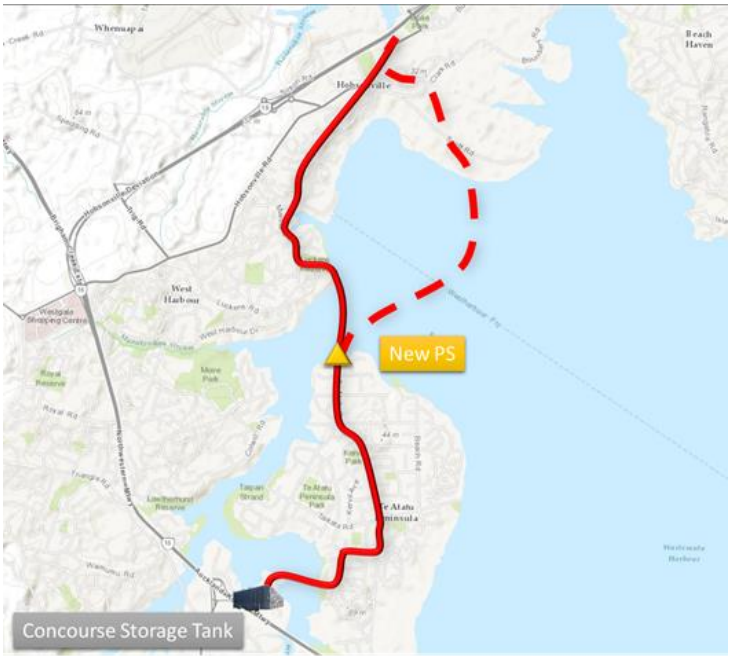


Figure 5-11: Option 9 – Gloria Road

5.1.10 Option 10 – Direct to Te Atatu Road

This option combines two broad concepts: that of maximising the use of roads and urban environments, and avoiding urban environments. Option 10 considers an alternate route from the Concourse Storage Tank, to the Te Atatu peninsula (Figure 5-12). From here the route alignment either follows route 5 or 6 to Hobsonville PS70, and for the purposes of this longlist assessment route Option 6 has been adopted. This option is based on the broad concept of maximising the use of roads and urban environments.

The section of gravity pipeline from Concourse to Te-Atatu point would be constructed by micro-tunnelling. A tunnel drive of 500m is proposed under Henderson Creek through to the coastal area at the southern end of Edgerton Road.

From a construction perspective, the long micro-tunnel drive lengths, the limited area available for construction activities, and the need to micro-tunnel under private property immediately to the north of the Concourse Storage Tank, and a number of residential properties were considered to be the most challenging aspects of this option.

This option would also require a new pump station to be constructed at the Te Atatu Peninsula.

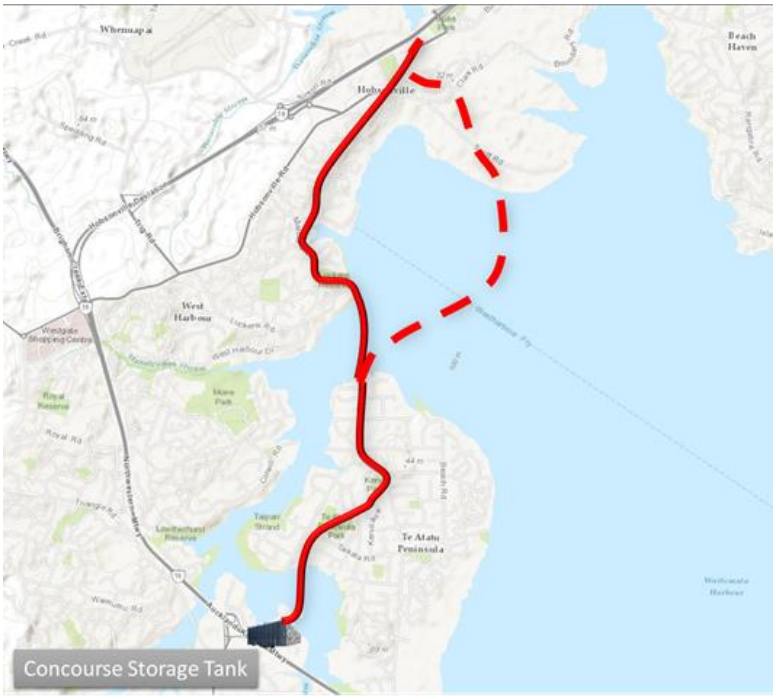


Figure 5-12: Option 10 – Direct to Te Atatu Road

5.1.11 Option 11 – Tunnel

This option is based on the broad concept of maximising the use of deep tunnels, and is considered to be a more direct route from Concourse to the Hobsonville PS (Figure 5-13). From a construction perspective, the need to construct the pipeline under private property, the grade requirements for the tunnel, and construction safety were considered to be the most challenging aspects of this option.

For the purpose of longlist development, it is assumed that the tunnel would comprise of a 3m bored tunnel to allow for longer driver lengths, and would require a shaft in Moire Park and Picasso Reserve. Uncertainty with respect to changes in Health and Safety Legislation and the future requirements for additional access shafts was identified as potential risk.

This option would require a new pump station at the existing Hobsonville Pump Station site.

Figure 5-13: Option 11 – Tunnel

5.1.12 Option 12 – Gravity Micro-Tunnel

This option is based on the broad concept of maximising the use of roads and urban environments, and combines alignments from other options (Option 6 for the southern component, and Option 3 for the northern component) (Figure 5-14). From a construction perspective, the following elements of this option were considered to be the most challenging aspects:

- The limited area available to set up a HDD landing site on the northern end of the crossing (near Scott Road);
- The need for long micro-tunnel drives;
- The need to set up construction activities on the reef off Orukuwai Point;
- Difficult/constrained access to multiple deep shafts; and
- Very deep pipe sections of 55m+

For the purpose of longlist development, it is assumed that the entire pipeline would be installed by micro-tunnelling.

Figure 5-14: Option 12 – Gravity Micro-Tunnel

5.1.13 Option 13 – Full Route Rising Main

This option has been developed to maximise the overall length of rising main in order to minimise pipeline construction depths (Figure 5-15). This option is based on the broad concept of avoiding urban environments, with the pipeline constructed primarily within the CMA.

The rising main would be constructed from a new pumping station at Concourse along Henderson Creek, Waipareira Bay and Limeburners Bay to a break pressure chamber at Scott Road. The pipeline would then be gravity from Scott Road to Hobsonville PS.

For the purpose of longlist development, it was assumed that the pipeline would be constructed by a combination of HDD and open trenching techniques.

From a construction perspective, the large extent of pipeline within coastal strip, long HDD drives required for marine pipeline construction, the difficulty in accessing HDD setup points, septicity and odour issues and friction loss were considered to be the most challenging aspects of this option.

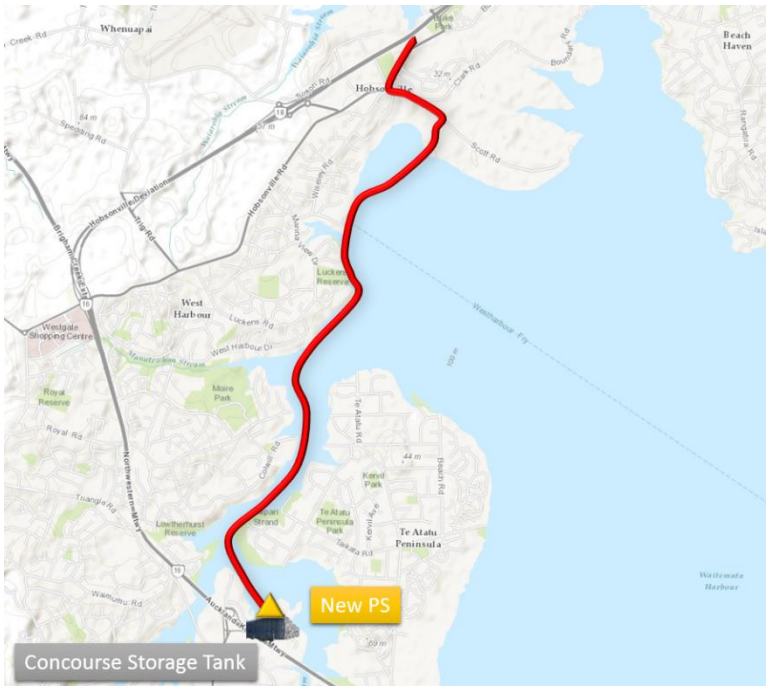


Figure 5-15: Option 13 – Full Route Rising Main

5.2 Qualitative Risk Analysis

Upon identification of the longlist options, consideration was given to qualitative risk factors associated with each Option.

Given the concept design stage of the Project at this point, it was acknowledged that there was varying degrees of uncertainty/risk associated with the cost and non-cost attributes of the Options that could influence the consideration of alternatives process. It was determined that an awareness of the degrees of uncertainty/risk was necessary in determining preferred Options. Once identified, the potential uncertainty/risk was rated and subsequently considered along with cost and non-cost attributes.

The outcomes of the uncertainty/risk analysis is summarised in the following table:

Table 5-1: Southern Alignment (Stage 2) Issues and Qualitative Risk Ratings

Option	Route	Issues Identified	Qualitative Risk Rating
1	Option 1 – Te Atatu Road	Harbour crossing, limited geotechnical information, poor ground conditions near the marina which may result in increased depth for gravity sewer and Hobsonville PS, Some micro tunnel shaft sites in coastal foreshore areas.	HIGH
2	Option 2 – Te Atatu Road – avoiding difficult coastal areas	Harbour crossing, limited geotechnical information, deep sections of micro-tunnel near limit of the technology with deep shafts in residential urban areas. Shaft site on Orukuwai Point reef would likely be required.	HIGH
3	Option 3 - Te Atatu Road – avoiding difficult coastal areas and the use of deep tunnels	Harbour crossing, limited geotechnical information, deep sections of micro-tunnel near limit of the technology with deep shafts in residential urban areas. Shaft site on Orukuwai Point reef would likely be required.	HIGH
4	Option 4 - Te Atatu Road – avoiding difficult coastal areas and the use of deep tunnels with alternate harbour crossing	Harbour crossing, limited geotechnical information, deep sections of micro-tunnel near limit of the technology with deep shafts in residential urban areas. Shaft site on Orukuwai Point reef would likely be required.	HIGH
5	Option 5 – Matipo Road	Marine trenching through Orukuwai Point reef, long pipeline crossing across main channel to the marina, limited geotechnical information, relatively (>30m) deep micro tunnel shafts along narrow Matipo Road	VERY HIGH
6	Option 6 – Matipo Road – alternate pipeline alignment	Harbour crossing, limited geotechnical information, relatively (>30m) deep micro tunnel shafts along narrow Matipo Road	MEDIUM

Option	Route	Issues Identified	Qualitative Risk Rating
7	Option 7 – Henderson Creek	Harbour crossing, limited geotechnical information, Micro tunnel shaft sites in coastal foreshore areas.	HIGH
8	Option 8 – North Western Motorway	Deep gullies may force gravity pipeline lower and increase micro tunnel shaft depths. Limited geotechnical information. Crossing of Henderson Creek using marine trenching or long HDD pipeline	MEDIUM
9	Option 9 – Gloria Road	Long micro tunnel drives under residential property (>25m deep) Limited geotechnical information	MEDIUM
10	Option 10 – Direct to Te Atatu Road	Long micro tunnel drives under residential property (>25m deep) Limited geotechnical information	MEDIUM
11	Option 11 – Tunnel	No geotechnical information at this stage. Costs based on 3m dia TBM. Impact of new mining regulations might require this to be increased. Construction under residential property, may require tunnel to be deeper impacting on the depth of the Hobsonville PS.	HIGH
12	Option 12 – Gravity Micro-Tunnel	Harbour crossing, limited geotechnical information, deep sections of micro-tunnel near limit of the technology with deep shafts in residential urban areas	HIGH
13	Option 13 – Full Route Rising Main	Construction within the marine and coastal environment. Limited geotechnical information, poor ground conditions near the marina which may result in increased depth or need for HDD construction.	HIGH

5.3 Multi-Criteria Analysis

Once the 13 longlist options were identified, criteria were developed by the Project Team to enable the assessment of the longlist options against an MCA process (similar to the MCA process that was developed for the Hobsonville to Rosedale route selection process). The following table outlines the criteria and sub-criteria adopted for the MCA process:

Table 5-2: MCA Criteria and Sub-Criteria

Criteria	Operational	Technical	Environmental	Staging
Sub-Criteria	**Safety:** ability for Watercare staff to operate and maintain the works in a safe manner, includes issues such as confined spaces, working at heights, gas accumulation, accessibility etc.	**Reliability:** whether the option provides for a reliable technology with prior application and proof of performance in NZ	**Cultural/heritage:** impacts on areas of cultural or heritage significance	**Ability to be staged**
	Complexity: degree of difficulty and interdependency of the operation of the works	**Flexibility:** adaptable to change/adjustment to suit future requirements	**Natural Environment:** impacts on areas of environmental significance such as native flora and fauna, CMAs	
	Maintenance: overall requirements and frequency of maintenance activities, degree of difficulty, impacts on system performance during maintenance etc.	**Constructability:** ease of construction, availability of local contractors, need for specialist equipment or techniques	**Community:** impact on community groups and local interests through construction and ongoing operation of new assets	
	Odour/Corrosion: septicity and odour generation, noxious gases, accelerated corrosion rates due to sulphide attack	**Opportunity/benefit:** provides additional benefits beyond the base requirements for the project	**Landowners/property:** impact on individual property owners during construction and ongoing operation	

The MCA process was undertaken within a workshop involving Watercare staff and MWH consultants. Through the MCA process:

- The workshop participants assessed each longlist option against each of the sub criteria. For each sub criteria a score of 1 - 5 was awarded based on the professional judgement of the collective workshop group. A score of 1 indicates a high risk associated with the criteria (i.e. the option will potentially fail to meet requirements), a score of 5 would indicate a low risk associated with the criteria (i.e. the option is considered reliable);
- Each criteria was weighted evenly; and
- Each longlist option was given a preliminary capital cost estimate. These cost estimates were developed using Watercare Unit Rate Cost Models and estimating data from the Central Interceptor and Associated Works project. The operating costs associated with

each option were considered to be quite similar and as such a NPV assessment was not undertaken at this stage.

The following table summarises the northern alignment longlist options, their relative MCA score and capital cost from which the four shortlisted options were identified. The full assessment, and comments on select criterion, is contained in Appendix A of this Report.

Table 5-3: Southern Alignment longlist Options

Route	Description	Capital Cost	Capital Cost Rank	NPV (50 year)	NPV Rank	MCA Score	MCA Rank
Option 1 – Te Atatu Road	This option was developed as the most straightforward road based alignment from Concourse to Hobsonville outside of the motorway corridor.	$113M	6	$148	6	2.75	4
Option 2 – Te Atatu Road – avoiding difficult coastal areas	This option was developed as a variation to Option 1 with the route altered to avoid construction in the potentially difficult coastal areas.	$107M	4	$141	4	2.57	8
Option 3 - Te Atatu Road – avoiding difficult coastal areas and the use of deep tunnels	This option was developed as a variation to Option 2 with the aim of avoiding the need for a deep tunnelling shaft on Luckens Road.	$104M	2	$139	3	2.57	8
Option 4 - Te Atatu Road – avoiding difficult coastal areas and the use of deep tunnels with alternate harbour crossing	This option was also developed as a variation to Option 2 with the aim of avoiding the need for a deep tunnelling shaft on Luckens Road. This is achieved by altering the harbour crossing alignment with the tunnel connecting to Luckens Reserve then onto Marina View Drive.	$104M	2	$138	2	2.63	6
Option 5 – Matipo Road	This option was developed to be able to cross the harbour using HDD rather than micro-tunnelling as HDD is capable of much longer drives.	$132M	12	$176	12	2.69	5
Option 6 – Matipo Road – alternate pipeline alignment	This option was developed as a variation to Option 5, with an alternative pipeline alignment from the proposed pumping station to Hobsonville.	$114M	7	$150	7	2.82	2
Option 7 – Henderson Creek	This option was developed as an alternative gravity pipeline route from Concourse to a Te Atatu Peninsula Pumping Station (i.e. alternative for Options 5 and 6). The route follows Henderson Creek from Concourse to the proposed pumping station at the tip of Te Atatu Peninsula and the balance of the route is as per Options 5 or 6	$124M	10	$161	9	2.51	12

Route	Description	Capital Cost	Capital Cost Rank	NPV (50 year)	NPV Rank	MCA Score	MCA Rank
Option 8 – North Western Motorway	This option follows the alignment of the North-Western Motorway. A pumping station at Concourse would pump flows into twin 2.5km long rising mains to a break pressure chamber located to the south of the Royal Road off-ramp. From here a gravity pipe would take flows to Hobsonville Pumping Station.	$116M	8	$152	8	3.2	1
Option 9 – Gloria Road	This option was developed as an alternative gravity pipeline route from Concourse to a Te Atatu Peninsula Pumping Station (i.e. alternative for Options 5 and 6). The route crosses Henderson Creek from Concourse then follows Gloria Road, Yeovill Road and Te Atatu Road to the proposed pumping station location. The balance of the route is as per Options 5 or 6.	$125M	11	$162	10	2.57	8
Option 10 – Direct to Te Atatu Road	This option was developed as an alternative gravity pipeline route from Concourse to a Te Atatu Peninsula Pumping Station (i.e. alternative for Options 5 and 6). The route crosses Henderson Creek from Concourse then takes the most direct route to Te Atatu Road and the proposed pumping station. The balance of the route is as per Options 5 or 6.	$111M	5	$147	5	2.57	8
Option 11 – Tunnel	This option was developed as a 3 metre bored tunnel to allow longer driver lengths and a more direct route from Concourse to Henderson.	$174M	13	$181	13	2.82	2
Option 12 – Gravity Micro-Tunnel	This option combines alignments from other options, based on the south (Concourse to end of Te Atatu Peninsula) and north (from Te Atatu Peninsula to Henderson) sections.	$102M	1	$108	1	2.19	13
Option 13 – Full Route Rising Main	This option was developed as a rising main for the majority of the route length.	$120M	9	$165	11	2.62	7

5.4 Identification of Shortlist Options

In comparing the MCA outcomes, capital costs and qualitative risk of each of the of the longlist options, the following table was developed for comparison:

Table 5-4: Summary of Outcomes, Southern Alignment (Stage 2)

Option	Description	Capital Cost	Capital Cost Rank	NPV (50 year)	NPV Cost Rank	MCA Score	MCA Rank	Qualitative Risk
1	Te Atatu Road	$113M	6	$148	6	2.75	4	HIGH
2	Te Atatu Road – avoiding difficult coastal areas	$107M	4	$141	4	2.57	8	HIGH
3	Te Atatu Road – avoiding difficult coastal areas and the use of deep tunnels	$104M	2	$139	3	2.57	8	HIGH
4	Te Atatu Road – avoiding difficult coastal areas and the use of deep tunnels with alternate harbour crossing	$104M	2	$138	2	2.63	6	HIGH
5	Matipo Road	$132M	12	$176	12	2.69	5	VERY HIGH
6	Matipo Road – alternate pipeline alignment	$114M	7	$150	7	2.82	2	MEDIUM
7	Henderson Creek	$124M	10	$161	9	2.51	12	HIGH
8	North-Western Motorway	$116M	8	$152	8	3.2	1	MEDIUM
9	Gloria Road	$125M	11	$162	10	2.57	8	MEDIUM
10	Direct to Te Atatu Road	$111M	5	$147	5	2.57	8	MEDIUM
11	Tunnel	$174M	13	$181	13	2.82	2	HIGH
12	Gravity Micro Tunnel	$102M	1	$108	1	2.19	13	HIGH
13	Full Route Rising Main	$120M	9	$165	11	2.62	7	HIGH

Three shortlisted options were selected for consideration through the shortlist process. These are shown in Table 5-5. The full assessment, and comments on select criterion, is contained in Appendix A of this Report.

Table 5-5: Shortlisted Options

Option	Description	Capital Cost	Capital Cost Rank	NPV (50 year)	NPV Cost Rank	MCA Score	MCA Rank	Qualitative Risk
8	North-Western Motorway	$116M	8	$152	8	3.2	1	MEDIUM
1	Te Atatu Road	$113M	6	$148	6	2.75	4	HIGH
6	Matipo Road – alternate pipeline alignment	$114M	7	$150	7	2.82	2	MEDIUM

The shortlisted options were selected on the following basis:

- Option 8 was taken forward as it has the highest overall MCA score and comparable cost. This Option also has the capacity to service future development alongside and north of State Highway 16 and 18 and avoids a major crossing of the harbour and has a medium level of overall risk;
- Option 6 was taken forward as it was considered to be the better of the two route Options 5 and 6, having an equal MCA score but a 16% lower capital cost, and the equal second highest MCA score. Options 7, 9 and 10 were considered variants of Option 6 but all had lower MCA scores and approximately equivalent or higher capital costs;
- Option 1 was taken forward as it had comparable capital costs to the other options, and has the most direct alignment.

The remaining options were not shortlisted for the following reasons:

Table 5-6: Discarded Southern Alignment (Stage 2) Longlist Options

Option	Description	Reasons for Discarding the Option
2	Option 2 – Te Atatu Road – avoiding difficult coastal areas	Variant to Option 1 with similar MCA, similar capital cost and qualitative risk to Option 1. See comments below re: approach to Option 1 and potential re-evaluation of this Option.
3	Option 3 - Te Atatu Road – avoiding difficult coastal areas and the use of deep tunnels	Variant to Option 1 with similar MCA, similar capital cost and qualitative risk to Option 1. See comments below re: approach to Option 1 and potential re-evaluation of this Option.
4	Option 4 - Te Atatu Road – avoiding difficult coastal areas and the use of deep tunnels with alternate harbour crossing	Variant to Option 1 with similar MCA, similar capital cost and qualitative risk to Option 1. See comments below re: approach to Option 1 and potential re-evaluation of this Option.
5	Option 5 – Matipo Road	Higher capital cost and qualitative risk compared to Option 6 with the same MCA score.
7	Option 7 – Henderson Creek	Variant to Option 5 or 6, lower MCA score and higher capital cost and qualitative risk than the preferred Option 6.
9	Option 9 – Gloria Road	Variant to Option 5 or 6, lower MCA score and higher capital cost than the preferred Option 6.

Option	Description	Reasons for Discarding the Option
10	Option 10 – Direct to Te Atatu Road	Variant to Option 5 or 6, lower MCA score with only a marginally lower capital cost than the preferred Option 6.
11	Option 11 – Tunnel	Capital cost over 50% (approximately $60M) higher than the preferred Options 6 and 8 with a lower or equivalent MCA score
12	Option 12 – Gravity Micro-Tunnel	Lowest MCA score of all options.
13	Option 13 – Full Route Rising Main	Lower MCA score and higher capital cost than all three preferred options.

It should be noted that Options 2, 3 and 4 were originally developed as variants of Option 1 with different route alignments through the northern section of the alignment and have similar MCA scores, levels of risk and estimated capital costs. It was determined that should the further development of Option 1 indicate that the northern part of the proposed alignment was unsuitable, the alternative alignments proposed as Options 2, 3 and 4 would be reconsidered.

5.5 Shortlist Options

Once the preferred shortlist options were identified, further detailed analysis was undertaken to identify the preferred option. The following figure summarises the shortlist investigation process for Stage 2.

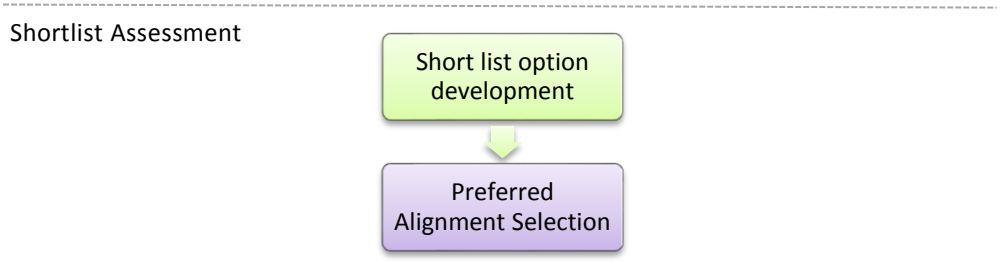


Figure 5-16: Shortlist Assessment Process

5.5.1 Shortlist Option Development

The shortlisted options identified through the longlist MCA process were further developed in order to select a preferred route. This development process included:

- A review of overall option sizing;
- Preliminary siting of main components;
- Review of alignments for access and constructability;
- Preparation of plans and longitudinal section drawings;
- Updating of cost estimates using pricing data obtained during the ECI process;
- Undertaking discussions with contractors to identify any significant issues.

During this process, an additional route alignment was identified. This alignment was developed as a combination of Options 1 and Option 6 and was called Option 1A – Te Atatu Road alternative and was included in the subsequent shortlisted options assessment process. This alternative alignment retains the same basic premise of Option 1 (of a pumping station at Concourse, rising main to a high point and a gravity sewer to Hobsonville) but utilises the general route alignment of Option 6. The alignment was identified as being more direct and avoided the construction around the West Harbour marina and the gravity micro-tunnel across Henderson Creek compared to Option 1 and the difficult micro-tunnelling along Matipo Road required for Options 6.

The following plan shows all 4 of the shortlist options.

Figure 5-17: Shortlist Options, Southern Alignment (Stage 2)

The further development work resulted in some modifications to the shortlist options and the identification of the advantages and disadvantages of each option. The modifications for Options 1, 6 and 8 were in relation to estimated depths of micro-tunnelling and pump stations and minor adjustments to the alignments to provide locations for micro-tunnelling shafts and HDD construction and to suit overall hydraulic requirements.

Table 5-7: Summary of Modifications, Advantages and Disadvantages of Southern Alignment (Stage 2) Shortlist Option

Shortlist Option	Finding of Further Investigations	Modifications to the Option	Advantages	Disadvantages
Option 1 – Te Atatu Road	• Ground conditions for the upper reaches of Hendersons Creek are good and would facilitate marine trenching or HDD • Existing (narrow) access road from Luckens Reserve down to foreshore • Shallow inlet into Waipareoira Bay immediately south of Westpark Marina is known to be poor ground with deep layer of soft muds • Restrictcted access to coastal forshore along Limeburners Bay • Long micro-tunnel drive across from Te Atatu to Luckens Reserve • New SHA at Scotts Point	• Allowance for HDD across Henderson Creek • 1800mm dia Micro-tunnel from Te Atatu to Luckens Reserve to enable longer drive length. Pit within marine section will be required. • Alignment through Scotts Point adjusted to suit proposed new road layouts.	• Shallow micro-tunnel shafts, which reduce costs and are safer to construct • Substantial length of gravity sewer, as there are lessissues with septicity and risks of odour. From an overall perspective, the reduced friction head would require less pumping, reducing the costs of energy	• Limited ability to pick up local flows from nearby areas of growth, which results in the need to provide additional infrastructure to be built in the future to service these areas. • Potential disruption to local residents and industry during construction activities • Potential significant adverse effects associated with: o removal of protected trees; o long length of coastal marine crossing; o construction activities in close proximity to sites and places of value to Mana Whenua • Break pressure chamber located in close to residents, which may impact local amenity values

Shortlist Option	Finding of Further Investigations	Modifications to the Option	Advantages	Disadvantages
				• Longer length of the gravity sewer requires additional maintenance.
Option 1A – Te Atatu Road alternative	• No suitable landing site on Matipou Road for HDD pipeline crossing of Henderson Creek • Long HDD crossing from Te Atatu point to Luckens Reserve • Shallow gully/inlet into Waipareira Bay immediately south of Westpark Marina is known to be poor ground with deep layer of soft muds • Several long micro-tunnel drives required for the gravity sewer section	• HDD crossing of Henderson's Creek with landing site moved east to open space adjacent to 22A Waione Avenue • HDD landing site in Luckens Reserve • Pipe bridge across small gully into Waipareira Bay • Allowance for additional micro-tunnel shafts for all micro tunnel drives over 400m	• Similar to Option 6, this is the shortest route from Concourse to Hobsonville • Lower capital cost than Option 1 • Avoids encroaching the CMA and construction around the West Harbour marina by using HDD technology, which would enable the pipeline to be constructed under the seabed • Utilises existing infrastructure and avoids the need to create a new discharge by utilising the existing Hobsonville PS as a discharge point	• Limited ability to pick up local flows from nearby areas of growth, which results in the need to provide additional infrastructure to be built in the future to service these areas. • Potentially significant disruption to local residents and industries from construction activities • Long length of rising main (approx. 4.1km) which increases the septicity and odour risks, particularly at discharge locations.
Option 6 – Matipo Road – alternate pipeline alignment	• Long micro-tunnel drive across Henderson Creek • Deep micro-tunnel shafts along Matipou Road	• Relatively longer micro-tunnel drive lengths proposed along Matipou Road to limit the number of shafts required	• Similar to Option 1A, this is the shortest route from Concourse to Hobsonville • Largely avoids impacting the CMA	• Limited ability to pick up local flows from nearby areas of growth, which results in the need to provide additional infrastructure to be built in the future to service these areas.

Shortlist Option	Finding of Further Investigations	Modifications to the Option	Advantages	Disadvantages
			• HDD crossing of Henderson Creek, which avoids disruption to the CMA at this location • As the gravity sewer will be shallow, there is the ability to utilise existing infrastructure and avoid the need to create a new discharge by utilising the existing Hobsonville PS as a discharge point	• Pump station would need to be located on the foreshore area at the end of Te Atatu peninsula, which would impact the coastal environment and coastal edges. • Potentially significant disruption to local residents, due to the need to construct numerous micro-tunnel shafts in narrow roads, and break pressure chamber in close proximity to residents
Option 8 – North-Western Motorway	• Ground conditions for the upper reaches of Henderson Creek are good and would facilitate marine trenching or HDD • Road widening proposed for North Western Motorway and future busway proposed for western side • Hydraulic assessment indicates that the change from rising main to gravity sewer will be required at around RL35-40m to provide grade to get to Hobsonville	• Allowance for HDD across Henderson Creek • Alignment shifted from western side of Motorway to eastern side with rising main through Radio NZ land, along Huruhuru Road and Cedar Heights Drive • Break pressure tank located on Cedar Heights Drive • Larger diameter (1500mm) micro-tunnel proposed to facilitate longer drive lengths (>400m)	• Has the ability to pick up a large amount of local flows from the surrounding area, which can potentially delay the need to build future infrastructure to service this area. • Unlike other options, this option offers opportunity to coordinate works and collaborate with other service providers, who have project earmarked for this area. This may include the future cycle way and bus route along	• Break pressure chamber located in close to residents, which may impact local amenity values • Very deep micro-tunnel and micro-tunnel shafts, which escalate cost and are a safety risk during construction. • Longest and most expensive route

Shortlist Option	Finding of Further Investigations	Modifications to the Option	Advantages	Disadvantages
	• Ridgelines along Royal Road and Hobsonville Road will require deep micro-tunnels • Deep gully alongside Manutewhau Walk to be avoided or will likely require pipe bridge • Rapid development of the Westgate commercial area		the motorway, and the future North Harbour 2 Watermain (“NH2”)	

5.6 Preferred Option Selection

The project specific MCA tool that was developed for the assessment of the Stage 1 shortlist options was also used for the evaluation of the Stage 2 shortlist options. The criteria and basis for the assessment are described in Table 4-9 above.

The MCA scores for each option are summarised in Table 5-8 below. In this MCA tool, lower scores represent the better outcome. Whilst the options have different impacts associated with each of the criteria, overall the total scores are relatively similar.

Table 5-8: MCA Score Summary (Southern Alignment, Stage 2)

MCA Criteria		Option 1	Option 1A	Option 6	Option 8
Functionality		2.8	2.6	2.6	1.6
O&M		2.7	2.7	2.7	2.7
Constructability		2.3	3.0	2.7	2.3
Assessment of Environmental Effects	Environmental	3.1	2.4	2.4	1.8
	Social	2.9	2.6	2.9	2.6
	Cultural	3.0	2.0	2.5	2.0
	Economic	3.0	2.8	2.8	2.8
	TOTAL	2.82	2.59	2.66	2.26

5.7 Comparative Costs

Preliminary capital cost estimates for the shortlist options were further developed from a range of sources including the Watercare Unit Cost database, escalated tender prices from the South West Interceptor and the Kohimarama Storage Tank and additional cost information provided by Fletchers and McConnell Dowell.

The median capital cost estimates are shown in the table below. In summary:

- Option 1A has the lowest estimated capital cost; and
- Option 8 has the highest estimated capital cost due to the overall longer length and larger sizing of the gravity sewer section alongside the upper harbour motorway.

Table 5-9: Comparative Cost Summary – Estimated Costs

Costs	Option 1	Option 1A	Option 6	Option 8
Capital Costs $M	$105.5	$92.7	$108.3	$118.6

It is anticipated that operating costs for the options will not be substantially different. The net present cost for 50 years operating costs for each option are shown in Table 13-4. These costs are based on Stage 2 being completed in the year 2035 and cover operation from 2035 to 2085. A discount rate of 6% per annum has been applied, starting from the year 2035.

Table 5-10: Operating Cost Comparison

Costs	Option 1	Option 1A	Option 6	Option 8
Operating Cost (50 yr NPC) $M	36.8	45.1	38.6	38.0

Chemical dosing will be required for all options as the rising main lengths are all between 2km and 4km. For the shorter rising main, a rate of $150/ML was adopted for chemical dosing costs and for the longer rising main (Option 1A), we have adopted $200/ML. Power costs have been determined based on a charge of $0.09/kWhr. Other O&M costs including attendance labour and maintenance activities have been based on a percentage of the overall capital cost.

5.8 Preferred Option

The shortlist options were compared and a preferred Stage 2 option agreed by the Project Team. To summarise the comparison and analysis:

- Option 8 has the best (lowest) MCA score, primarily due to the better environmental score;
- Option 8 has the highest capital cost but will provide a significant capital savings offset as the section along the Upper Harbour Motorway (State Highway 18) can double as the trunk sewer servicing the Massey North, Westgate, Trig Road, and Whenuapai areas of the Service Catchment;
- Option 1A had the second best MCA score;
- Option 1A has the lowest capital cost. It also has the lowest combined capital and operating cost;
- Overall the net capital costs for Option 1A and Option 8 quite comparable (allowing for the capital savings offset for Option 8) and when operating costs are also considered, Option 8 is more economic overall; and
- Option 6 has the second worst MCA score and allowing for the capital savings offset for Option 8, has the highest combined capital and operating cost. This option was not preferred.

Option 8 was selected as the preferred option as it had the highest non-price MCA score and also provides capacity to service the Redhills, Massey North, Westgate and Trig Road areas of the Service Catchment. It also provides the lowest overall combined capital and operating cost solution when factoring in the expected savings in infrastructure servicing costs.

5.9 Impacts on Private Land

Once Option 8 was identified as the preferred option for Stage 2, more detailed consideration was given to the alignment from Royal Road to St Margarets Park. As per Concept Design to date, it is anticipated that the pipeline will be relatively shallow in this location and as a result, the following potential issues arise:

- Potential adverse effects on private property. The alignment may need to pass directly under private property and properties may need to be acquired to enable a crossing of the Manutewhau Reserve;
- Potential need to cross the Manutewhau Reserve. The Manutewhau Reserve constitutes a steep stream and gully system that is identified as a Significant Ecological Area - Land (SEA:L) as a “stepping stone, migration pathway and buffer” in the PAUP, and a Managed Natural Area in the Auckland Council District Plan (Waitakere). This reserve also contains the Manutewhau Walkway; and

- A potential need to cross State Highway 16.

Given the identification of these potential issues, further consideration of the route alignment options from Royal Road to St Margarets Park was undertaken.

5.9.1 Development of Options

As noted above, the route alignment being considered constitutes the route from Royal Road to St Margarets Park (South to North). In terms of eastern and western boundaries to the catchment, the following boundaries were identified:

- Western – State Highway 16. It is considered undesirable to cross the State Highway due to accessibility and settlement issues as well as the need for additional pipeline length.
- Eastern – Moire Road. Due to topography a route alignment further east than Moire Road would result in micro-tunnel shafts deep in the ground escalating cost and safety risk during construction.

Within this catchment, the following route alignment options were identified:

- Option 1 - Generally follows local roads parallel to the alignment of the North-Western Motorway. After passing through Makora Reserve, Option 1 runs underneath Royal Road, under a public access way to Landsdale Place. Option 1 then follows Landsdale Place and turns left into Holmes Drive South. At the end of Holmes Drive South Option 1 passes underneath private property through to Ruze Vida Drive. Option 1 then follows Ruze Vida Drive to the intersection with Jadewynn Drive where it crosses under private property, across Manutewhau reserve and along Holmes Drive. At the intersection of Holmes Drive and Oreil Avenue Option 1 passes underneath private property an in to St Margaret's reserve.
- Option 2 – Option 2 generally follows the natural gully that is formed between the North-Western Motorway and Moire Road. Option 2 crosses under Royal Road and into reserve area, tracking along the green space created by the gully. Option 2 crosses Holmes Road South and into Holmes Reserve, then crosses Ruze Vida Drive in to Manutewhau Reserve. Across Manutewhau Reserve Option 2 crosses Oreil Avenue and in to St Margaret's Park.
- Option 3 – Option 3 is a hybrid between Options 1 and 2 to try and mitigate some of their constraints. Option 3 initially follows Option 2 along the gully parallel to Moire Rd. Option 3 then moves away from the gully and towards Option 1. Option 3 crosses Manutewhau Reserve at the same point as Option 1.

These alignment options are illustrated below.

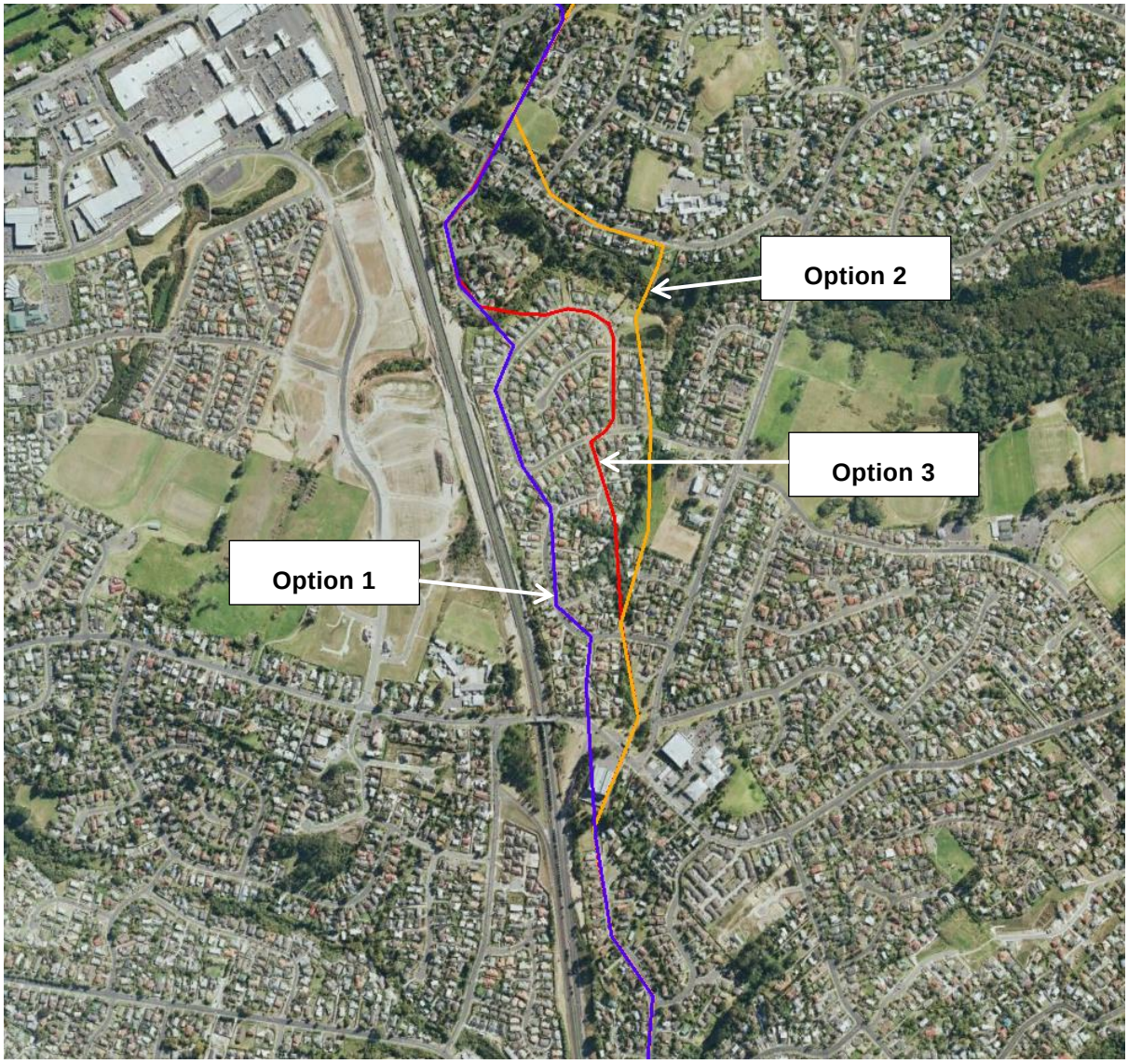


Figure 5-18: Alignment Options (Royal Road to St Margaret's Park)

A summary of the anticipated physical characteristics (as per concept design) of each option are outlined below:

Table 5-11: Physical Characteristics of Each Alternative

Parameter	Alignment 1	Alignment 2	Alignment 3
Indicative overall pipe length	2170m	2170m	2375m
Estimated No. of micro-tunnel shafts	16	14	16
Estimated total micro-tunnel shaft depth	163m	165m	164m
Average micro-tunnel shaft depth	10.2m	11.8m	10.3m
Estimated pipe bridge length	15m	45m	25m
Estimated No. of private properties that pipe will pass under	13	21	12
Estimated number of properties that will likely need to be acquired	2	0	2
Length in Private Property (approx.)	240m	640m	350m

As noted in the above table, a pipe bridge will be required to cross the Manutewhau Reserve. The reason why a pipe bridge is required at this location is because the pipeline will be operating under gravity at this location and it will need to continue on a steady gradient. For these reasons it cannot be installed by trenchless methods below the stream.

Through analysis of each of the alignment options, a number of advantages and disadvantages with each option were identified as follows:

Table 5-12: Advantages and Disadvantages of Options

Option	Construction		Operation	
	Advantage	Disadvantage	Advantage	Disadvantage
1	Anticipated to be shortest pipe length	• Virtually all construction within road corridors which impacts on traffic and residents in close proximity to work areas. • Difficulty constructing micro-tunnel shafts in narrow residential streets • Crossing Manutewhau Reserve will likely require the construction of a short pipe bridge. • Anticipated to pass under 13 different private properties. • Anticipated depth under private properties ranges between 7 – 15m. • Anticipated that 2 private properties will be temporarily required to enable construction works.	• Anticipated to be shortest pipe length for maintenance. • Minimal visual impact compared to other options • Good access to sewer manholes within road corridor	• Anticipated to pass under 13 different private properties. • Anticipated depth under private properties ranges between 7 – 15m.
2	• Anticipated to require the least number of micro-tunnel shafts. • Most use of open green space to facilitate construction and provide good access to micro-tunnel shafts	• Some construction within road corridors which impacts on traffic and residents in close proximity to work areas. • Loss of public use of open green space areas during construction • Crossing Manutewhau Reserve will require the construction of a 50m long pipe bridge through an area which is considered to have a very high amenity and environmental value. • Anticipated to pass under 21 different private properties.		• Ongoing aesthetic impact of the Manutewhau Reserve pipe bridge which would be up to 13m above ground level. • Maintenance requirements for the pipe bridge • Anticipated to pass under 21 different private properties • Anticipated depth under private properties

Option	Construction		Operation	
	Advantage	Disadvantage	Advantage	Disadvantage
		• Anticipated depth under private properties ranges between 3 – 18m. • Anticipated that 1 private property will be temporarily required to enable construction works		ranges between 3 – 18m.
3	• Easy to access micro-tunnel pits	• The majority of construction will be within road corridors which impacts on traffic and residents in close proximity to work areas. • Anticipated to pass under 12 different private properties. • It is likely that a section within the road corridor would need to be constructed by trenching because it is close to surface level. • Three micro-tunnel shafts are likely to be located on private property and Watercare would likely need to purchase three properties to provide suitable space for construction.	• Minimal visual impact • Good access to sewer manholes with road corridor	• Option 3 is longer than Options 1 and 2. • Anticipated to pass under 12 different private properties.

5.9.2 Cost Estimates

An estimate of the overall alignment costs are summarised below. The rates for micro-tunnelling are based on cost estimates received during early contractor engagement during the development of options.

	Option 1	Option 2	Option 3
Overall Cost	$23,300,000	$22,800,000	$25,600,000

5.9.3 Conclusions and Identification of Preferred Option

In the context of the above assessment and cost analysis, the following comments were made with respect to the alternative alignments:

- **Constructability** – Options 2 and 3 have the advantage of locating a number of micro-tunnel shaft sites in green space without size restrictions on construction areas. Option 1 has a number of microtunnel shafts that are located in tight road corridors, restricting the

area available for construction activities. The health and safety risk increases with confined construction sites and work in public roads which is a disadvantage of Option 1.

- **Social** – Due to the nature of construction in local roads versus green field sites, Option 1 is likely to create a greater disturbance to local residents, particularly around traffic flow. However, Option 2 will have a greater impact on recreational users of Manutewhau Reserve when compared to Option 1. Option 3 has construction in both roads and the reserves, but the reserve is less accessible in this location when compared to others, which limits the impact on recreational users.
- **Social** – Having a pipe bridge in a publicly accessed reserve will have a visual impact on users and neighbouring properties, which is a disadvantage of Option 2. Consultation with Auckland Council Parks, Sports and Recreation have indicated that the pipe bridge associated with Option 2 was not desirable.
- **Social** –Option 2 will require the most easements in private property, and the route through Housing New Zealand's site is considered undesirable.
- **Social** – Options 1 and 3 are likely to require more private property acquisition that Option 2.
- **Environmental** – While all options have construction works in reserve areas, Option 2 has a greater risk of effects to local waterways from construction, due to the number off micro-tunnel shafts in close proximity to watercourses.

Having regard to the above, Option 3 was identified as the preferred alignment.

6 Project Phasing

As a result of the processes described above, Option 9 (Northern) and Option 8 (Southern) were identified as the preferred alignment options for the Northern Interceptor Project to ultimately service the flows from the entire Service Catchment area, which is projected to reach approx. 350,000 by 2070. This growth is set to occur over a period of 50 years.

As noted above in Section 3.3, the ability to stage the project to adequately respond to actual population uptake was a key consideration in determining the preferred options. With this in mind, upon identification of the preferred options, further consideration was given to the potential staging of the Project, having regard to anticipated growth within the Service Catchment. Key factors that were taken into consideration during this process included:

- The rate and location of growth and development in Auckland and the need to service an ultimate population of 350,000;
- The ability to service new growth in the NWTA, which will likely be needed before the ultimate route is required;
- The need to divert flows from Mangere WWTP at some point in the future;
- The ability to size the pipeline according to the flows that are coming to them;
- Capability of the system to service low flows until the ultimate population is reached; and
- Ability to use existing new and used infrastructure and to potentially use some of the new infrastructure to defer the timing of new expenditure.

Subsequently, the following phases to the Project were identified:

Table 6-1: Project staging

Phase	Estimated construction timeframes	Description	Interrelationship with other Project phases
1[2]	2017-2020	**Hobsonville to Rosedale** This will serve the immediate population growth. Existing flows from the Hobsonville PS are transferred to the Rosedale WWTP, crossing the Upper Waitemata Harbour and through Greenhithe. Resource consents were granted in January 2016. Construction is expected to begin between 2016 and 2018.	The existing Hobsonville PS pumps up to 120L/s to the Whenuapai Branch Sewer. The Project will divert all of the Hobsonville PS flow away from this branch sewer and deal with immediate growth within the Service Catchment.
2	2022-2027	**Westgate to Hobsonville PS** This comprises the installation of a tunnel from near Westgate to the Hobsonville PS, along State Highway 18 (SH18), and	Primarily to convey flows to Hobsonville, but will also serve flows from newly developed and developing areas in the Service Catchment. These flows will then be diverted north to the Rosedale WWTP, via the Phase 1 pipeline.

[2] The works associated with Phase 1 was granted resource consent in January 2016 (reference LCO 2141617, LQ 2141618, LUC-2015-1326, LUC-2015- 1329, LUC-2015-1346, LUC-2015-1347 REG-2015-1332, REG-2015-1334, REG-2015-1336, REG 2141632, REG 2141623, REG 2141624, REG 2141625)

Phase	Estimated construction timeframes	Description	Interrelationship with other Project phases
		is mostly within the NZ Transport Agency's (the "Transport Agency") designation.	
3	2022-2027	**Wainoni Park (Booster PS)** This Phase is a new Booster PS that will increase the capacity of the Phase 1 pipeline from 275L/s to 520L/s.	This PS will double the flow transferred to the Rosedale WWTP and extend the capacity of the Phase 1, deferring large upgrades. This is considered necessary as it is anticipated that the Hobsonville PS will exceed capacity sometime around 2022 – 2027.
4	2032-2035	**Greenhithe to Rosedale and Wainoni Park (Intermediate PS)** This includes a new pipeline from the Hobsonville PS, across the Upper Waitemata Harbour, through Greenhithe to the Rosedale WWTP. This Phase follows a similar alignment to Phase 1, and will include an Intermediate PS in Wainoni Park North. Phase 4 will transfer flows from Red Hills, Kumeu, Huapai, Riverhead, Whenuapai and Hobsonville Ultimately, Phase 4 will also pick up the flows from the future Phase 5 pipeline.	Phase 4 will accommodate the flows coming from Phase 2 & 5 and will transfer up to 1,820L/s flow from the Concourse Storage Tank to the Rosedale WWTP.
5	2035+	**The Concourse to Hobsonville Road (Westgate)** The purpose of this connection is to divert flows away from the Western Interceptor (Swanson area) to free capacity at Mangere WWTP. The PS that will be installed at The Concourse will transfer flow northward, to the Rosedale WWTP.	Divert flows away from the Western Interceptor and the Concourse Storage Tank to free up capacity at Mangere WWTP
6	2035+	**Greenhithe to Rosedale** This Phase involves the duplication of the rising main sections of Phase 4 and increases the capacity of the Intermediate PS at Wainoni Park.	Phase 6 increases the capacity of Phase 4 from 1,850 L/s up to 3,600 L/s to accommodate growth.

7 Construction Methodologies

Throughout the development of the Project Concept Design, consideration of the preferred construction methodology has been undertaken. With regards to establishing the pipeline, there are broadly two construction methodologies available.

1) Trenched; or
2) Trenchless.

Open trenching is a cost efficient method of installing pipelines, however, open cut construction has several short comings, chief amongst which are; health and safety concerns for workers, surface disturbance, disruption to vehicular/pedestrian traffic and inability to cross certain sites.

Trenchless technologies comprise an array of different methods or techniques, with each method having certain capabilities and limitations. A number of factors are assessed to determine when trenchless technologies are suitable over open trenching:

- Ground conditions
- Site conditions (Rivers, creeks, railways, major roads)
- Impact to local stakeholders
- Access
- Depth of installation
- Pipe diameter
- Environmental impacts
- Traffic volumes
- Handling and treatment of contaminated soil
- Cost

As noted above, these factors have been considered throughout the development of Concept Design, and the preferred approach is reflected in the designation drawings.

8 Pump Station Location Development

Option 9 (Northern) and Option 8 (Southern) were identified as the preferred alignment options for the Project. Option 9 (Northern) requires two new pump stations, both located at a point midway along the alignment. Option 8 (Southern) requires a new pump station at the Concourse Storage Tank site, and one at the existing Hobsonville PS site. As such, four new pump stations are required for the Project.

Two of the pump station locations, being the Concourse site and the Hobsonville PS site, are required at 'fixed point' locations (refer Section 3). In addition, one of these, the new pump station at Concourse, is subject to existing Watercare designations.[3] The second, the new pump station at Hobsonville, is subject to NoR – NH2 (Waitakere, shared corridor). As these pump stations are proposed at fixed points (and are thus considered to be determined by the adoption of the preferred alignment, no further consideration of alternatives has been undertaken for these two pump stations

Subsequently, the following consideration of alternative pump station sites is thus limited to the Intermediate and Booster pump station locations.

8.1 Multi Criteria Assessment

A project specific MCA tool was used for the evaluation of the shortlisted options for both the Intermediate Pump Station ("IPS") and the Booster Pump Station ("BPS"). The criteria and basis for the assessment is shown in Table 8-1. Each assessment point was given a score from 1 to 5, with the lower scores representing better outcomes.

Table 8-1: MCA Criteria and Basis of Assessment

Assessment Framework	Basis for Assessment
Functionality	Operational and maintenance access to site for crane, truck, trailer, etc. Site location/space
	Operation and maintenance of gravity length versus rising main length
	Provide benefit or alignment with other utilities or public services. (Electricity supply (south east easier in Wainoni Park). Public space amenity as a park or cemetery
	Flow management in instance of failure
	Natural hazards affecting the PS (Flooding, liquefaction, fire, wind, SL-Mse, land stability)
	Provides for future operational flexibility (ex. How easy it will be to deal with a significant increase in flow or expand the pump station)
	Operational and maintenance Health & Safety
Constructability	Pump station Construction access and site establishment
	Pump station Potential for construction risks that may hold up, stop or adversely affect construction time and cost
	Pump station construction Health & Safety
	Site servicing
	Pipeline Construction access and site establishment
	Pipe line Potential for construction risks that may hold up, stop or adversely affect construction time and cost
	Pipeline construction Health & Safety
Environmental	Potential construction impacts on water quality

[3] Designation WSL8, Auckland Council District Plan (Waitakere Section) 2003, and Designation No. 9327 in the PAUP

Assessment Framework	Basis for Assessment
	Potential operational impacts on water quality
	Potential construction impacts on coastal ecosystems (e.g. Mangroves)
	Potential operational impacts on coastal ecosystems (e.g. Mangroves)
	Effects during construction on terrestrial ecosystems(habitats, flora, fauna)
	Effect during operation on terrestrial ecosystem (habitats, flora, fauna)
	Effects during construction on trees (protective)
	Effects during operation on trees
Social	Impact to neighbouring properties from construction activity includes (visual, dust, noise, odour, traffic) impact from construction activities
	Impact to neighbouring properties from operation and maintenance activity (includes visual, dust, noise, odour, traffic) and risk of operational failures
	Impact short term on use of recreational users, etc.
	Impact long term activity on use of recreational users, etc.
	Visual impact to neighbouring properties, park users, etc. during operation
	Impact on Amenity value, perception of effects by residential
	Impact on Amenity value, perception of effects by park users
Mana Whenua, Cultural, Archaeological and Heritage	Potential impacts waahi tapu sites identified in District Plan and impact on heritage and traditional sites for Mana Whenua
	Effects on mauri as a result of the pump station on land, water and air
	Archaeological/heritage

8.2 Booster Pump Station

The Phase 1 pipeline is designed to transfer flows from the Hobsonville PS to the Rosedale WWTP, to service immediate growth in the area. As growth continues, a new Pump Station will be required along the Phase 1 alignment to boost the ability of the pipeline to match the increase in population and carry additional flows to the Rosedale WWTP. This is referred to as the Booster Pump Station.

The location of the Booster Pump Station ("BPS") is governed by a number of considerations, namely:

- The need to be located along the Phase 1 pipeline,
- Hydraulics - the BPS is best located at or near to a high point along the pipeline for efficient operation and to limit the amount of emergency storage volume required;
- General configuration and layout requirements - the BPS will require a wet well for incoming wastewater, a dry well to house the pumps, a control building and site access, providing a minimum overall site footprint of 2,500m^2;
- Pumping systems - overall pumping heads are preferably limited to around 60 metres to match the capacity of standard wastewater pumps and pump station configurations
- Operational and emergency storage requirements –Watercare typically require sufficient operational and emergency storage such that pumping stations can be non-operational for a period of 4 hours

Based on the above, the following six locations were identified for the BPS. These can be seen in Figure 8-1:

- Option 1 – Wainoni Park (Southeast)
- Option 2 – Wainoni Park (Southwest)
- Option 3 – Collins Park
- Option 4 – Wainoni Park (North)
- Option 5 – Greenhithe Road
- Option 6 – Faith Grove

Figure 8-1: Booster Pump Station Locations

The following section provides a more detailed description of each of the options.

8.2.1 Option 1: Wainoni Park (Southeast)

This location at the North West of the intersection of Greenhithe Road and Orwell Road, in Wainoni Park was selected as it is the highest area of land along this part of the route of the Phase 1 pipeline at approximately RL35m. Access would be from Greenhithe and/or Orwell Road. The Phase 1 pipeline would need to follow the yellow dashed line in Figure 8-1: to accommodate this BPS site. The advantages of this location are that it equalises the pumping heads between the Hobsonville PS and the BPS, has the minimum possible operational and emergency storage volume, and is clear open space.

8.2.2 Option 2: Wainoni Park (Southwest)

This location in the Southwest corner of Wainoni Park adjacent to Greenhithe Road was selected as it was at a high point of RL 33m on the periphery of the park on the western side of the existing drainage gully. The advantages of this location are that it equalises the pumping heads between the Hobsonville PS and the BPS, has the minimum possible operational and emergency storage volume, is clear open space with excellent access off Greenhithe Road.

8.2.3 Option 3: Collins Park

This site is located at the top of Collins Park alongside Greenhithe Road. The site was selected as it is in open space at the northerly extreme of the localised high point on Greenhithe Road which is shaded red on Figure 8-1:. The site has a ground level of RL31m and is located on the periphery of the park. Access would be from Greenhithe Road. The preferred location within the park is in the south eastern corner behind the playground area as it has the least impact on the existing playing fields.

8.2.1 Option 4: Wainoni Park (North)

This site is located further north in Wainoni Park. This site is along the route of the Phase 1 pipeline but the land falls away as we move north from Greenhithe Road which means that this option requires a break pressure chamber to be installed at a high point along the route (Preferably near the site identified as option 1). The Phase 1 pipeline would be replaced with a section of gravity sewer between the break pressure chamber and the pump station. Access would most likely be through the sports complex car park off Churchouse Road. The BPS would also require additional emergency storage capacity compared to other options.

8.2.2 Option 5: Greenhithe Road

This site is located at 79 Greenhithe Road and was selected as an alternative to parkland within open space, part of which is currently used for a stormwater detention pond. Access would be from Greenhithe Road. The advantages of this location are that with a ground level of approximately RL35m it equalises the pumping heads between the Hobsonville PS and the BPS, has the minimum possible operational and emergency storage volume, is already being used for public purposes.

8.2.3 Option 6: Faith Grove

There is a possibility of locating the BPS in private property. For the purposes of assessing this option against the other five, a property in Faith Road was adopted due to proximity to the Phase 1 pipeline through Wainoni Park. The same method proposed for Option 4 would need to be applied to this option, utilising a break pressure chamber and gravity sewer. The pump station could be located in a practicable position coinciding with the location of the Phase 1 pipeline. The advantage of this option is that it does not use up any existing parkland but it will require the acquisition of one or more private properties.

8.2.4 Assessment

Using the above assessment criteria the six options for the BPS were assessed by the Project Team. The comparison is shown in Table 8-2

Table 8-2: Summary of MCA Assessment (BPS)

criteria	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6
Functionality	1	2	2	5	2	4
Construction : Pump Station	1	2	3	5	5	5
Environmental	2	2	2	4	4	5
Construction : Social	3	2	5	4	5	5
Operation : Social	2	2	5	4	4	4
Cultural	2	2	2	3	3	3
Total	1.83	2.00	3.17	4.17	3.83	4.33

8.2.5 Booster Pump Station Preferred Option

On the basis of the above assessment, BPS Options 1 and 2 were identified as having the least overall impact. They also provide the greatest flexibility for siting of the pumping station and associated facilities.

From this point, further consultation with the Greenhithe Pony Club was undertaken to identify a preferred option of Options 1 and 2. Through this process it was agreed that Option 2 was preferred over Option 1.

8.3 Intermediate Pump Station

The Intermediate Pump Station ("IPS") will be up to seven time's greater capacity than the booster pump station. The IPS will have a significantly larger footprint and will require greater level of maintenance, labour and frequent deliveries to site.

Based on technical requirements the catchment considered for the IPS was limited to the area between Wainoni Park and the North Shore Golf Club ("NSGC"). Locations from Hobsonville PS to Wainoni Park were considered inappropriate as they would require the IPS to have a long rising main that would result in pumping pressures beyond the capacity of the pipeline and conventional manufacture pumping standards. Locations from NSGC to Rosedale WWTP were also considered inappropriate as they would require a very deep pump station well in excess of 30m due to the rising terrain elevation.

Within the catchment considered, specific options were selected based on technical site requirements, existing or future possible access and ground profile. Four possible options for the IPS site were identified, these being:

- Option 1 - Centre Wainoni Park
- Option 2 - North Wainoni Park
- Option 3 - North Shore Memorial Park ("NSMP")
- Option 4 - North Shore Golf Club ("NSGC")

The proposed IPS Options noted above are shown in Figure 8-2, and are described in more detail below.

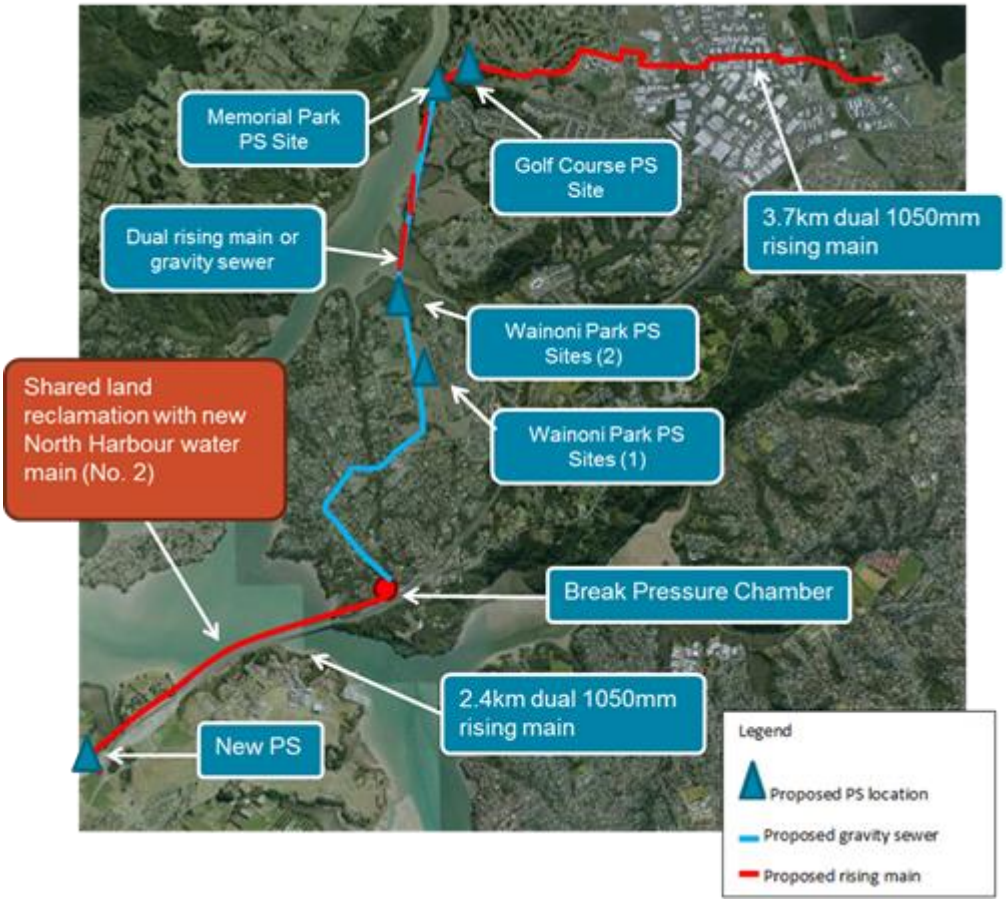


Figure 8-2: Alignment and PS Options

Geotechnical investigations have not been carried out for the four possible locations. At this stage it is assumed that proximity to the Te Wharau Creek will mean a high water level and possible alluvial soils at the pump station locations.

For Options 3 and 4, two construction methodologies for the pipe across Te Wharau Creek and Lucas Creek were considered in this MCA process; marine trenching and by pipe bridge.

8.3.1 Identification of Alternative Sites

8.3.1.1 Option 1: Wainoni Park (Central)

Option 1 is toward the centre of Wainoni Park. This location was considered due to the large working area available and the possible access to the site from an adjacent carpark. The following table outlines the advantages and disadvantages of Option 1:

Table 8-3: Advantages and Disadvantages of Options 1 ("IPS")

Advantages	Disadvantages
• Large working area allows site layout to be optimised and provides better future operational flexibility. • Good site access for construction and maintenance. • Expected that excavations would be above groundwater level. • Site is not located near any known sites and places of value to Mana Whenua. • Approximately 1,100 m length of gravity tunnel upstream for use as emergency storage. This will facilitate flow management in instance of failure and will reduce storage construction at the PS. • Relatively shallow IPS meaning comparatively less excavation required. • Longer rising main which require less maintenance than gravity sewer.	• Community lose access to a portion of existing reserve • Potential visual and amenity effects as the IPS will be located in the centre of the park • Site is located in close proximity to a Significant Ecological Area (Land) • Potential noise, vibration (construction) and odour (operation) effects on nearby residents as IPS will be in close proximity to homes located to the east of the proposed site • Long length of rising main. HDD pits require bigger space than micro-tunnelling shafts meaning comparatively more complex construction process • IPS is in eye line of local residents and park users thus potential visual effects.

8.3.1.2 Option 2: Wainoni Park (North)

Option 2 is situated further towards the northern end of Wainoni Park. This location was considered due to the large working area and the good site access for construction. The following table outlines the advantages and disadvantages of Option 2:

Table 8-4: Advantages and Disadvantages of Option 2 (IPS)

Advantages	Disadvantages
• Large working area allows the site layout to be optimised and provides better future operational flexibility. • Good site access for construction, operations and maintenance. • Out of the direct eye line of local residents and users of the main park area. • Longer rising main which require less maintenance than a gravity sewer.	• Community lose access to a portion of an existing reserve. • Site is located near a Significant Ecological Areas (Land) and within sites and places of value to Mana Whenua • Long length of rising main. HDD pits require bigger space than micro-tunnelling shafts meaning comparatively more complex construction process • Closer to the creek, resulting in potentially less favourable ground condition than other locations. • Higher cost and complexity relating to providing site services due to longer route to existing systems (water supply, stormwater, electricity, etc.). • No upstream gravity tunnel available as emergency storage.

8.3.1.3 Option 3: North Shore Memorial Park

Option 3 is adjacent to the northwest corner of Schnapper Rock Road, within the North Shore Memorial Park ("NSMP"). Preliminary discussions with the trustees have determined that this site is not part of the ongoing development plan, and is presently used for spoil and general stockpiling. It has been indicated that this site could potentially be available. For the purpose of concept design, marine trenching has been considered across Te Wharau Creek for Option 3.

The following table outlines the advantages and disadvantages of Option 3:

Table 8-5: Advantages and Disadvantages of Option 3 (IPS)

Advantages	Disadvantages
• Adequate site access for construction and permanent access. • Preliminary discussions with the NSMP representatives were positive. • Approximately 1,400 m length of gravity tunnel upstream of IPS for use as emergency storage. This will facilitate flow management in instance of failure and will reduce storage requirements at the pump station.	• Restricted working area limits operational flexibility and future opportunities. • Although this area is undeveloped at this time, it is still part of a cemetery, which has value to the park users and Mana Whenua. • Deep excavations are expected to be well below groundwater. • Site is close to consented development (residential properties). • IPS hydraulics will increase size of rising main to Rosedale WWTP. • High pumping costs. • Disturbance to users of the NSMP from construction activities. • Septicity and operational risks increased due to low velocity in the rising main. • Site in close proximity to Significant Ecological Areas (Marine 2 and land) and is within sites of value to Mana Whenua. • Construction impacts on coastal ecosystems due to potential marine trenching of the Te Wharau Creek for the construction of the gravity line. • Longer gravity sewer which require higher maintenance.

8.3.1.4 Option 4: North Shore Golf Club

Option 4 is within the southwest corner of the North Shore Golf Club proposed location for the pump station at this site is on land currently not used for playing purposes. The NSGC is in discussions with a developer for subdivision of the parcel of land along the southern boundary. Final layout details and arrangements for permanent access to the PS site area would depend on the final configuration for this subdivision, with the likely pumping station access road alignment following the new southern property boundary.

For the purpose of concept design, Marine Trenching has been considered across Te Wharau Creek in order to reduce the depth of the IPS.

The following table outlines the advantages and disadvantages of Option 4:

Table 8-6: Advantages and Disadvantages of Option 4

Advantages	Disadvantages
• Adequate site area for construction. • Preliminary discussions with the NSGC management concerning the use of the site have been positive. • Approximately 2,000m length of gravity tunnel upstream of the pump station for use as emergency storage. This will facilitate flow management in instance of failure and will reduce storage requirements at the PS.	• Deep excavations are expected to be below groundwater. • Complicated connections to water supply, stormwater, electricity, etc. • Disturbance to users of the NSGC from construction activities. • Isolated site which would require a new access road. • IPS hydraulics will increase size of rising main to Rosedale WWTP. • High pumping costs. • Septicity and operational risks increased due to low velocity in the rising main. • Higher potential construction and operational impacts on coastal ecosystems especially mangroves due to potential marine trenching of the Te Wharau Creek for the construction of the gravity line. • Longer length gravity sewer which require higher maintenance.

8.3.2 MCA Results

The results of the MCA assessment for the four different IPS options are summarised in Table 8-7 below. Lower scores represent a better outcome.

Table 8-7: Summary of MCA Assessment (IPS)

criteria	Option 1	Option 2	Option 3	Option 4
Functionality	3	3	2	2
Construction : Pump Station	2	2	4	5
Construction : Pipeline	2	2	4	5
Environmental	3	3	3	3
Construction : Social	5	4	3	3
Operation : Social	4	3	4	3
Cultural	2	2	3	2
Total	3	2.71	3.29	3.29

8.3.3 Estimated Costs

A comparison of costs was undertaken for each IPS option. This cost comparison considered only the section between the Greenhithe culvert to the Location 5 NSGC as shown in Figure 8-3

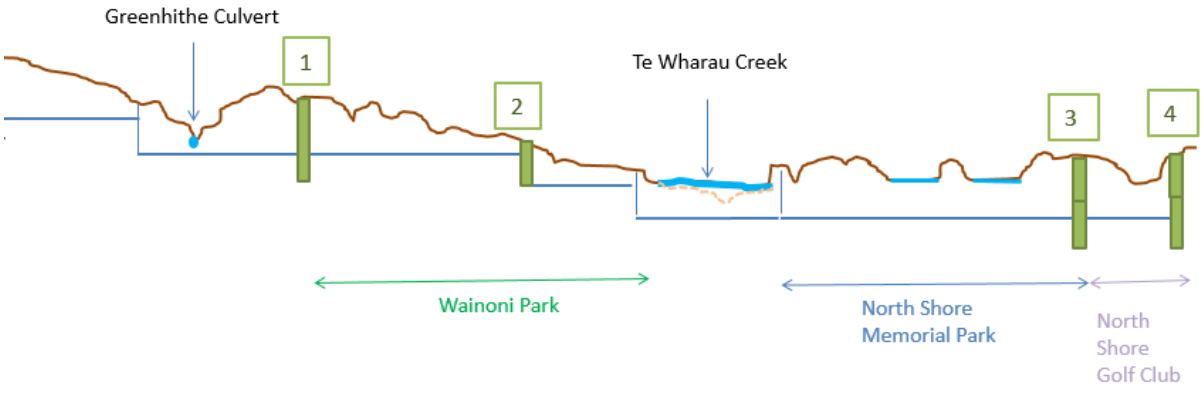


Figure 8-3: Cost Comparison Area for IPS

Pricing has used costs provided from previous Early Contractor Involvement engagements, Watercare Unit Rates, and other project sources.

The estimated costs for the works based on the pump station Options are summarised in Table 8-4**.** Cost estimation allows for 17.5% Preliminary and General Overheads, and 17.5% Design Development and Minor Works.

Land cost has been included in the cost estimation. For the purpose of this consideration of alternatives, it has been assumed that the land required to construct the IPS is 0.6 ha, therefore the cost has been calculated as the actual cost per m^2 for the 6000 m^2 required for the IPS.

For Option 4, it has been assumed that the four required private properties will be purchased.

NPV analysis comparison has been calculated for Capital Cost and operational energy costs between the period 2043 to 2035.

Table 8-8: Cost Estimates

	Option 1 (Centre Wainoni Park Site)	Option 2 (North Wainoni Park Site)	Option 3 (NSMP)	Option 4 (NSGC)
CAPEX	$88,419,154	$90,114,098	$104,436,049	$103,124,923

8.3.4 Intermediate Pump Station Preferred Option

IPS Option 2 has the best MCA score and the second lowest capital cost. As such Option 2 was identified as the preferred option.

9 Alternative Statutory methods

As discussed in more detail in Sections 3 and 6 of this Report, the Northern Interceptor Project is proposed to be implemented in 6 phases over a period of 20 years. As part of the consideration of alternative methods, the Project Team gave consideration to the preferred methods of statutory implementation. The following alternative options were identified:

1. Seek a private plan change to the relevant District Plans to provide for the Project;
2. Seek a suite of District and Regional resource consents to authorise the Project; or
3. Utilise Watercare's Requiring Authority status to seek designations through a Notice of Requirement Process;

With regards to Option 1, a Plan Change process was dismissed as a potential option as it is considered that the timeframes associated with such a process would retain the risk of the Project becoming compromised (potentially completely) as a result of loss of optimum network locations (e.g. for the crossing of watercourses) through development. In addition, this option is not considered to provide any advantages over either a resource consent or designation process.

As such, Options 2 and 3 were shortlisted for further consideration. Each Phase of the Project was considered against Options 2 and 3 in the context of the following criteria:

- Criteria 1 – implementation timeframe: The timeframe for which the phase is anticipated to be required to be implemented to allow for growth and the potential for significant changes in the environment over that timeframe. Where there is no to low risk of significant changes to the environment prior (anticipated implementation to begin between within 5 years) to the anticipated phase of the Project being implemented, a resource consent process is generally preferred. Where there is a medium to high risk of significant changes to the environment (anticipated implementation to begin 5+ years) prior to the anticipated phase of the Project being implemented, a designation process is generally preferred.
    - Long Term – implementation anticipated to begin 10 years+
    - Medium Term – implementation anticipated to begin between 5 and 10 years.
    - Short Term – implementation anticipated to begin within 5 years.
- Criteria 2 - The need to protect the route: Where there is a need for the route alignment and pump station sites to be protected from potential conflicting development (including the provision of other utilities). Where there is no to low need for route protection, a resource consent process is generally preferred. With the obligations of Section 178(2) of the RMA in mind, where there is medium to high need for route protection, a designation process is generally preferred.
    - High – the phase faces significant pressure from conflicting urban development (e.g. is within an identified growth area).
    - Medium – the phase faces some pressure from conflicting urban development (e.g. is within an area identified for intensification).
    - Low – the phase is within an area unlikely to face pressure from conflicting urban development.
- Criteria 3 – the need for flexibility: The need for flexibility with respect to construction methodology and route alignment. In many cases, this criteria is influenced by the anticipated implementation timeframe and subsequently the degree of certainty in times of detail of design. Where there is no to low need for flexibility, a resource consent process

is generally preferred. Where there is a medium to high need for flexibility, a designation process is generally preferred.

- High – there is a high need for route and/or construction flexibility (e.g. phase is at concept design);
- Medium – there is a medium need for route and/or construction flexibility (e.g. phase is preliminary design);
- Low– there is a low need for route and/or construction flexibility (e.g. phase is at detailed design).

Table 9-1: Overview of Phases 1-6 of the Northern Interceptor

Phase	Description	Anticipated Construction Timeframe[4]	Criteria 1	Criteria 2	Criteria 3	Preferred Statutory Method of Implementation
1	This phase transfers existing flows from the Hobsonville flows to the Rosedale WWTP, crossing the Upper Waitemata Harbour and through Greenhithe.	2018-2020	Short term	Low	Medium	Given the short term anticipated implementation timeframe a Resource Consent process is the preferred method of implementation.
2	This phase of the project comprises the installation of a tunnel from near Westgate to the Hobsonville PS, along the State Highway ("SH18"), and is mostly within the NZ Transport Agency's designation.	2022-2027	Medium Term	High	Medium	Given the medium term anticipated implementation timeframe and the high need for route protection, a designation processes is the preferred methods of implementation.
3	This phase is a new BPS that will increase the capacity of the Phase 1 pipeline from 275L/s to 520L/s	2022 - 2027	Medium Term	Low	High	Given the medium term anticipated implementation timeframe and high need for construction and/or route flexibility, a designation process is the preferred method of implementation.
4	This phase includes a new pipeline from the eastern abutment of the Greenhithe Bridge to the Rosedale WWTP and an	2032 - 2034	Long Term	Medium	High	Given the long term anticipated implementation timeframe, medium need for route protection and high need for construction and/or

[4] Dependant on the rate of growth of the catchment area

Phase	Description	Anticipated Construction Timeframe[4]	Criteria 1	Criteria 2	Criteria 3	Preferred Statutory Method of Implementation
	Intermediate PS in Wainoni Park					route flexibility, a designation process is the preferred method of implementation.
5	This includes the installation of a pipeline from the Concourse Storage tank to Hobsonville Road, where it will connect with the Phase 2 pipeline.	2035+	Long Term	Medium	High	Given the long term anticipated implementation timeframe and high need for construction and/or route flexibility, a designation process is the preferred method of implementation.
6	This phase involves the duplication of the rising main sections of Phase 4.	2035+	Long Term	Low	High	Given the long term anticipated implementation timeframe and high need for construction and/or route flexibility, a designation process is the preferred method of implementation.

10 Conclusion

Watercare has evaluated a wide range of alternatives for addressing the wastewater network needs for the Service Catchment. That evaluation process confirmed the delivery of wastewater to Rosedale WWTP for treatment and discharge is the preferred option. Northern Interceptor was confirmed as the preferred integrated network upgrading solution. A subsequent detailed consideration of alignment options and design and construction configurations confirmed the alignment. The Northern Interceptor project represents the outcome of that process and is considered to be the option that best provides for future wastewater network needs and best meets Watercare's Strategic Intent. The work lays the foundations for the wastewater network in this part of Auckland for the next 50 years and represents a cost effective solution to provide for future growth, asset risk management and an appropriate level of overflow mitigation.

Appendix A

Longlist criteria and basis for assessment for Northern and Southern Alignment

Criteria	Operational	Technical	Environmental	Staging
Sub-Criteria	**Safety:** ability for Watercare staff to operate and maintain the works in a safe manner, includes issues such as confined spaces, working at heights, gas accumulation, accessibility etc.	**Reliability:** whether the option provides for a reliable technology with prior application and proof of performance in NZ	**Cultural/heritage:** impacts on areas of cultural or heritage significance	**Ability to be staged**
	Complexity: degree of difficulty and interdependency of the operation of the works	**Flexibility:** adaptable to change/adjustment to suit future requirements	**Environment:** impacts on areas of environmental significance such as native flora and fauna, CMAs	
	Maintenance: overall requirements and frequency of maintenance activities, degree of difficulty, impacts on system performance during maintenance etc.	**Constructability:** ease of construction, availability of local contractors, need for specialist equipment or techniques	**Community:** impact on community groups and local interests through construction and ongoing operation of new assets	
	Odour/Corrosion: septicity and odour generation, noxious gases, accelerated corrosion rates due to sulphide attack	**Opportunity/benefit:** provides additional benefits beyond the base requirements for the project	**Landowners/property:** impact on individual property owners during construction and ongoing operation	

Shortlist criteria and basis for assessment for Northern and Southern Alignment

Assessment Framework		Basis for Assessment
Functionality	Baseline requirements	Options consistent with the Three Waters Strategy, particularly the future utilisation of treatment capacity Rosedale vs Mangere, providing for increasing network capacity to **service** growth the North West Transformation Area ("NWTA"), Kumeu, Huapai, Riverhead ("KHR"), Northern Waitakere catchments and South Rodney areas
		Capacity to **support** growth and development in the North West Transformation Area ("NWTA"), Kumeu, Huapai, Riverhead ("KHR"), Northern Waitakere catchments and South Rodney areas
	Additional requirements	Ability to intercept catchments and allow the decommissioning of local pump stations
		Ability to delay or replace local and wastewater network upgrades
		Provide benefit or alignment with other utilities or public services
Operational & Maintenance		Site location and space available for on-going operational and maintenance access requirements (e.g. at shaft sites)
		Site appropriately buffered from surrounding community
		Provides for future operational flexibility (e.g. how easy will it be to deal with a significant increase in flow)
Constructability		Potential for construction risks that may hold up, stop or adversely affect construction time
		Ability for construction techniques to be delivered by a number of Contractors allowing competitive tenders to be obtained
		Potential for construction risks that result in significant cost overruns
Assessment of Environmental Effects	Environmental	Potential construction impacts on coastal and freshwater quality
		Potential construction effects on terrestrial ecosystems. Sites located in close proximity to SEA-Land and/or riparian margins will have a greater impact on habitats, flora fauna
		Potential effects on protected trees during construction
		Potential construction effects on landscape/neutral character values, and their ability to be mitigated
		Potential construction on coastal ecosystems. Construction activities that are near to the CMA and/or are within the CMA (e.g. marine trenching) will have a greater impact on coastal ecosystems
		Sensitivity of ecosystems from operational overflow discharges. Assume dilution and dispersion is better at the head of creeks in the CMA

Assessment Framework		Basis for Assessment
	Social	Distance from site to arterial road for operational and maintenance purposes
		Likelihood of adverse effects on local roads resulting from construction activities
		Operational effects on residential properties with line of sight of permanent structures e.g. pump stations). This includes effects relating to visual amenity, noise, and odour
		Impact to neighbouring properties within 200m of construction sites resulting from construction activity (visual, dust noise, odour, traffic)
		Short-term impact on community facilities resulting from construction activities (e.g. reduced access to community facilities (e.g. Beach, sports club, community hall, playground, etc.)
		Proximity of construction activities to sensitive community facilities (e.g. School, play centre, medical facility) located on likely construction traffic route
		Extent to which construction works will reduce access to parks and reserves when considering the ability to operate parks/reserves 'as usual' during construction, and the amount of reserve required for construction activities. This considers the sensitivity of the users of the reserve (e.g. North Shore Memorial Park and mourners)
		Effects arising from potential operational odour discharges (e.g. at break pressure chamber sites and pump station sties)
		Impact to neighbouring properties from operation and maintenance activity (includes visual, dust, noise, odour, traffic) and risk of operational failures
		Number of properties above the centreline of the pipeline
	Cultural	Potential impacts waahi tapu sites identified in District Plan and impact on heritage and traditional sites for Mana Whenua
		Effects on mauri of waterbodies through wastewater overflows
		Impact on cemetery (as an urupā)
	Economic	Excavations in alluvium with risk of settlement of sensitive structures
		Number of private property purchases required to facilitate the construction of the pipeline
		Potential for short-term business disruption during construction
		Disruption to existing services and utility providers
		Energy use required for operating the facility (pump stations sties)

Longlist Options Assessment – Hobsonville to Rosedale

MCA scoring and comments on scoring

- The workshop participants assessed each longlist option against each of the sub criteria. For each sub criteria a score of 1 - 5 was awarded based on the professional judgement of the collective workshop group. A score of 1 indicates a high risk associated with the criteria (i.e. the option will potentially fail to meet requirements), a score of 5 would indicate a low risk associated with the criteria (i.e. the option is considered reliable);
- Each criteria was weighted evenly (0.25%)

Option	Criteria	Operational Criteria						Technical Criteria						Environmental Criteria						Staging		Overall MCA SCORE (sum of weighted scores)	Rank
	Sub-criteria	Safety	Complexity	Maintenance	Odour/ Corrosion	**Score Average (Operational)**	**Score Weighted (Operational)**	Reliability	Flexibility	Constructability	Opportunity/ Benefit	**Score Average (Technical)**	**Score Weighted (Technical)**	Cultural/ Heritage	Environment	Community	Landowner/ Property	**Score Average (Environmental)**	**Score Weighted (Environmental)**	Ability to Stage	**Score Weighted (Staging)**		
1	Upper Harbour Drive	2	3	2	3	**2.5**	**0.63**	3	2	1	2	**2.0**	**0.5**	3	4	3	4	**3.5**	**0.87**	2	**0.5**	2.5	9
2	Beach Haven Road	3	3	3	4	**3.25**	**0.81**	2	2	1	3	**2.0**	**0.5**	3	4	2	3	**3.0**	**0.75**	2	**0.5**	2.56	7
3	Upper Harbour Highway	2	3	1	3	**2.25**	**0.56**	3	2	1	2	**2.0**	**0.5**	3	4	3	2	**3.0**	**0.75**	2	**0.5**	2.31	11
4	Kyle Road	4	2	3	2	**2.75**	**0.69**	3	2	2	3	**2.50**	**0.63**	3	3	2	3	**2.75**	**0.69**	2	**0.5**	2.51	8
5	Lucas Creek (rising main and gravity sewer)	4	3	2	2	**2.75**	**0.69**	3	2	2	2	**2.25**	**0.56**	2	2	3	3	**2.5**	**0.63**	2	**0.5**	2.38	10
6	Lucas Creek (rising main only)	4	3	2	2	**2.75**	**0.69**	3	2	2	2	**2.25**	**0.56**	2	2	3	3	**2.5**	**0.63**	4	**1**	2.88	6
7	Deep Tunnel (western alignment)	4	4	4	4	**4.0**	**1.0**	4	5	4	3	**4.0**	**1.0**	4	5	4	4	**4.25**	**1.06**	2	**0.5**	3.56	2
8	Deep Tunnel (eastern alignment)	4	4	4	4	**4.0**	**1.0**	4	5	4	5	**4.5**	**1.13**	4	5	4	4	**4.25**	**1.06**	3	**0.75**	3.94	1
9	Tauhinu Road, Greenhithe	4	3	3	2	**3.0**	**0.75**	3	2	3	3	**2.75**	**0.69**	3	3	3	3	**3.0**	**0.75**	3	**0.75**	2.94	4
10	Beach Haven (coastal and tunnel)	4	3	2	3	**3.0**	**0.75**	3	3	2	3	**2.75**	**0.69**	2	2	4	4	**3.0**	**0.75**	3	**0.75**	2.94	4
11	Shallow Tunnel (eastern alignment)	4	4	3	2	**3.25**	**0.81**	4	2	2	3	**2.75**	**0.69**	4	4	2	3	**3.25**	**0.81**	3	**0.75**	3.06	3

Comments on select individual scores

Option 1 - Upper Harbour Drive

This option is based on the broad concept of maximising the use of roads and urban environments. From a construction perspective, the need for a crossing of the CMA at the Upper Waitemata Harbour was considered to be the most challenging aspect of this option.

For the purpose of longlist development it is assumed that the crossing of the Harbour would be constructed by HDD into the flatter coastal area north of the existing bridge as this would reduce HDD length to around 600m but would increase the overall rising main route by approximately 200m. However, early analysis also determined that a crossing to the north of the bridge would also be a preferred option for marine trenching if this technique is preferred. Construction along Upper Harbour Drive would be by micro-tunnelling. As this road runs up along the main ridgeline the micro-tunnelling needs to be very deep under this option.

This option would require new pump stations to be constructed at the Rosedale WWTP and the Concourse Storage Tank.

Criteria	*Score*	*Comment*
Safety	2	Difficulty associated with deep micro-tunnelling operations, traffic and public safety.
Maintenance	2	Long rising mains, high head pumping station and very deep gravity sewer.
Flexibility	2	System has no surplus design capacity for additional flows and requires flows to be delivered to the Hobsonville PS by rising main or shallow sewer due to the very high pump heads required to transfer flows onward.
Constructability	1	Difficulties of a marine crossing or long HDD shot and the deep micro-tunnelling along upper harbour drive.
Opportunity benefits	2	A pumping station at Rosedale inlet would provide some operational benefit to the existing network by removing existing siphons.
Staging	2	Options available for staging include using smaller diameter rising main on start-up to defer construction of the major works. Predominant length of gravity sewer and inlet PS at Rosedale need to be sized for ultimate capacity from day 1 thereby limiting overall staging capability.

Option 2 - Beach Haven Road

This option is based on the broad concept of maximising the use of roads and urban environments. This option was developed as a predominantly gravity sewer alignment on an easterly approach to Rosedale from Hobsonville. Preliminary investigations suggest that the main challenge with this alignment is likely to be the harbour crossing which is anticipated to require deep micro-tunnelling and thus increase the overall gravity sewer depth and pumping head requirements compared to other options.

For the purpose of longlist development it was assumed that the crossing of the Harbour would be constructed by marine trenching, and micro-tunnelling would be utilised along Beach Haven Road and Glenfield Road. This option would require new pump stations to be constructed near Glenfield Road and at the existing Hobsonville PS site.

Criteria	*Score*	*Comment*
Odour Corrosion	4	Odour/corrosion risk was scored at 4 due to the predominantly gravity alignment.
Flexibility	2	System has no surplus design capacity for additional flows and the very high pump heads required to lift flows at Glenfield College.
Constructability	1	Difficulties of a shallow gravity marine crossing the deep micro-tunnelling along Glenfield Road and through the residential streets in Totaravale.
Opportunity benefits	3	Some potential to replace existing assets in the North Shore if the gravity sewer and pumping station and rising mains were upsized.
Staging	2	Options available for staging include using smaller diameter rising main on start-up to defer construction of the major works. Predominant length of gravity sewer and PS at Glenfield College need to be sized for ultimate capacity from day 1 thereby limiting overall staging capability.

Option 3 - Upper Harbour Highway

This option is based on the broad concept of maximising the use of roads and urban environments, and is the most direct road based alignment. From a construction perspective, the need for a crossing of the CMA and the deep gravity section along Upper Harbour Highway, were considered to be the most challenge aspects of this option.

For the purpose of longlist development it is assumed that the crossing of the Harbour would be constructed by HDD into the flatter coastal area north of the existing bridge as this would reduce HDD length to around 400m but would increase the overall rising main route by approximately 200m. However, early analysis also determined that a crossing to the north of the bridge would also be a preferred option for marine trenching if this technique is preferred.

With respect to the gravity main, it is assumed that this would be constructed by micro-tunnelling from a break pressure chamber north of the Upper Harbour Bridge to the Rosedale WWTP. This tunnel would be very deep in places (over 50m in parts), and would require micro-tunnel shafts every 250m due to the depth and jacking forces required.

This option would require new pump stations to be constructed at the existing Hobsonville PS site and the Rosedale WWTP.

Criteria	*Score*	*Comment*
Safety	2	Difficulty associated with deep micro-tunnelling operations, traffic and public safety.
Maintenance	1	Deep section of rising main and accessibility to the deep gravity sewer within the highway corridor.
Flexibility	2	System has no surplus design capacity for additional flows and requires flows to be delivered to the Hobsonville PS by rising main or shallow sewer due to the very high pump heads required to transfer flows onward.
Constructability	1	Difficulties of a marine crossing or long HDD shot and the deep micro-tunnelling along upper harbour highway.
Opportunity benefits	2	A pumping station at Rosedale inlet would provide some operational benefit to the existing network by removing existing siphons.
Landowner/ property	2	Due to the work within the highway corridor.
Staging	2	Options available for staging include using smaller diameter rising main on start-up to defer construction of the major works. Predominant length of gravity sewer and inlet PS at Rosedale need to be sized for ultimate capacity from day 1 thereby limiting overall staging capability.

Option 4 - Kyle Road

This option is based on the broad concept of maximising the use of roads and urban environments. This option is a predominantly gravity sewer alignment on a westerly approach. From a construction perspective, the need for two crossings of the CMA, the potential need to reclaim land, and the need to micro-tunnel along the existing North Harbour Water Main were considered to be the most challenging aspects of this option.

For the purpose of longlist development it is assumed that the crossing of the Harbour would be constructed by HDD. Early analysis of marine crossing options noted that a crossing in the shallow area of the harbour (across to Herald Island) may be viable to construct by marine trenching, but the channel between Herald Island and the North Shore is deep, making trenching in this area less viable.

This option would require new pump stations to be constructed at the existing Hobsonville PS site and midway along the route.

Criteria	*Score*	*Comment*
Safety	4	Shallower gravity sewer and construction away from highly trafficked roads.
Complexity	2	There are two or even potentially 3 pump stations depending on Rosedale inlet arrangements and multiple air treatment facilities.
Odour and Corrosion	2	Two separate sections of rising main.
Flexibility	2	No surplus design capacity for additional flows.
Constructability	2	Perceived difficulties of the marine crossing between Herald Island and Rahui Road and micro-tunnelling through the residential streets in Greenhithe and the industrial area at Rosedale.
Opportunity benefits	3	Some potential to replace existing assets in the North Shore if the gravity sewer and pumping station and rising mains were upsized.
Community	2	Construction impacts on Herald Island, and in the Greenhithe area.
Staging	2	Options available for staging include using smaller diameter rising main on start-up to defer construction of the major works. Predominant length of gravity sewer and PS at Kyle Road need to be sized for ultimate capacity from day 1 thereby limiting overall staging capability.

Option 5 - Lucas Creek (rising main and gravity sewer)

This option is based on the broad concept of avoiding the use of roads and urban environments. This option was developed to avoid the higher ridgelines to the south and east of Rosedale by cutting across to Lucas Creek and approach Rosedale from the west. From a construction perspective, the depth of micro-tunnelling through Rosedale's industrial area, the large extent of pipeline within the CMA (including Coastal Protection and Significant Ecological Areas) were considered to be the most challenging aspects of this option.

For the purpose of longlist development, it was assumed that a combination of marine trenching and HDD would be used to construct the rising main components of the pipeline within the marine areas from the north side of Herald Island up to Lucas Creek, and that micro-tunnelling would be used to install the gravity section of the pipeline to the Rosedale WWTP due to the construction depths required (over 50m) in some locations.

This option would require new pump stations to be constructed at the existing Hobsonville PS site and the Rosedale WWTP.

Criteria	*Score*	*Comment*
Safety	4	Majority of construction away from roads and residential areas.
Maintenance	2	Inaccessibility of rising mains and the risk of low/high points in rising mains without ability to scour or air relief.
Odour and Corrosion	2	The long (4.9km) section of rising main.
Flexibility	2	The system has no surplus design capacity for additional flows.
Constructability	2	Perceived difficulties of marine pipeline construction and the deep micro-tunnelling section.
Opportunity benefits	2	Potential to divert Kyle Road PS into the new gravity sewer. Using Rosedale inlet PS to remove existing gravity sewer siphons coming into the plant would increase pumping station size and pumping costs significantly and is not considered practical. However, the use of the pump well for regular sewer siphon scouring might be practical.
Cultural/Heritage	2	Impacts of the extensive marine pipeline works.
Staging	2	Options available for staging include using smaller diameter rising main on start-up to defer construction of the major works. The long gravity sewer would need to be sized for ultimate capacity from day 1 and the Rosedale PS structure would be sized for ultimate capacity but pumps could be staged.

Option 6 - Lucas Creek (rising main only)

This option is based on the broad concept of avoiding the use of roads and urban environments. This option is a variation on the route above (Lucas Creek) and has been developed as entirely rising mains with no gravity sewer to minimise pipeline construction depths. From a construction perspective, the large extent of pipeline within the CMA (including Coastal Protection and Significant Ecological Areas), the odour risks due to significant retention time, and the potential impact on sites of significance along the route were identified as the most challenging aspects of this option.

For the purpose of longlist development, it was assumed that the pipeline would be constructed by open trenching techniques for both the land-based and marine crossing components. Early analysis indicated that HDD was a viable option for the marine crossing as an alternative.

This option would require new pump stations to be constructed at the existing Hobsonville PS site and midway along the route.

Criteria	*Score*	*Comment*
Safety	4	Majority of construction away from roads and residential areas
Maintenance	2	Inaccessibility of rising mains and the risk of low/high points in rising mains without ability to scour or air relief
Odour and Corrosion	2	Long sections of rising main
Flexibility	2	The system has no surplus design capacity for additional flows
Constructability	2	Perceived difficulties of marine pipeline construction and the deep micro-tunnelling section.
Opportunity benefits	3	No real potential to connect existing catchments
Cultural/Heritage	2	Impacts of the extensive marine pipeline works.
Staging	4	Options available for staging include using smaller diameter rising main on start-up to defer construction of the major works. For the new pumping station at the Golf Course, the structure would be sized for ultimate capacity but pumps could be staged.

Option 7 - Deep Tunnel (western alignment)

This option is based on the broad concept of maximising the use of deep tunnels and constitutes the use of a deep gravity tunnel direct from Hobsonville to Rosedale WWTP across the Greenhithe peninsula. From a construction perspective, the depth of the tunnel was considered to be the most challenging aspect of this option.

The western alignment was selected to maintain clearance from the Upper Harbour Highway bridge and to provide a number of suitable open space options for the location of tunnel shafts.

For the purpose of longlist development, it was assumed that the pipeline would be installed by a Tunnel Boring Machine ("TBM"). However, uncertainty with respect to changes in Health and Safety Legislation and the future requirements for additional access shafts was identified as potential risk.

This option would require a new pump station to be constructed at the Rosedale WWTP.

Criteria	*Score*	*Comment*
Safety	4	Controlled discreet working sites and a segmental lining TBM tunnelling operation.
Complexity	4	It is a gravity sewer, the existing Hobsonville PS is removed and only a single PS is required at Rosedale.
Maintenance	4	Large diameter gravity sewer with good accessibility.
Odour and Corrosion	4	No rising mains.
Reliability	4	Only a single PS at Rosedale and there is storage capacity in the system for managing PS failure.
Flexibility	5	The system has surplus design capacity for additional flows, provides storage capacity at Rosedale and could accommodate any connection option for the Concourse to Rosedale works.
Constructability	4	TBM construction is well proven and tunnel is below all existing services and construction will have little impact on the community
Opportunity benefits	4	The storage afforded by a tunnel would provide operational security at Rosedale. Existing network assets such as the Kyle Road PS could be abandoned
Assessment of Effects	4 and 5	Shafts can be located to minimise any impacts on Cultural, Heritage, Environment, Community or Landowners.
Staging	2	Any staging would require additional works that are not part of the ultimate scheme. An example would be to only construct part of the tunnel from Rosedale through to Greenhithe Road and to use a 600mm diameter rising main from an augmented Hobsonville PS for start-up.

Option 8 - Deep Tunnel (eastern alignment)

This option is based on the broad concept of maximising the use of deep tunnel and was developed as a deep gravity tunnel direct from Hobsonville to Rosedale WWTP through Beach Haven and then north up to Rosedale. From a construction perspective the depth of the tunnel, which would require tunnel shafts of between 30 to 100m, was considered to be the most challenging aspect of this option.

The eastern alignment was selected to maintain clearance from the Upper Harbour Highway bridge and to provide a number of suitable open space options for the location of tunnel shafts. It also passes adjacent to the main wastewater pumping station at Kahika providing the opportunity to incorporate a large proportion of the lower North Shore into the scheme.

As with the option above, for the purpose of longlist development, it was assumed that the pipeline would be installed by a TBM. However, uncertainty with respect to changes in Health and Safety Legislation and the future requirements for additional access shafts was identified as potential risk.

This option would require a new pump station to be constructed at the Rosedale WWTP.

Criteria	*Score*	*Comment*
Safety	4	Controlled discreet working sites and a segmental lining TBM tunnelling operation.
Complexity	4	It is a gravity sewer, the existing Hobsonville PS is removed and only a single PS is required at Rosedale.
Maintenance	4	Large diameter gravity sewer with good accessibility.
Odour and Corrosion	4	No rising mains.
Reliability	4	Only a single PS at Rosedale and there is storage capacity in the system for managing PS failure.
Flexibility	5	The system has surplus design capacity for additional flows, provides storage the Concourse to Hobsonville works.
Constructability	4	TBM construction is well proven and tunnel is below all existing services and construction will have little impact on the community.
Opportunity benefits	5	The storage afforded by a tunnel would provide operational security at Rosedale. Existing network assets such as the Kahika PS could be abandoned.
Assessment of Effects	4 and 5	Shafts can be located to minimise any impacts on Cultural, Heritage, Environment, Community or Landowners.
Staging	2	Any staging would require additional works that are not part of the ultimate scheme. An example would be to only construct part of the tunnel from Rosedale through to Kahika and to use a 600mm diameter rising main from an augmented Hobsonville PS for start-up. This alternative is discussed further as Option 11.

Option 9 - Tauhinu Road, Greenhithe

This option is based on the broad concept of maximising the use of roads and urban environments, and combines sections from other routes. This option was developed to avoid the higher ridgelines to the south and east of Rosedale by cutting across to the upper section of Lucas Creek and approach Rosedale from the west.

From a construction perspective, the need for a crossing of the CMA was considered to be the most challenging aspect of this option. As with Option 1, for the purpose of longlist development it is assumed that the crossing of the Upper Waitemata Harbour would be constructed by HDD into the flatter coastal area north of the existing bridge.

This option would require new pump stations to be constructed at the existing Hobsonville PS site and midway along the route.

Criteria	*Score*	*Comment*
Safety	4	Shallower gravity sewer and construction away from highly trafficked roads
Complexity	3	Only one additional pumping station (plus Hobsonville) at the golf course
Odour and Corrosion	2	Two separate sections of rising main
Flexibility	2	The system has no surplus design capacity for additional flows
Constructability	3	The marine crossing and connection through to Tauhinu Road is difficult but the balance of the alignment being pipe jack and rising main is more straightforward. Opportunity benefits were scored at 3. There is the potential to abandon Kyle Road Pumping station if the gravity sewer and pumping station and rising mains were upsized
Assessment of Effects	3	Limited marine work, impact on parks and private property. There are potential cultural/heritage locations in this area as identified in the Unitary Plan
Staging	3	Options available for staging include using smaller diameter rising main on start-up to defer construction of the major works. Predominant length of gravity sewer would need to be sized for ultimate capacity from day one. The new Golf Course pump station structure would be sized for ultimate but pump installation and emergency storage capacity may be staged.

Option 10 - Beach Haven (coastal and tunnel)

This option is based on the broad concept of avoiding the use of roads and urban environments. This option was developed to maximise marine pipeline construction along an easterly approach to Rosedale WWTP. This option was abandoned due to the difficulties associated with traversing the high ridge line (approximately RL 105m) along the Albany Highway and the associated pumping head requirements.

This option would require a new pump station at the existing Hobsonville PS site.

Criteria	*Score*	*Comment*
Safety	4	Working well away from public areas, deep gravity section would be 3 to 3.5m diameter and constructed by TBM
Complexity	3	Only one additional pumping station (plus Hobsonville) at Rosedale inlet and the availability of storage within the tunnel section
Odour and Corrosion	3	Long rising main
Flexibility	3	The long rising main sections have no surplus design capacity for additional flows.
Constructability	2	The marine pipeline being seen as difficult with ability to maintain grades and stability of shallow trenched large diameter rising mains in the long term.
Opportunity/ Benefit	3	Opportunity benefits were scored at 3. Some existing North Shore assets could be redirected into the gravity tunnel through new link sewers. The Rosedale inlet PS would enable existing siphons to be removed but being very deep would mean significant additional pumping costs unless a double lift configuration was adopted.
Cultural/Heritage and Environment	2	Extent of the marine work
Community and Landowner	4	Limited impact due to marine route and tunnel
Staging	3	Options available for staging include using smaller diameter rising main on start-up to defer construction of the major works. Tunnelled section of gravity sewer and Rosedale inlet pumping station (civils) would need to be sized for ultimate capacity from day 1.

Option 11 - Shallow Tunnel (eastern alignment)

This option is based on the broad concept of maximising the use of deep tunnels, and also on the broad concept of avoiding the use of roads and urban environments. This option was developed as a shallow tunnel option to Rosedale following an easterly alignment. The alignment provides for a new pumping station at Hobsonville with rising main to Kahika, connecting to a 3m diameter tunnel section from Kahika to Rosedale and a new pump station at Rosedale to lift flows into the WWTP.

From a construction perspective, the need to avoid existing deep gullies where the pipeline is shallow as well as the need for a crossing of the CMA, were identified as the most challenging aspects of this option.

For the purpose of longlist development it was assumed that the pipeline would be installed by a TBM. However, uncertainty with respect to changes in Health and Safety Legislation and the future requirements for additional access shafts was identified as potential risk.

This option would require new pump stations to be constructed at the existing Hobsonville PS site and Rosedale WWTP.

Criteria	*Score*	*Comment*
Safety	4	Controlled discreet working sites and a segmental lining TBM tunnelling operation and small diameter rising main construction
Complexity	4	Whilst there is a pump station at Hobsonville and at Rosedale, the overall operation at Rosedale WWTP would be simplified through the single pump station arrangement and the storage afforded by the section of oversized tunnel.
Maintenance	3	The long rising mains are predominantly within road reserves and the large diameter gravity sewer has good accessibility
Odour and Corrosion	2	The very long rising mains and discharge to the tunnel at a Park close to residential properties.
Reliability	4	There is storage capacity in the system for managing PS failure and Hobsonville would be designed to also maintain the ability to pump to Whenuapai for the initial stage. The new Hobsonville pump station would require a full backup power supply and substantial emergency storage.
Flexibility	2	The tunnel is too shallow at Kaipatiki Park to be extended further towards Hobsonville or enable the Kahika Road PS to be abandoned. The rising mains are only sized for design flows
Constructability	2	Marine works and construction through Hobsonville and Beach Haven. TBM construction is well proven and tunnel is below all existing services and construction of this section will have little impact on the community
Opportunity benefits	3	The storage afforded by a tunnel would provide operational security at Rosedale. Existing network assets such as the Kahika Road PS rising main and some sections of the North Shore gravity network could be redirected into the tunnel if these assets were under capacity or in poor condition.

Assessment of Effects	Various	Shafts can be located to minimise any impacts on Cultural, Heritage, Environment, Community or Landowners. Marine crossing will impact slightly on Cultural Heritage and Environment and both were scored at 4. Works through Hobsonville and Beach Haven Road will affect Community and Landowners and were scored at 2 and 3 respectively
Staging	3	The tunnel is sized for ultimate capacity but the initial rising main will provide interim capacity until growth requires additional capacity (the length of time that the interim rising main will be adequate will depend upon the actual rate of growth experienced by the catchment, the design should be sized to ensure that at a minimum that 10 years of capital deferral

Shortlist Options Assessment – Hobsonville to Rosedale

MCA scoring

Criteria	Sub-criteria	Basis for Assessment	Basis for scoring	Upper Harbour Highway	Tauhinu Road, Greenhithe
Functionality	Baseline requirements	Options consistent with the Three Waters Strategy, particularly the future utilisation of treatment capacity Rosedale vs Mangere, providing for increasing network capacity to service growth the North West Transformation Area ("NWTA"), Kumeu, Huapai, Riverhead ("KHR"), Northern Waitakere catchments and South Rodney areas	1 = entirely consistent; 2 = closely aligned; 3 = aligned on key aspects on; 4 = little alignment; 5 = no alignment	1	1
		Capacity to support growth and development in the North West Transformation Area ("NWTA"), Kumeu, Huapai, Riverhead ("KHR"), Northern Waitakere catchments and South Rodney areas.	1 = Very Good; 2 = Good; 3 = Adequate; 4 = Barely Adequate; 5 = Inadequate	1	1
	Additional requirements	Ability to intercept catchments and allow the decommissioning of local pump stations	1 = Very Good; 2 = Good; 3 = Adequate; 4 = Barely Adequate; 5 = Inadequate	4	2
		Ability to delay or replace local and wastewater network upgrades	1 = Very Good; 2 = Good; 3 = Adequate; 4 = Barely Adequate; 5 = Inadequate	4.5	4
		Provide benefit or alignment with other utilities or public services	1 = Very Good; 2 = Good; 3 = Adequate; 4 = Barely Adequate; 5 = Inadequate	4	4
Functionality Average Score				**2.9**	**2.4**
Operational & Maintenance		Site location and space available for on-going operational and maintenance access requirements (e.g. at shaft sites)	1 = neutral or positive; 2 = minor construction risks; delay < 4wks; 3 =moderate risk, delay 4 - 12wks; 4 = high level of risk, delay >12wks; 5 = high risk, construction held up indefinitely.	3	2
		Site appropriately buffered from surrounding community	1 = Very Good; 2 = Good; 3 = Adequate; 4 = Unlikely (only 1or 2 Contractors); 5 = Impossible (1 or none Contractors).	2	2
		Provides for future operational flexibility (e.g. how easy will it be to deal with a significant increase in flow)	1 <5%; 2 = 5-10%; 3 = 10%-15%; 4 = 20-25%; 5 = >25%	4	2

Operational & Maintenance Average Score				**3.0**	**2.0**
Constructability		Potential for construction risks that may hold up, stop or adversely affect construction time	1 = neutral or positive; 2 = minor construction risks; delay < 4wks; 3 =moderate risk, delay 4 - 12wks; 4 = high level of risk, delay >12wks; 5 = high risk, construction held up indefinitely.	4	3
		Ability for construction techniques to be delivered by a number of Contractors allowing competitive tenders to be obtained	1 = Very Good; 2 = Good; 3 = Adequate; 4 = Unlikely (only 1or 2 Contractors); 5 = Impossible (1 or none Contractors).	2	2
		Potential for construction risks that result in significant cost overruns	1 <5%; 2 = 5-10%; 3 = 10%-15%; 4 = 20-25%; 5 = >25%	3.5	3
Constructability Average Score				**3.2**	**2.7**
Assessment of Effects on the Environment	Environmental	Potential construction impacts on coastal and freshwater quality	1 = neutral or positive; 2 = slight impact – localised & minor; 3 = moderate impact, slightly more than localised effect; 4 = high impact – wide spread impacts; 5 = very significant – widespread impacts on sensitive environments (e.g. CPA 1, beaches).	2	3
		Potential construction effects on terrestrial ecosystems. Sites located in close proximity to SEA-Land and/or riparian margins will have a greater impact on habitats, flora fauna.	1 = neutral or positive; 2 = slight impact – localised & minor; 3 = moderate impact, slightly more than localised effect; 4 = high impact – wide spread impacts loss of ecologically valuable habitats; 5 = very significant – widespread impacts, loss of ecologically habitats, rare/threatened species.	2	2
		Potential effects on protected trees during construction	1 = neutral or positive; 2 = slight impact – removal or trimming of a couple of non-protected trees; 3 = moderate impact, removal of a couple of protected trees; 4 = high impact – removal of a scheduled or notated tree; 5 = very significant – removal of several scheduled or notated trees.	2	2
		Potential construction effects on landscape/neutral character values, and their ability to be mitigated	1 = neutral or positive; 2 = slight impact – temporary minor reduction in visual quality; 3 = moderate impact, slightly more than localised effect, temporary effect that can be mitigated; 4 = high impact – significant visual or natural character impacts, permanent effect; 5 = very significant – significant impact in regionally significant landscape, permanent effect.	3	4
		Potential construction on coastal ecosystems. Construction activities that are near to the CMA and/or are within the CMA (e.g. marine trenching) will have a greater impact on coastal ecosystems.	1 = neutral or positive; 2 = slight impact – localised & minor; 3 = moderate impact, slightly more than localised effect; 4 = high impact – wide spread, permanent loss of CMA; 5 = very significant – widespread impacts on sensitive environments (e.g. CPA 1, beaches).	2	3
		Sensitivity of ecosystems from operational overflow discharges. Assume dilution and dispersion is better at the head of creeks in the CMA.	1 = neutral or positive; 2 = slight impact – localised & minor; 3 = moderate impact, slightly more than localised effect, visual; 4 = high impact – wide spread impacts loss of ecologically valuable habitats; 5 = very significant – widespread pollution.	2	3

	Environmental Average Score			**2.2**	**2.8**
	Social	Distance from site to arterial road for operational and maintenance purposes.	1 = site on arterial; 2 = <200; 3 = <1 km; 4 = 1.3 km 5 = => 3 km	1	4
		Likelihood of adverse effects on local roads resulting from construction activities.	1 = neutral or positive; 2 = minor effect; 3 = moderate effect; 4 = significant effect that is difficult to mitigate; 5 = major effect.	3	4
		Operational effects on residential properties with line of sight of permanent structures e.g. pump stations). This includes effects relating to visual amenity, noise, and odour.	1 = neutral or positive; 2 = minor effect; 3 = moderate effect; 4 = significant effect that is difficult to mitigate; 5 = major visual impact.	2	4
		Impact to neighbouring properties within 200m of construction sites resulting from construction activity (visual, dust noise, odour, traffic)	1 = neutral or positive; 2 = minor effect; 3 = moderate effect, limited amount of complaints; 4 = significant effect that is difficult to mitigate, large number of complaints; 5 = major effect.	4	4
		Short-term impact on community facilities resulting from construction activities (e.g. reduced access to community facilities (e.g. Beach, sports club, community hall, playground, etc.)	1 = neutral or positive; 2 = minor disturbance, facilities can continue to operate with minor restrictions; 3 = moderate disturbances, facilities can be continue to operate but with temporary loss of access to part of site; 4 = high level of restrictions on facilities, only limited operability; 5 = facilities no longer able to operate.	2	3
		Proximity of construction activities to sensitive community facilities (e.g. School, play centre, medical facility) located on likely construction traffic route	1 = no facilities on route; 2 = park or similar on route; 3 = sports complex on route; 4 = schools, play centres in vicinity of route; 5 = schools, play centres on route.	2	4
		Extent to which construction works will reduce access to parks and reserves when considering the ability to operate parks/reserves 'as usual' during construction, and the amount of reserve required for construction activities. This considers the sensitivity of the users of the reserve (e.g. North Shore Memorial Park and mourners)	1 = neutral or positive; 2 = minor disturbance, facilities can continue to operate with minor restrictions; 3 = moderate disturbances, facilities can be continue to operate but with temporary loss of access to part of site; 4 = high level of restrictions on facilities, only limited operability; 5 = facilities no longer able to operate.	1	3
		Effects arising from potential operational odour discharges (e.g. at break pressure chamber sites and pump station sties)	1 = neutral or positive; 2 = low potential for odour effects; 3 = moderate potential for odour effects; 4 = odour effects almost certain over local area; 5 = adverse effects over widespread area.	2	3
		Impact to neighbouring properties from operation and maintenance activity (includes visual, dust, noise, odour, traffic) and risk of operational failures	1 = neutral or positive; 2 = minor effect; 3 = moderate effect; 4 = significant effect that is difficult to mitigate; 5 = major effect.	2	3
		Number of properties above the centreline of the pipeline	1 = <5; 2 = <20; 3 = <50; 4 = <100; 5 = >100	2	1

	Social Average Score			**2.1**	**3.3**
	Cultural	Potential impacts waahi tapu sites identified in District Plan and impact on heritage and traditional sites for Mana Whenua	1 = neutral or positive; 2 = minor disturbance of site; 3 = moderate disturbance of lower value site; 4 = destruction of significant site; 5 = destruction of very significant site.	2	3
		Effects on mauri of waterbodies through wastewater overflows	1 = neutral or positive; 2 = emergency overflow only; 3 = if overflow, it is not direct to waterbody, and little potential for adverse effect on Mauri; 5 = If overflow, it is direct to special environment (stream, beach) and mauri reduced.	3	3
		Impact on cemetery (as an urupā)	1 = neutral or positive; 2 = minor disturbance of site; 3 = moderate disturbance; 4 = destruction of significant site; 5 = destruction of very significant site.	1	3
	Cultural Average Score			**2.0**	**3.0**
	Economic	Excavations in alluvium with risk of settlement of sensitive structures	1 = no settlement expected; 2 = settlement but with negligible effect; 3 = excavation in alluvium with localised settlement – no damage; 4 = excavation in alluvium, widespread settlement, moderate non-structural damage; 5 = excavation in alluvium with widespread settlement and significant structural damage.	3	4
		Number of private property purchases required to facilitate the construction of the pipeline	1 = <2; 2 = <5; 3 = <10; 4 = <20; 5 = >20	2	2
		Potential for short-term business disruption during construction	1 = neutral, site not in commercial area; 2 = site in commercial area, or commercial area in proximity, minor disruption possible; 3 = site in commercial area, or commercial are in proximity, with likely disruption to commercial activities; 4 = site in commercial area or commercial are in proximity, significant disruption to commercial activity; 5 = site in commercial area or commercial area in proximity, major disruption to commercial activity.	2	3
		Disruption to existing services and utility providers	1 = neutral or positive; 2 = slight impact - localised, minor disturbance; 3 = moderate impact, minor services relocation required; 4 = high impact - major services require relocation, limited disruption to services operation and moderate cost; 5 = very significant - major services require relocation, major disruption to services operation, significant cost.	2	3
		Energy use required for operating the facility (pump stations sties)	1 = neutral or positive; 2 =low energy use; 3 = moderate energy use 4 = high energy use; 5 = very significant energy use.	5	5
	Economic Average Score			**2.8**	**3.4**
Overall MCA Score				**2.6**	**2.8**

Longlist Options Assessment – Concourse to Hobsonville

MCA scoring and comments on scoring

- The workshop participants assessed each longlist option against each of the sub criteria. For each sub criteria a score of 1 - 5 was awarded based on the professional judgement of the collective workshop group. A score of 1 indicates a high risk associated with the criteria (i.e. the option will potentially fail to meet requirements), a score of 5 would indicate a low risk associated with the criteria (i.e. the option is considered reliable)
- Each criteria was weighted evenly (0.25)

Option	Criteria	Operational Criteria						Technical Criteria						Environmental Criteria						Staging			
	Sub-criteria	Safety	Complexity	Maintenance	Odour/ Corrosion	**Average Score (Operational)**	**Weighted Score (Operational)**	Reliability	Flexibility	Constructability	Opportunity/ Benefit	**Average Score (Technical)**	**Weighted Score (Technical)**	Cultural/ Heritage	Environment	Community	Landowner/ Property	**Average Score (Environmental)**	**Weighted Score (Environmental)**	Ability to Stage	**Weighted Score (Staging)**	**Overall MCA SCORE (sum of weighted scores)**	**Rank**
1	Te Atatu Road	3	3	3	3	**3.0**	**0.75**	3	4	2	2	**2.75**	**0.69**	3	2	2	2	**2.25**	**0.56**	3	**0.75**	2.75	4
2	Te Atatu Road – Avoiding Difficult Coastal Areas	3	3	3	3	**3.0**	**0.75**	3	4	1	2	**2.5**	**0.63**	1	2	2	2	**1.75**	**0.44**	3	**0.75**	2.57	8
3	Te Atatu Road – Avoiding Difficult Coastal Areas and the Use of Deep Tunnels	3	3	3	3	**3.0**	**0.75**	3	4	1	2	**2.5**	**0.63**	1	2	2	2	**1.75**	**0.44**	3	**0.75**	2.57	8
4	Te Atatu Road – avoiding difficult coastal areas and the use of deep tunnels with alternate harbour crossing	3	3	3	3	**3.0**	**0.75**	3	4	2	2	**2.75**	**0.69**	1	2	2	2	**1.75**	**0.44**	3	**0.75**	2.63	6
5	Matipo Road	3	3	3	3	**3.0**	**0.75**	3	4	2	2	**2.75**	**0.69**	2	2	2	2	**2.0**	**0.5**	3	**0.75**	2.69	5
6	Matipo Road – alternate pipeline alignment	3	3	3	3	**3.0**	**0.75**	3	4	2	2	**2.75**	**0.69**	2	2	2	4	**2.5**	**0.63**	3	**0.75**	2.82	2
7	Henderson Creek	3	3	2	3	**2.75**	**0.69**	3	4	2	2	**2.75**	**0.69**	2	1	1	2	**1.5**	**0.38**	3	**0.75**	2.51	12

Option	Criteria	Operational Criteria						Technical Criteria						Environmental Criteria						Staging		**Overall MCA SCORE (sum of weighted scores)**	**Rank**
	Sub-criteria	Safety	Complexity	Maintenance	Odour/ Corrosion	**Average Score (Operational)**	**Weighted Score (Operational)**	Reliability	Flexibility	Constructability	Opportunity/ Benefit	**Average Score (Technical)**	**Weighted Score (Technical)**	Cultural/ Heritage	Environment	Community	Landowner/ Property	**Average Score (Environmental)**	**Weighted Score (Environmental)**	Ability to Stage	**Weighted Score (Staging)**		
8	North Western Motorway	3	3	3	2	**2.75**	**0.69**	3	4	3	4	**3.5**	**0.88**	4	4	4	2	**3.5**	**0.88**	3	**0.75**	3.2	1
9	Gloria Road	3	3	2	3	**2.75**	**0.69**	3	4	2	2	**2.75**	**0.69**	2	2	1	2	**1.75**	**0.44**	3	**0.75**	2.57	8
10	Direct to Te Atatu	3	3	2	3	**2.75**	**0.69**	3	4	2	2	**2.75**	**0.69**	2	2	1	2	**1.75**	**0.44**	3	**0.75**	2.57	8
11	Tunnel	2	4	2	4	**3.0**	**0.75**	3	4	4	3	**3.5**	**0.88**	4	4	4	3	**3.75**	**0.94**	1	**0.25**	2.82	2
12	Gravity Microtunnel	3	3	3	4	**3.25**	**0.81**	4	3	1	3	**2.75**	**0.69**	1	1	2	3	**1.75**	**0.44**	1	**0.25**	2.19	13
13	Full Route rising main	3	3	2	1	**2.25**	**0.56**	2	3	2	2	**2.25**	**0.56**	2	1	2	3	**2.0**	**0.5**	4	**1**	2.62	7

Comments on select individual scores

Option 1 - Te Atatu Road

This option is based on the broad concepts of maximising the use of roads and urban environments for the first component of works (to Luckens Point), an on the broad concept of avoiding urban environments for the second component, from Luckens Point to Limeburners Bay. This option is considered to be the most straightforward alignment for the Concourse to Hobsonville section of the project.

From a construction perspective, the need for a crossing of the CMA over long distances, the potential impacts on the coastal environment, and the poor ground conditions near the existing marina were considered to be the most challenging aspects of this option.

For the purposes of this option it is assumed that the rising main from Concourse will cross Henderson Creek using HDD through to KunWoo Park/Rutherford College, and then be trenched along Toru Street and Te Atatu Road. The crossing of the harbour and the alignment through to Hobsonville PS will be micro-tunnelled. At 500m long the crossing of the harbour is seen as the greatest challenge and may require some additional micro-tunnel shafts to be constructed within the marine environment. This option would require a new pump station to be constructed at the existing Concourse Storage Tank site.

Criteria	*Score*	*Comment*
Constructability	2	Difficulties of a marine crossing by long micro-tunnelling shot and difficult access to shoreline sections.
Opportunity benefits	2	Little or no opportunity to pick up other catchments
Environment	2	Work on shoreline and potential (although unlikely) for a failure during harbour crossing
Community	2	Disruption to marina and reserves.
Landowner property	2	Works would be quite disruptive for Westharbour Marina and other private properties.

Option 2 - Te Atatu Road – avoiding difficult coastal areas

This option is based on the broad concept of maximising the use of roads and urban environments, and was developed as a variation to Option 1. In this option, the route has been altered to minimise the overall length of the harbour crossing section and to avoid construction in the potentially difficult coastal areas.

The overall construction techniques are the same as for Option 1, however, from a construction perspective, the deep sections of micro-tunnelling around Lukens Road and Marina View Drive and the need to set up construction activities on the reef off Orukuwai Point, were considered to be the most challenging aspects of this option.

Criteria	*Score*	*Comment*
Constructability	1	Microtunnelling at depths over 50m is not practicable
Opportunity benefits	2	Little or no opportunity to pick up other catchments
Cultural and Heritage	1	Orukuwai Point reef is of cultural importance
Environment	2	Significant works in the harbour
Community	2	Disruption to reserves.
Landowner/ Property	2	Works would be quite disruptive for private properties.

Option 3 - Te Atatu Road – avoiding difficult coastal areas and the use of deep tunnels

This option is based on the broad concept of maximising the use of roads and urban environments, and maximising the use of deep tunnels. This option was developed as a variation to Option 2, and uses the same overall construction approach as Options 1 and 2 but seeks to avoid the need for the deepest micro-tunnelling shaft (on Luckens Road) by tunnelling under private property from the West Harbour esplanade reserve to Luckens Road.

This option would also require a new pump station to be constructed at the existing Concourse Storage Tank site.

Criteria	*Score*	*Comment*
Constructability	1	Microtunnelling at depths over 50m is not practicable
Opportunity benefits	2	Little or no opportunity to pick up other catchments
Cultural and Heritage	1	Orukuwai Point reef is of cultural importance
Environment	2	Significant works in the harbour
Community	2	Disruption to reserves.
Landowner/ Property	2	Works would be quite disruptive for private properties.

Option 4 - Te Atatu Road – avoiding difficult coastal areas and the use of deep tunnels with alternate harbour crossing

Similar to Option 3, this option is based on the broad concept of maximising the use of roads and urban environments, and maximising the use of deep tunnels. This option was also developed as a variation to Option 2, and seeks to avoid the need for a deep tunnelling shaft (on Luckens Road) by tunnelling under private property from the West Harbour esplanade reserve to Luckens Road, and altering the location of the marine crossing. This alignment is more direct than Options 2 and 3 but passes under a larger number of private properties.

This option would also require a new pump station to be constructed at the existing Concourse Storage Tank site.

Criteria	*Score*	*Comment*
Constructability	2	Deep microtunnel and long drives required
Opportunity benefits	2	Little or no opportunity to pick up other catchments
Cultural and Heritage	1	Orukuwai Point reef is of cultural importance
Environment	2	Significant works in the harbour
Community	2	Disruption to reserves.
Landowner/ Property	2	Works would be quite disruptive for private properties.

Option 5 - Matipo Road

This option is based on the broad concepts of maximising the use of roads and urban environments for the first component of works (to Te Atatu Road), an on the broad concept of avoiding urban environments for the second component (to the esplanade reserve near Scott Road). For the purposes of longlist development it is assumed that the initial gravity section from Concourse under Henderson Creek and through the Te Atatu peninsula will be constructed by micro-tunnelling. The rising main across the harbour through to Scott Road will be constructed using a combination of marine trenching and HDD and the remaining gravity section from Scott Road to Hobsonville PS will be constructed by micro-tunnelling.

From a construction perspective, the following elements of this option were considered to be the most challenging aspects:

- Finding a satisfactory site to locate the new pump station at the top of the Te Atatu peninsula;
- The limited area available to set up a HDD landing site on the northern end of the crossing (near Scott Road);
- The need to construct the pipe under private properties;
- The construction and environmental risks associated with long HDD drives; and
- The need to set up construction activities on the reef off Orukuwai Point.

For the purpose of longlist development it is assumed that the marine crossing would be constructed by HDD. This option would require a new pump station to be constructed at the Te Atatu peninsula rather than at Concourse.

Criteria	*Score*	*Comment*
Constructability	2	Long HDD drives, potentially constrained work sites
Opportunity benefits	2	Little or no opportunity to pick up other catchments
Cultural and Heritage	2	Orukuwai Point reef is of cultural importance
Environment	2	Significant works in the harbour
Community	2	Disruption to reserves.
Landowner/ Property	2	Works would be quite disruptive for private properties.

Option 6 - Matipo Road – Alternate pipeline alignment

This option is based on the broad concept of maximising the use of roads and urban environments. It has a similar configuration as Option 5 with a gravity section from Concourse to new pumping station to be located Te Atatu point; a rising main section under the harbour through to a break pressure tank, and a second gravity section through to Hobsonville PS.

The alignment and construction approach for Option 6 is the same as for Option 5 through to Te Atatu point. The rising main across the harbour through to Luckens Reserve will be constructed using HDD and then by open trenching through to a break pressure chamber to be located in Wiseley Road. The remaining gravity section to Hobsonville PS will be constructed by micro-tunnelling.

This option comprises of a shorter marine crossing, with a landing point at Luckens Point. From a construction perspective, the following elements of this option were considered to be the most challenging aspects:

- Finding a satisfactory site to locate the new pump station at the top of the Te Atatu peninsula;
- The limited area available to set up a HDD landing site on the northern end of the crossing (at the coastal end of Luckens Reserve); and
- The construction and environmental risks associated with long HDD drives;

Criteria	*Score*	*Comment*
Constructability	2	Long HDD drives, potentially constrained work sites
Opportunity benefits	2	Little or no opportunity to pick up other catchments
Cultural and Heritage	2	Orukuwai Point reef is of cultural importance
Environment	2	Significant works in the harbour
Community	2	Disruption to reserves.

Option 7 - Henderson Creek

Option 7 considers an alternate route from the Concourse Storage Tank, to a new pumping station at Te Atatu point. From here the route alignment could follow either route Option 5 or 6 to Hobsonville PS and for the purposes of this longlist assessment route Option 6 has been adopted. This option is based on the broad concept of avoiding urban environments for the first component of the route from Concourse to Te Atatu point and maximising the use of roads and urban environments for the second component.

The section of gravity pipeline along Hendersons Creek would be constructed by micro-tunnelling but will require a number of shafts to be constructed within the coastal reserve.

From a construction perspective, the need for multiple crossings of Henderson Creek, the associated environmental and cultural impacts, and the potentially long drive lengths, were considered to be the most challenging aspects of this option.

This option would also require a new pump station to be constructed at the Te Atatu Peninsula.

Criteria	*Score*	*Comment*
Constructability	2	Long microtunnelling drives, potentially constrained access to route
Opportunity benefits	2	Little or no opportunity to pick up other catchments
Cultural and Heritage	2	Significant impact to the banks of Henderson Creek
Environment	1	Significant works in the harbour
Community	1	Significant disruption to reserves.
Land owner/ property	2	Significant works close to private property

Option 8 - North Western Motorway

This option is based on the broad concept of maximising the use of roads and urban environments, and follows the alignment of the North Western Motorway.

For the purposes of this option it was assumed that the rising main from Concourse will cross Hendersons Creek using HDD and run alongside the motorway (but not in the motorway corridor) to a break pressure chamber at around RL35m where it will change to gravity sewer constructed by micro-tunnelling.

From a construction perspective, the need to build the pipeline in or alongside the motorway corridor, the need for a marine crossing, the relatively deep micro-tunnel and shafts (35m+ in some locations to cross under ridgelines at Royal Road, Fred Taylor Drive and Trig Road) and the high static pumping head, were considered to be the most challenging aspects of this option.

This option would require a new pump station to be constructed at the existing Concourse Storage Tank site.

Criteria	*Score*	*Comment*
Odour and Corrosion	2	Long rising mains discharge into a residential area so odour will need to be controlled
Land owner/property	2	Significant works close to private property

Option 9 - Gloria Road

This option combines two broad concepts: that of maximising the use of roads and urban environments, and avoiding urban environments. Option 9 considers an alternate route from the Concourse Storage Tank, to a new pumping station at Te Atatu point. From here the route alignment either follows route Option 5 or 6 to Hobsonville PS, and for the purposes of this longlist assessment route Option 6 has been adopted. This option is based on the broad concept of maximising the use of roads and urban environments.

The section of gravity pipeline from Concourse to Te-Atatu point would be constructed by micro-tunnelling. A tunnel drive of 400m is proposed under Henderson Creek through to Gloria Park.

From a construction perspective, the long micro-tunnel drive lengths, the limited area available for construction activities, and the need to micro-tunnel under private property immediately to the north of the Concourse storage tank were considered to be the most challenging aspects of this option.

This option would also require a new pump station to be constructed at the Te Atatu Peninsula.

Criteria	*Score*	*Comment*
Maintenance	2	Difficult ongoing access
Constructability	2	Long microtunnelling drives, potentially constrained access to route
Opportunity benefits	2	Little or no opportunity to pick up other catchments
Cultural and Heritage	2	Significant impact to the banks of Henderson Creek
Environment	2	Significant works in the harbour
Community	1	Significant disruption to reserves.
Land owner/ property	2	Significant works close to private property

Option 10 - Direct to Te Atatu

This option combines two broad concepts: that of maximising the use of roads and urban environments, and avoiding urban environments. Option 10 considers an alternate route from the Concourse Storage Tank, to the Te Atatu peninsula. From here the route alignment either follows route 5 or 6 to Hobsonville PS70, and for the purposes of this longlist assessment route Option 6 has been adopted. This option is based on the broad concept of maximising the use of roads and urban environments.

The section of gravity pipeline from Concourse to Te-Atatu point would be constructed by micro-tunnelling. A tunnel drive of 500m is proposed under Henderson Creek through to the coastal area at the southern end of Edgerton Road.

From a construction perspective, the long micro-tunnel drive lengths, the limited area available for construction activities, and the need to micro-tunnel under private property immediately to the north of the Concourse Storage Tank, and a number of residential properties were considered to be the most challenging aspects of this option.

This option would also require a new pump station to be constructed at the Te Atatu Peninsula.

Criteria	*Score*	*Comment*
Maintenance	2	Difficult ongoing access
Constructability	2	Long microtunnelling drives, potentially constrained access to route
Opportunity benefits	2	Little or no opportunity to pick up other catchments
Cultural and Heritage	2	Significant impact to the banks of Henderson Creek
Environment	2	Significant works in the harbour
Community	1	Significant disruption to reserves.
Land owner/property	2	Significant works close to private property

Option 11 – Tunnel

This option is based on the broad concept of maximising the use of deep tunnels, and is considered to be a more direct route from Concourse to Henderson. From a construction perspective, the need to construct the pipeline under private property, the grade requirements for the tunnel, and construction safety were considered to be the most challenging aspects of this option.

For the purpose of longlist development, it is assumed that the tunnel would comprise of a 3m bored tunnel to allow for longer driver lengths, and would require a shaft in Moire Park and Picasso Reserve. Uncertainty with respect to changes in Health and Safety Legislation and the future requirements for additional access shafts was identified as potential risk.

This option would require a new pump station at the existing Hobsonville Pump Station site.

Criteria	*Score*	*Comment*
Safety	2	Although access is not often required personnel entry presents significant safety issues
Maintenance	2	Difficult access
Ability to Stage	1	Full capacity would need to be constructed at day one.

Option 12 - Gravity Microtunnel

This option is based on the broad concept of maximising the use of roads and urban environments, and combines alignments from other options (Option 6 for the southern component, and Option 3 for the northern component). From a construction perspective, the following elements of this option were considered to be the most challenging aspects:

- The limited area available to set up a HDD landing site on the northern end of the crossing (near Scott Road);
- The need for long micro-tunnel drives;
- The need to set up construction activities on the reef off Orukuwai Point;
- Difficult/constrained access to multiple deep shafts; and
- Very deep pipe sections of 55m+

For the purpose of longlist development, it is assumed that the entire pipeline would be installed by micro-tunnelling.

Criteria	*Score*	*Comment*
Constructability	1	Long microtunnelling drives, potentially constrained access to route and too deep
Cultural and Heritage	1	Significant impact to the reef opposite Orukuwai Point
Environment	1	Significant works in the harbour
Community	2	Significant disruption to reserves.

Option 13 - Full Route Rising Main

This option has been developed to maximise the overall length of rising main in order to minimise pipeline construction depths. This option is based on the broad concept of avoiding urban environments, with the pipeline constructed primarily within the CMA.

The rising main would be constructed from a new pumping station at Concourse along Henderson Creek, Waipareira Bay and Limeburners Bay to a break pressure chamber at Scott Road. The pipeline would then be gravity from Scott Road to Hobsonville PS.

For the purpose of longlist development, it was assumed that the pipeline would be constructed by a combination of HDD and open trenching techniques.

From a construction perspective, the large extent of pipeline within coastal strip, long HDD drives required for marine pipeline construction, the difficulty in accessing HDD setup points, septicity and odour issues and friction loss were considered to be the most challenging aspects of this option.

Criteria	*Score*	*Comment*
Odour and Corrosion	1	The very long rising mains and discharge to the tunnel at a Park close to residential properties.
Reliability	2	Long rising main with difficult access added to likely corrosion issues
Environment	1	Harbour works andf potential odour issues from septicity.
Community	2	As environment

Shortlist Options Assessment – Concourse to Hobsonville

MCA scoring

Criteria	Sub-criteria	Basis for Assessment	Basis for scoring	Te Atatu	Te Atatu (alternative)	Matipo Road – alternate pipeline	North Western Motorway
Functionality	Baseline requirements	Options consistent with the Three Waters Strategy, particularly the future utilisation of treatment capacity Rosedale vs Mangere, providing for increasing network capacity to service growth the North West Transformation Area ("NWTA"), Kumeu, Huapai, Riverhead ("KHR"), Northern Waitakere catchments and South Rodney areas	1 = entirely consistent; 2 = closely aligned; 3 = aligned on key aspects on; 4 = little alignment; 5 = no alignment	1	1	1	1
		Capacity to support growth and development in the North West Transformation Area ("NWTA"), Kumeu, Huapai, Riverhead ("KHR"), Northern Waitakere catchments and South Rodney areas	1 = Very Good; 2 = Good; 3 = Adequate; 4 = Barely Adequate; 5 = Inadequate	1	1	1	1
	Additional requirements	Ability to intercept catchments and allow the decommissioning of local pump stations	1 = Very Good; 2 = Good; 3 = Adequate; 4 = Barely Adequate; 5 = Inadequate	4	4	3	2
		Ability to delay or replace local and wastewater network upgrades	1 = Very Good; 2 = Good; 3 = Adequate; 4 = Barely Adequate; 5 = Inadequate	4	4	4	2
		Provide benefit or alignment with other utilities or public services	1 = Very Good; 2 = Good; 3 = Adequate; 4 = Barely Adequate; 5 = Inadequate	4	3	4	2
Functionality Average Score				**2.8**	**2.6**	**2.6**	**1.6**
Operational & Maintenance		Site location and space available for on-going operational and maintenance access requirements (e.g. at shaft sites)	1 = neutral or positive; 2 = minor construction risks; delay < 4wks; 3 =moderate risk, delay 4 - 12wks; 4 = high level of risk, delay >12wks; 5 = high risk, construction held up indefinitely.	2	2	2	2
		Site appropriately buffered from surrounding community	1 = Very Good; 2 = Good; 3 = Adequate; 4 = Unlikely (only 1or 2 Contractors); 5 = Impossible (1 or none Contractors).	2	2	2	2

Criteria	Sub-criteria	Basis for Assessment	Basis for scoring	Te Atatu	Te Atatu (alternative)	Matipo Road – alternate pipeline	North Western Motorway
		Provides for future operational flexibility (e.g. how easy will it be to deal with a significant increase in flow)	1 <5%; 2 = 5-10%; 3 = 10%-15%; 4 = 20-25%; 5 = >25%	4	4	4	4
Operational & Maintenance Average Score				**2.7**	**2.7**	**2.7**	**2.7**
Constructability		Potential for construction risks that may hold up, stop or adversely affect construction time	1 = neutral or positive; 2 = minor construction risks; delay < 4wks; 3 =moderate risk, delay 4 - 12wks; 4 = high level of risk, delay >12wks; 5 = high risk, construction held up indefinitely.	3	4	3	3
		Ability for construction techniques to be delivered by a number of Contractors allowing competitive tenders to be obtained	1 = Very Good; 2 = Good; 3 = Adequate; 4 = Unlikely (only 1or 2 Contractors); 5 = Impossible (1 or none Contractors).	2	2	2	2
		Potential for construction risks that result in significant cost overruns	1 <5%; 2 = 5-10%; 3 = 10%-15%; 4 = 20-25%; 5 = >25%	2	3	3	2
Constructability Average Score				**2.3**	**3.0**	**2.7**	**2.3**
Assessment of Effects on the Environment	Environmental	Potential construction impacts on coastal and freshwater quality	1 = neutral or positive; 2 = slight impact – localised & minor; 3 = moderate impact, slightly more than localised effect; 4 = high impact – wide spread impacts; 5 = very significant – widespread impacts on sensitive environments (e.g. CPA 1, beaches).	3	2.5	2.5	2
		Potential construction effects on terrestrial ecosystems. Sites located in close proximity to SEA-Land and/or riparian margins will have a greater impact on habitats, flora fauna	1 = neutral or positive; 2 = slight impact – localised & minor; 3 = moderate impact, slightly more than localised effect; 4 = high impact – wide spread impacts loss of ecologically valuable habitats; 5 = very significant – widespread impacts, loss of ecologically habitats, rare/threatened species.	4	3	3	2
		Potential effects on protected trees during construction	1 = neutral or positive; 2 = slight impact – removal or trimming of a couple of non-protected trees; 3 = moderate impact, removal of a couple of protected trees; 4 = high impact – removal of a scheduled or notated tree; 5 = very significant – removal of several scheduled or notated trees.	3	2	2	2

Criteria	Sub-criteria	Basis for Assessment	Basis for scoring	Te Atatu	Te Atatu (alternative)	Matipo Road – alternate pipeline	North Western Motorway
		Potential construction effects on landscape/neutral character values, and their ability to be mitigated	1 = neutral or positive; 2 = slight impact – temporary minor reduction in visual quality; 3 = moderate impact, slightly more than localised effect, temporary effect that can be mitigated; 4 = high impact – significant visual or natural character impacts, permanent effect; 5 = very significant – significant impact in regionally significant landscape, permanent effect.	3	2	2	1.5
		Potential construction on coastal ecosystems. Construction activities that are near to the CMA and/or are within the CMA (e.g. marine trenching) will have a greater impact on coastal ecosystems	1 = neutral or positive; 2 = slight impact – localised & minor; 3 = moderate impact, slightly more than localised effect; 4 = high impact – wide spread, permanent loss of CMA; 5 = very significant – widespread impacts on sensitive environments (e.g. CPA 1, beaches).	3.5	3	3	1.5
		Sensitivity of ecosystems from operational overflow discharges. Assume dilution and dispersion is better at the head of creeks in the CMA	1 = neutral or positive; 2 = slight impact – localised & minor; 3 = moderate impact, slightly more than localised effect, visual; 4 = high impact – wide spread impacts loss of ecologically valuable habitats; 5 = very significant – widespread pollution.	2	2	2	2
	Environmental Average Score			**3.1**	**2.4**	**2.4**	**1.8**
	Social	Distance from site to arterial road for operational and maintenance purposes	1 = site on arterial; 2 = <200; 3 = <1 km; 4 = 1.3 km 5 = => 3 km	3	1	2	2
		Likelihood of adverse effects on local roads resulting from construction activities	1 = neutral or positive; 2 = minor effect; 3 = moderate effect; 4 = significant effect that is difficult to mitigate; 5 = major effect.	3	3	3	2
		Operational effects on residential properties with line of sight of permanent structures e.g. pump stations). This includes effects relating to visual amenity, noise, and odour	1 = neutral or positive; 2 = minor effect; 3 = moderate effect; 4 = significant effect that is difficult to mitigate; 5 = major visual impact.	2	2	3	2
		Impact to neighbouring properties within 200m of construction sites resulting from construction activity (visual, dust noise, odour, traffic)	1 = neutral or positive; 2 = minor effect; 3 = moderate effect, limited amount of complaints; 4 = significant effect that is difficult to mitigate, large number of complaints; 5 = major effect.	5	5	5	5

Criteria	Sub-criteria	Basis for Assessment	Basis for scoring	Te Atatu	Te Atatu (alternative)	Matipo Road – alternate pipeline	North Western Motorway
		Short-term impact on community facilities resulting from construction activities (e.g. reduced access to community facilities (e.g. Beach, sports club, community hall, playground, etc.)	1 = neutral or positive; 2 = minor disturbance, facilities can continue to operate with minor restrictions; 3 = moderate disturbances, facilities can be continue to operate but with temporary loss of access to part of site; 4 = high level of restrictions on facilities, only limited operability; 5 = facilities no longer able to operate.	3	3	3	2
		Proximity of construction activities to sensitive community facilities (e.g. School, play centre, medical facility) located on likely construction traffic route	1 = no facilities on route; 2 = park or similar on route; 3 = sports complex on route; 4 = schools, play centres in vicinity of route; 5 = schools, play centres on route.	4	3.5	3.5	2
		Extent to which construction works will reduce access to parks and reserves when considering the ability to operate parks/reserves 'as usual' during construction, and the amount of reserve required for construction activities. This considers the sensitivity of the users of the reserve (e.g. North Shore Memorial Park and mourners)	1 = neutral or positive; 2 = minor disturbance, facilities can continue to operate with minor restrictions; 3 = moderate disturbances, facilities can be continue to operate but with temporary loss of access to part of site; 4 = high level of restrictions on facilities, only limited operability; 5 = facilities no longer able to operate.	4	4	4	2
		Effects arising from potential operational odour discharges (e.g. at break pressure chamber sites and pump station sties)	1 = neutral or positive; 2 = low potential for odour effects; 3 = moderate potential for odour effects; 4 = odour effects almost certain over local area; 5 = adverse effects over widespread area.	2	2	2	2
		Impact to neighbouring properties from operation and maintenance activity (includes visual, dust, noise, odour, traffic) and risk of operational failures	1 = neutral or positive; 2 = minor effect; 3 = moderate effect; 4 = significant effect that is difficult to mitigate; 5 = major effect.	2	1	2	2
		Number of properties above the centreline of the pipeline	1 = <5; 2 = <20; 3 = <50; 4 = <100; 5 = >100	1	1	1	5
	Social Average Score			**2.9**	**2.6**	**2.9**	**2.6**
	Cultural	Potential impacts waahi tapu sites identified in District Plan and impact on heritage and traditional sites for Mana Whenua	1 = neutral or positive; 2 = minor disturbance of site; 3 = moderate disturbance of lower value site; 4 = destruction of significant site; 5 = destruction of very significant site.	3	1	2	1

Criteria	Sub-criteria	Basis for Assessment	Basis for scoring	Te Atatu	Te Atatu (alternative)	Matipo Road – alternate pipeline	North Western Motorway
		Effects on mauri of waterbodies through wastewater overflows	1 = neutral or positive; 2 = emergency overflow only; 3 = if overflow, it is not direct to waterbody, and little potential for adverse effect on Mauri; 5 = If overflow, it is direct to special environment (stream, beach) and mauri reduced.	3	3	3	3
		Impact on cemetery (as an urupā)	1 = neutral or positive; 2 = minor disturbance of site; 3 = moderate disturbance; 4 = destruction of significant site; 5 = destruction of very significant site.	n/a	n/a	n/a	n/a
	Cultural Average Score			**3.0**	**2.0**	**2.5**	**2.0**
	Economic	Excavations in alluvium with risk of settlement of sensitive structures	1 = no settlement expected; 2 = settlement but with negligible effect; 3 = excavation in alluvium with localised settlement – no damage; 4 = excavation in alluvium, widespread settlement, moderate non-structural damage; 5 = excavation in alluvium with widespread settlement and significant structural damage.	4	4	4	4
		Number of private property purchases required to facilitate the construction of the pipeline	1 = <2; 2 = <5; 3 = <10; 4 = <20; 5 = >20	1	1	1	1
		Potential for short-term business disruption during construction	1 = neutral, site not in commercial area; 2 = site in commercial area, or commercial area in proximity, minor disruption possible; 3 = site in commercial area, or commercial are in proximity, with likely disruption to commercial activities; 4 = site in commercial area or commercial are in proximity, significant disruption to commercial activity; 5 = site in commercial area or commercial area in proximity, major disruption to commercial activity.	4	3	3	3
		Disruption to existing services and utility providers	1 = neutral or positive; 2 = slight impact - localised, minor disturbance; 3 = moderate impact, minor services relocation required; 4 = high impact - major services require relocation, limited disruption to services operation and moderate cost; 5 = very significant - major services require relocation, major disruption to services operation, significant cost.	3	3	3	2

Criteria	Sub-criteria	Basis for Assessment	Basis for scoring	Te Atatu	Te Atatu (alternative)	Matipo Road – alternate pipeline	North Western Motorway
		Energy use required for operating the facility (pump stations sties)	1 = neutral or positive; 2 =low energy use; 3 = moderate energy use 4 = high energy use; 5 = very significant energy use.	3	3	3	4
	Economic Average Score			**3.0**	**2.8**	**2.8**	**2.8**
Overall MCA Score				**2.82**	**2.59**	**2.66**	**2.26**

Appendix B Watercare Gazette Notice

Environment

Resource Management Act 1991

The Resource Management (Approval of Watercare Services Limited as a Requiring Authority) Notice 2012

Pursuant to section 167 of the Resource Management Act 1991, the Minister for the Environment hereby gives the following notice.

Notice

1. Title and commencement—(1) This notice may be cited as the Resource Management (Approval of Watercare Services Limited as Requiring Authority) Notice 2012.

(2) This notice shall come into force on **1 July 2012**.

2. Approval as a requiring authority—Watercare Service Limited is hereby approved as a requiring authority, under section 167 of the Resource Management Act 1991, for its network utility operations of:

(a) undertaking the distribution of water for supply; and

(b) undertaking a drainage and sewerage system;

including the operation, maintenance, replacement, upgrading and improvement of infrastructure related to these operations, in the Auckland region and in the Waikato Region, for the purposes of providing services to Auckland.

3. Interpretation—This approval includes infrastructure relating to the abstraction, storage, supply and treatment of water and the collection, treatment and disposal of wastewater.

4. Revocations—This notice revokes the following:

(a) Resource Management (Approval of Watercare Services Limited as Requiring Authority) Order 1992 (SR 1992/351) (*New Zealand Gazette*, 10 December 1992, No. 201, page 4459).

(b) Resource Management (Approval of Watercare Services Limited as Requiring Authority) Notice 1993 (*New Zealand Gazette*, 5 August 1993, No. 119, page 2286).

(c) Resource Management (Approval of Watercare Services Limited as Requiring Authority) Notice 1994 (*New Zealand Gazette*, 7 April 1994, No. 31, page 1278).

(d) Resource Management (Approval of Watercare Services Limited as Requiring Authority) Notice (No. 2) 1994 (*New Zealand Gazette*, 7 April 1994, No. 31, page 1278).

(e) Resource Management (Approval of Watercare Services Limited as Requiring Authority) Notice 1996 (*New Zealand Gazette*, 15 February 1996, No. 13 page 450).

(f) Resource Management (Approval of Watercare Services Limited as Requiring Authority) Notice 1996 (*New Zealand Gazette*, 26 April 1996, No. 39 page 1120).

(g) Resource Management (Approval of Watercare Services Limited as Requiring Authority) Notice 1999 (*New Zealand Gazette*, 22 July 1999, No. 85 page 2005).

(h) Resource Management (Approval of Metro Water Limited as Requiring Authority) Notice (No. 1) 1998 (*New Zealand Gazette*, 20 August 1998, No. 120 page 2899).

(i) Resource Management (Approval of Metro Water Limited as Requiring Authority) Notice (No. 2) 1998 (*New Zealand Gazette*, 20 August 1998, No. 120 page 2899).

(j) Resource Management (Approval of Manukau Water Limited as Requiring Authority) Notice 2006 (*New Zealand Gazette*, 22 June 2006, No.63, page 1504).

Dated at Wellington this 11th day of June 2012.

HON AMY ADAMS, Minister for the Environment.

go3709

Appendix C Agreement in Principle (NZTA)

Level 11, HSBC House
1 Queen Street
Private Bag 106602
Auckland 1143
New Zealand
T 64 9 969 9800
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www.nzta.govt.nz

19 August 2014

Andy Spittal

Watercare Services Limited
Private Bag 92521
Wellesley Street
Auckland 1141

Dear Andy

State Highway 18: Watercare North Harbour No. 2 Watermain

1. This is in response to your request dated 27th May 2014 for the NZ Transport Agency's approval-in-principle and affected party approval under the Resource Management Act (RMA) for the proposed alignment of the North Harbour No.2 Watermain (NH2) along State Highway 18 Motorway corridor from Albany Highway to Westgate (SH16).

2. The State Highway Manager has agreed to grant provisional approval-in-principle for Watercare Services Ltd (WSL) to undertake the following works in SH16 North Western Motorway and SH18 Upper Harbour Motorway corridor:

    I. construct the NH2 Watermain between Albany Highway and Westgate, which includes land reclamation at the western end of Upper Harbour Bridge No.2 and the optional construction of a cycleway to serve as the pipeline corridor from Albany Highway Underpass to Greenhithe Road Underpass, subject to an acceptable design and construction methodology;

    II. operate and maintain the installed service.

3. Approvals under the Resource Management Act will be given after the Transport Agency's Planning and Investment Manager has received and considered your resource consent application.

4. The final formal approvals will take several forms following an extensive process commencing with preliminary design review of each stage or section of the proposed installations and will include prior consultation where necessary, with the other key stakeholders. WSL will need to demonstrate to Transport Agency satisfaction that each stage or section of work can be physically accommodated within the motorway corridor and that each of the construction activities or on-going service operation and maintenance activities can be undertaken using methodologies that will not compromise the Transport Agency's ability to comply with its legal obligations or cause traffic disruption. Appropriate conditions would be imposed in the agreements and work permits to ensure that Transport Agency interests will be protected.

5. The Transport Agency gives its conditional approval-in-principle, subject to the following conditions:

    a) prior approvals-in-principle that were granted to WSL on 13th March 2013 to construct the NH2 Watermain on the new Upper Harbour Bridge and on the Hobsonville Road Motorway Bridge at

Westgate are superseded by the latest proposals; and

b) approval-in-principle for Option 2 alignment is preferred, however approval-in-principle for Option 1 alignment is not excluded provided that the stakeholders reach prior formal agreement to fund and construct a cycleway along the motorway, which will also serve as the watermain corridor and enable watermain repair and/or maintenance without needing access from the motorway carriageway. Due to current uncertainty about spatial constraints and funding contributions for construction of the proposed cycleway, approval-in-principle for Option 1 alignment is subject to an acceptable design and methodology, and availability of contribution funding by Auckland Transport/ the Transport Agency; and

c) the pipeline installation on Upper Harbour Bridge will involve payment of a bridge charge and must ensure that the current traffic loading capacity, which includes capacity for full High Productivity Motor Vehicles (HPMV), is maintained and this may involve bridge strengthening at WSL cost; and

d) the detailed design shall respond sufficiently to the ground conditions, to ensure that any residual potential for increased risk to the Motorway is no more than minor, and

e) trenchless installation methods shall be utilised at the motorway crossings and any other sections where the Transport Agency prefers the trenchless method for any valid reasons; and

f) design and location of the pipeline infrastructure in close proximity to the western end of SH18 must not preclude future implementation of likely new connections on this part of the motorway network, which may include new north-facing connections from SH18 to SH16. WSL and/or their consultants will be required to supply preliminary design proposals for early consideration by the Transport Agency's Transportation Team; and

g) following acceptance by the Transportation Planning Team of the preliminary design proposals, WSL and/or their consultants and contractors will be required to supply design and methodology details for consideration by the Auckland Motorway Alliance (AMA), including the geotechnical assessment reports. Any peer reviews that may be required by the AMA shall be undertaken at WSL cost. Design details are to comply with Transport Agency requirements for safeguarding safety and motorway operational service levels, for protecting the structural integrity of Transport Agency assets and for monitoring and managing the works to prevent settlement or heave of the Motorway corridor surfaces; and

h) consequential effects that cannot be adequately catered for during the construction stage to the satisfaction of the Transport Agency, shall be remedied at WSL cost, to Transport Agency satisfaction during the ensuing five year period following practical completion; and

i) WSL will be required to indemnify the Transport Agency against all risks and costs due to the works within Motorway reserve and furnish proof of adequate public liability cover; and

j) WSL may be required to provide an on-demand bond as a performance guarantee for those works involving high risk; and

k) the Transport Agency will recover from WSL reasonable costs for processing the agreements and permits for installation, works monitoring and completion inspections.

6. The Transport Agency's Safety and Network Performance Manager and Property Manager will undertake, subject to cycleway funding availability, negotiations with WSL, Auckland Transport and Auckland Council and prepare for execution by the Property Manager, a Licence Agreement for Option 1 cycleway to be constructed by WSL in conjunction with installation of the water main as a joint project involving a funding contribution from Auckland Transport/Transport Agency.

7. The AMA Director and the Transport Agency's Property Manager will undertake negotiations with WSL in relation to Upper Harbour Bridge No.2, to prepare a Deed of Licence for the watermain installation (including any bridge strengthening provisions) and a Bridge Protocol for the Watermain Management and Maintenance.

8. The AMA Director will evaluate the detailed design proposals for the phased installation works in accordance with acceptable criteria for permitting utility services in Motorway corridors and approve the various Works Access Permits as and when needed, in accordance with the Utilities' Code.

9. Requirements for permitting the works on Motorways include the following:
   i. no permanent direct access from the Motorway carriageways or ramps can be given due to legislation restrictions,
   ii. no temporary access will be permitted from the Motorway carriageways for construction or maintenance purposes unless specifically agreed with the AMA Director,
   iii. wherever possible temporary access for construction activities in the Motorway berm are to be obtained only via Motorway ramps or adjacent properties,
   iv. temporary traffic management shall comply with the Code of Practice for Temporary Traffic Management (CoPTTM),
   v. WSL will be required to locate and identify any existing services and undertake service protection/relocation as necessary and as agreed with the service owners,
   vi. any boundary fencing, acoustic barriers and landscaping removed for construction shall be reinstated to Transport Agency minimum standard or better,
   vii. no future maintenance legacy due to the pipeline installation, other than currently prevails, shall be left for actioning by Transport Agency,
   viii. detailed requirements relating to stormwater provisions, surface restoration and measures for obviating new motorway maintenance activities will be determined by the AMA following review of the final design and construction methodology,
   ix. conditions relating to environmental protection and historic heritage impacts.

The AMA will in due course advise more detailed information requirements for consideration of the various works.

Please contact Deepak Rama at 09 928 8716 regarding the RMA approval process or Stephen Beynon at 09 539 9101regarding the Corridor Access Request process should you have any queries.

Yours faithfully

Paul Geck
Acting Safety and Network Performance Manager

Cc AMA: Steve Mutton
Dave Rendall/Stephen Beynon

NZ Transport Agency
Brett Gliddon/Mal Moir/Deepak Rama/Patrick Kelly/Mieszko Iwaskow/Sarah Cronwright/Coralie O'Brien

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29 January 2016

Tim Barry

Watercare Services Limited
Private Bag 92521
Wellesley Street
Auckland 1141

Dear Tim

State Highway 18: Northern Interceptor Wastewater Pipeline

1. This is in response to your request dated 6th November 2014 for the NZ Transport Agency's approval-in-principle and affected party approval under the Resource Management Act (RMA) for the proposed Northern Interceptor to be placed within State Highway 18 Motorway corridor between Tauhinu Road intersection and SH16 Motorway connections, Massey North, as shown on your Phase Plan numbered PCG AO Plan (2014-11-19), a copy of which is attached.

2. The State Highway Manager has agreed to grant provisional approval-in-principle for Watercare Services Ltd (WSL) to undertake the following works in SH18 Upper Harbour Motorway corridor:

    I. design and construct Phases 1 to 2 and 4 of the Northern Interceptor wastewater pipeline within the motorway road reserve between Westgate and Tauhinu Road, to serve as part of the pipeline corridor from Westgate to Albany, subject to acceptable design and construction methodologies; and

    II. operate and maintain the service following installation.

3. Approvals under the Resource Management Act will be given after the Transport Agency's Planning and Investment Manager has received and considered each resource consent application.

4. The final detailed approvals will take several forms following an extensive process commencing with preliminary design review of each stage or section of the proposed installations and will include prior consultation where necessary, with the other key stakeholders. WSL will need to demonstrate to Transport Agency satisfaction that each stage or section of work can be physically accommodated within the motorway corridor and that each of the construction activities or on-going service operation and maintenance activities can be undertaken using methodologies that will not compromise the Transport Agency's ability to comply with its legal obligations or cause traffic disruption. Appropriate conditions would be imposed in the agreements and work permits to ensure that Transport Agency interests will be protected.

5. The Transport Agency gives its conditional approval-in-principle, subject to the following conditions:

    a) that Watercare, the Transport Agency and other stakeholders with an interest in the provision of a cycleway reach prior formal agreement to fund and construct a cycleway or sections of cycleway along the motorway, which will also serve as the wastewater pipeline corridor for most of the pipeline route to be situated within the motorway corridor, and

b) timely availability of contribution funding by Auckland Transport and/or the Transport Agency for construction of the proposed cycleway sections, and

c) acceptable design details and construction methodologies given current uncertainty about spatial constraints, that will enable pipeline repair and/or maintenance without needing access from a motorway carriageway, and

d) that the proposed pipeline alignment makes allowance for additional future third motorway lanes in both directions, and

e) the design and location of the pipeline infrastructure in close proximity to the western end of SH18 must not preclude future implementation of likely new connections on this part of the motorway network, which may include new north-facing connections from SH18 to SH16. WSL and/or their consultants will be required to supply preliminary design proposals for early consideration by the Transport Agency's Transportation Team; and

f) the detailed design shall respond sufficiently to the ground conditions, to ensure that any residual potential for increased risk to the Motorway is no more than minor, and

g) trenchless installation methods shall be utilised within the Motorway corridor and for all crossings, and

h) following acceptance by the Transportation Planning Team of the preliminary design proposals, WSL and/or their consultants and contractors will be required to supply design and methodology details for consideration by the Auckland Motorway Alliance (AMA), including the geotechnical assessment reports. Any peer reviews that may be required by the AMA shall be undertaken at WSL cost. Design details are to comply with Transport Agency requirements for safeguarding safety and motorway operational service levels, for protecting the structural integrity of Transport Agency assets and for monitoring and managing the works to prevent settlement or heave of the Motorway corridor surfaces; and

i) consequential effects that cannot be adequately catered for during the construction stage to the satisfaction of the Transport Agency, shall be remedied at WSL cost, to Transport Agency satisfaction during the ensuing five year period following practical completion; and

j) WSL will be required to indemnify the Transport Agency against all risks and costs due to the works within Motorway reserve and furnish proof of adequate public liability cover; and

k) WSL may be required to provide an on-demand bond as a performance guarantee for those works involving high risk; and

l) the Transport Agency will recover from WSL reasonable costs for processing the agreements and permits for installation, works monitoring and completion inspections.

6. The Transport Agency's Safety and Network Performance Manger and the Property Manager will undertake, subject to cycleway funding availability, negotiations with WSL, Auckland Transport and Auckland Council and prepare for execution by the Property Manager, a Licence Agreement for the cycleway to be constructed by WSL in conjunction with installation of the wastewater pipeline as a joint project involving a funding contribution from Auckland Transport and/or Transport Agency.

7. The AMA Director will evaluate the detailed design proposals for the phased installation works in accordance with acceptable criteria for permitting utility services in Motorway corridors and approve the various Works Access Permits as and when needed, in accordance with the Utilities' Code.

8. Requirements for permitting the works on Motorways include the following:
   i. no permanent direct access from the Motorway carriageways or ramps can be given due to legislation restrictions,
   ii. no temporary access will be permitted from the Motorway carriageways for construction or maintenance purposes unless specifically agreed with the AMA Director,

iii. wherever possible temporary access for construction activities in the Motorway berm are to be obtained only via Motorway ramps or adjacent properties,

iv. temporary traffic management shall comply with the Code of Practice for Temporary Traffic Management (CoPTTM),

v. WSL will be required to locate and identify any existing services and undertake service protection/relocation as necessary and as agreed with the service owners,

vi. any boundary fencing, acoustic barriers and landscaping removed for construction shall be reinstated to Transport Agency minimum standard or better,

vii. no future maintenance legacy due to the pipeline installation, other than currently prevails, shall be left for actioning by Transport Agency,

viii. detailed requirements relating to stormwater provisions, surface restoration and measures for obviating new motorway maintenance activities will be determined by the AMA following review of the final design and construction methodology,

ix. conditions relating to environmental protection and historic heritage impacts.

The AMA will in due course advise more detailed information requirements for consideration of the various works.

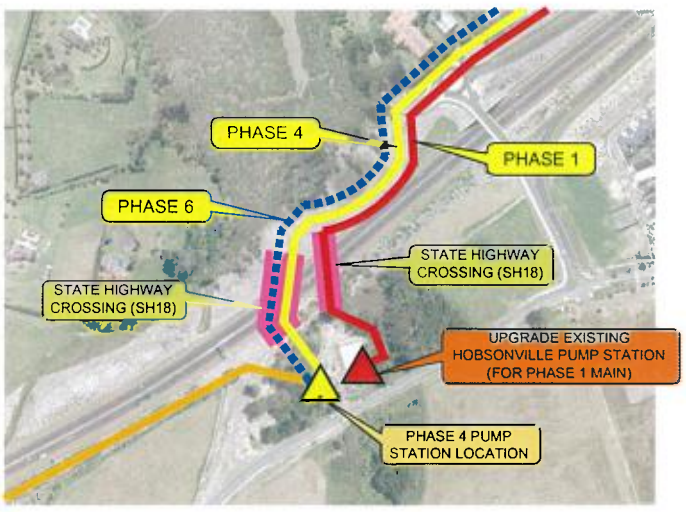
Please contact Chris Gasson at 09 928 8708 regarding the RMA approval process or Stephen Beynon at 09 539 9101 regarding the Corridor Access Request process should you have any queries.

Yours faithfully

Tim Crow
Safety and Network Performance Manager

Cc AMA: Steve Mutton/Stephen Beynon

NZ Transport Agency
Brett Gliddon/Keith Morris/Chris Gasson/Gareth Mills/Mieszko Iwaskow/Coralie O'Brien



HOBSONVILLE PUMP STATION

DETAIL PLAN (NOT TO SCALE)

0m 500m 1000m

1:13,000 APPROX. AT A0
1:20,000 APPROX. AT A1
1:37,500 APPROX. AT A3

ROSEDALE
ALBANY HIGHWAY ADVANCE WORKS
PHASE 6 : DUPLICATION OF PHASE 4 PIPELINE
ROSEDALE TREATMENT PLANT
NORTH SHORE GOLF CLUB
NORTH SHORE MEMORIAL PARK
PIPE BRIDGE
STREAM CROSSING : ROSEDALE PARK
SCHNAPPER ROCK
UNSWORTH HEIGHTS
UPPER HARBOUR M'WAY (SH18)
STREAM CROSSING : LUCAS CREEK
PHASE 4 PUMP STATION (LOCATION T.B.C.)
PHASE 3 : BOOSTER PUMP STATION (LOCATION T.B.C.)
PHASE 1 : HOBSONVILLE PUMP STATION TO ROSEDALE WTP
GREENHITHE
BAYVIEW
PHASE 1 DUAL HARBOUR CROSSING
PHASE 4 : NEW HOBSONVILLE PUMP STATION TO ROSEDALE WTP
CAUSEWAY WIDENING (RECLAIMED LAND)
BREAK PRESSURE CHAMBER (15 THE KNOLL)
PHASE 4 & PHASE 6 HARBOUR CROSSING
WHENUAPAI
PHASE 6 : DUPLICATION OF PHASE 4 PIPELINE
HOBSONVILLE PUMP STATION (SEE BLOW-UP ABOVE)
HOBSONVILLE
PHASE 2 : WESTGATE TO HOBSONVILLE PUMP STATION
NORTH-WESTERN M'WAY (SH16)
UPPER HARBOUR M'WAY (SH18)
PHASE 2 / PHASE 5 BREAK POINT
WEST HARBOUR
PHASE 5 : NEW CONCOURSE PUMP STATION TO WESTGATE
MASSEY
BREAK PRESSURE CHAMBER (CEDAR HEIGHTS AVENUE)
TE ATATU PENINSULAR
STREAM CROSSING : HENDERSON CREEK
CONCOURSE STORAGE TANK
PREFERRED PUMP STATION LOCATION (CONCOURSE STORAGE TANK)
NORTH-WESTERN M'WAY (SH16)
HENDERSON
TE ATATU SOUTH

Watercare

MWH

Mott MacDonald

Tonkin & Taylor

NORTHERN INTERCEPTOR PHASE PLAN

LEGEND

- Phase 1 (2017-2020) Pipeline : Existing Hobsonville Pump Station to Rosedale
- Phase 1 (2017-2020) Structure : Upgrade Existing Pump Station
- Phase 2 (2022-2027) Pipeline : Westgate to Hobsonville Pump Station
- Phase 3 (2022-2027) Structure : New Booster Pump Station
- Phase 4 (2032-2035) Pipeline : New Hobsonville Pump Station to Rosedale
- Phase 4 (2032-2035) Structure : New Hobsonville Pump Station
- Phase 5 (2035) Pipeline : New Concourse Pump Station to Westgate
- Phase 6 (Dictated by Future Demand) Pipeline : Duplication of Phase 3 Pipeline
- Crossing : HDD Sections
- Crossing : Pipe Bridge
- Crossing : Under Motorway
- Structure : Break Pressure Chamber

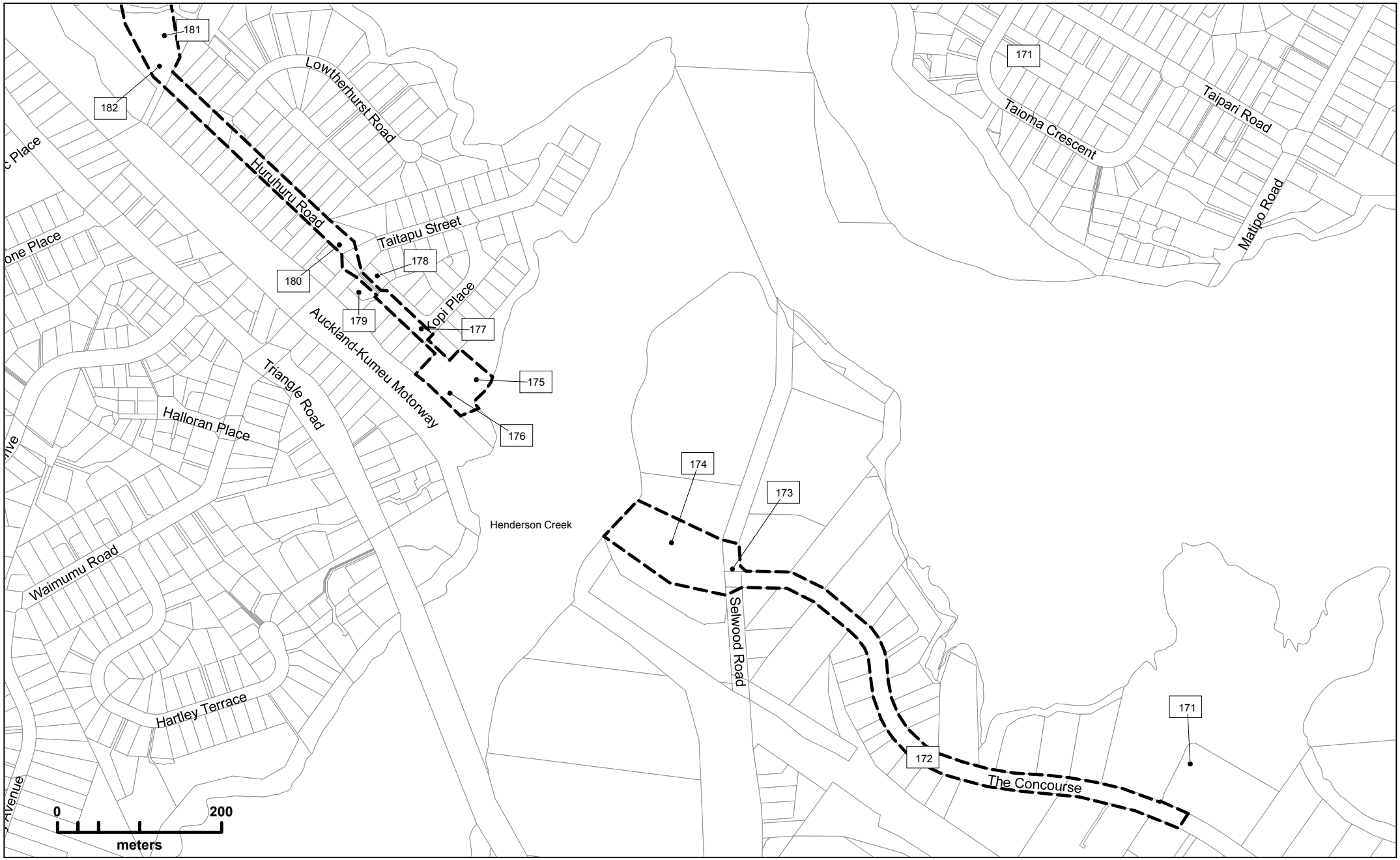
LABEL INFORMATION CLASS

- CONSTRUCTION PHASE
- PLACE / LOCATION
- PUMP STATION (PHASE 1)
- PUMP STATION (PHASE 3)
- STATE HIGHWAY CROSSING
- OTHER CROSSING
- OTHER INFORMATION

P:\2012 Onwards\Watercare Services\805 02292 WSL Northern Interceptor\800 Drawings\PCG Plan\Northern Interceptor - PCG A0 Plan (2014-11-19).dwg

Appendix D

Land Requirement Plans and Property Schedule



Key

Proposed Designation

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Northern Interceptor

Proposed Designation of Land for Wastewater Purposes

Property Plan

NoR NI - Waitakere:

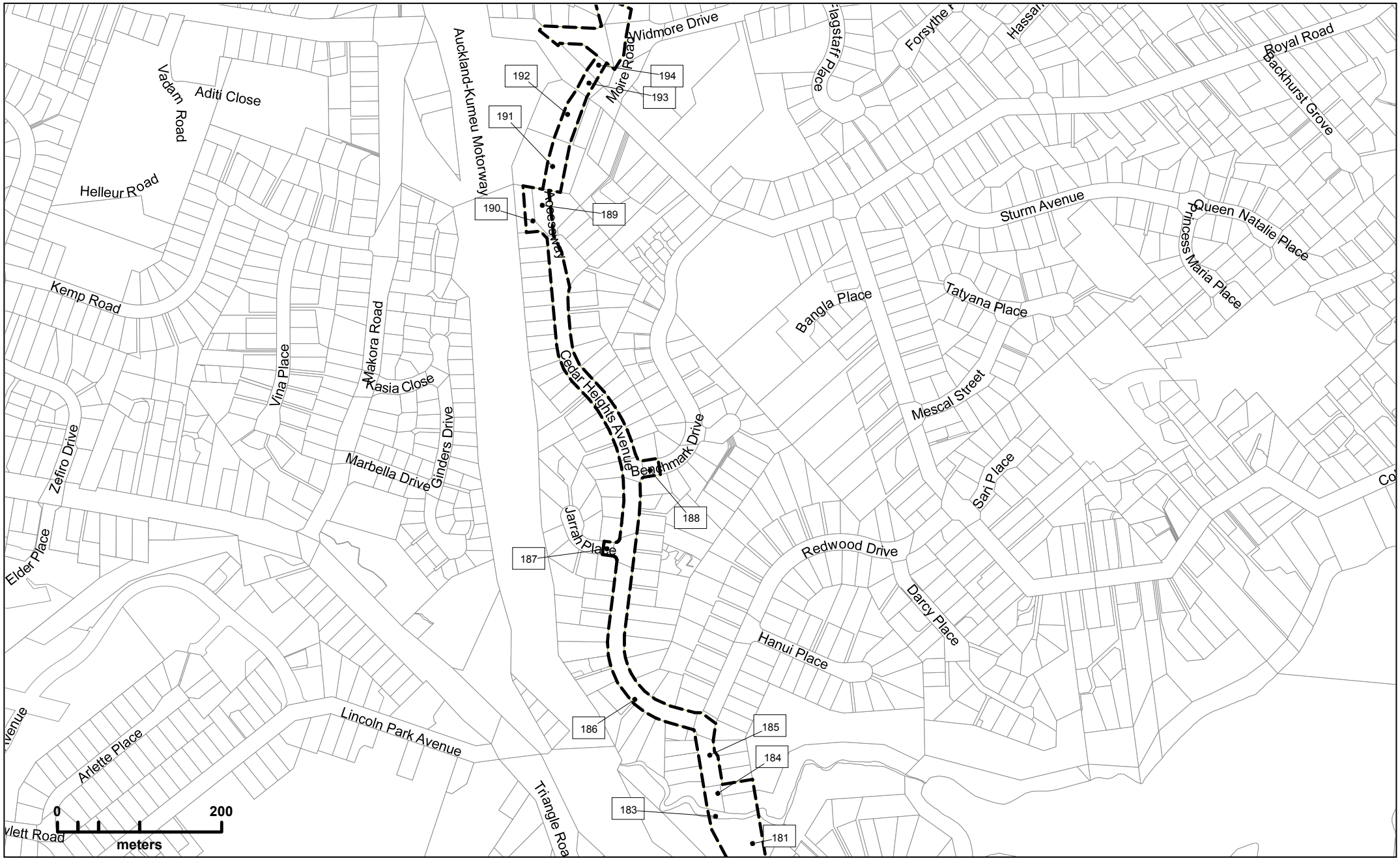
Map 1 of 4

Map Scale @ A4 - 1:6,000

Date: 27/07/2016

Watercare Services

An Auckland Council Organisation



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Northern Interceptor

Proposed Designation of Land for Wastewater Purposes

Property Plan

NoR NI - Waitakere:

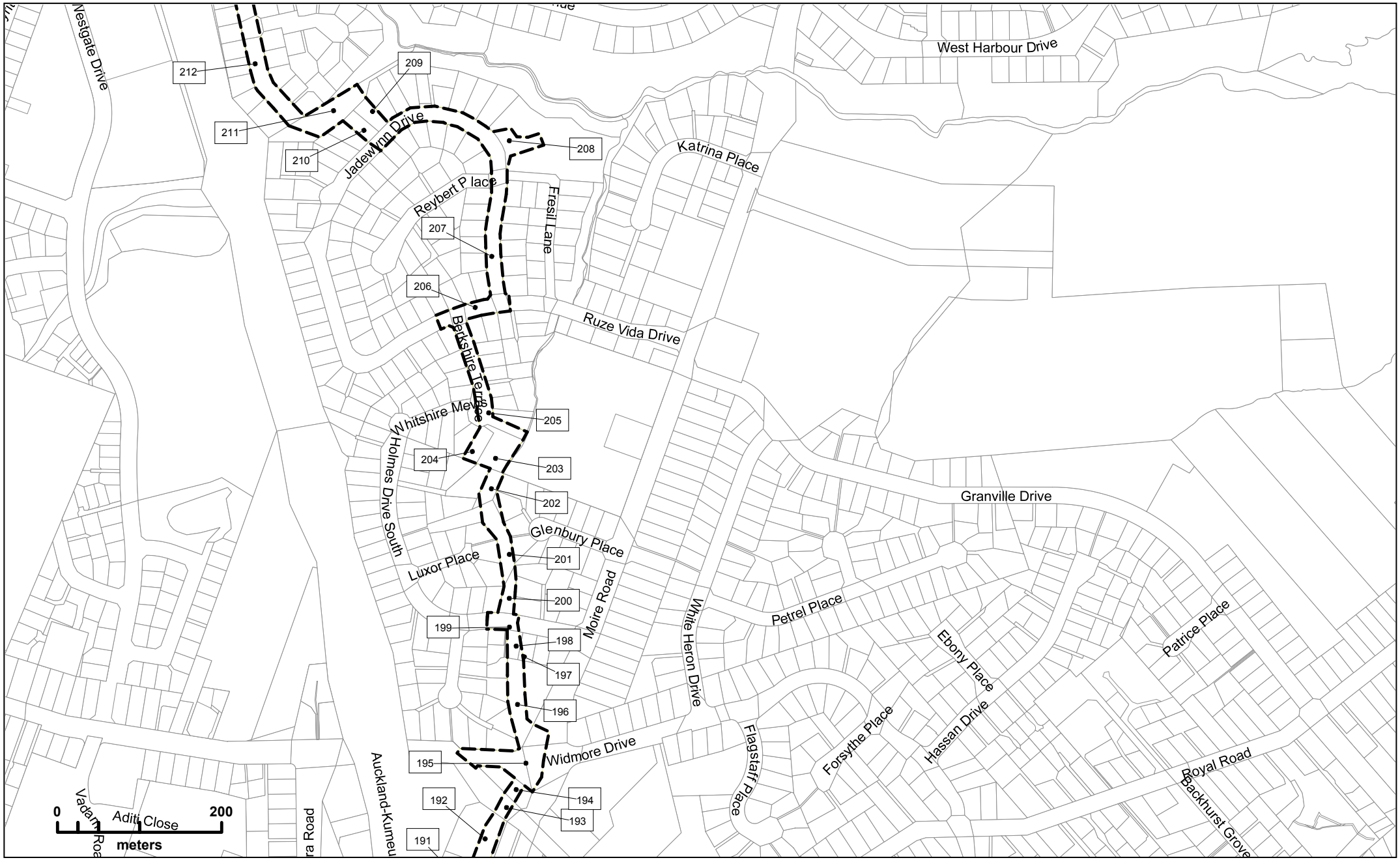
Map 2 of 4

Map Scale @ A4 - 1:6,000

Date: 27/07/2016

Watercare Services

An Auckland Council Organisation



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Northern Interceptor

Proposed Designation of Land for Wastewater Purposes

Property Plan

NoR NI - Waitakere:

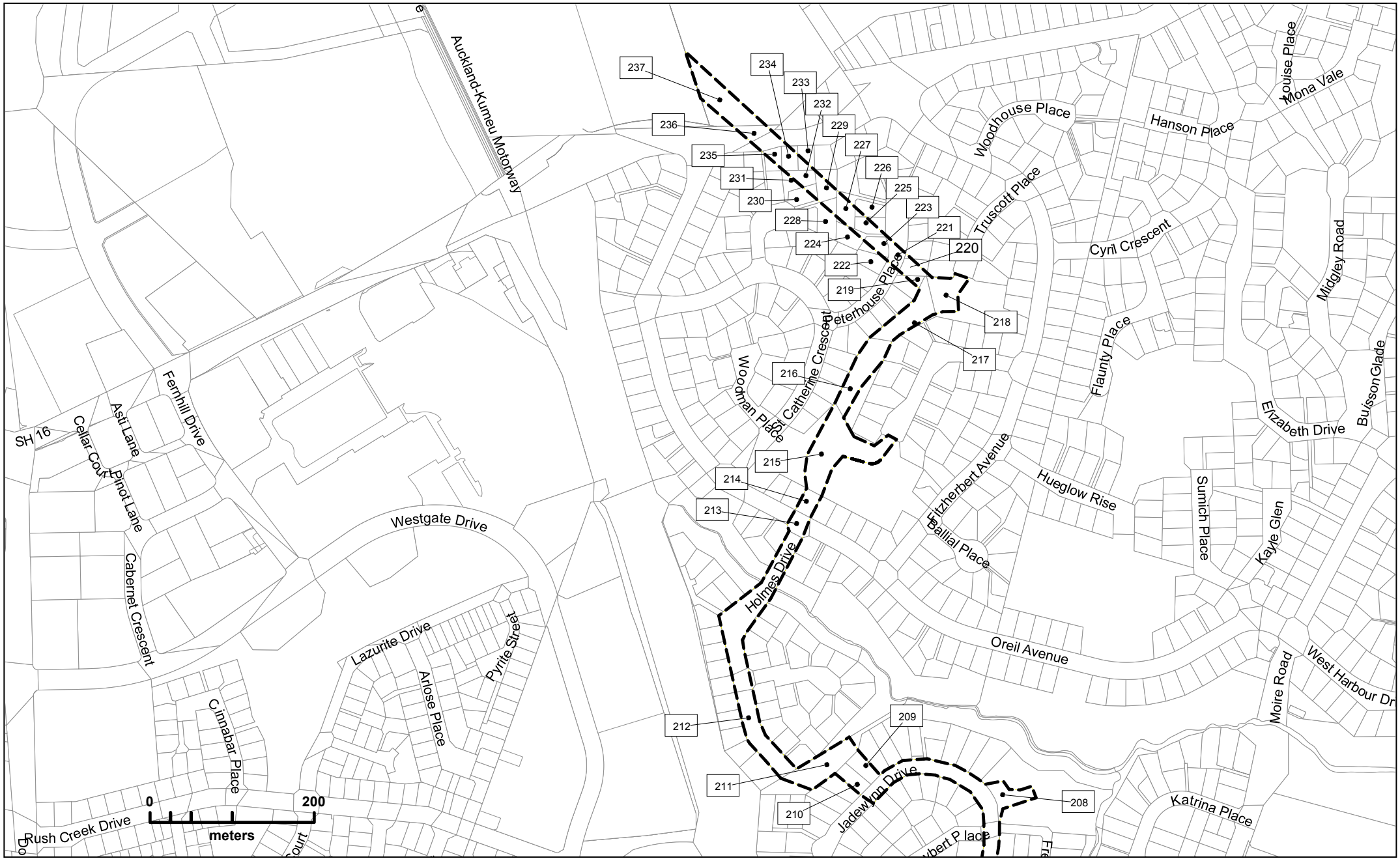
Map 3 of 4

Map Scale @ A4 - 1:6,000

Date: 27/07/2016

Watercare Services

An Auckland Council Organisation



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Northern Interceptor

Proposed Designation of Land for Wastewater Purposes

Property Plan

NoR NI - Waitakere:

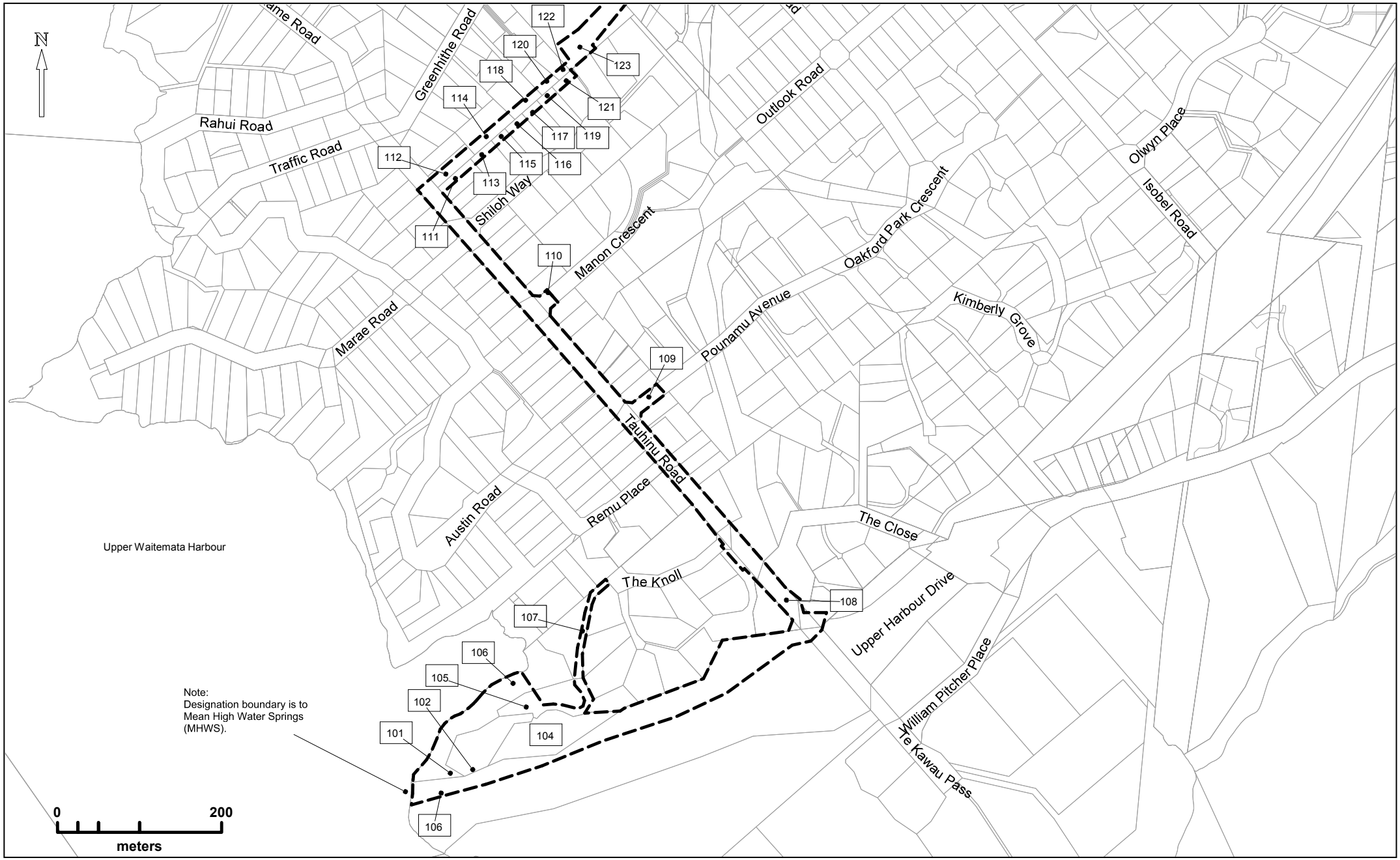
Map 4 of 4

Map Scale @ A4 - 1:6,000

Date: 27/07/2016

Watercare Services

An Auckland Council Organisation



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Proposed Designation

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Northern Interceptor

Proposed Designation of Land for Wastewater Purposes

Property Plan

NoR NI - North Shore:

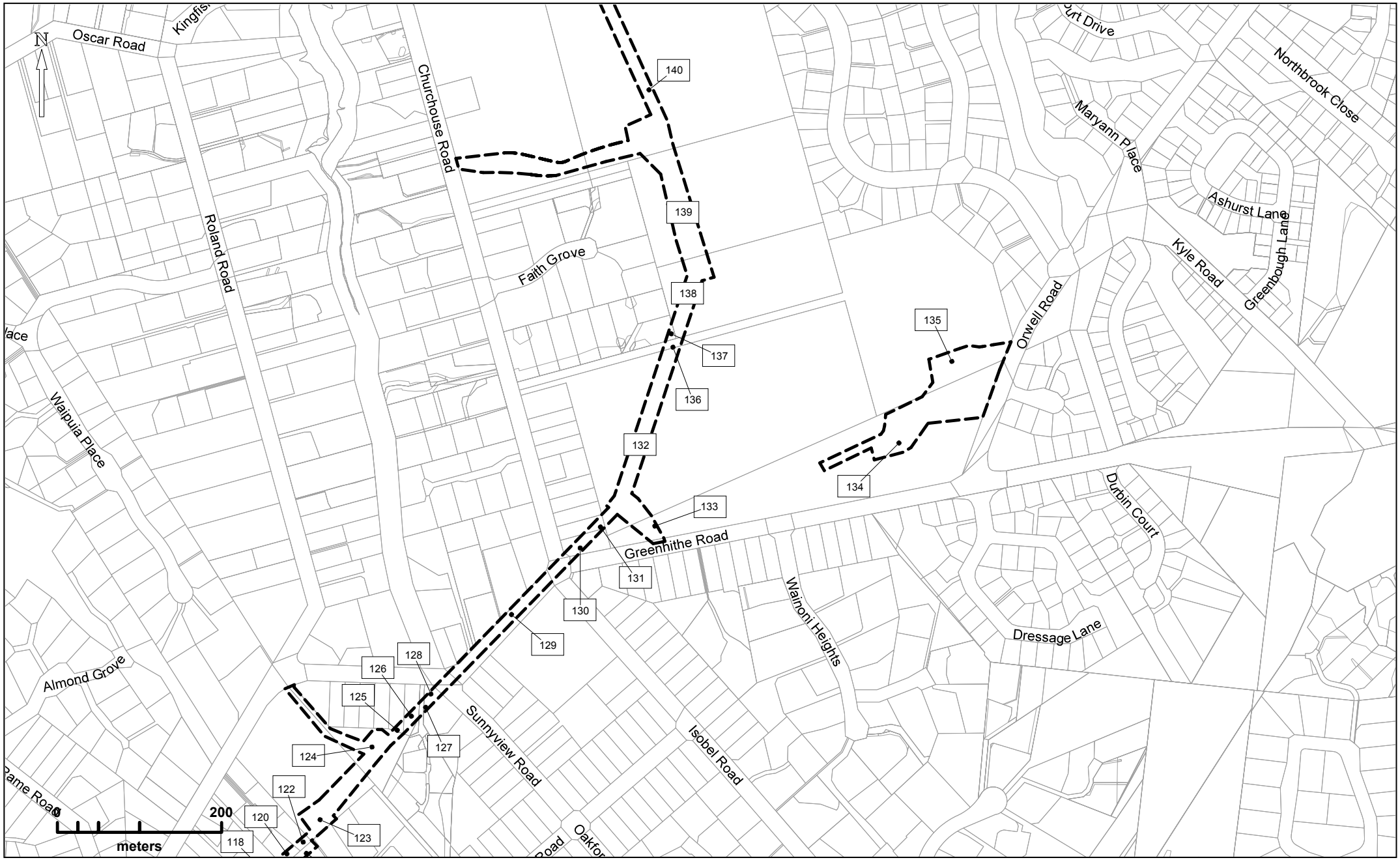
Map 1 of 5

Map Scale @ A4 - 1:6,000

Date: 27/07/2016

Watercare Services

An Auckland Council Organisation



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Northern Interceptor

Proposed Designation of Land for Wastewater Purposes

Property Plan

NoR NI - North Shore:

Map 2 of 5

Map Scale @ A4 - 1:6,000

Date: 27/07/2016

Watercare Services

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Key

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Northern Interceptor

Proposed Designation of Land for Wastewater Purposes

Property Plan

NoR NI - North Shore:

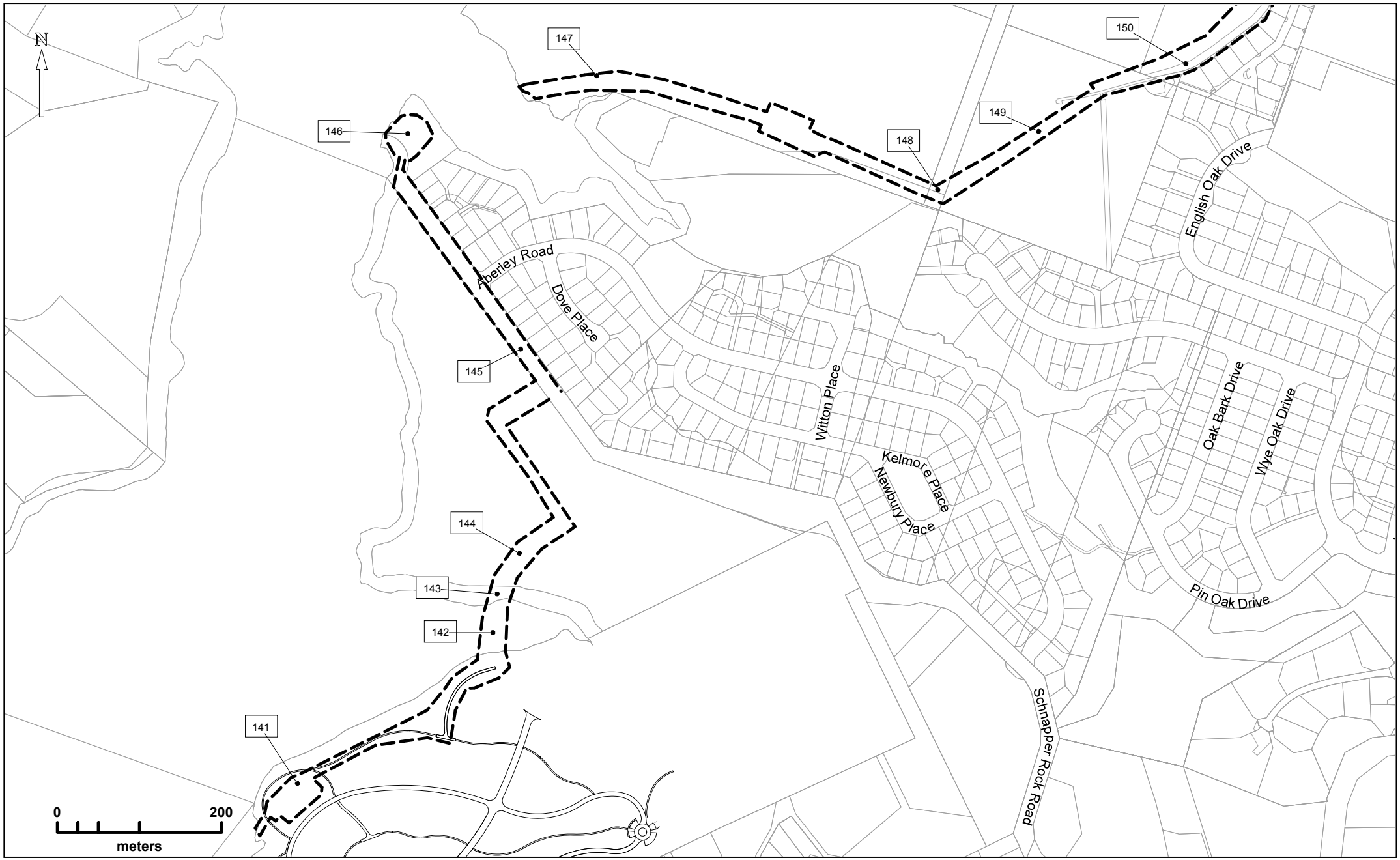
Map 2a of 5

Map Scale @ A4 - 1:6,000

Date: 27/07/2016

Watercare Services

An Auckland Council Organisation



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Northern Interceptor

Proposed Designation of Land for Wastewater Purposes

Property Plan

NoR NI - North Shore:

Map 3 of 5

Map Scale @ A4 - 1:6,000

Date: 27/07/2016

Watercare Services

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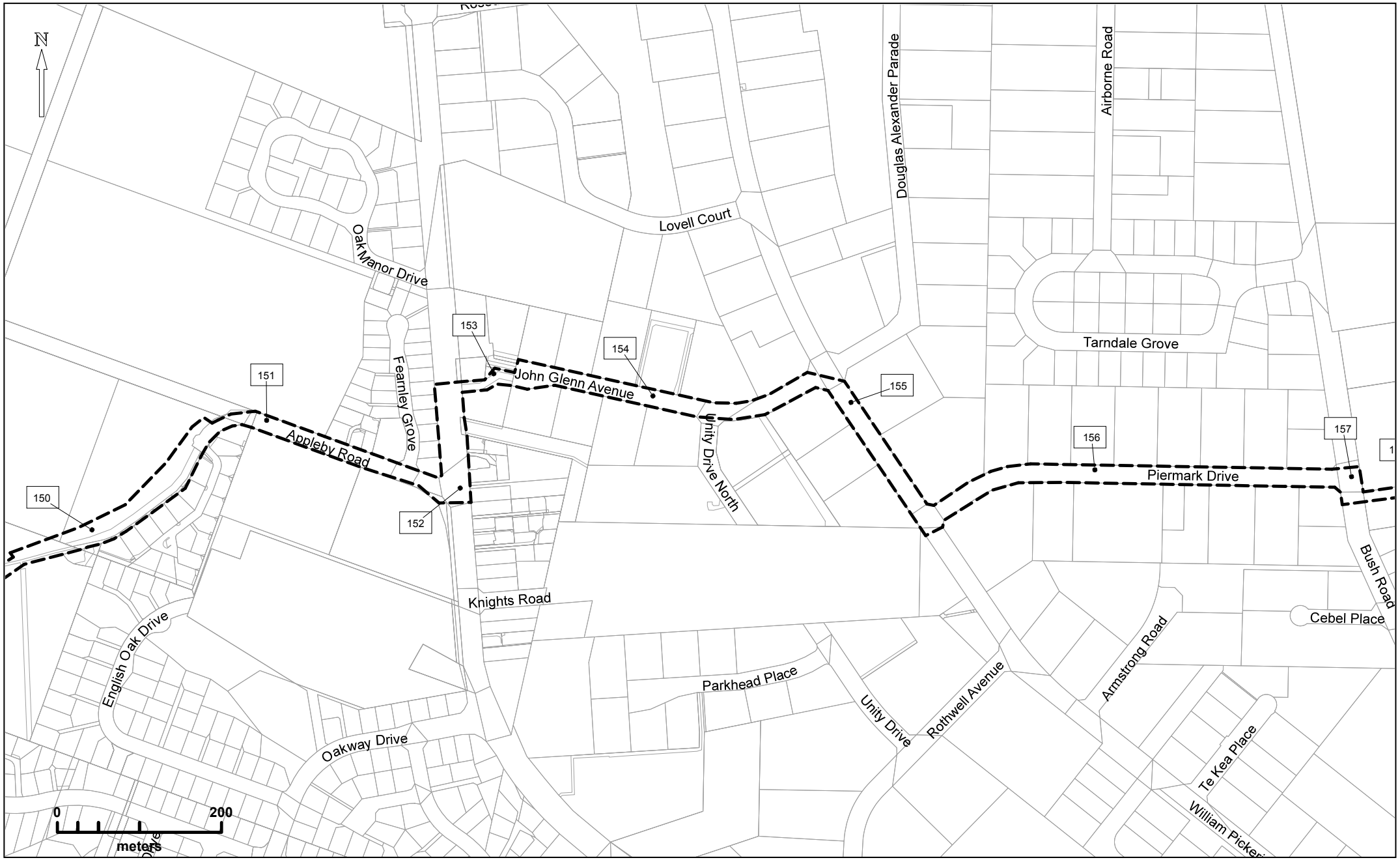

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Northern Interceptor

Proposed Designation of Land for Wastewater Purposes

Property Plan

NoR NI - North Shore:

Map 4 of 5

Map Scale @ A4 - 1:6,000

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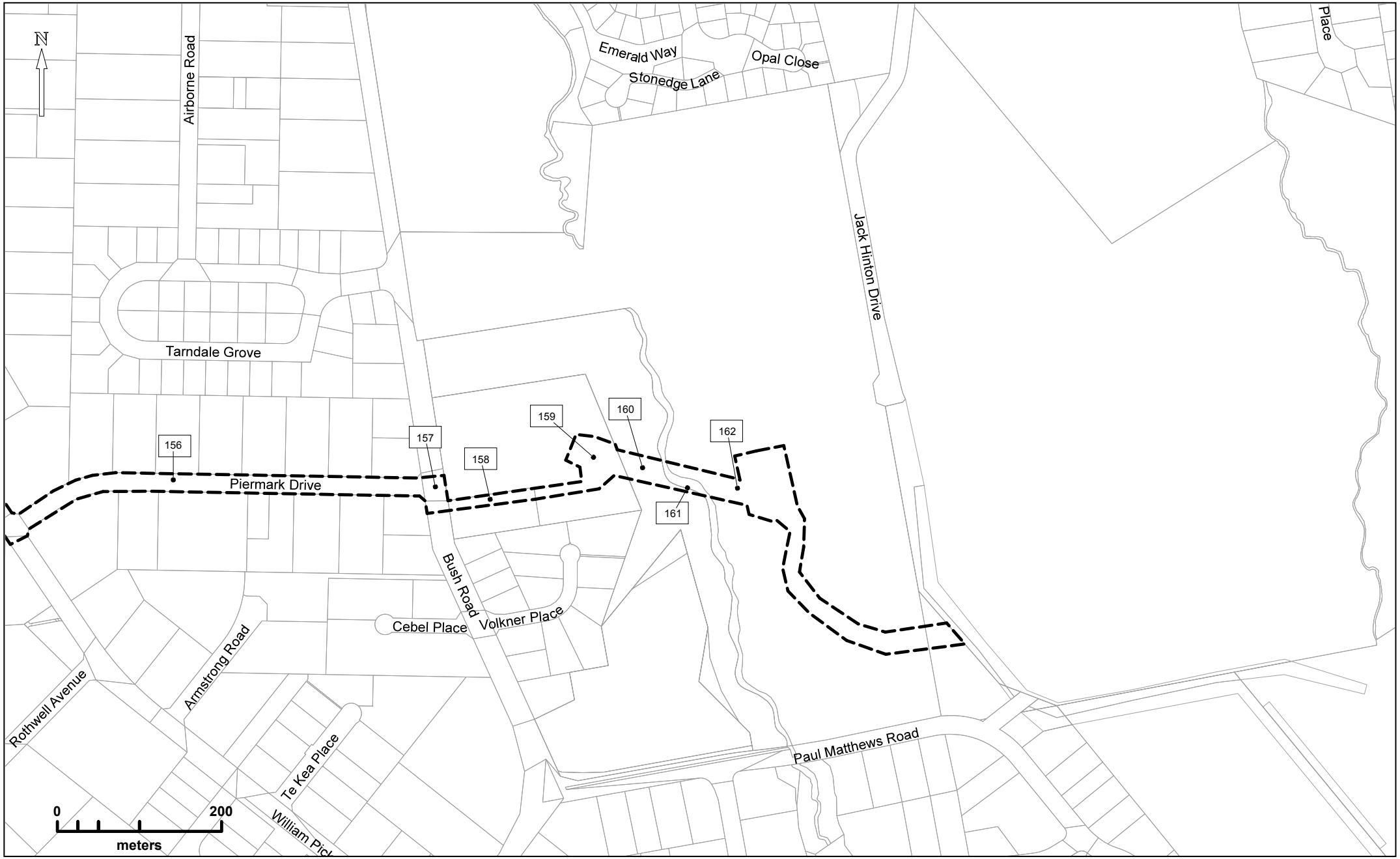

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Northern Interceptor

Proposed Designation of Land for Wastewater Purposes

Property Plan

NoR NI - North Shore:

Map 5 of 5

Map Scale @ A4 - 1:6,000

Date: 27/07/2016

Watercare Services

An Auckland Council Organisation

Map Reference No.	Description	Legal Description/ Appellation/ Road or Park/Reserve Name	Certificate of Title	Physical Address
171	Network Utility	Lot 1 DP 134799	CT-79C/327	56 The Concourse, Henderson
172	Road reserve	The Concourse		
173	Road reserve	Selwood Road		
174		LOT 8 & Pt Lot 7 DP 1034	CT-487/87	2-12 Selwood Road, Henderson
175	Park/Reserve	Taitapu Park	CT-VESTED, CT-GAZETTECT-GAZETTE	16A Taitapu Street, Massey
176	Park/Reserve	Taitapu Park	CT-VESTED, CT-GAZETTECT-GAZETTE	16A Taitapu Street, Massey
177	Road reserve	Kopi Place		
178	Residential	LOT 56 DP 81616	CT-38B/859	35 Kopi Place, Massey
179	Residential	Lot 57 DP 77891	CT-34A/1095	16 Kopi Place, Massey
180	Road reserve	Huruhuru Road		
181	Park/Reserve	Lowtherhurst Reserve	CT-58B/833, CT-VESTED, CT-VESTED, CT-VESTED, CT-VESTED, CT-GAZETTE, CT-VESTED	4A Lowtherhurst Road, Massey
182	Park/Reserve	Lowtherhurst Reserve	CT-58B/833, CT-VESTED, CT-VESTED, CT-VESTED, CT-VESTED, CT-GAZETTE, CT-VESTED	4A Lowtherhurst Road, Massey
183		Stream		
184	Park/Reserve	Lowtherhurst Reserve	CT-58B/833, CT-VESTED, CT-VESTED, CT-VESTED, CT-VESTED, CT-GAZETTE, CT-VESTED	4A Lowtherhurst Road, Massey
185	Road reserve	Redwood Drive		
186	Road reserve	Cedar Heights Avenue		
187	Road reserve	Jarrah Place		
188	Road reserve	Benchmark Drive		
189	Park/Reserve	Makora Park	CT-VESTED	78 Cedar Heights Avenue, Massey
190	Park/Reserve	Makora Park	CT-VESTED	78 Cedar Heights Avenue, Massey
191	Park/Reserve	Makora Park	CT-VESTED	78 Cedar Heights Avenue, Massey
192	Park/Reserve	Makora Park	CT-VESTED	78 Cedar Heights Avenue, Massey
193	Road reserve	Royal Road		
194	Residential	Pt Lot 3 DP 29333	CT-54D/1253	128 Royal Road, Massey
195	Road reserve	Grassed area		

196		Lot 1 DP 65291	CT-21C/272	2-22 Moire Road, Massey
197	Residential	Lot 26 DP 124122	CT-72B/946	6 Holmes Drive, South Massey
198	Residential	Lot 27 DP 124122	CT-72B/947	8 Holmes Drive, South Massey
199	Road reserve	Holmes Drive South		
200	Park/Reserve	Holmes Reserve	CT-VESTED, CT-VESTEDCT-VESTED	13 Holmes Drive, South Massey
201	Park/Reserve	Holmes Reserve	CT-VESTED, CT-VESTEDCT-VESTED	13 Holmes Drive, South Massey
202	Park/Reserve	Holmes Reserve	CT-VESTED, CT-VESTEDCT-VESTED	13 Holmes Drive, South Massey
203	Residential	Lot 163 DP 186800	CT-117A/261	15 Berkshire Terrace, Massey
204	Residential	LOT 162 DP 186800	CT-117A/260	13 Berkshire Terrace, Masey
205	Road reserve	Berkshire Terrace		
206	Road reserve	Ruze Vida Drive		
207	Road reserve	Jadewynn Drive		
208	Park/Reserve	Manutewhau Reserve	13 Jadewynn Drive, Massey	
209	Residential	Lot 104 DP 199705	CT-128A/974	33 Jadewynn Drive, Massey
210	Residential	Lot 105 DP 199705	CT-128A/975	35 Jadewynn Drive, Massey
211	Park/Reserve	Manutawhau Walk	CT-128A/962, CT-128A/963, CT-128A/964, CT-128A/965, CT-45B/357, CT-45B/394, CT-VESTED, CT-VESTED, CT-VESTED, + others	113A Oriel Avenue, West Harbour
212	Road reserve	Holmes Drive		
213	Road reserve	Oriel Avenue		
214	Residential	Lot 99 DP 78481	CT-34C/498	40 Oriel Avenue, West Harbour
215	Park/Reserve	St Margarets Park	CT-33C/326, CT-VESTED, CT-GAZETTE, CT-VESTED, CT-VESTED, CT-VESTED	38 St Catherine Crescent, West Harbour
216	Park/Reserve	St Margarets Park	CT-33C/326, CT-VESTED, CT-GAZETTE, CT-VESTED, CT-VESTED, CT-VESTED	38 St Catherine Crescent, West Harbour
217	Park/Reserve	St Margarets Park	CT-33C/326, CT-VESTED, CT-GAZETTE, CT-VESTED, CT-VESTED, CT-VESTED	38 St Catherine Crescent, West Harbour

218	Park/Reserve	St Margarets Park	CT-33C/326, CT-VESTED, CT-GAZETTE, CT-VESTED, CT-VESTED, CT-VESTED	38 St Catherine Crescent, West Harbour
219	Residential	Lot 220 DP 79322	CT-35D/562	11 Peterhouse Place, West Harbour
220	Residential	Lot 219 DP 79322	CT-35D/561	13 Peterhouse Place, West Harbour
221	Road reserve	Peterhouse Place		
222	Residential	Lot 203 DP 79322	CT-36A/984	8 Peterhouse Place, West Harbour
223	Residential	Lot 204 DP 79323	CT-36A/986	10 Peterhouse Place, West Harbour
224	Residential	Lot 205 DP 79323	CT-36A/987	12 Peterhouse Place, West Harbour
225	Residential	Lot 206 DP 79323	CT-36A/988	14 Peterhouse Place, West Harbour
226	Residential	Lot 207 DP 79323	CT-36A/989	16 Peterhouse Place, West Harbour
227	Residential	Lot 208 DP 79323	CT-36A/990	18 Peterhouse Place, West Harbour
228	Residential	Lot 190 DP 77079	CT-33C/215	10 Magdalen Place, West Harbour
229	Residential	Lot 189 DP 77079	CT-33C/214	12 Magdalen Place, West Harbour
230	Residential	Lot 188 DP 77079	CT-33C/213	19 Magdalen Place, West Harbour
231	Residential	Lot 1 DP 392810	CT-372014	17 Magdalen Place, West Harbour
232	Residential	Lot 2 DP 392810	CT-327015	17A Magdalen Place, West Harbour
233	Residential	Lot 164 DP 77079	CT-33C/201	33 Hobsonville Road, West Harbour
234	Residential	Lot 165 DP 77079	CT-33C/202	31 Hobsonville Road, West Harbour
235	Residential	Lot 166 DP 77079	CT-33C/203	29 Hobsonville Road, West Harbour
236	Road reserve	Hobsonville Road		
237	Residential	Section 6 SO 445955	CT-579283	4-6 Hobsonville Road, West Harbour
101	Park/Reserve	Esplanade Reserve Lot 19 DP 160724	CT-96C/557, CT-96C/556	R 2 Upper Harbour Drive, Greenhithe
102	Residential	Lot 16 DP 160724	CT-96C/555	55 Tauhinu Road, Greenhithe
103	Motorway	Tauhinu Road Off Ramp	State Highway	
104	Residential	Lot 15 DP 160724	CT-96C/554	15 The Knoll, Greenhithe
105	Park/Reserve	Esplanade Reserve Lot 18 DP 160724	CT-96C/557, CT-96C/556	R 2 Upper Harbour Drive, Greenhithe

106	Park/Reserve	Esplanade Reserve Lot 19 DP 160724	CT-96C/557, CT-96C/556	R 2 Upper Harbour Drive, Greenhithe
107	Residential	Lot 14 DP 160724	CT-96C/553	14 The Knoll, Greenhithe
108	Road reserve	Tauhinu Road		
109	Road reserve	Ponamu Avenue		
110	Road reserve	Manon Crescent		
111	Residential	Lot 1 DP 48037	CT-3C/1333	8 Tauhinu Road, Greenhithe
112	Residential	Lot 8 DP 17713	CT-902/67	6 Tauhinu Road, Greenhithe
113	Residential	Lot 1 DP 160534	CT-96C/111	4 Shiloh Way, Greenhithe
114	Residential	Lot 3 DP 155552	CT-92D/762	5B Greenhithe Road, Greenhithe
115	Residential	Lot 2 DP 160534	CT-96C/112	4A Shiloh Way, Greenhithe
116	Residential	Lot 1 DP 140574	CT-83C/78	6 Shiloh Way, Greenhithe
117	Residential	Lot 2 DP 140574	CT-83C/79	6A Shiloh Way, Greenhithe
118	Residential	Lot 2 DP 143722	CT-85B/561	7B Greenhithe Road, Greenhithe
119	Residential	Lot 1 DP 147890	CT-88A/269	8A Shiloh Way, Greenhithe
120	Residential	Lot 4 DP 72373	CT-28C/136	11B Greenhithe Road, Greenhithe
121	Residential	Lot 2 DP 147890	CT-88A/270	8 Shiloh Way, Greenhithe
122	Residential	Lot 3 DP 72373	CT-28C/135	13B Greenhithe Road, Greenhithe
123	Park/Reserve	Collins Park Pt Lot 5 DP 7132, Pt Lot 1 DP 20786	CT-31C/960	R 15 Greenhithe Road, Greenhithe
124	Park/Reserve	Collins Park Pt Lot 5 DP 7132, Pt Lot 1 DP 20786	CT-31C/960	R 15 Greenhithe Road, Greenhithe
125	Residential	Lot 7 DP 20786	CT-1978/39	25 Greenhithe Road, Greenhithe
126	Residential	Lot 8 DP 20786, Lot 2 DP 429115	CT-514221	27 Greenhithe Road, Greenhithe
127	Residential	Lot 1 DP 471824	CT-641222	29 Greenhithe Road, Greenhithe
128	Residential	Lot 1 DP 164937	CT-99B/588	29A Greenhithe Road, Greenhithe
129	Road reserve	Greenhithe Road		
130	Residential	Lot 1 DP 47373	CT-1A/1136	2 Churchouse Road, Greenhithe
131	Residential	Lot 2 DP 47373	CT-1879/73	4 Churchouse Road, Greenhithe

132	Park/Reserve	Wainoni Park Pt Allotment 18 Parish of Paremoremo, Pt Lot 3 Deeds Plan 34	CT	R 52 Greenhithe Road, Greenhithe
133	Park/Reserve	Wainoni Park Pt Lot 3 DEEDS 34	CT	R 52 Greenhithe Road, Greenhithe
134	Park/Reserve	Wainoni Park Pt Lot 3 DEEDS 34	CT	R 52 Greenhithe Road, Greenhithe
135	Park/Reserve	Wainoni Park Lot 1 DP 53735, Lot 5 DP 10508, Pt Lot 4 DP 10508	CT-29A/670, CT-312/47CT	R 52 Greenhithe Road, Greenhithe
136	Park/Reserve	Wainoni Park Lot 1 DP 53735, Lot 5 DP 10508, Pt Lot 4 DP 10508	CT-29A/670, CT-312/47CT	R 52 Greenhithe Road, Greenhithe
137	Residential	Lot 8 DP 401480	CT-404909	40 Churchouse Road, Greenhithe
138	Park/Reserve	Wainoni Park Lot 1 DP 53735, Lot 5 DP 10508, Pt Lot 4 DP 10508	CT-29A/670, CT-312/47CT	R 52 Greenhithe Road, Greenhithe
139	Park/Reserve	Wainoni Park Lot 1 DP 53735, Lot 5 DP 10508, Pt Lot 4 DP 10508	CT-29A/670, CT-312/47CT	R 52 Greenhithe Road, Greenhithe
140	Park/Reserve	Wainoni Park Lot 2 DP 69817, Lot 1 DP 10508, Lot 2 DP 10508, Lot 6 DP 10508, Lot 8 DP 10508, Lot 9 DP 10508, Lot 208 DP 196200, Lot 209 DP 197099, Lot 1 DP 69817	R 56 Churchouse Road, Greenhithe	
141	Cemetery	Pt Allotment 23 Parish Paremoremo, Allot 152 Parish of Paremoremo - 2.0000 Ha - Non Rateable	RA 235 Schnapper Rock Road, Schnapper Rock	
142		Unknown		
143	Park/Reserve	Wharepapa Reserve		
144	Cemetery	Pt Allotment 23 Parish Paremoremo, Allot 152 Parish of Paremoremo - 2.0000 Ha - Non Rateable	RA 235 Schnapper Rock Road, Schnapper Rock	
145	Road reserve	Schnapper Rock Road		
146	Park/Reserve	Public Open Space (Informal) Allotment 151 PSH of Paremoremo	R 286 Schnapper Rock Road, Schnapper Rock	
147	Golf Course	Pt Lot 1 DP 846, Lot 6 DP 16323, Lot 7 DP 16323, Lot 1 DP 201888, Lot 2 DP 201888, Lot 3 DP 846, Lot 24 DP 430140, Lot 25 DP 430140, Lot 1 DP 201887	CT-733/55, CT-128C/487, CT-415/21, CT-517317, CT-517318, CT-128C/488	51 Appleby Road, Albany
148	Golf Course	Lot 6 DP 16323, Lot 7 DP 16323, Lot 1 DP 201888, Lot 2 DP 201888, Lot 3 DP	CT-733/55, CT-128C/487, CT-415/21,	51 Appleby Road, Albany

		846, Lot 24 DP 430140, Lot 25 DP 430140, Lot 1 DP 201887	CT-517317, CT-517318, CT-128C/488	
149	Golf Course	Lot 23 DP 430140, Lot 6 DP 16323, Lot 7 DP 16323, Lot 1 DP 201888, Lot 2 DP 201888, Lot 3 DP 846, Lot 24 DP 430140, Lot 25 DP 430140, Lot 1 DP 201887	CT-733/55, CT-128C/487, CT-415/21, CT-517317, CT-517318, CT-128C/488	51 Appleby Road, Albany
150	Golf Course	Lot 6 DP 16323, Lot 7 DP 16323, Lot 1 DP 201888, Lot 2 DP 201888, Lot 3 DP 846, Lot 24 DP 430140, Lot 25 DP 430140, Lot 1 DP 201887	CT-733/55, CT-128C/487, CT-415/21, CT-517317, CT-517318, CT-128C/488	51 Appleby Road, Albany
151	Road reserve	Appleby Road		
152	Road reserve	Albany Highway		
153	Business	Lot 56 DP 181692	CT-112D/114	14 John Glenn Avenue, Rosedale
154	Road reserve	John Glenn Avenue		
155	Road reserve	William Pickering Drive		
156	Road reserve	Piermark Drive		
157	Road reserve	Bush Road		
158	Network Utility	Lot 1 DP 210375	CT-138B/993	179 Bush Road, Rosedale
159	Business	Lot 2 DP 210375	CT-138B/994	169 Bush Road, Rosedale
160	Park/Reserve	Rosedale Park Lot 3 DP 180979, Lot 301 DP 189418, Lot 4 DP 180979, Pt Lot 5 DP 90026	CT-112B/304, CT, CT-112B/305	R 320 Rosedale Road, Albany
161		Alexandra Stream		
162	Park/Reserve	Rosedale Park Lot 106 DP 183218, Lot 102 DP 183218, Pt Allot 653 Parish of PAREMOREMO, Pt Allot 133 Parish of PAREMOREMO, Pt Lot 1 DP 174315, Pt Lot 1 DP 174315	CT-114A/895, CT-114A/892, CT-24A/237	R 320 Rosedale Road, Albany

Appendix E Relevant Statutory Provisions

New Zealand Coastal Policy Statement (2010)

Reference	Full text	Comment
Objective 1	To safeguard the integrity, form, functioning and resilience of the coastal environment and sustain its ecosystems, including marine and intertidal areas, estuaries, dunes and land, by: • maintaining or enhancing natural biological and physical processes in the coastal environment and recognising their dynamic, complex and interdependent nature; • protecting representative or significant natural ecosystems and sites of biological importance and maintaining the diversity of New Zealand's indigenous coastal flora and fauna; and • maintaining coastal water quality, and enhancing it where it has deteriorated from what would otherwise be its natural condition, with significant adverse effects on ecology and habitat, because of discharges associated with human activity	There will be temporary adverse effects on the coastal environment resulting from construction activities which my result in temporary adverse effects on the form of the coastal environment. However, once reinstated, it is considered that the Project will not result in adverse effects on integrity, form, functioning and resilience of the coastal environment. Vegetation within SEA_T_ SEA_T_8319 at the eastern abutment of the Greenhithe Bridge supports suitable potential habitat for at least five indigenous lizard species, four of which have a National threat classification of 'At Risk'. Threat rankings for some of these species, particularly those 'At Risk', may increase over the next 20 years. It is noted that the forest gecko, copper skink and ornate skink have been recorded from SEA_T_8319. The vegetation also has the potential to support roosting and nesting habitat for a range of common native bird species. Technical Report D recommends that preclearance surveys for lizards and nesting birds be undertaken where they have been identified as potentially present, and that an Ecological Management Plan should be prepared to address the potential presence and management of geckos and /or skinks within these areas. Through the adoption of proposed mitigation measures, it is considered that the Project will be consistent with this objective.
Objective 2	To preserve the natural character of the coastal environment and protect natural features and landscape values through: • recognising the characteristics and qualities that contribute to natural character, natural features and landscape values and their location and distribution; • identifying those areas where various forms of subdivision, use, and development would be inappropriate and protecting them from such activities; and • encouraging restoration of the coastal environment.	In addition to the comments above, we note that the proposed works are to provide a critical piece of a network that is considered to be regionally significant infrastructure. The most appropriate means of managing the effect on the coastal environment are to minimise the works footprint and the duration of works. These objectives have been central to the development of the construction method.
Objective 3	To take account of the principles of the Treaty of Waitangi, recognise the role of tangata whenua as kaitiaki and provide for tangata whenua involvement in management of the coastal environment by:	Watercare has engaged with Mana Whenua throughout the investigation of alternatives and development of the Project, with the proposed route avoiding as far as practicable any ancestral lands, sites, waahi tapu and other taonga

Reference	Full text	Comment
	• recognising the ongoing and enduring relationship of tangata whenua over their lands, rohe and resources; • promoting meaningful relationships and interactions between tangata whenua and persons exercising functions and powers under the Act; • incorporating mātauranga Māori into sustainable management practices; and • recognising and protecting characteristics of the coastal environment that are of special value to tangata whenua.	identified as being of significance to tangata whenua. Mana Whenua have indicated that there are values associated with the coastal edges around Lucas Creek, in particular at the reserve located at Schnapper Rock Road, as well as within the Upper Waitemata Harbour. Mana Whenua have noted that they would like to be engaged closer to the time construction is expected to commence. In the interim, Watercare will continue regular discussions with all Mana Whenua who have expressed an interest in the Project.
Objective 4	To maintain and enhance the public open space qualities and recreation opportunities of the coastal environment by: • recognising that the coastal marine area is an extensive area of public space for the public to use and enjoy; • maintaining and enhancing public walking access to and along the coastal marine area without charge, and where there are exceptional reasons that mean this is not practicable providing alternative linking access close to the coastal marine area; and • recognising the potential for coastal processes, including those likely to be affected by climate change, to restrict access to the coastal environment and the need to ensure that public access is maintained even when the coastal marine area advances inland.	There will be short term restrictions on public access and recreation in the coastal environment as a result of construction activities to ensure appropriate health and safety. Construction sites and works through these areas will be designed to minimise disruption on recreation and public access to and along the CMA and to publicly-owned land in the coastal environment as far as practicable. However, there will be temporary effects on public access during construction. Where temporary restrictions are necessary, Watercare will continue to consult with affected organisations to identify opportunities to address any restrictions.
Objective 6	To enable people and communities to provide for their social, economic, and cultural wellbeing and their health and safety, through subdivision, use, and development, recognising that: • the protection of the values of the coastal environment does not preclude use and development in appropriate places and forms, and within appropriate limits; • some uses and developments which depend upon the use of natural and physical resources in the coastal environment are important to the social, economic and cultural wellbeing of people and communities; • functionally some uses and developments can only be located on the coast or in the coastal marine area; • the coastal environment contains renewable energy resources of significant value; • the protection of habitats of living marine resources contributes to the social, economic and cultural wellbeing of people and communities;	The provision of infrastructure to service growth in the area is essential in order to enable the people and communities of those areas to provide for their social and economic wellbeing and for their health and safety by providing for appropriate conveyance of sewage to the Rosedale WWTP. As discussed above, the Project has been developed to avoid as far as practicable adverse effects on the coastal environment. In the overall context of the Project the area of the coastal environment affected is relatively small and any impact on access to the affected area of coastal environment will be temporary.

Reference	Full text	Comment
	• the potential to protect, use, and develop natural and physical resources in the coastal marine area should not be compromised by activities on land; • the proportion of the coastal marine area under any formal protection is small and therefore management under the Act is an important means by which the natural resources of the coastal marine area can be protected; and • historic heritage in the coastal environment is extensive but not fully known, and vulnerable to loss or damage from inappropriate subdivision, use, and development.	
Policy 6	1) In relation to the coastal environment: i. recognise that the provision of infrastructure, the supply and transport of energy including the generation and transmission of electricity, and the extraction of minerals are activities important to the social, economic and cultural well-being of people and communities; ii. consider the rate at which built development and the associated public infrastructure should be enabled to provide for the reasonably foreseeable needs of population growth without compromising the other values of the coastal environment; iii. encourage the consolidation of existing coastal settlements and urban areas where this will contribute to the avoidance or mitigation of sprawling or sporadic patterns of settlement and urban growth; iv. recognise tangata whenua needs for papakāinga, marae and associated developments and make appropriate provision for them; v. consider where and how built development on land should be controlled so that it does not compromise activities of national or regional importance that have a functional need to locate and operate in the coastal marine area; vi. consider where development that maintains the character of the existing built environment should be encouraged, and where development resulting in a change in character would be acceptable; vii. take into account the potential of renewable resources in the coastal environment, such as energy from wind, waves, currents and tides, to meet the reasonably foreseeable needs of future generations; viii. consider how adverse visual impacts of development can be avoided in areas sensitive to such effects, such as headlands and prominent ridgelines, and as far as practicable and reasonable apply controls or conditions to avoid those effects;	Refer above for comment regarding the provision of infrastructure in the coastal environment. Policy 6 recognises that the provision of infrastructure is important to the social, economic and cultural well-being of people and communities. The Project is therefore consistent with Policy 6.

Reference	Full text	Comment
	ix. set back development from the coastal marine area and other water bodies, where practicable and reasonable, to protect the natural character, open space, public access and amenity values of the coastal environment; and x. where appropriate, buffer areas and sites of significant indigenous biological diversity, or historic heritage value	
Policy 11	To protect indigenous biological diversity in the coastal environment: a. avoid adverse effects of activities on: i. indigenous taxa that are listed as threatened or at risk in the New Zealand Threat Classification System lists; ii. taxa that are listed by the International Union for Conservation of Nature and Natural Resources as threatened; iii. indigenous ecosystems and vegetation types that are threatened in the coastal environment, or are naturally rare6; iv. habitats of indigenous species where the species are at the limit of their natural range, or are naturally rare; v. areas containing nationally significant examples of indigenous community types; and vi. areas set aside for full or partial protection of indigenous biological diversity under other legislation; and b. avoid significant adverse effects and avoid, remedy or mitigate other adverse effects of activities on: i. areas of predominantly indigenous vegetation in the coastal environment; ii. habitats in the coastal environment that are important during the vulnerable life stages of indigenous species; iii. indigenous ecosystems and habitats that are only found in the coastal environment and are particularly vulnerable to modification, including estuaries, lagoons, coastal wetlands, dunelands, intertidal zones, rocky reef systems, eelgrass and saltmarsh; iv. habitats of indigenous species in the coastal environment that are important for recreational, commercial, traditional or cultural purposes; v. habitats, including areas and routes, important to migratory species; and	Refer above.

Reference	Full text	Comment
	vi. ecological corridors, and areas important for linking or maintaining biological values identified under this policy.	
Policy 13	**Preservation of natural character** 1) To preserve the natural character of the coastal environment and to protect it from inappropriate subdivision, use, and development: a) avoid adverse effects of activities on natural character in areas of the coastal environment with outstanding natural character; and b) avoid significant adverse effects and avoid, remedy or mitigate other adverse effects of activities on natural character in all other areas of the coastal environment; including by: c) assessing the natural character of the coastal environment of the region or district, by mapping or otherwise identifying at least areas of high natural character; and d) ensuring that regional policy statements, and plans, identify areas where preserving natural character requires objectives, policies and rules, and include those provisions. 2) Recognise that natural character is not the same as natural features and landscapes or amenity values and may include matters such as: a) natural elements, processes and patterns; b) biophysical, ecological, geological and geomorphological aspects; c) natural landforms such as headlands, peninsulas, cliffs, dunes, wetlands, reefs, freshwater springs and surf breaks; d) the natural movement of water and sediment; e) the natural darkness of the night sky; f) places or areas that are wild or scenic; g) a range of natural character from pristine to modified; and h) experiential attributes, including the sounds and smell of the sea; and their context or setting.	Refer above.
Policy 15	**Natural features and natural landscapes** To protect the natural features and natural landscapes (including seascapes) of the coastal environment from inappropriate subdivision, use, and development: a. avoid adverse effects of activities on outstanding natural features and outstanding natural landscapes in the coastal environment; and	Refer above.

Reference	Full text	Comment
	b. avoid significant adverse effects and avoid, remedy, or mitigate other adverse effects of activities on other natural features and natural landscapes in the coastal environment; including by: c. identifying and assessing the natural features and natural landscapes of the coastal environment of the region or district, at minimum by land typing, soil characterisation and landscape characterisation and having regard to: i. natural science factors, including geological, topographical, ecological and dynamic components; ii. the presence of water including in seas, lakes, rivers and streams; iii. legibility or expressiveness—how obviously the feature or landscape demonstrates its formative processes; iv. aesthetic values including memorability and naturalness; v. vegetation (native and exotic); vi. transient values, including presence of wildlife or other values at certain times of the day or year; vii. whether the values are shared and recognised; viii. cultural and spiritual values for tangata whenua, identified by working, as far as practicable, in accordance with tikanga Māori; including their expression as cultural landscapes and features; ix. historical and heritage associations; and x. wild or scenic values; d. ensuring that regional policy statements, and plans, map or otherwise identify areas where the protection of natural features and natural landscapes requires objectives, policies and rules; and e. including the objectives, policies and rules required by (d) in plans.	

National Policy Statement for Freshwater Management (2014)

Reference	Full text	Comment
Objective A1	To safeguard: a) the life-supporting capacity, ecosystem processes and indigenous species including their associated ecosystems, of fresh water; and b) the health of people and communities, at least as affected by secondary contact with fresh water; in sustainably managing the use and development of land, and of discharges of contaminants.	Effective wastewater management is integral to the protection of freshwater resources, as management will reduce the potential for contaminants (via overflows) to enter freshwater and having adverse environmental impacts on in-stream ecology and other downstream effects. The proposed designation will safeguard the wastewater pipeline route, enabling these future communities within the Service Catchment to be serviced by the city's sewage treatment facilities, controlling discharges and overflows – meeting community and freshwater health outcomes, and avoiding sensitive freshwater habitats where practicable. Further to the above, through the adoption of proposed mitigation measures (e.g. Ecological Management Plan) it is considered that the Project will be consistent with this objective.
Objective D1	To provide for the involvement of iwi and hapū, and to ensure that tāngata whenua values and interests are identified and reflected in the management of fresh water including associated ecosystems, and decision-making regarding freshwater planning, including on how all other objectives of this national policy statement are given effect to.	The NoR has been developed in consultation with a variety of stakeholders, including tāngata whenua and local communities. The designation covers a large corridor, and detailed design of the pipeline itself will further identify specific community and tāngata whenua interests and address them accordingly.

Auckland Regional Policy Statement (Operative 1999)

Reference	Full text	Comment
Strategic Objective 2.6.1.1	To ensure that provision is made to accommodate the Region's growth in a manner which gives effect to the purposes and principles of the Resource Management Act 1991 and Section 40 of the Local Government (Auckland) Amendment Act 2004, and is consistent with these Strategic objectives and with the provisions of this RPS.	The Project, which is considered to be regionally significant infrastructure, will provide additional wastewater conveyance and treatment infrastructure to service the increasing urban development in the North West Auckland (the Service Catchment). The Project is needed to provide safe and efficient wastewater services to the growing Auckland Region. The proposed designation will safeguard the wastewater pipeline route, enabling these future communities to be serviced by the city's sewage treatment facilities, controlling discharges and overflows – meeting community and freshwater health outcomes. The construction and operation of the Project will provide necessary infrastructure that supports the economic and social wellbeing of the region, and will enable Watercare to meet its obligations under the LGA, and will provide the infrastructure needed to service a growing Auckland.
Strategic Objective 2.6.1.12	To encourage the efficient use of natural and physical resources, including urban land, infrastructure, and energy resources.	As noted above, Watercare is subject to particular statutory obligations as an Auckland water organisation under the Local Government (Auckland Council) Act 2009. Section 57 (1) of that Act says that Watercare must, amongst other things: *"manage its operations efficiently with a view to keeping the overall costs of water supply and wastewater services to its customers (collectively) at the minimum levels consistent with the effective conduct of its undertakings and the maintenance of the long-term integrity of its assets"* The Project will enable Watercare to maintain and enhance the wastewater network within the Service Catchment, and will enhance public health and amenity. It is considered that the project constitutes the efficient use and development of natural and physical resources.
Strategic Objective 2.6.1.16	To improve the overall health, well-being and quality of life of the people of the Region.	Refer above.
Strategic Objective 2.6.1.17	To enable the redevelopment, operation and maintenance of existing and provision of new regionally significant infrastructure.	The Project, which is considered to be regionally significant infrastructure, will provide additional wastewater conveyance and treatment infrastructure to service the increasing urban development in the Service Catchment. The Project is needed to provide safe and efficient wastewater services to the growing Auckland Region. The proposed designation will safeguard the

Reference	Full text	Comment
		wastewater pipeline route, enabling these future communities to be serviced by the city's sewage treatment facilities, controlling discharges and overflows – meeting community and freshwater health outcomes. The construction and operation of the Project will provide necessary infrastructure that supports the economic and social wellbeing of the region.
Strategic Policy 2.6.14	1. The operation of existing regionally significant infrastructure and the provision of new or upgraded regionally significant infrastructure shall: i. be consistent with the Strategic Direction of the Regional Policy Statement; ii. support and reinforce the Regional Growth Strategy and the proposed outcomes of that strategy; and iii. ensure that any adverse effects of those activities on the environment (including human health) are avoided, remedied or mitigated in a manner consistent with the relevant provisions of this RPS. 2. Provision is to be made to enable the safe and efficient operation, maintenance and development of regionally significant infrastructure which is necessary for the social and economic wellbeing of the region's people. 3. Land use change should avoid significant reverse sensitivity effects on regionally significant infrastructure. Refer also to Strategic Policies 2.6.2(2) (viii), 2.6.11(1) (n), 2.6.17(e) (i) and 2.6.17(4) (ii). 4. The provision and operation of infrastructure, including transport infrastructure should support the development of high quality urban amenity. 5. In the operation of existing regionally significant infrastructure and the provision of new infrastructure consideration and appropriate provision is to be made for the following matters: i. the avoidance of significant adverse effects (including cumulative adverse effects) on: a. the environmental values protected by defined limits to metropolitan Auckland and defined limits of rural or coastal settlements; b. significant and outstanding coastal and natural landscapes, vegetation and fauna areas; c. amenity values throughout the whole of the region and the rural character of rural areas in the Region; d. human health;	Refer above.

Reference	Full text	Comment
	where significant adverse effects cannot be avoided they shall be remedied or mitigated; ii. avoiding prematurely foreclosing, or compromising options for future urban and rural and coastal town growth including areas identified in Schedule 1; iii. consideration of alternative locations (including locations in urban areas) for utility service facilities which give rise to significant adverse effects on the environment; iv. environmental enhancement and/or remediation opportunities.	
Objective 3.3.1	To sustain the mauri of natural and physical resources in ways which enable provision for the social, economic and cultural wellbeing of Maori.	Watercare has engaged with Mana Whenua throughout the development of the Project, with the proposed route avoiding as far as practicable any ancestral lands, water, sites, waahi tapu and other taonga identified as being of significance to tangata whenua. A range of mitigation measures, such as erosion and sediment controls in accordance with TP90 during construction, will be undertaken which will assist in sustaining the mauri of natural resources such as waterbodies and the coastal environment. The Project allows for the management of natural and physical resources in a way that enables people and communities, including Mana Whenua, to provide for their social, economic and cultural wellbeing and for their health and safety.
Objective 3.3.3	To involve Tangata Whenua in resource management processes in ways which: i. take into account the principles of the Treaty of Waitangi, including rangatiratanga; ii. have particular regard to the practical expression of kaitiakitanga.	Refer above.
Objective 6.3.1	To preserve or protect a diverse and representative range of the Auckland Region's heritage resources	As noted in Technical Report B, one heritage building is recorded within c.100m of the proposed NoR – NI (Waitakere). This is the Radio New Zealand Transmitter Building which is scheduled within the Auckland Council District Plan – Operative Waitakere Section 2003 (ID 1174) and as a Category A historic heritage place within the PAUP (Appendix 9: ID 56). The proposed works are anticipated to have no effect on the recorded extent of this site.
Objective 7.3.1	To preserve the natural character of the coastal environment and to protect it from inappropriate subdivision, use and development	As discussed above, the Project will to provide a critical piece of a network that is considered to be regionally significant infrastructure. The most appropriate means of managing the effect on the coastal environment are to minimise the works footprint and the duration of works. These objectives have been central to the development of the construction method.

Reference	Full text	Comment
		There will be temporary adverse effects on the coastal environment resulting from construction activities which my result in temporary adverse effects on the form of the coastal environment. However, once reinstated, it is considered that the Project will not result in adverse effects on integrity, form, functioning and resilience of the coastal environment, as the infrastructure associated with the Project will generally be sub-surface (with the exception of pump stations, etc.). Construction sites and works through these areas will be designed to minimise disruption to publicly-owned land in the coastal environment as far as practicable.
Objective 7.3.3	To enable appropriate subdivision, use and development to be undertaken in the coastal environment	Refer above.
Objective 7.3.4	To enable the use of the coastal environment for appropriate port purposes, other water-related industrial and commercial activities and network utilities.	Refer above.
Objective 7.3.6	To maintain and enhance public access to and along the CMA and to publicly-owned land in the coastal environment.	The proposed alignment traverses a number of reserves and public open spaces. Construction sites and works through these areas will be designed to minimise disruption on recreation and public access to and along the CMA and to publicly-owned land in the coastal environment as far as practicable. However, there will be temporary effects on public access during construction. Public access will only be restricted temporarily to the extent necessary to carry out the works in a safe manner, and will only be restricted for the relatively short period of construction in the coastal environment.
Objective 7.3.9	To recognise and provide for the relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu and other taonga of the coastal environment.	Refer above.
Policy 7.4.4	1. The natural character of the coastal environment shall be preserved, and protected from inappropriate subdivision, use and development by: i. In areas of high natural character, avoiding adverse effects on: a. the natural functioning and natural processes of sediment transport, substrate composition and movement of biota; b. areas of indigenous vegetation and habitats of indigenous fauna and associated processes;	Refer above.

Reference	Full text	Comment
	c. the physical integrity of coastal landforms and geological features and associated natural processes; d. features, elements and patterns which contribute to landscape value and scenic and visual value; e. natural features, sites and natural areas of historic, aesthetic, cultural or spiritual value; f. water or air quality; g. habitat important for preserving the range, abundance and diversity of indigenous and migratory coastal species; h. habitat important for breeding and feeding of coastal species; i. the healthy functioning of estuaries, coastal wetlands, mangroves, dunes, sand spits and their margins. ii. In all other areas, avoiding any adverse effects which result in the significant reduction in habitat important for preserving the range and diversity of indigenous and migratory coastal species within the Auckland Region.	
Policy 7.4.10	1. The diverse range of values of the coastal environment shall be recognised and the need to enable people and communities to provide for their social, economic and cultural wellbeing shall be provided for in appropriate areas of the coastal environment. 2. In assessing the appropriateness of subdivision, use and development in the coastal environment particular regard shall be had to the following matters: i. natural character is preserved and protected in accordance with Policies 7.4.4-1 (i), (ii) and (iii), and 7.4.4-2; ii. public access is maintained or enhanced in accordance with Policies 7.4.13-1, 2 and 3; iii. amenity values are maintained or enhanced as far as practicable; iv. public open space is maintained or enhanced as far as practicable; v. there is a functional need for use and development within the CMA; vi. efficient use is made of the natural and physical resources of the coastal environment;	Refer above.

Reference	Full text	Comment
	vii. activities are of a scale, design and location that maintain or enhance landscape values in the area, including seascapes and landforms; viii. there are no significant adverse effects of activities on the CMA, or on adjacent land, including effects across the MHWS boundary; ix. adverse effects are avoided, remedied or mitigated in Areas of Special Value in accordance with policies in 7.4.7; x. activities are designed and located to avoid the need for hazard protection works; xi. provision is made for adequate utility services (including the disposal of waste); xii. effect is given to all other relevant provisions of this policy statement, in particular those stated in Chapter 2 – Regional Overview and Strategic Direction, Chapter 6 – Heritage and Chapter 8 – Water Quality.	
7.4.13	**Public access** 1. Public access shall be maintained and enhanced to and along the CMA and to publicly owned land in the coastal environment. 2. Particular regard shall be had to enhancing public access to and along the CMA and to publicly owned land in the coastal environment where: i. areas are of high amenity or recreational value; or ii. areas are of importance to Tangata Whenua for carrying out customary activities and in order to exercise kaitiakitanga; or iii. access would be of particular value or potential value for educational or scientific reasons; or iv. areas are adjacent to the Areas of Special Value identified in Appendix B and Map Series 2, where this would be consistent with the protection of natural and cultural heritage values; or v. a number of esplanade reserves or other public open spaces exist in the vicinity, and the enhancement of public access would contribute to the linking together of disconnected reserves. 3. Public access to and along the CMA should only be restricted where it is necessary to: i. protect significant natural or cultural heritage values; or ii. protect sites and areas of Maori spiritual and cultural value; or	As noted above, public access will only be restricted temporarily to the extent necessary to carry out the works in a safe manner, and will only be restricted for the relatively short period of construction in the coastal environment.

Reference	Full text	Comment
	iii. protect public health and safety; or iv. ensure a level of security consistent with the purpose of a resource consent; or v. protect areas of the coast which are sensitive to physical disturbance from the presence of people; or vi. in other exceptional circumstances sufficient to justify the restriction notwithstanding the national importance of maintaining that access.	
Objective 8.3.1	To maintain water quality in water bodies and coastal waters which have good water quality, and to enhance water quality which is degraded particularly for the following purposes: (i) Estuaries and harbours: protection of aquatic ecosystems, recreation, fishing and shellfish gathering, cultural and aesthetic purposes; and (iv) Lakes, rivers and streams: protection of aquatic ecosystems, recreation, food gathering, water supply, cultural and aesthetic purposes.	In some instances, earthworks will be required in riparian margins (including coastal edges). Erosion and sediment control measures will be implemented (TP90) for the duration of the land disturbance activities undertaken as part of the project. The measures are expected to prevent the discharge of sediment laden water to nearby waterbodies, particularly in areas on slopes and land subject to instability. We note that resource consents have not been applied for at this time because, commensurate with the "route protection" phase that the project has reached, only a concept level of design has been undertaken of the network and this is insufficient to inform those resource consent applications. The necessary resource consents (include those for coastal permits and earthworks) will be applied for at the time of detailed design of the network in the future.
Policy 8.4.7.3	All land disturbance activities which may result in elevated levels of sediment discharge shall be carried out so that the adverse effects of such discharges are avoided, remedied, or mitigated.	Refer above.
Objective 17.3	To remedy or mitigate any adverse effects of existing contaminated sites	As noted in Technical Report C, the Preliminary Site Investigation indicated that there is potential to encounter contaminated soil during the works, and that there is a very low to moderate risk for significant contamination to be encountered (depending on the source of contamination). Subject to the adoption of recommended mitigation measures (e.g. Contaminated Land Management Plan) it is considered that the proposed works can be undertaken in a manner that mitigates any adverse effects on existing contaminated sites.

Proposed Auckland Regional Policy Statement

Reference	Full text	Comment
Objective B2.2.1(3)	Sufficient development capacity and land supply is provided to accommodate residential, commercial, industrial growth and social facilities to support growth.	The Project is regionally significant infrastructure, in that it will provide additional wastewater conveyance and treatment infrastructure to service the increasing urban development in the Service Catchment. Population forecasts indicate that the Northern Waitakere area, inclusive of the North West Transformation Area (NWTA) inclusive of Massey North Whenuapai and Hobsonville, and South Rodney, inclusive of Kumeu, Huapai and Riverhead will grow significantly, from 75,000 to potentially over 350,000 people over the next 50 years. The Project constitutes an integrated and cost effective solution for the network, addressing the capacity of the network to provide for increased growth in the Service Catchment. Once completed, the Project will facilitate the continued effective operation of the wastewater network generally, and provide capacity in the wastewater network for future growth and development in the Auckland region.
Policy B2.4.2(6)	Ensure development is adequately serviced by existing infrastructure or is provided with infrastructure prior to or at the same time as residential intensification.	A key design parameter in the design of the Northern Interceptor has been the ability to stage the construction so as to adequately respond to actual population growth, rather than build an oversized pipeline based on conservative population projections. By enabling the staging of the Northern Interceptor construction and operation potentially gains: a) Flexibility to respond in design and delivery to actual future demand; b) Further ability to utilise existing design life in current assets; and c) The ability to defer large capital expenditure until the community has grown to support it. This also allows capital costs to be spread over a number of years, and to be responsive to actual population growth. The designation will give Watercare the capability to undertake construction as things change in the network, and will give developers and Auckland Council certainty that critical infrastructure will be provided. This also provides assurance that the areas being developed will be serviced (or have the ability to be serviced/connected to), supporting residential and business growth.
Objective B2.7.1(2)	Public access to and along Auckland's coastline, coastal marine area, lakes, rivers, streams and wetlands is maintained and enhanced.	There will be short term restrictions on public access and recreation in the coastal environment as a result of construction activities to ensure appropriate health and safety. Construction sites and works through these areas will be designed to minimise disruption on recreation and public access to and along

Reference	Full text	Comment
		the CMA and to publicly-owned land in the coastal environment as far as practicable. However, there will be temporary effects on public access during construction. Where temporary restrictions are necessary, Watercare will continue to consult with affected organisations to identify opportunities to address any restrictions.
Policy B2.7.2(1)	Enable the development and use of a wide range of open spaces and recreation facilities to provide a variety of activities, experiences and functions.	The proposed alignment traverses a number of reserves and public open spaces. Watercare has been working with Auckland Council Parks, Sports and Recreation regarding proposed works in these spaces.
Policy B2.7.2(7)	Avoid, remedy or mitigate significant adverse effects of land use or development on open spaces and recreation facilities.	Refer above, and to Section 10.11 of the Report.
Objective B3.2.1(1)	Infrastructure is resilient, efficient and effective	The increasing urban development in the Service Catchment area requires additional wastewater conveyance and treatment infrastructure to service this growth. The construction and operation of the Project will therefore provide infrastructure that supports the economic and social wellbeing of the region. Watercare's service objectives require development of resilient assets to meet required service delivery standards and foreseeable future needs. This includes providing sufficient capacity to convey and treat wastewater. Once completed the Project will facilitate the continued effective operation of the wastewater network generally, and provide capacity in the wastewater network for future growth and development in the Auckland region. This will also help to prevent further major wastewater overflows by providing appropriate infrastructure. Watercare will maintain and enhance the wastewater infrastructure for the northern Auckland Region by implementing the Project. This will ensure the long-term integrity for the expected population increase over the next 30 years. The proposed designation will safeguard the wastewater pipeline route, enabling these future communities to be serviced by the city's sewage treatment facilities, controlling discharges and overflows – meeting community and freshwater health outcomes.
Objective B3.2.1(2)	The benefits of infrastructure are recognised, including:	Refer above.

Reference	Full text	Comment
	(a) providing essential services for the functioning of communities, businesses and industries within and beyond Auckland; (b) enabling economic growth; (c) contributing to the economy of Auckland and New Zealand; (d) providing for public health, safety and the well-being of people and communities; (e) protecting the quality of the natural environment; and (f) enabling interaction and communication, including national and international links for trade and tourism.	
Objective B3.2.1(3)	Development, operation, maintenance, and upgrading of infrastructure is enabled, while managing adverse effects on: (a) the quality of the environment and, in particular, natural and physical resources that have been scheduled in the Unitary Plan in relation to natural heritage, Mana Whenua, natural resources, coastal environment, historic heritage and special character; (b) the health and safety of communities and amenity values	Vegetation within SEA_T_ SEA_T_8319 at the eastern abutment of the Greenhithe Bridge supports suitable potential habitat for at least five indigenous lizard species, four of which have a National threat classification of 'At Risk'. Threat rankings for some of these species, particularly those 'At Risk', may increase over the next 20 years. It is noted that the forest gecko, copper skink and ornate skink have been recorded from SEA_T_8319. The vegetation also has the potential to support roosting and nesting habitat for a range of common native bird species. Technical Report D recommends that preclearance surveys for lizards and nesting birds be undertaken where they have been identified as potentially present, and that an Ecological Management Plan should be prepared to address the potential presence and management of geckos and /or skinks within these areas. With respect to historic heritage, one heritage building is recorded within c.100m of the proposed NoR – NI (Waitakere). This is the Radio New Zealand Transmitter Building which is scheduled within the Auckland Council District Plan – Operative Waitakere Section 2003 (ID 1174) and as a Category A historic heritage place within the PAUP (Appendix 9: ID 56). The proposed works are anticipated to have no effect on the recorded extent of this site. At the time of writing this Report, no significant cultural site(s) has been identified by Mana Whenua. The provision of infrastructure to service growth in the area is essential in order to enable the people and communities of those areas to provide for their social and economic wellbeing and for their health and safety by providing for appropriate conveyance of sewage to the Rosedale WWTP.

Reference	Full text	Comment
Objective B3.2.1(4)	The functional and operational needs of infrastructure are recognised.	The projected population growth requires additional wastewater conveyance and treatment infrastructure. As such the Project will service growth in the Service Catchment, it is considered to be regionally significant infrastructure. The proposed designation recognises both the locational and function-based requirements of this infrastructure.
Objective B3.2.1(5)	Infrastructure planning and land use planning are integrated to service growth efficiently.	Refer above. We note that Watercare has undertaken consultation with transport authorities (NZ Transport Agency, Auckland Transport and Auckland Motorway Alliance) as well as other network utility providers (Vector, Radio New Zealand) to inform them of the Project and to coordinate works where practicable.
Objective B3.2.1(6)	Infrastructure is protected from reverse sensitivity effects caused by incompatible subdivision, use and development.	The proposed designation will safeguard the wastewater pipeline route, enabling these future communities to be serviced by the city's sewage treatment facilities, controlling discharges and overflows – meeting community and freshwater health outcomes. The designation provides a statutory mechanism to implement the works and protect from potential reverse sensitivity effects.
Objective B3.2.1(8)	The adverse effects of infrastructure are avoided, remedied or mitigated.	Refer above.
Policy B3.2.2(1)	Enable the efficient development, operation, maintenance and upgrading of infrastructure.	The proposed designation will provide for the efficient development, use, operation maintenance and future upgrading of the Northern Interceptor, which is considered to be regionally significant infrastructure.
Policy B3.2.2(3)	Provide for the locational requirements of infrastructure by recognising that it can have a functional or operational need to be located in areas with natural and physical resources that have been scheduled in the Unitary Plan in relation to natural heritage, Mana Whenua, natural resources, coastal environment, historic heritage and special character.	Refer above.
Policy B3.2.2(4)	Avoid where practicable, or otherwise remedy or mitigate, adverse effects of subdivision, use and development on infrastructure.	Refer above.
Policy B3.2.2(6)	Enable the development, operation, maintenance and upgrading of infrastructure in areas with natural and physical resources that have been scheduled in the Unitary Plan in relation to natural heritage, Mana Whenua, natural resources, coastal environment, historic heritage and special character while ensuring that the adverse effects on the values of such areas are avoided where practicable or otherwise remedied or mitigated.	Refer above.
Policy B3.2.2(7)	Encourage the co-location of infrastructure and the shared use of existing infrastructure corridors where this is safe and satisfies operational and technical requirements.	Where practicable, the proposed pipeline will be co-located within the road reserve while avoiding impacts on other network utilities. Watercare will continue to engage with network utility operators to confirm these locations.

Reference	Full text	Comment
Policy B3.2.2(8)	Avoid, remedy or mitigate the adverse effects from the construction, operation, maintenance or repair of infrastructure.	Refer above.
Objective B5.2.1(1)	Significant historic heritage places are identified and protected from inappropriate subdivision, use and development.	As noted in Technical Report B, one heritage building is recorded within c.100m of the proposed NoR – NI (Waitakere). This is the Radio New Zealand Transmitter Building which is scheduled within the Auckland Council District Plan – Operative Waitakere Section 2003 (ID 1174) and as a Category A historic heritage place within the PAUP (Appendix 9: ID 56). The proposed works should have no effect on the recorded extent of this site.
Policy B5.2.2(8)	Encourage new development to have regard to the protection and conservation of the historic heritage values of any adjacent significant historic heritage places.	Refer above.
Objective B6.2.1(1)	The principles of the Treaty of Waitangi/Te Tiriti o Waitangi are recognised and provided for in the sustainable management of natural and physical resources including ancestral lands, water, air, coastal sites, wāhi tapu and other taonga.	A summary of the ongoing engagement with Mana Whenua is summarised in Section 8.2 and the potential effects on Maori and Cultural Heritage matters are discussed in Section 10.12. As the project progresses, Mana Whenua who have expressed an interested in the Project will continue to be consulted, and as noted previously, the preparation of CIAs will be discussed closer to the time of construction. The ongoing engagement with tangata whenua will ensure that appropriate regards has been had for treaty matters.
Objective B6.2.1(2)	The principles of the Treaty of Waitangi/Te Tiriti o Waitangi are recognised through Mana Whenua participation in resource management processes.	Refer above.
Policy B6.2.2(1)	Provide opportunities for Mana Whenua to actively participate in the sustainable management of natural and physical resources including ancestral lands, water, sites, wāhi tapu and other taonga in a way that does all of the following: (a) recognises the role of Mana Whenua as kaitiaki and provides for the practical expression of kaitiakitanga; (b) builds and maintains partnerships and relationships with iwi authorities; (c) provides for timely, effective and meaningful engagement with Mana Whenua at appropriate stages in the resource management process, including development of resource management policies and plans; (d) recognises the role of kaumātua and pūkenga; (e) recognises Mana Whenua as specialists in the tikanga of their hapū or iwi and as being best placed to convey their relationship with their ancestral lands, water, sites, wāhi tapu and other taonga; (f) acknowledges historical circumstances and impacts on resource needs; (g) recognises and provides for mātauranga and tikanga; and (h) recognises the role and rights of whānau and hapū to speak and act on matters that affect them.	Watercare have engaged with tangata whenua throughout the investigation of alternatives and development of the Project, with the proposed route avoiding as far as practicable any ancestral lands, sites, waahi tapu and other taonga identified as being of significance to tangata whenua. As noted in Section 8.2 of this Report, with respect to CIAs for the future phases of the Northern Interceptor, Mana Whenua have noted that they would like to be engaged closer to the time construction is expected to commence. In the interim, Watercare will continue regular discussions with all Mana Whenua who have expressed an interest in the Project. Protocols for the management of accidental discoveries of archaeological material have been provided in the draft conditions (refer Appendix F) A range of mitigation measures, such as erosion and sediment controls in accordance with TP90 during construction, will be undertaken which will assist in sustaining the mauri of natural resources such as waterbodies and the coastal environment.

Reference	Full text	Comment
Policy B6.3.2(3)	Ensure that any assessment of environmental effects for an activity that may affect Mana Whenua values includes an appropriate assessment of adverse effects on those values.	Refer above.
Policy B6.3.2(6)	Require resource management decisions to have particular regard to potential impacts on all of the following: (a) the holistic nature of the Mana Whenua world view; (b) the exercise of kaitiakitanga; (c) mauri, particularly in relation to freshwater and coastal resources; (d) customary activities, including mahinga kai; (e) sites and areas with significant spiritual or cultural heritage value to Mana Whenua; and (f) any protected customary right in accordance with the Marine and Coastal Area (Takutai Moana) Act 2011.	Refer above.
Policy B6.5.2(4)	Protect the places and areas listed in Schedule 12 Sites and Places of Significance to Mana Whenua Schedule from adverse effects of subdivision, use and development by avoiding all of the following: (a) the destruction in whole or in part of the site or place and its extent; (b) adverse cumulative effects on the site or place; (c) adverse effects on the location and context of the site or place; and significant adverse effects on the values and associations Mana Whenua have with the site or place; taking into account in such circumstances whether or not any structures, buildings or infrastructure are present and the adverse effects are temporary.	Refer above.
Policy B6.5.2(6)	Protect Mana Whenua cultural heritage that is uncovered during subdivision, use and development by all of the following: (a) requiring a protocol to be followed in the event of accidental discovery of kōiwi, archaeology or artefacts of Māori origin; (b) undertaking appropriate actions in accordance with mātauranga and tikanga Māori; and (c) requiring appropriate measures to avoid, remedy or mitigate further adverse effects	Refer above. We note that an accidental discovery protocol condition has been provided.
Policy B6.5.2(8)	Encourage appropriate design, materials and techniques for infrastructure in areas of known historic settlement and occupation by the tūpuna of Mana Whenua.	Refer above from comments regarding the provision of infrastructure in/near the coastal environment.
Objective B7.2.1(1)	Areas of significant indigenous biodiversity value in terrestrial, freshwater, and coastal marine areas are protected from the adverse effects of subdivision use and development.	In some instances, earthworks will be required in riparian margins (including coastal edges). Erosion and sediment control measures will be implemented (TP90) for the duration of the land disturbance activities undertaken as part of

Reference	Full text	Comment
		the project. The measures are expected to prevent the discharge of sediment laden water to nearby waterbodies, particularly in areas on slopes and land subject to instability. We note that resource consents have not been applied for at this time because, commensurate with the "route protection" phase that the project has reached, only a concept level of design has been undertaken of the network and this is insufficient to inform those resource consent applications. The necessary resource consents (include those for coastal permits and earthworks) will be applied for at the time of detailed design of the network in the future. Refer to Section 10.6 of the AEE for further information.
Policy B7.2.2(5)	Avoid adverse effects on areas listed in the Schedule 3 of Significant Ecological Areas – Terrestrial Schedule and Schedule 4 Significant Ecological Areas – Marine Schedule.	Refer above.
Objective B7.3.1(3)	The adverse effects of changes in land use on freshwater are avoided, remedied or mitigated.	Refer above.
Policy B7.3.2(1)	Integrate the management of subdivision, use and development and freshwater systems by undertaking all of the following: (a) ensuring water supply, stormwater and wastewater infrastructure is adequately provided for in areas of new growth or intensification; (b) ensuring catchment management plans form part of the structure planning process; (c) controlling the use of land and discharges to minimise the adverse effects of runoff on freshwater systems and progressively reduce existing adverse effects where those systems or water are degraded; and (d) avoiding development where it will significantly increase adverse effects on freshwater systems, unless these adverse effects can be adequately mitigated.	Refer above.
Objective B7.4.1(6)	Mana Whenua values, mātauranga and tikanga associated with coastal water, freshwater and geothermal water are recognised and provided for, including their traditional and cultural uses and values.	Refer to previous comments, and to Sections 8.2 and 10.12 of the AEE.
Policy B7.4.2(1)	Integrate the management of subdivision, use, development and coastal water and freshwater, by: (a) ensuring water supply, stormwater and wastewater infrastructure is adequately provided for in areas of growth; and	Refer above.

Reference	Full text	Comment
	(b) requiring catchment management planning as part of structure planning; (c) controlling the use of land and discharges to minimise the adverse effects of runoff on water and progressively reduce existing adverse effects where those water are degraded; and (d) avoiding development where it will significantly increase adverse effects on water, unless these adverse effects can be adequately mitigated.	
Objective B8.2.1(2)	Subdivision, use and development in the coastal environment are designed, located and managed to preserve the characteristics and qualities that contribute to the natural character of the coastal environment.	During construction it is likely that there will be adverse effects on the natural character of the coastal environment. Adverse effects are associated with construction activities (e.g. the presence of the drilling rig and vegetation removal). These adverse effects are considered to be temporary and not significant, having regard to proposed mitigation. There are not considered to be any significant adverse effects on the natural character associated with permanent works. Refer to previous comments regarding proposed works in the coastal environment.
Objective B8.3.1(1)	Subdivision, use and development in the coastal environment are located in appropriate places and are of an appropriate form and within appropriate limits, taking into account the range of uses and values of the coastal environment.	As noted above, it is considered that there is a locational and function-based requirement for the proposed designation to the within the coastal environment. In assessing the potential effects on the environment in these locations, the range of uses and values of the coastal environment has been taken into account (refer to AEE).
Objective B8.3.1(2)	The adverse effects of subdivision, use and development on the values of the coastal environment are avoided, remedied or mitigated	Refer above.
Objective B8.3.1(5)	Uses and developments that have a need to locate on land above and below the mean high water springs are provided for in an integrated manner.	Refer above.
Objective B8.3.1(6)	Conflicts between activities including reverse sensitivity effects are avoided, remedied or mitigated.	Refer above.
Policy B8.3.2(3)	Provide for use and development in the coastal marine area that: (a) have a functional need which requires the use of the natural and physical resources of the coastal marine area; (b) are for the public benefit or public recreation that cannot practicably be located outside the coastal marine area; (c) have an operational need making a location in the coastal marine area appropriate and that cannot practicably be located outside the coastal marine area; or	Refer above.

Reference	Full text	Comment
	(d) enable the use of the coastal marine area by Mana Whenua for Māori cultural activities and customary uses.	
Policy B8.3.2(4)	Require subdivision, use and development in the coastal environment to avoid, remedy or mitigate the adverse effects of activities above and below the mean high water springs, including the effects on existing uses and on the coastal receiving environment.	Refer above.
Policy B8.3.2(5)	Adopt a precautionary approach towards proposed activities whose effects on the coastal environment are uncertain, unknown or little understood, but could be significantly adverse	Refer above.
Policy B8.2.3(7)	Set back development from the coastal marine area, where practicable, to protect the natural character and amenity values of the coastal environment.	Refer above.
Objective B8.4.1(1)	Public access to and along the coastal marine area is maintained and enhanced, except where it is appropriate to restrict that access, in a manner that is sensitive to the use and values of an area.	Refer above and to previous comments concerning public access to and along the CMA during construction.
Objective B8.4.1(3)	The open space, recreation and amenity values of the coastal environment are maintained or enhanced, including through the provision of public facilities in appropriate locations.	Refer above.
Policy B8.4.2(1)	Subdivision, use and development in the coastal environment must, where practicable, do all of the following: (a) maintain and where possible enhance public access to and along the coastal marine area, including through the provision of esplanade reserves and strips; (b) be designed and located to minimise impacts on public use of and access to and along the coastal marine area; (c) be set back from the coastal marine area to protect public open space values and access; and (d) take into account the likely impact of coastal processes and climate change, and be set back sufficiently to not compromise the ability of future generations to have access to and along the coast	Refer above.
Policy B8.5.2(13)	Require management and decision-making to take into account the historical, cultural and spiritual relationship of Mana Whenua with the Hauraki Gulf, and the ongoing capacity to sustain these relationships.	Refer above.

Auckland Council Regional Plan: Coastal

Reference	Full text	Comment
Objective 3.3.1	To preserve the natural character of the coastal environment by protecting the coastal marine area from inappropriate subdivision, use and development.	As discussed above, the Project will to provide a critical piece of a network that is considered to be regionally significant infrastructure. The most appropriate means of managing the effect on the coastal environment are to minimise the works footprint and the duration of works. These objectives have been central to the development of the construction method. It is anticipated that, during construction it is likely that there will be adverse effects on the natural character of the coastal environment associated with construction activities (e.g. the establishment of construction sites, vegetation removal, and permanent structures in the vicinity of the coastal environment). With the exception of the pump stations, most of these are considered to be temporary in nature. In these areas, a suite of mitigation measures have been proposed that seek to reduce the visual and landscape effects that the works will have, whilst taking into consideration the natural character of the surrounding environment in the overall design. With the adoption of recommended mitigation measures in consultation with PSR and park users, it is considered that potential adverse effects can be appropriately managed.
Policy 3.4.1	The natural character of the coastal environment shall be preserved and protected from inappropriate subdivision, use, and development by avoiding where practicable, remedying or mitigating the adverse effects of subdivision, use and development on the qualities, elements and features which contribute to the natural character of the coastal environment, including those areas characterised by modification and development.	Refer above.

Auckland Council Regional Plan: Sediment Control

Reference	Full text	Comment
Objective 5.1.1	To maintain or enhance the quality of water in waterbodies and coastal water.	We note that resource consents have not been applied for at this time because, commensurate with the "route protection" phase that the project has reached, only a concept level of design has been undertaken of the network and this is insufficient to inform those resource consent applications. The necessary resource consents (include those for coastal permits and earthworks) will be applied for at the time of detailed design of the network in the future. As noted above, the proposed earthworks will be undertaken in accordance with erosion and sediment control measures and earthworks will be sequenced, limiting the amount of earthworks being undertaken at any one time. The implementation of erosion and sediment control measures outlined above should avoid any adverse effects on the quality of water in waterbodies and coastal water.

Auckland Council Regional Plan: Air, Land and Water

Reference	Full text	Comment
Objective 2.2.3.4	To provide for the ongoing operation, maintenance, development and upgrading of physical infrastructure, in a manner that meets regional growth requirements and supports the economic, social and cultural wellbeing of the Region's people and communities and provides for their health and safety, while avoiding, remedying or mitigating adverse effects on the environment.	The Project, which is considered to be regionally significant infrastructure, will provide additional wastewater conveyance and treatment infrastructure to service the increasing urban development in the North West Auckland (the Service Catchment). The Project is needed to provide safe and efficient wastewater services to the growing Auckland Region. The proposed designation will safeguard the wastewater pipeline route, enabling these future communities to be serviced by the city's sewage treatment facilities, controlling discharges and overflows – meeting community and freshwater health outcomes. The designation will give Watercare the capability to undertake construction as things change in the network, and will give developers and Auckland Council certainty that critical infrastructure will be provided. This also provides assurance that the areas being developed will be serviced (or have the ability to be serviced/connected to), supporting residential and business growth. The provision of infrastructure to service growth in the area is essential in order to enable the people and communities of those areas to provide for their social and economic wellbeing and for their health and safety by providing for appropriate conveyance of sewage to the Rosedale WWTP.
Objective 5.3.7	To recognise and have regard to the significant contribution that stormwater and wastewater networks and other regionally significant infrastructure make to the sustainability of the Region's environment, including the health, safety, and economic, social and cultural wellbeing of the community.	Refer above.
Policy 2.2.4.4	The use, development, upgrading or maintenance of network utility infrastructure shall be considered appropriate where: (b) it is consistent with the strategic directions of the Auckland Regional Policy Statement; or (c) it is consistent with the Auckland Regional Growth Strategy; or (d) it is to improve environmental outcomes that result from the operation of this infrastructure; or (e) it is undertaken in an efficient and cost effective manner that recognises the community's ability to pay; and (f) significant adverse effects on natural and physical resources are avoided, remedied or mitigated.	The Project is considered appropriate as: • refer above for comment on the Project as it relates to the Auckland Regional Policy Statement; • refer to the AEE for an assessment of the Project against the Auckland Plan (supersedes the Auckland Regional Growth Strategy) • Once completed the Project will facilitate the continued effective operation of the wastewater network generally, and provide capacity in the wastewater network for future growth and development in the Auckland region. This will also help to prevent further major wastewater overflows by providing appropriate infrastructure. • The staging of the Project will allow capital costs to be spread over a number of years, and to be responsive to actual population growth.

Reference	Full text	Comment
		This in turn will ensure that the system operates efficiently and cost-effectively and enable Watercare to achieve its statutory obligations under the LGA (Section 57(1)) which states (in part) Watercare must "manage its operations efficiently with a view to keeping the overall costs of water supply and wastewater services to it customers" • During construction, there will be a range of potential and actual adverse effects within the vicinity of the construction areas, but, with the adoption of proposed mitigation measures, any adverse effects will be temporary in nature and can be appropriately managed. Permanent effects are generally associated with above ground structures (such as visual effects of pump stations) and it is considered that these effects can be adequately managed through the adoption of proposed mitigation measures.
Objective 2.3.3.1	To sustain the mauri of natural and physical resources in ways which enable provision for the social, economic and cultural wellbeing of Mäori.	As noted previously, Watercare has engaged with Mana Whenua throughout the investigation of alternatives and development of the Project, with the proposed route avoiding as far as practicable any ancestral lands, sites, waahi tapu and other taonga identified as being of significance to tangata whenua. The Project allows for the management of natural and physical resources in a way that enables people and communities, including Mana Whenua, to provide for their social, economic and cultural wellbeing and for their health and safety. A range of mitigation measures, such as erosion and sediment controls in accordance with TP90 during construction, will be undertaken which will assist in sustaining the mauri of natural resources such as waterbodies and the coastal environment.
Objective 2.3.3.2	To afford appropriate priority to the relationship of tangata whenua and their culture and traditions with their ancestral taonga when this conflicts with other values.	Refer above.
Objective 2.3.3.3	To involve tangata whenua in resource management processes in ways which: (a) Take into account the principles of the Treaty of Waitangi, including rangatiratanga; (b) Have particular regard to the practical expression of kaitiakitanga	Refer above.

Auckland Council District Plan (Operative North Shore)

Reference	Full text	Assessment
Policy 6.4.10	Integrated planning of growth to match the needs of the community and the capacity of infrastructure needs to be used in a way that protects environmental values, and avoids the adverse effects of growth that will arise if land use, community and infrastructure planning (including planning for regionally and nationally significant infrastructure) that contributes to the growth concept in the Auckland Regional Growth Strategy and land use transportation integration, is not co-ordinated and sequenced correctly. Infrastructure planning and new growth need to be carried out and sequenced in a timely and efficient manner if the desired urban form is to be achieved and if infrastructure is to be efficiently provided, operated, maintained and upgraded.	A key design parameter in the design of the Northern Interceptor has been the ability to stage the construction so as to adequately respond to actual population growth, rather than build an oversized pipeline based on conservative population projections. By enabling the staging of the Northern Interceptor construction and operation potentially gains: a) Flexibility to respond in design and delivery to actual future demand; b) Further ability to utilise existing design life in current assets; and c) The ability to defer large capital expenditure until the community has grown to support it. This also allows capital costs to be spread over a number of years, and to be responsive to actual population growth. The designation will give Watercare the capability to undertake construction as things change in the network, and will give developers and Auckland Council certainty that critical infrastructure will be provided. This also provides assurance that the areas being developed will be serviced (or have the ability to be serviced/connected to), supporting residential and business growth. Once completed the Project will facilitate the continued effective operation of the wastewater network generally, and provide capacity in the wastewater network for future growth and development in the Auckland region.
Objective 7.3	To take into account the principles of the Treaty of Waitangi and the concept of kaitiakitanga in the management of the city's natural and physical resources in such a way that ensures the sustainability of resources.	Watercare has engaged with tangata whenua throughout the investigation of alternatives and development of the Project, with the proposed route avoiding as far as practicable any ancestral lands, water, sites, waahi tapu and other taonga identified as being of significance to tangata whenua. Continued engagement with Mana Whenua as the Project progresses will ensure that appropriate regards has been had for Treaty matters. nt.
Objective 7.4	To identify and provide protection of traditional sites and objects of special significance to the tangata whenua, particularly waahi tapu and other taonga.	To date, no traditional sites and object of special significance to the tangata whenua have been identified. However, Watercare will continue to engage with Mana Whenua who have indicated an interest in the Project as it progresses.

Reference	Full text	Assessment
Objective 8.3.1	To protect the natural character, public access, cultural heritage values, ecology and landforms of the coastal environment	The Project has been developed to avoid as far as practicable adverse effects on the coastal environment. In the overall context of the Project the area of the coastal environment affected is relatively small and any impact on access to the affected area of coastal environment will be temporary. A range of mitigation measures will be undertaken which will assist in sustaining the natural character and landforms of the coastal environment. There will be short term restrictions on public access and recreation in the coastal environment as a result of construction activities to ensure appropriate health and safety. Construction sites and works through these areas will be designed to minimise disruption on recreation and public access to and along the CMA and to publicly-owned land in the coastal environment as far as practicable. However, there will be temporary effects on public access during construction. Where temporary restrictions are necessary, Watercare will continue to consult with affected organisations to identify opportunities to address any restrictions.
Policy 8.3.1.5	By protecting native coastal vegetation, in particular pohutukawa trees, for amenity, ecological and land stability purposes.	Refer above.
Policy 8.3.1.8	By ensuring that development and activities in the Coastal Conservation Area do not adversely affect the proper functioning of ecosystems, or adversely affect the natural coastal environment.	Refer above. Vegetation within SEA_T_ SEA_T_8319 at the eastern abutment of the Greenhithe Bridge supports suitable potential habitat for at least five indigenous lizard species, four of which have a National threat classification of 'At Risk'. Threat rankings for some of these species, particularly those 'At Risk', may increase over the next 20 years. It is noted that the forest gecko, copper skink and ornate skink have been recorded from SEA_T_8319. The vegetation also has the potential to support roosting and nesting habitat for a range of common native bird species. Technical Report D recommends that preclearance surveys for lizards and nesting birds be undertaken where they have been identified as potentially present, and that an Ecological Management Plan should be prepared to address the potential presence and management of geckos and /or skinks within these areas.

Reference	Full text	Assessment
		Through the adoption of proposed mitigation measures, it is considered that the Project will be consistent with this objective.
Policy 8.3.2.5	By ensuring that development and activities in the Coastal Conservation Area do not adversely affect the proper functioning of ecosystems, including those below mean high water springs.	Refer above.
Policy 8.3.2.6	By avoiding earthworks and vegetation removal affecting ecosystems and habitats.	The most appropriate means of managing the effect on the coastal environment are to minimise the works footprint and the duration of works. These objectives have been central to the development of the construction method.
Objective 9.3.1	To avoid, remedy or mitigate the adverse effects of subdivision and development on the environment, including the physical environment, biota, amenity values and landscape.	During construction, there will be a range of potential and actual adverse effects within the vicinity of the construction areas, but, with the adoption of proposed mitigation measures, any adverse effects will be temporary in nature and can be appropriately managed. Permanent effects are generally associated with above ground structures (such as visual effects of pump stations) and it is considered that these effects can be adequately managed through the adoption of proposed mitigation measures. Once completed, the majority of the Project works will be underground and temporary construction areas will be reinstated in an appropriate manner. The most significant changes and resultant effects on visual amenity will arise from vegetation removal, earthworks, trenching and construction activity and construction vehicle movements. As discussed in Section 10.8, these effects can be appropriately managed. Earthworks and vegetation removal will adversely affect several areas along/adjacent to the alignment. The works have been designed as far as practicable to avoid ecosystems and habitats, however, where vegetation removal and earthworks are required measures remedy and mitigate these effects are contained within Technical Report D. Subject to the implementation of the proposed mitigation outlined within this report, it is considered that the residual net effects on ecosystems and habitats will be appropriately managed. Measures have been proposed to mitigate adverse ecological effects and overall the effects can be appropriately managed.

Reference	Full text	Assessment
Policy 9.3.1.3	By ensuring that new subdivision and development recognises existing natural features and landscapes, such as waterways and that the form of development reflects the character and environmental qualities of the location	The location of above ground structures, such as pump stations and pipe bridges, will continue to be discussed with PSR and other key stakeholder. As far as practicable – and as discussed in Sections 8 and 10 – the location of these structures will be cited in a way that minimises impacts on recreational use, and are designed using recessive materials so as to limit any visual effects. A Landscape and Visual Management Plan will be prepared for the Project. The objective of this Plan will be to provide a framework to avoid, remedy or mitigate the adverse landscape and visual effects of the Project's above ground structures and buildings.
Objective 9.3.2	To ensure that new subdivision and development enables people and communities to provide for their well-being health and safety	The provision of infrastructure to service growth in the area is essential in order to enable the people and communities of those areas to provide for their social and economic wellbeing and for their health and safety by providing for appropriate conveyance of sewage to the Rosedale WWTP.
Policy 10.3.2.4	By ensuring that consideration is given to appropriate avoidance and mitigation techniques and, where possible, achieving compliance with noise controls by managing noise at the point of emission in preference to providing defensive infrastructure against noise intrusion.	For the activities identified as potentially exceeding the Project construction acoustic criteria, an adaptive mitigation / management approach will be adopted to avoid, remedy or mitigate adverse effects as far as practicable. The specifics of the required measures will be detailed in the CNVMP, which will be formulated and submitted to Council prior to construction commencement. Where exceedances of the relevant criteria are likely, a SSCNMP will be required to detail the enhanced mitigation measures, and will be kept up-to-date regarding actual timing of activities, equipment use and methodologies.
Objective 10.3.4	To ensure that any adverse effects from the vibration of equipment is avoided, or reduced to an acceptable level.	Vibration from pipe-jacking within 18 metres slant distance of single storey dwellings (15 metres for 2-storey dwellings with bedrooms on upper level), occurring during the night-time, has the potential to exceed the regenerated noise criterion of 35 dB LAeq. An SSCNMP will be required where night-time tunnelling occurs within these distances.
Objective 14.3.1.1	The construction, operation and maintenance of an efficient and effective network of utilities that meets the needs of the community, and recognises	The proposed designation will safeguard the wastewater pipeline route, enabling these future communities to be serviced by the city's sewage

Reference	Full text	Assessment
	reverse sensitivity effects of other uses locating in close proximity to utility structures.	treatment facilities, controlling discharges and overflows – meeting community and freshwater health outcomes. The designation provides a statutory mechanism to implement the works and protect from potential reverse sensitivity effects. Where practicable, the proposed pipeline will be co-located within the road reserve while avoiding impacts on other network utilities. Watercare will continue to engage with network utility operators to confirm these locations.
Objective 14.3.1.2	To avoid, remedy or mitigate any adverse environmental effects of network utilities, including effects on amenity, landscape, streetscape and heritage values, arising from the construction, operation, and maintenance of network utilities.	Refer above.
Objective 14.3.1.3	An environment where the health and safety of the community is not adversely affected by the construction, operation and maintenance of network utilities.	There will be short term restrictions on public access and recreation in the coastal environment as a result of construction activities to ensure appropriate health and safety. Once constructed, the Project will service growth in the area and enable the people and communities of those areas to provide for their social and economic wellbeing, as well as their health and safety.
Policy 14.3.2.3	Network utilities shall be designed, sited, operated and maintained in such a way that avoids, remedies or mitigates adverse effects on other network utilities.	Watercare meet regularly with various network utility operators to discuss the proposed designation. Watercare will continue to engage with these and other network utilities during the design process in order to confirm the locations of existing services or any future development plans in the vicinity of the proposed construction sites. During the preparation and implementation of the Construction Management Plan (CMP) Watercare will work collaboratively with network utility operators in relation to the management of potential adverse effects on the assets network utility operators (refer to Appendix F for the proposed conditions). The CMP will also detail the procedures for the management of works that that are in close proximity to or directly affected network utilities.
Policy 14.3.2.4	Network utilities, shall be designed, sited, operated and maintained in such a way as to avoid, remedy or mitigate adverse effects on the environment of emissions of noise, light, vibration, odour or hazardous substances.	During construction, there will be a range of potential and actual adverse effects within the vicinity of the construction areas, but, with the adoption of

Reference	Full text	Assessment
		proposed mitigation measures, any adverse effects will be temporary in nature and can be appropriately managed.
Policy 14.3.2.5	Network utilities shall be designed, sited, operated and maintained so that they avoid, remedy or mitigate any adverse effects on the area. This includes, but is not limited to, any adverse effects on; a) any site, building, place or area, and b) the landscape or steetscape, and c) any site, building, place or area of heritage and archaeological value, and d) the amenity values of any of these places.	Refer above.
Policy 14.3.2.6	To recognise that reserve land, and land zoned Recreation 1 in particular, is intended to be open public space free from the adverse effects of buildings, structures and activities not linked to the purpose of the zone. Siting of network utilities should avoid, remedy or mitigate adverse effects on; a) The amenity of the reserve, and b) Public use and enjoyment of the reserve, and c) The potential for future development of the reserve.	The Project will potentially result in adverse effects on parks and facilities whose primary purpose is to provide for sport and recreation activities for the well-being of the community. Watercare has been working with Auckland Council Parks, Sports and Recreation (PSR) to address these issues, which include points (a) to (c) in Policy 14.3.2.6.
Policy 14.3.2.7	To encourage the co-location of structures, the shared use of structures, and the use of existing network utility corridors, subject to; • Technical and operational feasibility, and • Recognition that the positive effects can be outweighed by the adverse cumulative effects. • Avoiding, remedying or mitigating any adverse effects.	Refer above.

Auckland Council District Plan (Operative Waitakere)

Reference	Full text	Assessment
Policy 1.6	Activities (including structures and impermeable surfaces), should be designed, located and carried out in a way that they do not impede or adversely affect the potential for the regeneration of native vegetation, or reduce the extent, range and linkages between areas of native vegetation within riparian margins and coastal edges	The removal of vegetation (both native and exotic) will be required to facilitate construction activities. Vegetation removal will be undertaken in accordance with good practices and the recommendations of the Tree Protection Methodology. In some instances, earthworks will be required in riparian margins (including coastal edges). Erosion and sediment control measures will be implemented (TP90) for the duration of the land disturbance activities undertaken as part of the project. The measures are expected to prevent the discharge of sediment laden water to nearby waterbodies, particularly in areas on slopes and land subject to instability. We note that resource consents have not been applied for at this time because, commensurate with the "route protection" phase that the project has reached, only a concept level of design has been undertaken of the network and this is insufficient to inform those resource consent applications. The necessary resource consents (include those for coastal permits and earthworks) will be applied for at the time of detailed design of the network in the future.
Objective 2	To protect the City's native vegetation and fauna habitat, including protecting: • the quality and resilience of the resource; • the variety and range of species and their contribution to the biodiversity of the City; • their ecological integrity; • their healthiness as a potential source of harvest for cultural purposes.	Erosion and sediment control measures will be implemented in accordance with TP90 for the duration of the land disturbances activities required as part of the Project to prevent the discharge of sediment laden water to nearby waterbodies. The proposed works will be undertaken in a modified environment. The removal of vegetation (both native and exotic) will be required to facilitate construction activities. Vegetation removal will be undertaken in accordance with good practices and the recommendations of the Tree Protection Methodology. As the permanent works will be located below ground, activities will not impede the regeneration, or future regeneration, of native vegetation. Construction activities will be temporary in nature during and immediately following the construction period and will be mitigated through replacement planting.

Reference	Full text	Assessment
		Land disturbance activities outside of the CMA will be predominantly open cut, and are to be undertaken progressively in stages. This will minimise the proportion of soil/rock exposed at any one time, minimising any adverse effects on the surrounding topsoil and soil structure. Permanent visual effects will predominantly result from the removal of vegetation and the presence of built structures (the pump station at No. 56 The Concourse, the pump stations within Wainoni Park, and a pipe bridge (crossing Manutewhau Creek) and surface features such as manhole covers which are proposed to sit flush within road corridors and open grass areas. Subject to the mitigation measures proposed, the majority of the adverse landscape and visual effects anticipated in the construction and operation phase of the Project can be managed and mitigated to result in low (less than minor) adverse effects overall.
Policy 2.4	Where native vegetation is cleared, this should be carried out in a way that: • avoids high quality bush and locates in lower quality bush - clearing should take place in areas which avoid native vegetation on the site which may have greater significance than other native vegetation, as assessed in an ecological or landscape context • avoids notable trees, - the tree's significance being measured by whether it is: – highly representative of its species, or – of a rare species, or – of high value in providing for the local diversity of species, or – of a significant size and/or shape, or – of significance in a landscape context • minimises any edge effect on remaining native vegetation; • minimises adverse effects on ecosystems; • does not isolate or remove linkages between areas of native vegetation or fauna habitat; • does not impede the movement of native fauna; • avoids disturbance of root systems of remaining native vegetation.	Erosion and sediment control measures will be implemented in accordance with TP90 for the duration of the land disturbances activities required as part of the Project to prevent the discharge of sediment laden water to nearby waterbodies. The proposed works will be undertaken in a modified environment. The removal of vegetation (both native and exotic) will be required to facilitate construction activities. Vegetation removal will be undertaken in accordance with good practices and the recommendations of the Tree Protection Methodology. As the permanent works will be located below ground, activities will not impede the regeneration, or future regeneration, of native vegetation. Construction activities will be temporary in nature during and immediately following the construction period and will be mitigated through replacement planting. Land disturbance activities outside of the CMA will be predominantly open cut, and are to be undertaken progressively in stages. This will minimise the proportion of soil/rock exposed at any one time, minimising any adverse effects on the surrounding topsoil and soil structure. Permanent visual effects will predominantly result from the removal of vegetation and the presence of built structures (the pump station at No. 56 The Concourse, the pump stations within Wainoni Park, and a pipe bridge (crossing Manutewhau Creek) and surface features such as manhole covers

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		which are proposed to sit flush within road corridors and open grass areas. Subject to the mitigation measures proposed, the majority of the adverse landscape and visual effects anticipated in the construction and operation phase of the Project can be managed and mitigated to result in low (less than minor) adverse effects overall.
Policy 2.15	Where activities result in an unavoidable adverse effect on native vegetation and fauna habitat, there may be a requirement to remedy or mitigate these adverse effects on or off the site.	Erosion and sediment control measures will be implemented in accordance with TP90 for the duration of the land disturbances activities required as part of the Project to prevent the discharge of sediment laden water to nearby waterbodies. The proposed works will be undertaken in a modified environment. The removal of vegetation (both native and exotic) will be required to facilitate construction activities. Vegetation removal will be undertaken in accordance with good practices and the recommendations of the Tree Protection Methodology. As the permanent works will be located below ground, activities will not impede the regeneration, or future regeneration, of native vegetation. Construction activities will be temporary in nature during and immediately following the construction period and will be mitigated through replacement planting. Land disturbance activities outside of the CMA will be predominantly open cut, and are to be undertaken progressively in stages. This will minimise the proportion of soil/rock exposed at any one time, minimising any adverse effects on the surrounding topsoil and soil structure. Permanent visual effects will predominantly result from the removal of vegetation and the presence of built structures (the pump station at No. 56 The Concourse, the pump stations within Wainoni Park, and a pipe bridge (crossing Manutewhau Creek) and surface features such as manhole covers which are proposed to sit flush within road corridors and open grass areas. Subject to the mitigation measures proposed, the majority of the adverse landscape and visual effects anticipated in the construction and operation phase of the Project can be managed and mitigated to result in low (less than minor) adverse effects overall.
Objective 3	To maintain the life-supporting capacity of the City's land resource.	Erosion and sediment control measures will be implemented in accordance with TP90 for the duration of the land disturbances activities required as part of the Project to prevent the discharge of sediment laden water to nearby waterbodies.

Reference	Full text	Assessment
		The proposed works will be undertaken in a modified environment. The removal of vegetation (both native and exotic) will be required to facilitate construction activities. Vegetation removal will be undertaken in accordance with good practices and the recommendations of the Tree Protection Methodology. As the permanent works will be located below ground, activities will not impede the regeneration, or future regeneration, of native vegetation. Construction activities will be temporary in nature during and immediately following the construction period and will be mitigated through replacement planting. Land disturbance activities outside of the CMA will be predominantly open cut, and are to be undertaken progressively in stages. This will minimise the proportion of soil/rock exposed at any one time, minimising any adverse effects on the surrounding topsoil and soil structure. Permanent visual effects will predominantly result from the removal of vegetation and the presence of built structures (the pump station at No. 56 The Concourse, the pump stations within Wainoni Park, and a pipe bridge (crossing Manutewhau Creek) and surface features such as manhole covers which are proposed to sit flush within road corridors and open grass areas. Subject to the mitigation measures proposed, the majority of the adverse landscape and visual effects anticipated in the construction and operation phase of the Project can be managed and mitigated to result in low (less than minor) adverse effects overall.
Policy 3.5	Activities and structures involving the disposal, movement and storage of solid waste, and human and animal waste, should be designed and managed in a way that avoids any discharge or leaching of contaminants into the City's soils.	Erosion and sediment control measures will be implemented in accordance with TP90 for the duration of the land disturbances activities required as part of the Project to prevent the discharge of sediment laden water to nearby waterbodies. The proposed works will be undertaken in a modified environment. The removal of vegetation (both native and exotic) will be required to facilitate construction activities. Vegetation removal will be undertaken in accordance with good practices and the recommendations of the Tree Protection Methodology.

Reference	Full text	Assessment
		As the permanent works will be located below ground, activities will not impede the regeneration, or future regeneration, of native vegetation. Construction activities will be temporary in nature during and immediately following the construction period and will be mitigated through replacement planting. Land disturbance activities outside of the CMA will be predominantly open cut, and are to be undertaken progressively in stages. This will minimise the proportion of soil/rock exposed at any one time, minimising any adverse effects on the surrounding topsoil and soil structure. Permanent visual effects will predominantly result from the removal of vegetation and the presence of built structures (the pump station at No. 56 The Concourse, the pump stations within Wainoni Park, and a pipe bridge (crossing Manutewhau Creek) and surface features such as manhole covers which are proposed to sit flush within road corridors and open grass areas. Subject to the mitigation measures proposed, the majority of the adverse landscape and visual effects anticipated in the construction and operation phase of the Project can be managed and mitigated to result in low (less than minor) adverse effects overall.
Policy 5.1	Activities within Restoration Natural Areas, should be carried out in a way that does not impede regeneration of native vegetation. Where possible, activities in areas identified as Ecological Linkage Opportunities should not prevent the future regeneration of these areas.	Erosion and sediment control measures will be implemented in accordance with TP90 for the duration of the land disturbances activities required as part of the Project to prevent the discharge of sediment laden water to nearby waterbodies. The proposed works will be undertaken in a modified environment. The removal of vegetation (both native and exotic) will be required to facilitate construction activities. Vegetation removal will be undertaken in accordance with good practices and the recommendations of the Tree Protection Methodology. As the permanent works will be located below ground, activities will not impede the regeneration, or future regeneration, of native vegetation. Construction activities will be temporary in nature during and immediately following the construction period and will be mitigated through replacement planting. Land disturbance activities outside of the CMA will be predominantly open cut, and are to be undertaken progressively in stages. This will minimise the

Reference	Full text	Assessment
		proportion of soil/rock exposed at any one time, minimising any adverse effects on the surrounding topsoil and soil structure. Permanent visual effects will predominantly result from the removal of vegetation and the presence of built structures (the pump station at No. 56 The Concourse, the pump stations within Wainoni Park, and a pipe bridge (crossing Manutewhau Creek) and surface features such as manhole covers which are proposed to sit flush within road corridors and open grass areas. Subject to the mitigation measures proposed, the majority of the adverse landscape and visual effects anticipated in the construction and operation phase of the Project can be managed and mitigated to result in low (less than minor) adverse effects overall.
Policy 5.3	Activities on any public land should be carried out in a way that promotes and enhances regeneration and the re-establishment of linkages between areas of native vegetation and fauna habitat within the Green Network, and the effectiveness of any adjacent Ecological Linkage Opportunities and Restoration Natural Areas in protecting the stability of native ecosystems.	Erosion and sediment control measures will be implemented in accordance with TP90 for the duration of the land disturbances activities required as part of the Project to prevent the discharge of sediment laden water to nearby waterbodies. The proposed works will be undertaken in a modified environment. The removal of vegetation (both native and exotic) will be required to facilitate construction activities. Vegetation removal will be undertaken in accordance with good practices and the recommendations of the Tree Protection Methodology. As the permanent works will be located below ground, activities will not impede the regeneration, or future regeneration, of native vegetation. Construction activities will be temporary in nature during and immediately following the construction period and will be mitigated through replacement planting. Land disturbance activities outside of the CMA will be predominantly open cut, and are to be undertaken progressively in stages. This will minimise the proportion of soil/rock exposed at any one time, minimising any adverse effects on the surrounding topsoil and soil structure. Permanent visual effects will predominantly result from the removal of vegetation and the presence of built structures (the pump station at No. 56 The Concourse, the pump stations within Wainoni Park, and a pipe bridge (crossing Manutewhau Creek) and surface features such as manhole covers which are proposed to sit flush within road corridors and open grass areas. Subject to the mitigation measures proposed, the majority of the adverse

Reference	Full text	Assessment
		landscape and visual effects anticipated in the construction and operation phase of the Project can be managed and mitigated to result in low (less than minor) adverse effects overall.
Objective 7	To preserve and enhance the natural character of the City's coastal environment and lakes, rivers and wetlands and their margins, including preserving the action on the land of those processes which form that natural character.	Erosion and sediment control measures will be implemented in accordance with TP90 for the duration of the land disturbances activities required as part of the Project to prevent the discharge of sediment laden water to nearby waterbodies. The proposed works will be undertaken in a modified environment. The removal of vegetation (both native and exotic) will be required to facilitate construction activities. Vegetation removal will be undertaken in accordance with good practices and the recommendations of the Tree Protection Methodology. As the permanent works will be located below ground, activities will not impede the regeneration, or future regeneration, of native vegetation. Construction activities will be temporary in nature during and immediately following the construction period and will be mitigated through replacement planting. Land disturbance activities outside of the CMA will be predominantly open cut, and are to be undertaken progressively in stages. This will minimise the proportion of soil/rock exposed at any one time, minimising any adverse effects on the surrounding topsoil and soil structure. Permanent visual effects will predominantly result from the removal of vegetation and the presence of built structures (the pump station at No. 56 The Concourse, the pump stations within Wainoni Park, and a pipe bridge (crossing Manutewhau Creek) and surface features such as manhole covers which are proposed to sit flush within road corridors and open grass areas. Subject to the mitigation measures proposed, the majority of the adverse landscape and visual effects anticipated in the construction and operation phase of the Project can be managed and mitigated to result in low (less than minor) adverse effects overall.
Policy 7.4	Activities should be carried out in a way that removal or damage to native vegetation that contributes to and is an essential part of the natural character of coastal edges and riparian margins, is minimised.	Erosion and sediment control measures will be implemented in accordance with TP90 for the duration of the land disturbances activities required as part of the Project to prevent the discharge of sediment laden water to nearby waterbodies. The proposed works will be undertaken in a modified environment.

Reference	Full text	Assessment
		The removal of vegetation (both native and exotic) will be required to facilitate construction activities. Vegetation removal will be undertaken in accordance with good practices and the recommendations of the Tree Protection Methodology. As the permanent works will be located below ground, activities will not impede the regeneration, or future regeneration, of native vegetation. Construction activities will be temporary in nature during and immediately following the construction period and will be mitigated through replacement planting. Land disturbance activities outside of the CMA will be predominantly open cut, and are to be undertaken progressively in stages. This will minimise the proportion of soil/rock exposed at any one time, minimising any adverse effects on the surrounding topsoil and soil structure. Permanent visual effects will predominantly result from the removal of vegetation and the presence of built structures (the pump station at No. 56 The Concourse, the pump stations within Wainoni Park, and a pipe bridge (crossing Manutewhau Creek) and surface features such as manhole covers which are proposed to sit flush within road corridors and open grass areas. Subject to the mitigation measures proposed, the majority of the adverse landscape and visual effects anticipated in the construction and operation phase of the Project can be managed and mitigated to result in low (less than minor) adverse effects overall.
Objective 8	To protect and maintain those aspects of the environment that are of significance to tangata whenua, including: • protecting the spiritual dimension and the mauri (life force) of natural and physical resources and of humans; • recognising and protecting the kaitiaki of these resources and significant sites and waahi tapu within the City; • providing for those institutions that are integral to the relationship of tangata whenua with their environment; in a way that promotes the expression and practice of kaitiakitanga (guardianship).	Erosion and sediment control measures will be implemented in accordance with TP90 for the duration of the land disturbances activities required as part of the Project to prevent the discharge of sediment laden water to nearby waterbodies. The proposed works will be undertaken in a modified environment. The removal of vegetation (both native and exotic) will be required to facilitate construction activities. Vegetation removal will be undertaken in accordance with good practices and the recommendations of the Tree Protection Methodology. As the permanent works will be located below ground, activities will not impede the regeneration, or future regeneration, of native vegetation. Construction activities will be temporary in nature during and immediately

Reference	Full text	Assessment
		following the construction period and will be mitigated through replacement planting. Land disturbance activities outside of the CMA will be predominantly open cut, and are to be undertaken progressively in stages. This will minimise the proportion of soil/rock exposed at any one time, minimising any adverse effects on the surrounding topsoil and soil structure. Permanent visual effects will predominantly result from the removal of vegetation and the presence of built structures (the pump station at No. 56 The Concourse, the pump stations within Wainoni Park, and a pipe bridge (crossing Manutewhau Creek) and surface features such as manhole covers which are proposed to sit flush within road corridors and open grass areas. Subject to the mitigation measures proposed, the majority of the adverse landscape and visual effects anticipated in the construction and operation phase of the Project can be managed and mitigated to result in low (less than minor) adverse effects overall.
Policy 8.1	Any activity that takes place within the City's coastal edges or riparian margins must be carried out in a way that adverse effects on the quality of the water resource, and the mauri of that waterway, taiapure or mahinga maataitai are avoided or, where unavoidable, are remedied or mitigated.	Erosion and sediment control measures will be implemented in accordance with TP90 for the duration of the land disturbances activities required as part of the Project to prevent the discharge of sediment laden water to nearby waterbodies. The proposed works will be undertaken in a modified environment. The removal of vegetation (both native and exotic) will be required to facilitate construction activities. Vegetation removal will be undertaken in accordance with good practices and the recommendations of the Tree Protection Methodology. As the permanent works will be located below ground, activities will not impede the regeneration, or future regeneration, of native vegetation. Construction activities will be temporary in nature during and immediately following the construction period and will be mitigated through replacement planting. Land disturbance activities outside of the CMA will be predominantly open cut, and are to be undertaken progressively in stages. This will minimise the proportion of soil/rock exposed at any one time, minimising any adverse effects on the surrounding topsoil and soil structure.

Reference	Full text	Assessment
		Permanent visual effects will predominantly result from the removal of vegetation and the presence of built structures (the pump station at No. 56 The Concourse, the pump stations within Wainoni Park, and a pipe bridge (crossing Manutewhau Creek) and surface features such as manhole covers which are proposed to sit flush within road corridors and open grass areas. Subject to the mitigation measures proposed, the majority of the adverse landscape and visual effects anticipated in the construction and operation phase of the Project can be managed and mitigated to result in low (less than minor) adverse effects overall.
Policy 8.4	Any activity within the Riparian Margins/Coastal Edges Natural Areas, Coastal Natural Areas and Protected Natural Areas that involves: • disturbance of soils and removal of rock; • alteration to the natural character of the coastal area or impeding of any natural process that forms that character; • alteration to the interface between land and water; • removal of vegetation; should be managed in a way that avoids, remedies or mitigates adverse effects on the natural character and mauri of the coastal area.	Erosion and sediment control measures will be implemented in accordance with TP90 for the duration of the land disturbances activities required as part of the Project to prevent the discharge of sediment laden water to nearby waterbodies. The proposed works will be undertaken in a modified environment. The removal of vegetation (both native and exotic) will be required to facilitate construction activities. Vegetation removal will be undertaken in accordance with good practices and the recommendations of the Tree Protection Methodology. As the permanent works will be located below ground, activities will not impede the regeneration, or future regeneration, of native vegetation. Construction activities will be temporary in nature during and immediately following the construction period and will be mitigated through replacement planting. Land disturbance activities outside of the CMA will be predominantly open cut, and are to be undertaken progressively in stages. This will minimise the proportion of soil/rock exposed at any one time, minimising any adverse effects on the surrounding topsoil and soil structure. Permanent visual effects will predominantly result from the removal of vegetation and the presence of built structures (the pump station at No. 56 The Concourse, the pump stations within Wainoni Park, and a pipe bridge (crossing Manutewhau Creek) and surface features such as manhole covers which are proposed to sit flush within road corridors and open grass areas. Subject to the mitigation measures proposed, the majority of the adverse landscape and visual effects anticipated in the construction and operation phase of the Project can be managed and mitigated to result in low (less than minor) adverse effects overall.

Reference	Full text	Assessment
Policy 8.5	Any activity (including subdivision design and placement of structures), should be carried out in a way that avoids adverse effects on the historical, cultural or spiritual significance of any site or waahi tapu of significance to iwi. The effect of activities which facilitate the direct relationship of iwi with their waahi tapu should also be taken into account. Particular regard should be had for the effect of activities within the iwi heritage areas.	Erosion and sediment control measures will be implemented in accordance with TP90 for the duration of the land disturbances activities required as part of the Project to prevent the discharge of sediment laden water to nearby waterbodies. The proposed works will be undertaken in a modified environment. The removal of vegetation (both native and exotic) will be required to facilitate construction activities. Vegetation removal will be undertaken in accordance with good practices and the recommendations of the Tree Protection Methodology. As the permanent works will be located below ground, activities will not impede the regeneration, or future regeneration, of native vegetation. Construction activities will be temporary in nature during and immediately following the construction period and will be mitigated through replacement planting. Land disturbance activities outside of the CMA will be predominantly open cut, and are to be undertaken progressively in stages. This will minimise the proportion of soil/rock exposed at any one time, minimising any adverse effects on the surrounding topsoil and soil structure. Permanent visual effects will predominantly result from the removal of vegetation and the presence of built structures (the pump station at No. 56 The Concourse, the pump stations within Wainoni Park, and a pipe bridge (crossing Manutewhau Creek) and surface features such as manhole covers which are proposed to sit flush within road corridors and open grass areas. Subject to the mitigation measures proposed, the majority of the adverse landscape and visual effects anticipated in the construction and operation phase of the Project can be managed and mitigated to result in low (less than minor) adverse effects overall.
Objective 10	To maintain and enhance those natural and physical characteristics (amenity values) that contribute to the wellbeing of residents and workers, including maintaining: • an acceptable level of quiet and freedom from nuisance created by noise, odour, dust and vibration; • adequate levels of daylight and sunlight in dwellings; • adequate levels of darkness for sleep; • a safe environment;	Following completion of the works, replacement planting will assist in returning sites to their previous appearance. Furthermore, noise mitigation measures will be implemented on-site and be monitored to ensure that proposed works do not have a detrimental impact on the health and safety of sensitive receivers.

Reference	Full text	Assessment
	• an accessible environment, which includes enhancing public access to and along the coast and waterways and between areas of public land; • adequate levels of on-site privacy; • healthy air quality.	
Policy 10.10	Any activity that generates vibration should be carried out in a way that does not cause a nuisance, or otherwise have an adverse effect on the health of occupants of adjacent properties.	Following completion of the works, replacement planting will assist in returning sites to their previous appearance. Furthermore, noise mitigation measures will be implemented on-site and be monitored to ensure that proposed works do not have a detrimental impact on the health and safety of sensitive receivers.
Policy 11.2	Activities should be managed in a way that avoids the clearance of or damage to trees and vegetation, to extent that the following characteristics are adversely affected: • the visual dominance of trees on private property within the neighbourhoods of the Living Environment; • the remnant native vegetation within the urban Human Environments; • the remaining native vegetation along riparian margins and coastal edges in the urban area and Foothills Environment; • the shelter trees along fencelines and clumps of vegetation within the pastoral landscape of the Countryside Environment; • the mixture of native and exotic vegetation and the scattering of native vegetation along ridgelines and stream edges in the Foothills Environment; • the lines of trees along road edges within the Transport Environment; • the amenity value associated with native vegetation and its relative significance in all parts of the City; • the historic and cultural value of trees associated with the above characteristics; provided that nothing in this policy should prevent the removal of species identified in the Environmentally Damaging Plants List.	Following completion of the works, replacement planting will assist in returning sites to their previous appearance. Furthermore, noise mitigation measures will be implemented on-site and be monitored to ensure that proposed works do not have a detrimental impact on the health and safety of sensitive receivers.
Policy 11.3	Buildings and structures should be located so that they maintain the neighbourhood character, visual amenity of the surrounding area and the characteristic streetscape of the area, including providing for:	Following completion of the works, replacement planting will assist in returning sites to their previous appearance. Furthermore, noise mitigation measures will be implemented on-site and be monitored to ensure that proposed works do not have a detrimental impact on the health and safety of sensitive receivers.
Policy 11.4	Structures (including infrastructure) within the Transport Environment should be of a scale (height, form and bulk), and designed, located and managed in a	Following completion of the works, replacement planting will assist in returning sites to their previous appearance.

Reference	Full text	Assessment
	way that the adverse effects on the amenity values and neighbourhood character of any surrounding Environments and which enhances the amenity of the Transport Environment itself. In particular, structures should: • be compatible with the existing streetscape, including the links between streetscape and the neighbourhood character and amenity of the surrounding Environments; • minimise impact on views from adjacent sites; • minimise the removal or damage to existing native and exotic vegetation; • minimise physical domination and intrusion into the privacy of adjoining sites; • located so that planting of road berms can be provided for.	Furthermore, noise mitigation measures will be implemented on-site and be monitored to ensure that proposed works do not have a detrimental impact on the health and safety of sensitive receivers.
Policy 11.7	Infrastructure should be designed and managed in a way that: • will maintain, and not adversely affect the amenity values and neighbourhood character of the surrounding area, including streetscape character; • placement on sensitive ridgelines in a way that visual intrusion above that ridgeline when viewed from a public place is avoided, or where unavoidable, remedied or mitigated; • does not detract from the significance to tangata whenua of any ridgeline; • minimises disturbance of natural and physical features; • does not physically dominate adjoining sites; • minimises adverse effects on the Upper Waitemata Harbour.	Following completion of the works, replacement planting will assist in returning sites to their previous appearance. Furthermore, noise mitigation measures will be implemented on-site and be monitored to ensure that proposed works do not have a detrimental impact on the health and safety of sensitive receivers.
Policy 11.8	Structures, (except within the Working and Community Environments and specific intensive Living Environments Living 5 and Living 6), should be of a form, height and scale which avoids physical domination of surrounding sites and buildings, which does not adversely affect the landscape character and other amenity values of these areas, and which minimises encroachment on views. In particular, relocated housing must be of a scale, form and finished quality, and located so as to maintain and enhance surrounding amenity values and neighbourhood character.	Following completion of the works, replacement planting will assist in returning sites to their previous appearance. Furthermore, noise mitigation measures will be implemented on-site and be monitored to ensure that proposed works do not have a detrimental impact on the health and safety of sensitive receivers.
Policy 11.9	Structures and accessways should be placed in such a way that they do not encroach visually on those natural landscape elements that have been identified as contributing to the amenity of an area. Particular regard should be had for the placement of structures so that intrusion above any sensitive ridgeline when viewed from a public place is avoided, or where unavoidable, remedied or mitigated.	Following completion of the works, replacement planting will assist in returning sites to their previous appearance. Furthermore, noise mitigation measures will be implemented on-site and be monitored to ensure that proposed works do not have a detrimental impact on the health and safety of sensitive receivers.
Policy 11.18	Non-residential activities (other than retail activities) may be located within residential areas of the City, provided that the individual and cumulative impacts of such a provision do not adversely affect amenity values and	Following completion of the works, replacement planting will assist in returning sites to their previous appearance.

Reference	Full text	Assessment
	neighbourhood character or fragment residential activities to the point that essential residential character is lost, and the safety of residents is harmed. In residential areas that provide for apartment-type developments, a broad range of non-residential activities can locate in these areas to provide a mixed use environment for residents, provided that the nature and scale of activities is managed to protect the vibrancy of adjacent town centre cores.	Furthermore, noise mitigation measures will be implemented on-site and be monitored to ensure that proposed works do not have a detrimental impact on the health and safety of sensitive receivers.
Policy 12.4	Activities on sites containing heritage items listed in the District Plan, should be managed and located, and be of a scale, form and appearance which does not detract from the appearance and integrity of the listed heritage item.	As noted in Technical Report B, one heritage building is recorded within c.100m of the proposed NoR – NI (Waitakere). This is the Radio New Zealand Transmitter Building which is scheduled within the Auckland Council District Plan – Operative Waitakere Section 2003 (ID 1174) and as a Category A historic heritage place within the PAUP (Appendix 9: ID 56). The proposed works should have no effect on the recorded extent of this site.
Policy 12.5	Activities on sites adjacent to sites containing listed heritage items shall be designed, located and carried out in a way that minimises: • physical domination of the listed heritage item; • loss of the original setting, including surrounding trees and gardens; • incompatibility with the scale and form of any heritage building, including roof form and roof angles.	As noted in Technical Report B, one heritage building is recorded within c.100m of the proposed NoR – NI (Waitakere). This is the Radio New Zealand Transmitter Building which is scheduled within the Auckland Council District Plan – Operative Waitakere Section 2003 (ID 1174) and as a Category A historic heritage place within the PAUP (Appendix 9: ID 56). The proposed works should have no effect on the recorded extent of this site.

Auckland Unitary Plan

Reference	Full text	Assessment
Objective D9.3(1)	Manage the effects of activities on the indigenous biodiversity values of areas identified as significant ecological areas by: (a) avoiding adverse effects as far as practicable, and where avoidance is not practicable, minimising adverse effects on the identified values; (b) remedying adverse effects on the identified values where they cannot be avoided; (c) mitigating adverse effects on the identified values where they cannot be avoided or remediated; and (d) considering the appropriateness of offsetting any residual adverse effects that are significant and where they have not been able to be mitigated, through protection, restoration and enhancement measures, having regard to Appendix 8 Biodiversity offsetting.	In some instances, earthworks will be required in riparian margins (including coastal edges). Erosion and sediment control measures will be implemented (TP90) for the duration of the land disturbance activities undertaken as part of the project. The measures are expected to prevent the discharge of sediment laden water to nearby waterbodies, particularly in areas on slopes and land subject to instability. We note that resource consents have not been applied for at this time because, commensurate with the "route protection" phase that the project has reached, only a concept level of design has been undertaken of the network and this is insufficient to inform those resource consent applications. The necessary resource consents (include those for coastal permits and earthworks) will be applied for at the time of detailed design of the network in the future. Refer to Section 10.6 of the AEE for further details on the potential effects and proposed mitigation on areas identified as SEAs. During construction, there will be a range of potential and actual adverse effects within the vicinity of the construction areas, but, with the adoption of proposed mitigation measures, any adverse effects on the values or sites included in the SEA overlays will be temporary in nature and can be appropriately managed.
Objective D9.3(3)	Enhance indigenous biodiversity values in significant ecological areas through any of the following: (a) restoration, protection and enhancement of threatened ecosystems and habitats for rare or threatened indigenous species; (b) control, and where possible, eradication of plant and animal pests; (c) fencing of significant ecological areas to protect them from stock impacts; (d) legal protection of significant ecological areas through covenants or similar mechanisms; (e) development and implementation of management plans to address adverse effects; (f) re-vegetating areas using, where possible, indigenous species sourced from naturally growing plants in the vicinity with the same climactic and environmental conditions; or	Refer above. A provision that plant species to be used should be appropriate to the area, and be chosen for site-specific conditions, has been included in the proposed conditions. Where possible, these will be eco-sourced.

Reference	Full text	Assessment
	(g) providing for the role of Mana Whenua as kaitiaki and for the practical exercise of kaitiakitanga in restoring, protecting and enhancing areas.	
Objective D9.3(6)	Avoid as far as practicable the removal of vegetation and loss of biodiversity in significant ecological areas from the construction of building platforms, access ways or infrastructure, through: (a) using any existing cleared areas on a site to accommodate new development in the first instance; (b) assessing any practicable alternative locations and/or methods that would reduce the need for vegetation removal or land disturbance; (c) retaining indigenous vegetation and natural features which contribute to the ecological significance of a site, taking into account any loss that may be unavoidable to create a single building platform for a dwelling and associated services, access and car parking on a site; (d) designing and locating dwellings and other structures to reduce future demands to clear or damage areas of significant indigenous biodiversity, for example to provide sunlight or protect property; (e) avoiding as far as practicable any changes in hydrology which could adversely affect indigenous biodiversity values; (f) implementing measures to maintain existing water quality and not increase the amount of sediment entering natural waterways, wetlands and groundwater; and (g) using techniques that minimise the effects of construction and development on vegetation and biodiversity and the introduction and spread of animal and plant pests.	Refer above. Construction sites and works through these areas will be designed to minimise disruption as far as practicable.
Objective D9.3(8)	Manage the adverse effects from the use, maintenance, upgrade and development of infrastructure in accordance with the policies above, recognising that it is not always practicable to locate and design infrastructure to avoid significant ecological areas	Refer above.
Objective E1.2(2)	The mauri of freshwater is maintained or progressively improved over time to enable traditional and cultural use of this resource by Mana Whenua.	Wet weather overflow mitigation is also required in the Northern Waitakere area to meet Regional Plan targets of no more than two events per discharge location per year in the separated network. Watercare needs to progress the development of overflow mitigation options, such as the proposed Northern Interceptor scheme, to achieve targeted levels of service. The proposed works will reduce the potential for overflows. This will in turn: • Minimise potentially harmful pathogens reaching freshwater and coastal environments;

Reference	Full text	Assessment
		• Minimise the potential for adverse amenity effects on public areas and recreation values and • Assist in the restoration of the mauri of waterways and coastal waters.
Objective E3.2(4)	Structures in, on, under or over the bed of a lake, river, stream or wetland are provided for where there are functional or operational needs for the structure to be in that location, or traverse that area.	For this Project, where it is not possible to use trenched or trenchless technologies (e.g. to cross beneath a stream or gully) a pipe bridge has be used. This is the case at Manutewhau Reserve, West Harbour.
Policy E3.3(1)	Avoid significant adverse effects, and avoid where practicable or otherwise remedy or mitigate other adverse effects of activities in, on, under or over the beds of lakes, rivers, streams or wetlands within the following overlays: (a) Natural Stream Management Areas Overlay; (b) Natural Lake Management Areas Overlay; (c) Urban Lake Management Areas Overlay; (d) Significant Ecological Areas Overlay; and (e) Wetland Management Areas Overlay	During construction, there will be a range of potential and actual adverse effects within the vicinity of the construction areas, but, with the adoption of proposed mitigation measures, any adverse effects on the values or sites included in the SEA overlays will be temporary in nature and can be appropriately managed.
Policy E3.3(6)	Manage the impact on Mana Whenua cultural heritage that is identified prior to, or discovered during, development or land use by: (a) complying with the protocol for the accidental discovery of kōiwi, archaeology and artefacts of Māori origin (b) undertaking appropriate actions in accordance with mātauranga and tikanga Māori (c) undertaking appropriate measures to avoid adverse effects, or where adverse effects cannot be avoided, effects are remedied or mitigated.	As noted above, protocols for the management of accidental discoveries of archaeological material have been provided in the draft conditions (refer also to Appendix F). Watercare have engaged with Mana Whenua throughout the development of the Project, with the proposed route avoiding as far as practicable any ancestral lands, sites, waahi tapu and other taonga identified as being of significance to tangata whenua.
Policy E3.3(7)	Provide for the operation, use, maintenance, repair, erection, reconstruction, placement, alteration or extension, of any structure or part of any structure in, on, under, or over the bed of a lake, river, stream or wetland, and any associated diversion of water, where the structure complies with all of the following: (a) there is no practicable alternative method or location for undertaking the activity outside the bed of the lake, river, stream or wetland; (b) the structure is designed to be the minimum size necessary for its purpose to minimise modification to the bed of a lake, river, stream or wetland; (c) the structure is designed to avoid creating or increasing a hazard; (d) the structure is for any of the following:	Refer above, and to Appendix A (Assessment of Alternatives)

Reference	Full text	Assessment
	(i) required as part of an activity designed to restore or enhance the natural values of any lakes, rivers, streams or wetlands and their margins, or any adjacent area of indigenous vegetation or habitat of indigenous fauna; (ii) designed to maintain and/or enhance public access to, over and along any lake, river, stream or wetland and their margins; (iii) necessary to provide access across a lake, river, stream or wetland; (iv) associated with infrastructure; (v) necessary for flood protection and the safeguarding of public health and safety; or (vi) required for the reasonable use of production land. (e) the structure avoids significant adverse effects and avoids, remedies or mitigates other adverse effects on Mana Whenua values associated with freshwater resources, including wāhi tapu, wāhi taonga and mahinga kai.	
Policy E3.3(9)	Provide for the excavation, drilling, tunnelling, thrusting or boring or other disturbance, and the depositing of any substance in, on or under the bed of a lake, river, stream or wetland, where it complies with all of the following: (a) there is no practicable alternative method or location for undertaking the activity outside the lake, river, stream or wetland; (b) the activity is required for any of the following: (i) as part of an activity designed to restore or enhance the natural values of any lake, river, stream or wetland, or any adjacent area of indigenous vegetation or habitat of indigenous fauna; (ii) to maintain and/or enhance public access to, over and along any lake, river, stream or wetland and associated margins; (iii) to provide access across a lake, river, stream or wetland; (iv) for the operation, use, maintenance, repair, development or upgrade of infrastructure; (v) to restore, maintain or improve access to wharves and jetties or mooring areas, or to maintain the navigation and safety of existing channels; (vi) to reduce the risk of occurrence or the potential adverse effects of flooding, erosion, scour or sediment depositing; (vii) for the reasonable use of production land; or	Refer above, and to Appendix A (Assessment of Alternatives)

Reference	Full text	Assessment
	(viii) to undertake mineral extraction activities and mitigation and following that, offsetting can be practicably implemented. (c) the disturbance avoids significant adverse effects and avoids, remedies or mitigates other adverse effects on Mana Whenua values associated with freshwater resources, including wāhi tapu, wāhi taonga and mahinga kai.	
Policy E3.3(15)	Protect the riparian margins of lakes, rivers, streams, and wetlands from inappropriate use and development and promote their enhancement to through all of the following: (a) safeguard habitats for fish, plant and other aquatic species, particularly in rivers and streams with high ecological values; (b) safeguard their aesthetic, landscape and natural character values; (c) safeguard the contribution of natural freshwater systems to the biodiversity, resilience and integrity of ecosystems; and (d) avoid or mitigate the effects of flooding, surface erosion, stormwater contamination, bank erosion and increased surface water temperature.	In some instances, earthworks will be required in riparian margins (including coastal edges). Erosion and sediment control measures will be implemented (TP90) for the duration of the land disturbance activities undertaken as part of the project. The measures are expected to prevent the discharge of sediment laden water to nearby waterbodies, particularly in areas on slopes and land subject to instability. We note that resource consents have not been applied for at this time because, commensurate with the "route protection" phase that the project has reached, only a concept level of design has been undertaken of the network and this is insufficient to inform those resource consent applications. The necessary resource consents (include those for coastal permits and earthworks) will be applied for at the time of detailed design of the network in the future.
Policy E11.3(1)	Avoid where practicable, and otherwise mitigate, or where appropriate, remedy adverse effects on areas where there are natural and physical resources that have been scheduled in the Plan in relation to natural heritage, Mana Whenua, natural resources, coastal environment, historic heritage and special character.	During construction, there will be a range of potential and actual adverse effects within the vicinity of the construction areas, but, with the adoption of proposed mitigation measures, any adverse effects on the values or sites included in the Natural Heritage and Natural Resource overlays will be temporary in nature and can be appropriately managed.
Policy E11.3(3)	Manage the impact on Mana Whenua cultural heritage that are discovered undertaking land disturbance by: (a) requiring a protocol for the accidental discovery of kōiwi, archaeology and artefacts of Māori origin; (b) undertaking appropriate actions in accordance with mātauranga and tikanga Māori; and undertaking appropriate measures to avoid adverse effects. Where adverse effects cannot be avoided, effects are remedied or mitigated.	Protocols for the management of accidental discoveries of archaeological material have been provided in the draft conditions (refer Appendix F)
Objective E15.2(1)	Ecosystem services and indigenous biological diversity values, particularly in sensitive environments, and areas of contiguous indigenous vegetation cover,	It is anticipated that, during construction it is likely that there will be adverse effects on the natural character of the coastal environment associated with construction activities (e.g. the establishment of construction sites, vegetation

Reference	Full text	Assessment
	are maintained or enhanced while providing for appropriate subdivision, use and development.	removal, and permanent structures in the vicinity of the coastal environment). With the exception of the pump stations, most of these are considered to be temporary in nature. Effects upon terrestrial ecosystems from construction activities primarily relate to vegetation clearance. A range of measures are therefore proposed such as replanting, avoiding vegetation clearance during peak bird breeding season where practicable and salvaging lizards prior to clearance commencing
Policy E15.3(1)	Protect areas of contiguous indigenous vegetation cover and vegetation in sensitive environments including the coastal environment, riparian margins, wetlands, and areas prone to natural hazards.	Refer above.
Policy E15.3(2)	Manage the effects of activities to avoid significant adverse effects on biodiversity values as far as practicable, minimise significant adverse effects where avoidance is not practicable, and avoid, remedy or mitigate any other adverse effects on indigenous biological diversity and ecosystem services, including soil conservation, water quality and quantity management, and the mitigation of natural hazards.	Refer above.
Policy 15.3(7)	Manage any adverse effects from the use, maintenance, upgrading and development of infrastructure in accordance with the policies in E15.3, recognising that it is not always practicable to locate or design infrastructure to avoid areas with indigenous biodiversity values.	Refer above.
Objective E16.2(1)	Trees in open space zones that contribute to cultural, amenity, landscape and ecological values are protected.	The proposed works will require the removal of areas of vegetation, individual and groups of trees, works within the dripline of trees, and associated pruning. Watercare will continue to consult with PSR on the works required and the proposed mitigation in open space zones.
Policy E16.3(2)	Manage trees within open space zones to protect their cultural, amenity, landscape and ecological values, while acknowledging that multiple uses occur in open space areas.	Refer above.
Objective E18.2(1)	The natural characteristics and qualities that contribute to the natural character of the coastal environment are maintained while providing for subdivision, use and development.	There will be temporary adverse effects on the coastal environment resulting from construction activities which my result in temporary adverse effects on the form of the coastal environment. However, once reinstated, it is considered that the Project will not result in adverse effects on integrity, form, functioning and resilience of the coastal environment. Vegetation within SEA_T_ SEA_T_8319 at the eastern abutment of the Greenhithe Bridge supports suitable potential habitat for at least five indigenous lizard species, four of which have a National threat classification of 'At Risk'. Threat rankings for some of these species, particularly those 'At Risk', may increase over the next 20 years. It is noted that the forest gecko, copper skink and ornate skink have been recorded from SEA_T_8319. The vegetation

Reference	Full text	Assessment
		also has the potential to support roosting and nesting habitat for a range of common native bird species. Technical Report D recommends that preclearance surveys for lizards and nesting birds be undertaken where they have been identified as potentially present, and that an Ecological Management Plan should be prepared to address the potential presence and management of geckos and /or skinks within these areas. Through the adoption of proposed mitigation measures, it is considered that the Project will be consistent with this objective.
Policy E18.3(1)	Manage subdivision, use and development of land adjoining scheduled outstanding natural character or high natural character areas that have a biophysical or visual linkage with the scheduled area to: (a) avoid adverse effects on the natural characteristics and qualities that contribute to the natural character values of outstanding natural character areas; and (b) avoid significant adverse effects, and avoid, remedy or mitigate other adverse effects, on the characteristics and qualities that contribute to the natural character values of high natural character areas.	Refer above.
Policy E18.3(3)	Manage the effects of subdivision, use and development in the coastal environment to avoid significant adverse effects, and avoid, remedy or mitigate other adverse effects, on the characteristics and qualities that contribute to natural character values, taking into account: (a) the location, scale and design of the proposed subdivision, use or development; (b) the extent of anthropogenic changes to landform, vegetation, coastal processes and water movement; (c) the presence or absence of structures, buildings or infrastructure; (d) the temporary or permanent nature of any adverse effects; (e) the physical and visual integrity of the area, and the natural processes of the location; (f) the intactness of any areas of significant vegetation, and vegetative patterns; (g) the physical, visual and experiential values that contribute significantly to the wilderness and scenic values of the area;	Refer above.

Reference	Full text	Assessment
	(h) the integrity of landforms, geological features and associated natural processes, including sensitive landforms such as ridgelines, headlands, peninsulas, cliffs, dunes, wetlands, reefs, freshwater springs, streams, rivers and surf breaks; (i) the natural characteristics and qualities that exist or operate across mean high water spring and land in the coastal environment, including processes of sediment transport, patterns of erosion and deposition, substrate composition and movement of biota, including between marine and freshwater environments; and (j) the functional or operational need for infrastructure to be located in a particular area.	
Objective E24.2(2)	The adverse effects of outdoor lighting on the environment and safety of road users are limited.	With respect to the design of any above ground structures (and associated lighting) refer to Technical Report F.
Policy E24.3(2)	Control the intensity, location and direction of artificial lighting to avoid significant glare and light spill onto adjacent sites, maintain safety for road users and minimise the loss of night sky viewing.	With respect to the design of any above ground structures (and associated lighting) refer to Technical Report F.
Objective E25.2(1)	People are protected from unreasonable levels of noise and vibration.	A number of noise and vibration mitigation measure will be set out in the Construction Noise and Vibration Management Plan. Other mitigations will include fitting mufflers to trucks, good site management, maintenance of equipment to a high level, the replacement of audible reversing alarms with visual or lower noise broadband audible reversing alarms, the use of noise barriers and through the increased vigilance of heavy equipment operators.
Objective E25.2(2)	The amenity values of residential zones are protected from unreasonable noise and vibration, particularly at night.	Refer above.
Policy E25.3(2)	Minimise, where practicable, noise and vibration at its source or on the site from which it is generated to mitigate adverse effects on adjacent sites.	Refer above.
Policy E25.3(10)	Avoid, remedy or mitigate the adverse effects of noise and vibration from construction, maintenance and demolition activities while having regard to: (a) the sensitivity of the receiving environment; and (b) the proposed duration and hours of operation of the activity; and (c) the practicability of complying with permitted noise and vibration standards	Refer above.
Objective E26.2.1(1)	The benefits of infrastructure are recognised.	The increasing urban development in the Service Catchment area requires additional wastewater conveyance and treatment infrastructure to service this growth. The construction and operation of the Project will therefore provide infrastructure that supports the economic and social wellbeing of the region.

Reference	Full text	Assessment
		Watercare's service objectives require development of resilient assets to meet required service delivery standards and foreseeable future needs. This includes providing sufficient capacity to convey and treat wastewater. Once completed the Project will facilitate the continued effective operation of the wastewater network generally, and provide capacity in the wastewater network for future growth and development in the Auckland region. This will also help to prevent further major wastewater overflows by providing appropriate infrastructure. Watercare will maintain and enhance the wastewater infrastructure for the northern Auckland Region by implementing the Project. This will ensure the long-term integrity for the expected population increase over the next 30 years. The proposed designation will safeguard the wastewater pipeline route, enabling these future communities to be serviced by the city's sewage treatment facilities, controlling discharges and overflows – meeting community and freshwater health outcomes.
Objective E26.2.1(2)	The value of investment in infrastructure is recognised.	Refer above.
Objective E26.2.1(3)	Safe, efficient and secure infrastructure is enabled, to service the needs of existing and authorised proposed subdivision, use and development.	The designation will give Watercare the capability to undertake construction as things change in the network, and will give developers and Auckland Council certainty that critical infrastructure will be provided. This also provides assurance that the areas being developed will be serviced (or have the ability to be serviced/connected to), supporting residential and business growth. The provision of infrastructure to service growth in the area is essential in order to enable the people and communities of those areas to provide for their social and economic wellbeing and for their health and safety by providing for appropriate conveyance of sewage to the Rosedale WWTP.
Objective E26.2.1(4)	Development, operation, maintenance, repair, replacement, renewal, upgrading and removal of infrastructure is enabled.	The NoRs will enable the development, operation, maintenance, and any repairs, replacements/renewals and upgrading necessary.
Objective E26.2.1(5)	The resilience of infrastructure is improved and continuity of service is enabled.	Once completed the Project will facilitate the continued effective operation of the wastewater network generally, and provide capacity in the wastewater network for future growth and development in the Auckland region.

Reference	Full text	Assessment
Objective E26.2.1(6)	Infrastructure is appropriately protected from incompatible subdivision, use and development, and reverse sensitivity effects.	The proposed designation will safeguard the wastewater pipeline route, enabling these future communities to be serviced by the city's sewage treatment facilities, controlling discharges and overflows – meeting community and freshwater health outcomes. The designation provides a statutory mechanism to implement the works and protect from potential reverse sensitivity effects.
Objective E26.2.1(9)	The adverse effects of infrastructure are avoided, remedied or mitigated.	During construction it is likely that there will be adverse effects on the natural character of the coastal environment. Adverse effects are associated with construction activities (e.g. the presence of the drilling rig and vegetation removal). These adverse effects are considered to be temporary and not significant, having regard to proposed mitigation. There are not considered to be any significant adverse effects on the natural character associated with permanent works.
Policy E26.2.2(1)	Recognise the social, economic, cultural and environmental benefits that infrastructure provides, including: (a) enabling enhancement of the quality of life and standard of living for people and communities; (b) providing for public health and safety; (c) enabling the functioning of businesses; (d) enabling economic growth; (e) enabling growth and development; (f) protecting and enhancing the environment; enabling the transportation of freight, goods, people; and (g) enabling interaction and communication	The Project constitutes an integrated and cost effective solution for the wastewater network, addressing existing issues within the network and providing sufficient capacity to provide for increased growth in the Service Catchment. Once completed, the Project will provide the following key benefits, which are seen as positive benefits: a. The provision of capacity in the wastewater network for future growth and development in Auckland; b. Reducing the potential for untreated wastewater overflows from the network by providing appropriate infrastructure to service growth; c. Positive effects on public health and the environment through the continued effective operation of the wastewater network generally.
Policy E26.2.2(2)	Provide for the development, operation, maintenance, repair, upgrade and removal of infrastructure throughout Auckland by recognising: (a) functional and operational needs; (b) location, route and design needs and constraints; (c) the complexity and interconnectedness of infrastructure services; (d) the benefits of infrastructure to communities with in Auckland and beyond;	Refer above.

Reference	Full text	Assessment
	(e) the need to quickly restore disrupted services; and (f) its role in servicing existing, consented and planned development.	
Policy E26.2.2(3)	Avoid where practicable, or otherwise remedy or mitigate adverse effects on infrastructure from subdivision, use and development, including reverse sensitivity effects, which may compromise the operation and capacity of existing, consented and planned infrastructure.	Refer above.
Policy E26.2.2(4)	Require the development, operation, maintenance, repair, upgrading and removal of infrastructure to avoid, remedy or mitigate adverse effects, including, on the: (a) health, well-being and safety of people and communities, including nuisance from noise, vibration, dust and odour emissions and light spill; (b) safe and efficient operation of other infrastructure; (c) amenity values of the streetscape and adjoining properties; (d) environment from temporary and ongoing discharges; and (e) values for which a site has been scheduled or incorporated in an overlay.	Refer above.
Policy E26.2.2(5)	Consider the following matters when assessing the effects of infrastructure: (a) the degree to which the environment has already been modified; (b) the nature, duration, timing and frequency of the adverse effects; (c) the impact on the network and levels of service if the work is not undertaken; (d) the need for the infrastructure in the context of the wider network; and (e) the benefits provided by the infrastructure to the communities within Auckland and beyond.	With respect to points (a) to (e): a. Refer to Section 6 and Section 10 of the AEE b. Refer to Section 3, 5 and 7, and the Technical Reports appended to the AEE c. Refer to Section 2 of the AEE d. Refer above
Policy E26.2.2(6)	Consider the following matters where new infrastructure or major upgrades to infrastructure are proposed within areas that have been scheduled in the Plan in relation to natural heritage, Mana Whenua, natural resources, coastal environment, historic heritage and special character: (a) the economic, cultural and social benefits derived from infrastructure and the adverse effects of not providing the infrastructure; (b) whether the infrastructure has a functional or operational need to be located in or traverse the proposed location;	With respect to the following matters: (a) Refer to Section 10.2 and 13 of the AEE; (b) Refer to Section 6 and Appendix A of the AEE; (c) As the Project is linear infrastructure, connections through such areas may be required; (d) Refer to Appendix A of the AEE; (e) An assessment of effects is included in Section 10 of the AEE; (f) Refer to Section 2 of the AEE. The Project will enable the planned growth and intensification of Auckland;

Reference	Full text	Assessment
	(c) the need for utility connections across or through such areas to enable an effective and efficient network; (d) whether there are any practicable alternative locations, routes or designs, which would avoid, or reduce adverse effects on the values of those places, while having regard to E26.2.2(6)(a) - (c); (e) the extent of existing adverse effects and potential cumulative adverse effects; (f) how the proposed infrastructure contributes to the strategic form or function, or enables the planned growth and intensification, of Auckland; (g) the type, scale and extent of adverse effects on the identified values of the area or feature, taking into account: (i) scheduled sites and places of significance and value to Mana Whenua; (ii) significant public open space areas, including harbours; (iii) hilltops and high points that are publicly accessible scenic lookouts; (iv) high-use recreation areas; (iv) natural ecosystems and habitats; and (v) the extent to which the proposed infrastructure or upgrade can avoid adverse effects on the values of the area, and where these adverse effects cannot practicably be avoided, then the extent to which adverse effects on the values of the area can be appropriately remedied or mitigated. (h) whether adverse effects on the identified values of the area or feature must be avoided pursuant to any national policy statement, national environmental standard, or regional policy statement.	(g) Refer to Section 10 of the AEE; (h) Refer to Section 10 of the AEE.
Policy E26.2.2(8)	Encourage new linear infrastructure to be located in roads, and where practicable within the road reserve adjacent to the carriage way.	Where practicable, the proposed pipeline will be co-located within the road reserve while avoiding impacts on other network utilities. Watercare will continue to engage with network utility operators to confirm these locations.
Policy E26.2.2(11)	Provide flexibility for infrastructure operators to use new technological advances that: (a) improve access to, and efficient use of services; (b) allow for the re-use of redundant services and structures where appropriate; (c) result in environmental benefits and enhancements; and (d) utilise renewable resources.	Given the long timeframe until construction, new technologies may become available. Notwithstanding this, it is considered that a reasonable degree of confidence can be had with regards to trenched and trenchless methods. This is demonstrated on the Project Drawings where anticipated construction methods are shown in different colours. It is considered that this establishes an effects envelope (i.e. trenched versus trenchless) with regards to the installation of pipelines. Overall if construction techniques change, they will be within the envelope of effects assessed in this Report.
Objective E30.2(1)	The discharge of contaminants from contaminated land into air, or into water, or onto or into land are managed to protect the environment and human	Technical Report C notes that there is potential to encounter contaminated soil during the works, and that there is a very low to moderate risk for significant contamination to be encountered. Further testing to establish contamination

Reference	Full text	Assessment
	health and to enable land to be used for suitable activities now and in the future.	levels within sections of the designation where potentially contaminating activities have been identified will be undertaken once the location of excavation works has been established.
Policy E30.3(2)	Require any use or development of land containing elevated levels of contaminants resulting in discharges to air, land or water to manage or remediate the contamination to a level that: (a) allows contaminants to remain in the ground/groundwater, where it can be demonstrated that the level of residual contamination is not reasonably likely to pose a significant adverse effect on human health or the environment; and (b) avoids adverse effects on potable water supplies; and (c) avoids, remedies or mitigates significant adverse effects on ecological values, water quality, human health and amenity values; while taking into account all of the following: (d) the physical constraints of the site and operational practicalities; (e) the financial implications of the investigation, remediation, management and monitoring options; (f) the use of best practice contaminated land management, including the preparation and consideration of preliminary and detailed site investigations, remedial action plans, site validation reports and site management plans for the identification, monitoring and remediation of contaminated land; and (g) whether adequate measures are in place for the transport, disposal and tracking of contaminated soil and other contaminated material removed from a site to prevent adverse effects on the environment.	Refer above.
Objective H7.2(2)	The adverse effects of use and development of open space areas on residents, communities and the environment are avoided, remedied or mitigated.	Permanent visual and amenity effects with public open spaces will predominantly result from the removal of vegetation and the presence of built structures (the pump station at No. 56 The Concourse, the pump stations within Wainoni Park, a pipe bridge (crossing Manutewhau Creek, and other aboveground air treatment facilities). Other surface features such as manhole covers, are proposed to sit flush within road corridors and open grass areas. Any potential adverse effects that do arise will be managed through the development and implementation of a Construction Management Plan (health and safety of communities), Landscape and Visual Management Plan (amenity values), and Reinstatement Plan (amenity values). Subject to the mitigation measures proposed, the majority of the adverse landscape and visual effects anticipated in the construction and operation

Reference	Full text	Assessment
		phase of the Project can be managed and mitigated to result in low (less than minor) adverse effects overall.
Policy H7.3(4)	Enable the construction operation, maintenance, repair and minor upgrading of infrastructure located on open spaces	The NoRs will enable the construction operation, maintenance of infrastructure located on open spaces.
Objective H7.4.2(1)	The natural, ecological, landscape, Mana Whenua and historic heritage values of the zone are enhanced and protected from adverse effects of use and development.	During construction, there may be a range of potential and actual adverse effect. However, with the adoption of proposed mitigation measures, it is anticipated that any adverse effects on the values or sites will be temporary in nature and can be appropriately managed.
Objective H7.4.2(2)	Use and development complements and protects the conservation values and natural qualities of the zone.	Refer above.
Policy H7.4.3(1)	Enable appropriate use and development that conserves, protects and enhances the natural, landscape, and historic heritage values of the zone.	Refer above.
Policy H7.4.3(2)	Protect and enhance ecological values, including habitats, significant ecological areas and any unique features present within the zone.	Technical Report D recommends that preclearance surveys for lizards and nesting birds be undertaken where they have been identified as potentially present, and that an Ecological Management Plan should be prepared to address the potential presence and management of geckos and /or skinks within these areas. Through the adoption of proposed mitigation measures, it is considered that the Project will be consistent with this objective.
Policy H7.4.3(3)	Manage the use of the open space to protect and enhance Mana Whenua values, and enable appropriate activities which support and re-establish the relationship of Mana Whenua and their culture and traditions to their ancestral lands, water, sites, wāhi tapu and other taonga.	Refer above.
Policy H7.4.3(4)	Limit activities, buildings and structures to those necessary to maintain or enhance the use or values of the zone	Refer above, and to Technical Report F.
Policy H7.4.3(5)	Locate and design new buildings, structures and additions to: (a) complement the context, character and values of the zone; and (b) ensure that there is minimal disturbance to existing landform, vegetation and vulnerable habitats.	Refer above, and to Technical Report F.
Policy H7.4.3(7)	Require areas surrounding buildings, structures and parking areas to be landscaped to mitigate visual impacts.	Refer above.
Policy H7.5.3(2)	Maintain or enhance the natural character values of open spaces by retaining significant vegetation (where appropriate and practical) and through weed removal, new planting and landscaping.	Refer above. A provision that plant species to be used should be appropriate to the area, and be chosen for site-specific conditions, has been included in the proposed conditions. Where possible, these will be eco-sourced.

Reference	Full text	Assessment
Policy H7.5.3(4)	Limit buildings, structures and activities to those necessary to enhance people's ability to use and enjoy the open space for informal recreation.	Refer above.
Policy H7.5.3(5)	Locate and design buildings and structures to: (a) complement the open and spacious character, function and amenity values of the zone; (b) maintain public accessibility and minimise areas for exclusive use; and (c) protect any natural or historic heritage values.	Refer above.
Policy H7.6.3(3)	Design and locate buildings and structures (including additions) to be compatible with the surrounding environment in which they are located, particularly residential environments, and to avoid or mitigate any adverse effects, including visual, dominance, overlooking and shading.	Refer above.

Appendix F Draft Conditions

CONDITIONS OF DESIGNATION

Note:

The following terms and acronyms are used in these conditions:

Term	Definition
Consultation	The process of providing information about the construction works, and receiving for consideration, information from stakeholders, directly affected parties, regarding those effects and proposals for the management and mitigation of them.
Directly affected parties	All property owners and occupiers identified within the designation footprint
Northern Interceptor	The Northern Interceptor comprises Phases 1 to 6
The Project	The Project comprises Phases 3 to 6 of the Northern Interceptor Project
Stakeholder(s)	The parties as listed in Appendix A
Project Stage	"Project stage" means a separable part of the Project, e.g. by Contract area or by geographical extent.
Cultural Monitor	Nominate Kaitiaki ….

Acronym	Description
PSR	Auckland Council Parks, Sports and Recreation
NoR 1	NOR – NI (North Shore)
NoR 2	NOR – NI (Waitakere)
CMP	Construction Management Plan
PCCP	Pre-Construction Consultation Plan
OPW	Outline Plan of Works
CPTED	Crime Prevention Through Environmental Design
CCP	Construction Communications Plan
EMP	Ecological Management Plan
CNVMP	Construction Noise and Vibration Management Plan
SSCNMP	Site Specific Construction Noise Management Plan
TMP	Traffic Management Plan
LVMP	Landscape and Visual Management Plan
CLMP	Contaminated Land Management Plan
SQEP	Suitably Qualified and Experienced Practitioner
CoPTTM	Code of Practice for Temporary Traffic Management
RMA	Resource Management Act 1991
Council	Auckland Council

Conditions:

Designation	Proposed Condition
General Condition	
NoR 1 NoR 2 Alteration	**General Accordance** 1. Except as modified by the conditions below and subject to final design, the works shall be undertaken in general accordance with the information provided by the Requiring Authority in Notices of Requirement NoR – NI (Waitakere) and NoR – NI (North Shore) and dated May 2016, and supporting documents being: List of relevant documentation 2. Where there is inconsistency between: (a) The documents provided by the Requiring Authority and listed above and these conditions, these conditions prevail. (b) The information and plans lodged with the Notice of Requirement and presented in evidence on behalf of the Requiring Authority at the Council hearing, the most recent information and plans prevail. (c) The evidence presented at the Council hearing and the management plans required by the conditions of this designation and submitted through the Outline Plan of Works, the requirements of the management plans prevail.
NoR 1 NoR 2 Alteration	**Lapse** 3. In accordance with section 184(1) of the Resource Management Act 1991 (the RMA), these designations shall lapse if not given effect to within 20 years from the date on which they are confirmed.
NoR 1 NoR 2	**Designation boundaries** 4. As soon as reasonably practicable, and no later than the point at which any part or parts of the Project becomes operational, the Requiring Authority shall: (a) Review the extent of the area designated for the Project; (b) Identify any areas of designated land that are no longer necessary for construction of the Project, or no longer necessary from the on-going operation and/or maintenance of the Project or for on-going mitigation measures; (c) Give notice to the Council in accordance with Section 182 of the RMA for the removal of those parts of the designation identified in (b) above
NoR 1 NoR 2	**Network Utility Operators** 5. The Requiring Authority and its contractor shall: (a) Work collaboratively with network utility operators during the development of the design for the Project to provide for the ongoing operation of and access to their networks. (b) Work collaboratively with network utility operators during the preparation and implementation of the Construction Management Plan in relation to the management of adverse effects on the assets of network utility operations.

	(c) Not require network utility operators with existing infrastructure within the designation footprint written to require approval under Section 176 of the RMA for on-going access to enable works associated with the routine operation and maintenance of existing assets.
NoR 1 NoR 2	6. The Requiring Authority shall consult with Auckland Council Parks, Sports and Recreation (PSR) during the development of the detail design for the Project to: (a) Where practicable, provide for the ongoing operation of and access to PSR maintained parks and reserves during construction; (b) Agree the location of suitable alternative carparking to be established sufficient to address the parking lost during construction activities within the Reserves. (c) Coordinate future works around PSR projects in parks and reserves (d) Liaise with PSR and incorporate comments about: i. Look, finish, materiality, colour and location of above ground structures located within parks and reserves; ii. Design options available with a view to achieving a balance of Project objectives and best practice outcomes for PSR land and features into the final design as far as practicable; iii. Design parameters of any infrastructure which may be dual purpose (for example, should a pipe bridge also include, or provide for, a future pedestrian walkway); and iv. Post-construction mitigation, landscaping and reinstatement. 7. In the period before construction begins on the Project (or a section thereof), PSR can undertake maintenance, urgent repair works and minor renewal works on existing PSR infrastructure without seeking the Requiring Authority's written approval under section 176(1)(b) of the RMA.
Pre-Construction Conditions	
NoR 1 NoR 2	**Pre-Construction Consultation Plan** 8. The Requiring Authority shall prepare a Pre-Construction Communications Plan (PCCP) for the pre-construction phase of the Project which shall be submitted to Auckland Council (Team Leader Specialist Integration Compliance) within 12 months of the designation being confirmed. The PCCP shall set out: (a) The method(s) of consultation and liaison with key stakeholders and the owners/occupiers of neighbouring properties regarding Project progress, likely commencement dates of construction works and works programming and staging; and (b) Full contact details for a liaison to manage the public information system and be the point of contact for related enquiries. 9. The PCCP shall be implemented, complied with and publically available from the date which the PCCP is submitted to Council until the date which a CCP prepared in accordance with Condition 16 is submitted to Council.
Construction Conditions	

NoR 1 NoR 2	**Pre-commencement Meeting** 10. Prior to the commencement of works (authorized by these designations), the Requiring Authority shall arrange and conduct a pre-start meeting that: (a) Is located on the site; (b) Is scheduled not less than five days before the anticipated commencement of earthworks; (c) Includes relevant and appropriate Council representatives; (d) Includes representation from the contractors who will undertake the works. 11. The Requiring Authority shall invite representatives from interested mana whenua entities to attend the pre-start meeting. 12. The following information shall be made available by the Requiring Authority at the pre-start meeting: (a) Timeframes for key stages of the works authorised by the designation; (b) The designation and resource consent conditions; (a) The CMP.
NoR 1 NoR 2	**Construction Management Plan - Preparation, Compliance and Monitoring** 13. Prior to commencement of the works authorised by these designations, the Requiring Authority shall submit a Construction Management Plan or Plans (CMP) for the relevant project stage to the Auckland Council (Team Leader Specialist Integration Compliance) as part of any required Outline Plan of Works (OPW). (b) The objective of the CMP is to confirm final project details and staging of works to illustrate that the works remain within the limits and standards approved by these conditions, and that the construction and operation activities avoid, remedy or mitigate adverse effects on the environment. (c) The CMP shall be implemented and maintained throughout the entire construction period for the project or relevant project stage to manage potential adverse effects arising from construction activities and shall be updated as necessary to reflect any substantive change. (d) Any substantive change to the CMP shall achieve the objective of the CMP. 14. Any CMP updated as a result of a substantive change shall be submitted to the Auckland Council (Team Leader – Specialist Integration Compliance) at least ten working days prior to any such substantive change taking effect.
NoR 1 NoR 2	**Construction Management Plan** 15. The CMP required by Condition 13 above, shall include sufficient details relating to the management of all construction activities associated with the relevant project stage to which it relates, including: (a) Details of the site or project manager and the construction liaison person, including their contact details (phone, postal address, email address); (b) An outline construction programme; (c) The proposed hours of work;

	(d) The measures to be adopted to maintain the land affected by the works in a tidy condition in terms of disposal / storage of rubbish, storage and unloading of construction materials and similar construction activities; (e) Measures to address the storage of fuels, lubricants, hazardous and/or dangerous materials, along with contingency procedures to address emergency spill response(s) and cleanup; (f) Location(s) of the site infrastructure including site offices, site amenities, contractors' yards site access, equipment unloading and storage areas, contractor car parking, and security; (g) Procedures for controlling sediment run-off, dust and removal of soil, debris, demolition and construction materials (if any) from public roads or places adjacent to the work site(s); (h) Procedures for ensuring that residents, road users and businesses in the immediate vicinity of the construction areas are given prior notice of the commencement of construction activities and are informed about the expected duration and effects of the works; (i) Means of providing for the health and safety of the general public; (j) Procedures for the management of works which directly affect and/or are located in close proximity to existing network utility services; (k) Procedures for responding to complaints about construction activities; (l) Measures to manage the potential impacts of construction on trees and vegetation; (m) Measures to address Crime Prevention Through Environmental Design (CPTED) issues at and around any construction site(s); (n) Protocols for the management of accidental discoveries of archaeological material; (o) Procedures for the refuelling of plant and equipment; (p) Measures to address the storage of fuels, lubricants, hazardous and/or dangerous materials, along with contingency procedures to address emergency spill response(s) and clean-up; (q) Methods and systems to inform and train all persons working on the site of potential environmental issues and how to avoid remedy or mitigate any potential adverse effects.
NoR 1 NoR 2 NoR 3	**Construction Communications Plan** 16. The Requiring Authority shall prepare a Construction Communications Plan (CCP) for the construction phase of the Project or for each Project stage, and submit the plan to Auckland Council (Team Leader Specialist Integration Compliance) as part of any required OPW. The CCP shall set out: (a) The method(s) of consultation and liaison with key stakeholders and the owners/occupiers of neighbouring properties regarding the likely timing, duration and effects of works; (b) Measures for consulting with mana whenua to identify any culturally sensitive sites that require cultural monitors in accordance with Condition 48. (c) Details of prior consultation or community liaison undertaken with the parties referred to in (a) above, including outlining any measures developed with such persons or groups to manage or to mitigate any adverse effects or inconvenience that may arise; (d) Full contact details for a liaison to manage the public information system and be the point of contact for related enquiries

NoR 1 NoR 2 NoR 3	**Site Reinstatement Plan** 17. Prior to commencement of works at all surface construction sites, the Requiring Authority shall prepare a Reinstatement Plan for the site, in consultation with the affected landowner(s). 18. The Reinstatement Plans shall be submitted to the Auckland Council (Team Leader Specialist Integration Compliance) as part of any required OPW. The Reinstatement Plan shall: (a) Identify any existing structures, vegetation, landscape (including soil) and other features on the site to be protected during works or reinstated on completion of the works; (b) Identify the location and design of any permanent above-ground water, wastewater and stormwater infrastructure and the associated contouring of ground; (c) Include the location and design of any permanent access to the water, wastewater and stormwater infrastructure; (d) Include details of proposed landscaping and planting, including implementation and maintenance programmes and soil reinstatement, including at least 300mm of topsoil, in vegetated areas; (e) Identify any fencing, signage and gating required as part b) and c) above; and (f) Include a summary of all consultation undertaken in relation to the development of the reinstatement plan, how feedback has been incorporated and where feedback has not been incorporated, the reasons why.
NoR 1 NoR 2 NoR 3	**Ecological Management Plan** 19. Unless Council are provided with evidence that a wildlife permit has been granted by the relevant authority for lizard and nesting bird capture and relocation, an Ecological Management Plan (EMP) including an implementation programme, developed by an appropriately qualified ecologist, shall be submitted to the Auckland Council (Team Leader Specialist Integration Compliance) as part of any required OPW. for works in the following locations: (a) Taitapu Park; (b) Lowtherhurst Reserve; (c) Tinema Stream Riparian Corridor; (d) The eastern abutment of the Greenhithe Bridge; (e) North Wainoni Park; and (f) North Shore Golf Course (coastal edges). 20. The EMP shall include, but not necessarily be limited to, the following: (a) Methods of lizard and nesting birds pre-clearance (including surveying), capture-relocation methodologies and timeframes; (b) Details of habitat enhancement/protection measures; (c) Details of predator control programmes including methodologies and timeframes; (d) Details of monitoring to assess the effectiveness of the above mitigation and habitat enhancement measures.

NoR 1 NoR 2 NoR 3	**Construction Noise and Vibration Standards** 21. Noise arising from construction activities on land shall be measured and assessed in accordance with NZS 6803:1999 Acoustics - Construction Noise and shall, unless otherwise provided for in Conditions 29 to 30 comply with the noise limits set out in the following table: | Day →	Time	L_{Aeq}	L_{Amax}
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Residential Receivers			
Weekdays	0630h - 0730h	55 dB	75 dB
	0730h - 1800h	70 dB	85 dB
	1800h - 2000h	65 dB	80 dB
	2000h - 0630h	45 dB	75 dB
Saturday	0630h - 0730h	45 dB	75 dB
	0730h - 1800h	70 dB	85 dB
	1800h - 2000h	45 dB	75 dB
	2000h - 0630h	45 dB	75 dB
Sundays and Public Holidays	0630h - 0730h	45 dB	75 dB
	0730h - 1800h	55 dB	85 dB
	1800h - 2000h	45 dB	75 dB
	2000h - 0630h	45 dB	75 dB
Commercial and Industrial receivers			
All	0730h — 1800h	70 dB	
	1800h — 0730h	75 dB		 22. Construction activities shall comply with the guideline vibration limits set out in the German Standard DIN 4150 – 3:1999 unless varied pursuant to condition 27. 23. The guideline vibration limits set out in the German Standard DIN 4150 – 3:1999 must not be exceeded except where the Requiring Authority can demonstrate to the satisfaction of the Council in advance: (a) That the receiving building(s) are capable of withstanding higher levels of vibration and what the new vibration limit is. The investigation required to demonstrate this must include an assessment of the building(s) by a chartered professional engineer or otherwise appropriately qualified person and a full pre-condition survey; and (b) That the Requiring Authority has obtained the written agreement of the building owner(s) and occupier(s), that a higher limit may be applied.
NoR 1 NoR 2 NoR 3	**Construction Noise and Vibration Management Plan** 24. A Construction Noise and Vibration Management Plan (CNVMP) shall be prepared by an appropriately qualified person, and shall be implemented and maintained throughout the entire construction period. 25. The objective of the CNVMP is to set out the management procedures and methods to be taken in order to avoid, remedy or mitigate potential noise and vibration effects arising from construction activities on adjacent landowners and occupiers. 26. The CNVMP shall be prepared in accordance with the Noise Management Plan requirements of Annex E2 of NZS 6803:1999 Acoustics - Construction Noise and shall describe the measures adopted to, as far as practicable, meet the noise limits in condition 21.

	27. For predicted exceedances of less than 5 decibels (refer condition 21) monitoring shall be undertaken to confirm the actual noise levels. If exceedance is shown to be more than 5 decibels, or the period exceeds those detailed in Condition 21, then a Site Specific Construction Noise Management Plan will be prepared in accordance with Condition 29 and 30. 28. The CNVMP shall also describe measures to be adopted to meet the requirements of the German Standard DIN 4150-3:1999, and as a minimum shall address the following aspects with regard to construction vibration: (a) Vibration sources, including machinery, equipment and construction techniques to be used; (b) Provision for determining the buildings that will require pre- and post-condition surveys; (c) Preparation of building condition surveys on 'at risk' buildings prior to, during and after completion of works, where for the purposes of this condition an 'at risk' building is one at which the levels in the German Standard DIN 4150-3:1999 are likely to be approached or exceeded; (d) Use of building condition surveys to determine the sensitivity of the building(s) on the adjacent sites to ground movement in terms of the Line 1-3 criteria of the German Standard DIN 451 – 3:1999; (e) Identification of any particularly sensitive activities in the vicinity of the proposed works (e.g. commercial activity using sensitive equipment such as radiography or mass-spectrometry) along with the details of consultation with the land owners and occupiers of the sites where the sensitive activities are located and any management measures that will be adopted based on this consultation; (f) The consultation undertaken by the Requiring Authority with affected parties to develop the proposed vibration management measures and any feedback received from those parties, along with the vibration management measures based on this consultation that will be adopted; (g) Methods for monitoring and reporting on construction vibration; and (h) Methods for receiving and responding to complaints about construction vibration.
NoR 1 NoR 2	**Site Specific Construction Noise Management Plan** 29. An SSCNMP shall be prepared for any receiver or activity for which construction noise is either predicted or measured to exceed the limits in Condition 25, except where the exceedance of the standards in Condition 21 is less than 5 decibels and does not exceed: (a) 0700-2200: 1 period of up to 2 consecutive weeks in any 2 months; or (b) 2200-0700: 1 period of up to 2 consecutive nights in any 10 days 30. The SSCNMP must establish the best practicable option for noise mitigation to be implemented for the construction activity.
NoR 1 NoR 2	**Traffic Management Plan** 31. A detailed Traffic Management Plan or Plans (TMP) shall be prepared for the project and or specific project site/s by an appropriately qualified person. A copy of the TMP approved by the relevant road controlling authority shall be provided to the Auckland

Council (Team Leader Specialist Integration Compliance) as part of any required OPW.

32. The TMP shall describe the measures that will be taken to avoid, remedy or mitigate the traffic effects associated with construction of the project. In particular, the TMP shall describe:

    (a) The traffic management measures to maintain traffic capacity and safety or minimise the impact on traffic capacity during weekdays and weekends;
    (b) Methods to manage the effects of the delivery of construction material, plant and machinery, including associated noise effects;
    (c) Measures to maintain existing vehicle access to property where practicable, or to provide alternative access arrangements when it will not be;
    (d) Measures to maintain pedestrian and cyclist movements and reduce the impact on mobility impaired users on roads, cycleways and footpaths adjacent to the construction works. Such access shall be safe, clearly identifiable and seek to minimise significant detours; and to maintain a cycle route where they exist, unless it is not practicable to do so for short periods in order to maintain public health and safety;
    (e) Any road closures and removal of kerbside parking that will be required and the nature and the duration of any traffic management measures that will result, including any temporary restrictions, detours or diversions for general traffic and buses;
    (f) Any proposed monitoring to measure the impact of the works on traffic and vice versa. If safety or operational issues are evident, the methodology for measures to be implemented to address these issues;
    (g) Measures to manage the proposed access to the site should access be unable to cater for two way traffic passing at the same time, and in particular to minimise reverse movements and blocking of the road; and
    (h) The availability of on-street and off-street parking if the project sites are unable to accommodate all contractor parking. This is to include an assessment of available parking (if any) for contractors on street and to identify measures to meet and/or reduce contractor parking demand should it be found that there is insufficient on-street parking to meet that demand.

33. All site access locations should achieve minimum sight distance standards. Where acceptable sight distances cannot be achieved, movements relating to the deficient sight distances should be banned and / or temporary speed limit measures imposed so as to reduce traffic operating speeds to a point at which an acceptable sight distance is achieved.

34. Heavy vehicle movements on Greenhithe Road between Sunnyview Road and Wainoni Heights, and on Churchouse Avenue should be avoided at the start and end of the school day during the school term. This period shall commence thirty minutes prior to the start of the school day through to at least fifteen minutes after the school day start, and from fifteen minutes before the end of the school day to thirty minutes after the end of the school day.

35. Construction activities on Appleby Road should be timed so that they occur during school holiday periods.

36. The TMP(s) required by conditions 31 shall be consistent with the New Zealand Transport Agency's Code of Practice for Temporary Traffic Management (CoPTTM) that applies at the time of construction.

	37. Any damage in the road corridor or shared paths directly caused by construction traffic shall be repaired as soon as practicable.
NoR 1 NoR 2	**Trees and Vegetation** 38. All works affecting trees shall be carried out in accordance with the recommended tree protection methodology contained in Appendix D ("Tree Protection Methodology") of the Arboricultural Assessment prepared by GreensceneNZ, dated 8 August 2016. 39. Where continuous areas of vegetation are removed the cleared areas should be re-vegetated in accordance with the replacement planting protocol contained in Appendix C ("Replacement Planting Protocol") of the Arboricultural Assessment prepared by GreensceneNZ, dated 8 August 2016. 40. The Requiring Authority shall undertake the planting during the first planting season (typically May to September) following completion of the works and installation of infrastructure. 41. The proposed planting required by Condition 42 and 43 above shall incorporate the use of eco-sourced indigenous species of tree and shrubs as far as practicable. The provenance of these shall be from within the ecological district as is achievable.
NoR 1 NoR 2	**Archaeology** 42. An appropriately qualified archaeologist shall monitor construction activities during the surface earthworks and excavation into natural ground in the following locations: (a) Lowtherhurst Reserve; (b) Wainoni Park North; (c) North Shore Memorial Park; and (d) Wharepapa Reserve. 43. Condition 42 shall not apply where the Requiring Authority holds all relevant approvals under the Heritage New Zealand Pouhere Taonga Act 2014, apart from the requirement in the case of discovery of human remains to contact mana whenua and the New Zealand Police. 44. The Requiring Authority shall invite mana whenua cultural monitors as to be present during any excavation or disturbance of any culturally sensitive site identified through Condition 16(b). 45. If any archaeological sites are exposed during the works, the following procedures will apply: (e) Immediately after it becomes apparent that an archaeological or traditional site has been exposed, all site works in the immediate vicinity shall cease; (f) The Requiring Authority shall immediately secure the area so that any artefacts or remains are untouched; (g) The Requiring Authority shall notify Heritage New Zealand, mana whenua and Auckland Council (Team Leader — Specialist Integration Compliance) (and in the case of human remains, the New Zealand Police) as soon as practicable that an archaeological site has been exposed so that appropriate action can be taken. Works shall not recommence in the immediate vicinity of the

	archaeological site until any approval required from Heritage New Zealand has been obtained.
	Landscape and Visual Management Plan 46. A Landscape and Visual Management Plan (LVMP) shall be prepared for the Project and or specific project site/s by an appropriately qualified person. A copy of the LVMP shall be provided to the Auckland Council (Team Leader Specialist Integration Compliance) as part of any required OPW that includes the development of above ground structures and buildings. 47. The objective of the LVMP is to provide a framework to avoid, remedy or mitigate the adverse landscape and visual effects of the Project's above ground structures and buildings. 48. The LVMP shall describe the measures that will be taken to achieve the objective of the LVMP as described in Condition 47. In particular, the LVMP shall describe: (a) The location of above ground structures and buildings, the landscape setting and surrounding land uses; (b) The layout, architectural form and detail of proposed buildings and above ground structures; (c) Measures adopted to ensure that above ground structures and buildings are appropriate to their context and minimise potential adverse effects on the amenity of the surroundings (including neighbouring properties) having regard to their functional nature; (d) How proposed materials are sufficiently robust and minimise the potential for graffiti and vandalism; (e) The extent to which the buildings are visually recessive through (for example) the use of appropriate colours, textures and modulation; (f) The extent to which buildings are designed to achieve appropriate visual amenity and scale with their surroundings through such aspects as modulation of building form, articulation of building components, and use of architectural detail; (g) The extent to which any planting enhances amenity and/or natural values of the surroundings; and (h) How site configuration, landscaping and planting maximises the use of CPTED principles.
NoR 1 NoR 2	**Contaminated Land Management Plan** 49. A Contamination Land Management Plan (CLMP) shall be prepared and submitted to Council (Team Leader Specialist Integration Compliance) as part of any required OPW to set out the framework for the management of the adverse effects relating to contaminated land during the construction of the Project. 50. The objective of the CLMP is to avoid, remedy or mitigate the adverse effects of construction on human health which may result from the disturbance of contaminated material during construction. 51. To achieve the objective in Condition 54 above, the CLMP should set out the procedures for the earthworks the contractor will follow during the works, and how

	these procedures will be implemented. The procedures should include (but not be limited to): (a) Excavation, handling and storage requirements; (b) Dust and erosion control measures to prevent the discharge of contamination; (c) Health and safety procedures; (d) Disposal of contaminated soils to a landfill approved to take the material; (e) Procedures for identifying and managing unexpected discovery of contaminated soils or hazardous materials; and (f) Appointment of a Contaminated Land Specialist who meets the requirements of a suitably qualified and experienced practitioner (SQEP) set out in the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health Users' Guide (2012).
NoR 1 NoR 2	**Cycleways** 52. The Requiring Authority shall ensure that any pipebridge is designed so as to not preclude use of the pipe bridge for a cycle facility.
NoR 1 NoR 2	**Kauri Die Back** 53. The Requiring Authority shall ensure that any works within 30 metres of any Kauri will be undertaken in accordance with best practice procedures to prevent the introduction or spread of Kauri Dieback Disease. Best practice procedures will be developed in conjunction with the Auckland Council (Manager Biosecurity).

Appendix A: List of Stakeholders

Northern Interceptor NoR – NI (North Shore) and NoR – NI (Waitakere)

The following listed parties constitute stakeholder(s) for the purposes of the Pre-Construction Consultation Plan and Construction Communications Plan (Conditions 8 and 16 respectively).

- Ministry of Education
- Greenhithe School
- Albany Junior High School
- Auckland Council Parks, Sports and Recreation where works are proposed in the following locations:
  - *Taitapu Park*
  - *Lowtherhurst Reserve*
  - *Makora Park*
  - *Holmes Reserve*
  - *Manutewhau Reserve*
  - *St Margarets Park*
  - *Esplanade Reserve (Upper Harbour Highway)*
  - *Collins Park*
  - *Wainoni Park*
  - *Wharepapa Reserve*
  - *Rosedale Park*
- North Harbour Air Gun Club
- Greenhithe Pony Club
- Greenhithe Riding for the Disabled
- North Shore Dog Training Club
- Greenhithe Residents' Association

Relevant NoR	Ref. No.	Physical Address	Legal Description	Certificate of Title	Residential/ Non-Residential	Private/ Non-Private	Trench/ Tunnelling	Rising Main/ Gravity	Depth	Acquire/ Easement
NoR – NI (Waitakere)	174	2-12 Selwood Road, Henderson	LOT 8 & Pt Lot 7 DP 1034	CT-487/87	Non-Residential	Crown (RNZ)	Open Cut	Rising	N/A	Permanent Easement
NoR – NI (Waitakere)	178	35 Kopi Place, Massey	LOT 56 DP 81616	CT-38B/859	Residential	Crown (HNZ)	Open Cut	Rising	N/A	Permanent Easement
NoR – NI (Waitakere)	179	16 Kopi Place, Massey	Lot 57 DP 77891	CT-34A/1095	Residential	Crown (HNZ)	Open Cut	Rising	N/A	Permanent Easement
NoR – NI (Waitakere)	194	128 Royal Road, Massey	Pt Lot 3 DP 29333	CT-54D/1253	Residential	Private	Trenchless	Gravity	12m	Easement
NoR – NI (Waitakere)	196	2-22 Moire Road, Massey	Lot 1 DP 65291	CT-21C/272	Non-Residential	Crown (Diocese)	Trenchless	Gravity	24m	Easement
NoR – NI (Waitakere)	197	6 Holmes Drive, South Massey	Lot 26 DP 124122	CT-72B/946	Residential	Private	Trenchless	Gravity	19m	Easement
NoR – NI (Waitakere)	198	8 Holmes Drive, South Massey	Lot 27 DP 124122	CT-72B/947	Residential	Private	Trenchless	Gravity	16m	Easement
NoR – NI (Waitakere)	203	15 Berkshire Terrace, Massey	Lot 163 DP 186800	CT-117A/261	Residential	Private	Microtunnel Pit	Gravity	9m	Acquire
NoR – NI (Waitakere)	204	13 Berkshire Terrace, Massey	LOT 162 DP 186800	CT-117A/260	Residential	Private	Trenchless	Gravity	9m	Easement
NoR – NI (Waitakere)	209	33 Jadewynn Drive, Massey	Lot 104 DP 199705	CT-128A/974	Residential	Crown (HNZ)	Pipe bridge	Gravity	N/A	Acquire
NoR – NI (Waitakere)	210	35 Jadewynn Drive, Massey	Lot 105 DP 199705	CT-128A/975	Residential	Private	Pipe bridge	Gravity	N/A	Acquire
NoR – NI (Waitakere)	214	40 Oriel Avenue, West Harbour	Lot 99 DP 78481	CT-34C/498	Residential	Private	Trenchless	Gravity	12m	Easement

NoR – NI (Waitakere)	219	11 Peterhouse Place, West Harbour	Lot 220 DP 79322	CT-35D/562	Residential	Private	Trenchless	Gravity	19m	Easement
NoR – NI (Waitakere)	220	13 Peterhouse Place, West Harbour	Lot 219 DP 79322	CT-35D/561	Residential	Private	Trenchless	Gravity	20m	Easement
NoR – NI (Waitakere)	222	8 Peterhouse Place, West Harbour	Lot 203 DP 79322	CT-36A/984	Residential	Private	Trenchless	Gravity	21m	Easement
NoR – NI (Waitakere)	223	10 Peterhouse Place, West Harbour	Lot 204 DP 79323	CT-36A/986	Residential	Private	Trenchless	Gravity	22m	Easement
NoR – NI (Waitakere)	224	12 Peterhouse Place, West Harbour	Lot 205 DP 79323	CT-36A/987	Residential	Private	Trenchless	Gravity	23m	Easement
NoR – NI (Waitakere)	225	14 Peterhouse Place, West Harbour	Lot 206 DP 79323	CT-36A/988	Residential	Private	Trenchless	Gravity	24m	Easement
NoR – NI (Waitakere)	226	16 Peterhouse Place, West Harbour	Lot 207 DP 79323	CT-36A/989	Residential	Private	Trenchless	Gravity	25m	Easement
NoR – NI (Waitakere)	227	18 Peterhouse Place, West Harbour	Lot 208 DP 79323	CT-36A/990	Residential	Private	Trenchless	Gravity	26m	Easement
NoR – NI (Waitakere)	228	10 Magdalen Place, West Harbour	Lot 190 DP 77079	CT-33C/215	Residential	Private	Trenchless	Gravity	27m	Easement
NoR – NI (Waitakere)	229	12 Magdalen Place, West Harbour	Lot 189 DP 77079	CT-33C/214	Residential	Private	Trenchless	Gravity	30m	Easement
NoR – NI (Waitakere)	230	19 Magdalen Place, West Harbour	Lot 188 DP 77079	CT-33C/213	Residential	Private	Trenchless	Gravity	32m	Easement
NoR – NI (Waitakere)	231	17 Magdalen Place, West Harbour	Lot 1 DP 392810	CT-372014	Residential	Private	Trenchless	Gravity	33m	Easement
NoR – NI (Waitakere)	232	17A Magdalen Place, West Harbour	Lot 2 DP 392810	CT-327015	Residential	Private	Trenchless	Gravity	35m	Easement
NoR – NI (Waitakere)	233	33 Hobsonville Road, West Harbour	Lot 164 DP 77079	CT-33C/201	Residential	Private	Trenchless	Gravity	37m	Easement

NoR – NI (Waitakere)	234	31 Hobsonville Road, West Harbour	Lot 165 DP 77079	CT-33C/202	Residential	Private	Trenchless	Gravity	40m	Easement
NoR – NI (Waitakere)	235	29 Hobsonville Road, West Harbour	Lot 166 DP 77079	CT-33C/203	Residential	Private	Trenchless	Gravity	38m	Easement
NoR – NI (Waitakere)	237	4-6 Hobsonville Road, West Harbour	Section 6 SO 445955	CT-579283	Residential	Private	Trenchless	Gravity	37m	Easement
NoR – NI (North Shore)	147, 148, 149, 150	51 Appleby Road, Albany	Pt Lot 1 DP 846, Lot 6 DP 16323, Lot 7 DP 16323, Lot 1 DP 201888, Lot 2 DP 201888, Lot 3 DP 846, Lot 24 DP 430140, Lot 25 DP 430140, Lot 1 DP 201887	CT-733/55, CT-128C/487, CT-415/21, CT-517317, CT-517318, CT-128C/488	Non-Residential	Private	Open Cut	Rising	N/A	Permanent Easement
NoR – NI (North Shore)	102	55 Tauhinu Road, Greenhithe	Lot 16 DP 160724	CT-96C/555	Residential	Private	Trenchless & Open Cut	Rising	Varies	Permanent Easement
NoR – NI (North Shore)	104	15 The Knoll, Greenhithe	Lot 15 DP 160724	CT-96C/554	Residential	Private	Break Pressure Chamber, MT Pit	Rising	8m	Acquire
NoR – NI (North Shore)	107	14 The Knoll, Greenhithe	Lot 14 DP 160724	CT-96C/553	Residential	Private	Construction access only	Rising	N/A	N/A
NoR – NI (North Shore)	153	14 John Glenn Avenue, Rosedale	Lot 56 DP 181692	CT-112D/114	Non-Residential	Private	Open Cut	Rising	N/A	Permanent Easement
NoR – NI (North Shore)	159	169 Bush Road, Rosedale	Lot 2 DP 210375	CT-138B/994	Non-Residential	Private	Open Cut	Rising	N/A	Permanent Easement
NoR – NI (North Shore)	111	8 Tauhinu Road, Greenhithe	Lot 1 DP 48037	CT-3C/1333	Residential	Private	Trenchless	Gravity	15m	Easement
NoR – NI (North Shore)	112	6 Tauhinu Road, Greenhithe	Lot 8 DP 17713	CT-902/67	Residential	Private	Trenchless	Gravity	15m	Easement

NoR – NI (North Shore)	113	4 Shiloh Way, Greenhithe	Lot 1 DP 160534	CT-96C/111	Residential	Private	Trenchless	Gravity	14m	Easement
NoR – NI (North Shore)	114	5B Greenhithe Road, Greenhithe	Lot 3 DP 155552	CT-92D/762	Residential	Private	Trenchless	Gravity	14m	Easement
NoR – NI (North Shore)	115	4A Shiloh Way, Greenhithe	Lot 2 DP 160534	CT-96C/112	Residential	Private	Trenchless	Gravity	13m	Easement
NoR – NI (North Shore)	116	6 Shiloh Way, Greenhithe	Lot 1 DP 140574	CT-83C/78	Residential	Private	Trenchless	Gravity	12m	Easement
NoR – NI (North Shore)	117	6A Shiloh Way, Greenhithe	Lot 2 DP 140574	CT-83C/79	Residential	Private	Trenchless	Gravity	10m	Easement
NoR – NI (North Shore)	118	7B Greenhithe Road, Greenhithe	Lot 2 DP 143722	CT-85B/561	Residential	Private	Trenchless	Gravity	10m	Easement
NoR – NI (North Shore)	119	8A Shiloh Way, Greenhithe	Lot 1 DP 147890	CT-88A/269	Residential	Private	Trenchless	Gravity	9m	Easement
NoR – NI (North Shore)	120	11B Greenhithe Road, Greenhithe	Lot 4 DP 72373	CT-28C/136	Residential	Private	Trenchless	Gravity	8m	Easement
NoR – NI (North Shore)	121	8 Shiloh Way, Greenhithe	Lot 2 DP 147890	CT-88A/270	Residential	Private	Trenchless	Gravity	7m	Easement
NoR – NI (North Shore)	122	13B Greenhithe Road, Greenhithe	Lot 3 DP 72373	CT-28C/135	Residential	Private	Trenchless	Gravity	7m	Easement
NoR – NI (North Shore)	125	25 Greenhithe Road, Greenhithe	Lot 7 DP 20786	CT-1978/39	Residential	Private	Trenchless	Gravity	21m	Easement
NoR – NI (North Shore)	126	27 Greenhithe Road, Greenhithe	Lot 8 DP 20786, Lot 2 DP 429115	CT-514221	Residential	Private	Trenchless	Gravity	20m	Easement
NoR – NI (North Shore)	127	29 Greenhithe Road, Greenhithe	Lot 1 DP 471824	CT-641222	Residential	Private	Trenchless	Gravity	18m	Easement
NoR – NI (North Shore)	128	29A Greenhithe Road, Greenhithe	Lot 1 DP 164937	CT-99B/588	Residential	Private	Trenchless	Gravity	17m	Easement

NoR – NI (North Shore)	130	2 Churchouse Road, Greenhithe	Lot 1 DP 47373	CT-1A/1136	Residential	Private	Trenchless	Gravity	27m	Easement
NoR – NI (North Shore)	131	4 Churchouse Road, Greenhithe	Lot 2 DP 47373	CT-1879/73	Residential	Private	Trenchless	Gravity	26m	Easement
NoR – NI (North Shore)	137	40 Churchouse Road, Greenhithe	Lot 8 DP 401480	CT-404909	Residential	Private	Trenchless	Gravity	23m	Easement