Central Interceptor

Main Project Works Detailed Design

WATERCARE SERVICES LIMITED

Main Tunnel and Link Sewer Realignment

Resource Consent Application and AEE

[PWCIN-DEL-REP-SP-J100344] | 3

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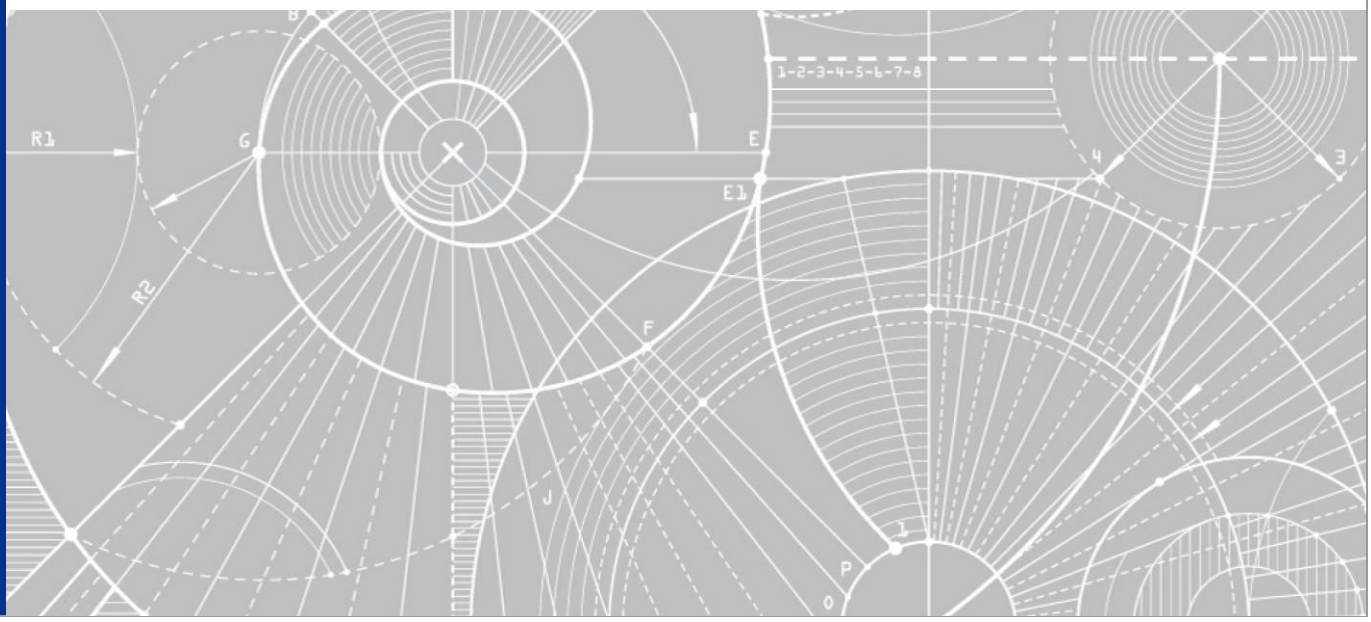

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1	30/03/17	Draft for Review – Internal	MKR	HH	
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Contents

1. Introduction

Watercare Services Limited (Watercare) is the water and wastewater service provider for Auckland. Watercare is currently in the process of designing and constructing a new underground wastewater interceptor within the Auckland Isthmus to collect, store, and convey wastewater to the Mangere Wastewater Treatment Plant (WWTP). The new interceptor comprises a tunnelled wastewater interceptor extending from Western Springs to the Mangere WWTP with a number of branched link sewers with connections to Watercare's existing wastewater network which divert flow into the new interceptor. This new interceptor is called the Central Interceptor.

Between 2012 and 2015 Watercare sought to secure the necessary statutory approvals to enable the construction and operation of the Central Interceptor. The statutory approvals were by way of designation and a suite of regional resource consents. The notices of requirement and consent applications were notified on 10 February 2014. The final consent order was issued by the Environment Court on 30 September 2015[1].

While each of the surface sites associated with the construction and operation of the Central Interceptor were designated by Watercare as part of the statutory approval process, statutory approval for the main tunnel and associated link sewers was obtained by way of a suite of resource consents which enabled (amongst other activities) the underground excavation of the tunnels and associated groundwater diversion and discharge. To enable flexibility in the subsequent detailed design, the resource consents provide for works within a three dimensional construction corridor, within which the final tunnels (both the Main Tunnel and Link Sewer Tunnels) were to be located. Figure 1.1 below provides an illustration of the consented corridors.

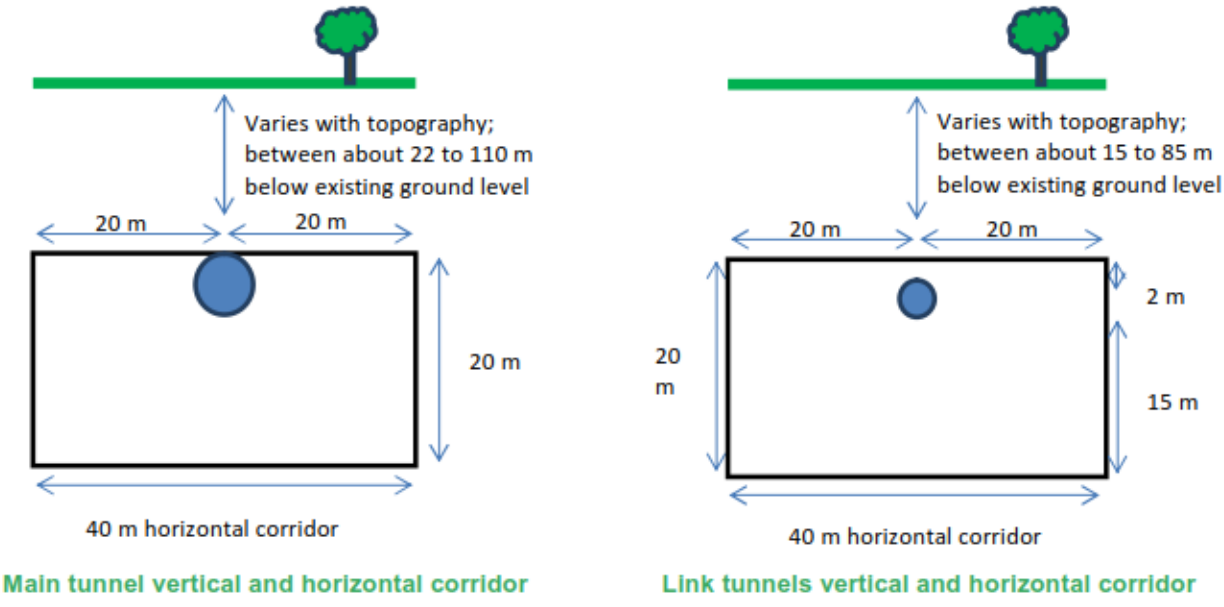


Figure 1-1 Central Interceptor Main Tunnel and Link Sewer - Consented Corridor

Subsequent to obtaining the statutory approvals for the Central Interceptor project Watercare has progressed with the detailed design of the tunnels and surface sites. The detailed design process has included a program of further geological investigation and further stakeholder engagement. The final alignment for the main tunnel and link sewers has been selected to respond to the additional information obtained as part of the detailed

[1] Subsequently Watercare has sought a new discharge permit to enable the project wide discharge of water and/or contaminants (including washwater) onto or into land and/or into water from construction site activities (referred to herein as the 'construction discharge'). The new permit was sought to correct a clerical error relating to the duration of the original permit. Auckland Council granted the new construction discharge permit on 22 April 2017 (Application Number: P52303).

design process. However, as an outcome of the detailed design process discrete sections of the final alignment of the main tunnel and one of the link sewer tunnels (referred to as 'Link Sewer C') are outside of the consented corridor (detail of each of these sections is provided in Section 1.3).

This assessment of environmental effects is in support of the application for resource consents to provide the necessary statutory approvals for those sections of the tunnel alignment which are outside the previously consented corridor. The application has been prepared in accordance with Section 88 and Schedule 4 of the Resource Management Act 1991 (RMA) and the relevant provisions of the Auckland Unitary Plan Operative in Part (AUP(OiP)).

For the avoidance of doubt, the scope of this application is limited to enabling the construction and operation of those sections of the tunnel alignment which are outside the previously consented corridor. All other aspects of the Central Interceptor project have existing RMA approvals which are unmodified by this application.

While this application is limited to the deviations of the Main Tunnel and Link Sewer C (full details of which are provided in Section 1.3 this report) it is recognised that these activities are part of the broader authorised project works. Where relevant, the key details of the wider project are summarised throughout this document to provide context where necessary. However, for brevity full details of each and every aspect of the wider project have not been provided within this document. Accordingly, cross-reference to the 'Central Interceptor Main Project Works AEE', Watercare 2012, is provided where necessary and that document should be referenced where further detail is required to provide context beyond the scope of this application.

1.1 Central Interceptor Overview

To provide context to this application, the following section provides an overview of the wider Central Interceptor Project.

The overall concept for the Central Interceptor scheme has two elements:

- The **"main project works"**, which comprise a 13 km gravity tunnel from Western Springs to the Mangere WWTP, two link sewers (previously four) extending from the main tunnel, a series of connections to the existing Watercare wastewater network, and a new pumping station at the WWTP to pump wastewater from the tunnel to the plant. These works will provide the network capacity required for future growth on the Auckland Isthmus, will duplicate the lower section of the Western Interceptor, and will provide overflow mitigation at some of Watercare's largest wastewater overflows.
- The **"CSO Collector Sewers"**, which comprise a series of smaller sewers that extend out from the main project works into the local catchments to provide overflow mitigation at the numerous network overflow locations. The CSO Collector Sewer works are a discrete element of works separate from main project works. Their timing would likely follow the completion of the main project works. Accordingly, the CSO Collector Sewers are provided in a separate suite of statutory approvals from the main project works.

As this application is only specific to aspects of the main project works of the Central Interceptor, no further reference to the CSO Collector Sewers is provided.

1.1.1 Central Interceptor Main Project Works

The Central Interceptor main project works involve the construction, commissioning, operation and maintenance of a bulk wastewater interceptor and associated activities. The works, shown on Figure 1-2 incorporate the following key features:

- A new sewer tunnel between Western Springs and the Mangere WWTP – approximately 13 km in length and between about 22 to 110 m below the ground surface (shown as the purple line on Figure 1-2).
- Two link sewer tunnels connecting the main tunnel and existing sewers (shown as black lines on Figure 1-2):

- Link Sewer B between Rawalpindi Reserve and the main tunnel at Mount Albert War Memorial Reserve: approximately 1 km length, and up to about 43 m deep;
- Link Sewer C between existing Pump Station 25 (Miranda Reserve) and the main tunnel at May Road: approximately 3 km long, and up to about 85 m deep;

The existing consents also provide for the construction and operation of an additional link sewer tunnel and a smaller trenched link sewer, described below:

- Link Sewer A between Motions Road and the main tunnel at Western Springs: approximately 1 km long and up to about 28 m deep;
- Link Sewer D, connecting the local network from Witla Court to the main tunnel at Kiwi Esplanade: approximately 0.6 km long, and comprising a small pipeline about 400 mm diameter, and buried up to about 3 m deep.

The construction of Link Sewers A and D is no longer necessary for the main project works and Watercare no longer intends to construct these elements of the project as part of the main project works. This has no direct impact on the activities associated with this application and is not discussed any further.

- Connections from the main tunnel and link sewers to the existing sewer network.
- Associated structures at the connection points, including access shafts, drop shafts, flow control structures, grit traps, air vents and air treatment facilities.
- Replacement/upgrading of overflow discharge structures in nearby watercourses at seven sites.
- A new pump station at the Mangere WWTP to pump wastewater from the tunnel to the WWTP.
- Other associated works at and in the vicinity of the Mangere WWTP, including an air treatment facility, a rising main to connect to the plant and an emergency pressure relief structure to enable the safe discharge of flows in the extreme scenario that pump station failure occurs and tunnel storage capacity is exceeded.

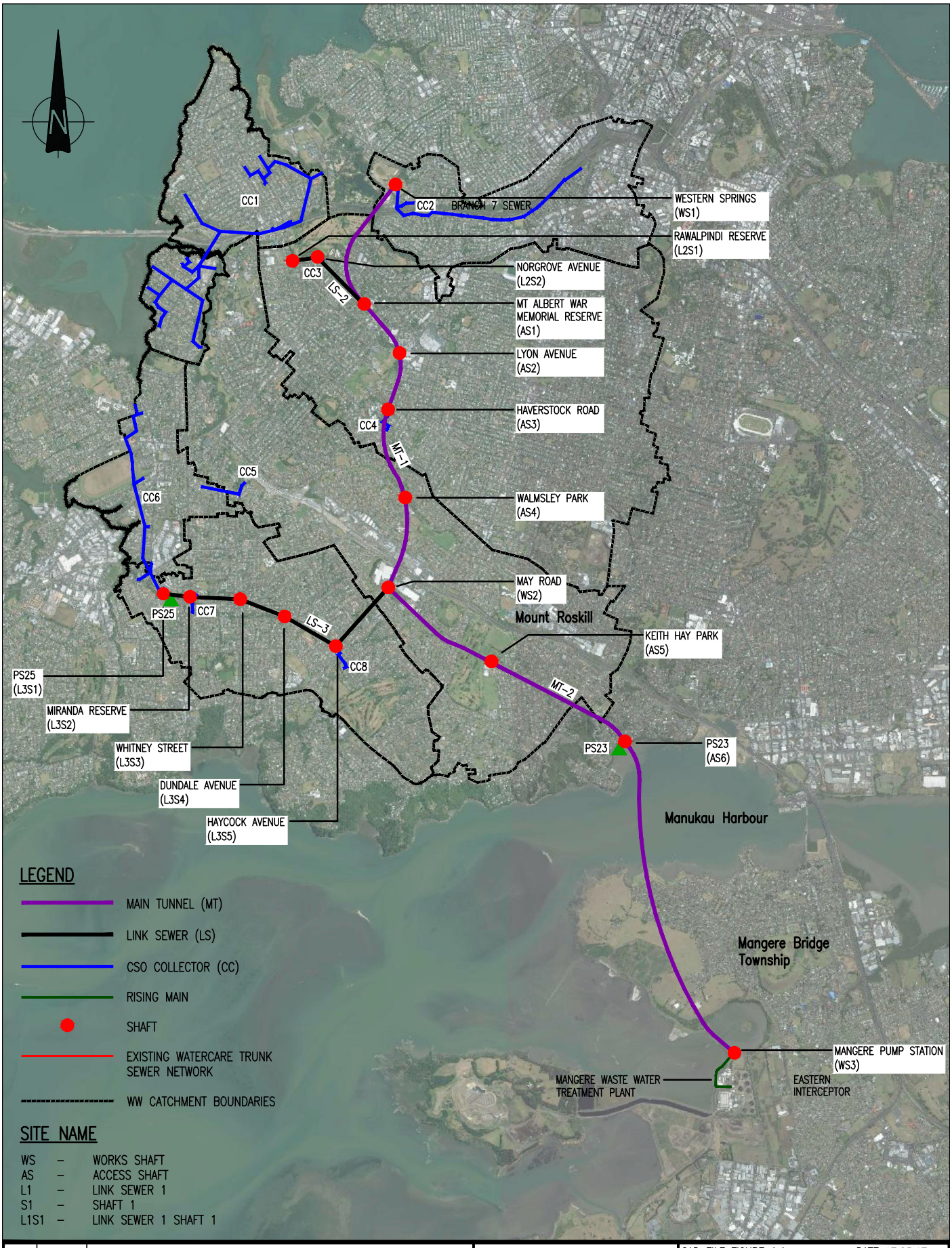
1.1.2 Necessity of the Project

Watercare, Auckland Council and predecessor organisations, spent many years evaluating network upgrading options that provide for network capacity and asset risk management, and reduce the environmental effects of network overflow discharges. The key challenge has been achieving an integrated network solution at a cost that is affordable to the community.

In 2008 Watercare completed the Three Waters Strategic Plan a four year planning exercise addressing the water, wastewater and stormwater needs for the Auckland Region. The Three Waters Strategic Plan identified that Auckland's most immediate wastewater need was upgrading of the sewer network in the Auckland Isthmus. The Plan highlighted the needs for the wastewater network as being:

- Providing additional network capacity for growth and development across the Auckland Isthmus;
- Duplicating the lower section of the regionally critical Western Interceptor, particularly the Hillsborough Tunnel and Manukau Siphon which are ageing and at risk of failure; and
- Reducing existing wastewater overflows from the old combined sewer system into urban streams and the Waitemata Harbour, improving public health and environmental conditions.

The Central Interceptor scheme has been developed by Watercare as the Best Practicable Option (BPO) for addressing these needs and options analysis has confirmed that the Central Interceptor represents the most cost effective solution for delivering the required wastewater network improvements.



1	17.03.17
ISSUE	DATE

CENTRAL INTERCEPTOR
GENERAL
OVERALL SITE LAYOUT

REVISED AEE MARCH 2017

Watercare

CAD FILE FIGURE 1.1	DATE 17.03.17
ORIGINAL SCALE A4 1:62500 A4	CONTRACT No. 0538
DRAWING No. FIGURE 1.1	ISSUE 1

1.2 Existing Project Approvals

As noted previously, the Central Interceptor main project works is authorised under the RMA by way of designations (covering the 19 shaft and construction sites) and a suite of resource consents (mostly regional) which provide for the sub-surface construction and operation of the tunnel as well as the associated regional approvals for both construction and operation which are beyond the scope of a designation.

Key milestones in the approval process for the Central Interceptor were as follows:

8 October 2012	Resource consent application and NoR publicly notified.
3 December 2012	Public submissions closed.
29 July - 13 August 2013	Hearing on NoRs and Resource Consent Applications.
26 November 2013	Commissioners Decision recommends NoRs are confirmed (with modification) and Resource Consents Granted.
23 January 2014	Watercare confirms NoRs with recommended modifications.
10 February 2014	Decision notified.
10 February – 3 March 2014	Appeals on decision to the Environment Court.
30 September 2015	Final consent order issued by the Environment Court.
22 April 2017	New consent granted to correct the duration date for the construction related discharges of contaminants to land and/or water to a period of 15 years (Consent Number: 52303).

The following sections provide details of the corresponding designation and suite of resource consents.

1.2.1 Existing Central Interceptor Designations

The Central Interceptor designations cover 19 surface sites which are located along the alignment (see Figure 1-2). The purpose of the designations is for “the construction, operation, and maintenance of wastewater infrastructure”. This includes permanent works as well as temporary construction works. Vertically, the designations extend to include works both above and below ground.

The designation area at each of the surface sites for the construction phase of the project allows for the following:

- Refinements to the site layout, alignment and design as a result of the detailed design process;
- Changes in site layout and alignment required during construction – e.g. the discovery of otherwise unknown services or other underground features, or unexpected ground conditions;
- Accommodation of all of the required physical works including sewer connections, shafts, air treatment facilities, connection and control chambers etc;
- Services relocation, temporary traffic management and all associated construction activities;
- Temporary construction access roads; and
- Site establishment activities, including storage of plant, equipment and materials; crane set-up; site offices; erosion and sediment control; dewatering and groundwater treatment facilities; machinery working and safety areas; and temporary diversion of pedestrian and vehicular access.

On completion of construction, the extent of the designations is to be reviewed. Areas of the designations not required for permanent works, inspection, or maintenance activities are to be removed where it is reasonable to do so, in accordance with s182 of the RMA.

1.2.2 Existing Consents and Permits

To supplement the designations Watercare holds a suite of resource consents which provide for those activities which are outside the designation (most notably the majority of the length of the tunnel and link sewers) and those activities at the surface sites which are beyond the scope of a designation (regional activities). The resource consents authorise the following key activities associated with the Central Interceptor:

- Earthworks for tunnels outside the designation (District)
- Land subject to instability (District)
- Construction of network utilities outside the designation (District)
- Tree removal outside the designation (District)
- Disturbance of contaminated sites (NES[2] and Regional)
- Earthworks (Regional)
- Taking and diverting groundwater during construction (Regional)
- Discharge of stormwater from permanent works (Regional)
- Discharge of stormwater during construction works(Regional)
- Discharges from tunnels and pump station at drop shafts and odour treatment facilities (Regional)
- Erection, occupation and use of tunnel and associated disturbance within the coastal environment (Regional)
- Construction, occupation, use and removal of temporary construction platform and associated disturbance within the coastal environment (Regional)
- Erection, occupation and use of permanent seawall and associated disturbance within the coastal environment (Regional)
- Discharge of stormwater from PS 23 (Frederick Street) site during construction and from permanent works (including from temporary construction platform during construction) (Regional)
- Removal of mangroves and disturbance of CMA associated with construction and removal of temporary construction platform (Regional)
- Erection, occupation and use of emergency pressure relief pipeline outlet structure at Mangere Pump Station and associated disturbance within the coastal environment (Regional)
- Removal of mangroves and disturbance of CMA associated with construction of EPR structure (Regional)
- Discharge of stormwater during construction and from permanent works (Regional)
- Discharge from emergency pressure relief structure at Mangere Pump Station (Regional)

The associated consents and permits providing for these activities is summarised in Table 1-1. A single set of conditions was issued for these consents by the Environment Court in July 2016. The table also identifies the relevant conditions in relation to each of the individual consents/permits. A full set of the conditions relating to these consents is provided in Appendix A.

[2] National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health 2012

Table 1-1Central Interceptor Resource Consents as issued by the Environment Court in July 2016

Consent Reference	Consent/Permit	Relevant Conditions
Auckland Council District Plan (Auckland City Isthmus Section)		
R/LUC/2012/2846	Construction of tunnel (earthworks and construction beneath land noted as being unstable)	1.1 – 1.34
Auckland Council District Plan (Manukau Section)		
PRC40962	Construction of tunnel and Link Sewer 4 (by network utility service, beneath road and earthworks beyond permitted levels); removal of existing pump station structure at Kiwi Esplanade Reserve. Tree removal / works in dripline / rootzone of trees associated with removal of existing pump station structure and construction of Link Sewer 4.	1.1- 1.34, 2.1 - 2.2
NES for Assessing and Managing Contaminants in Soil to Protect Human Health		
R/LUC/2012/2846/1 and PRC40963	Disturbance of contaminated sites (all surface construction sites)	1.1- 1.34, 8.1 – 8.23
Auckland Council Regional Plan (Sediment Control)		
40834	Earthworks above permitted levels (all surface construction sites)	1.1- 1.34, 3.1 – 3.18
Auckland Council Regional Plan (Air Land & Water)		
40836	Taking / diverting groundwater due to construction and dewatering of tunnels and shafts (Project-wide)	1.1 – 1.34, 4.1 – 4.34
40837	Discharge of stormwater from permanent works with impervious surfaces over 1,000m² (Western Springs)	1.1 and 1.5, 6.1 – 6.15
40838	Discharge of stormwater from permanent works with impervious surfaces over 1,000m² (Haverstock Road)	1.1 and 1.5, 6.1 – 6.15
40839	Discharge of stormwater from permanent works with impervious surfaces over 1000m² (PS25 Miranda)	1.1 and 1.5, 6.1 – 6.16
40840	Discharge of stormwater from permanent works with impervious surfaces over 5,000m² (May Road)	1.1 and 1.5, 6.1 – 6.15
40841	Discharge of stormwater during construction works (Project-wide)	1.1 – 1.34, 5.1 – 5.3

40835	Construction site related activities, e.g. tunnel dewatering, wheel wash, application of grout and concrete to land etc (Project-wide)	1.1 – 1.34, 3.1 – 3.18
40842	Discharges to air from tunnels and pump station at drop shafts and odour treatment facilities (Project-wide)	1.1 and 1.5, 7.1 – 7.11
40843	Disturbance of contaminated sites (Project-wide)	1.1 – 1.34, 8.1 – 8.23
Auckland Council Regional Plan (Coastal)		
40844	Works in the CMA – including all construction activities, occupation and use of tunnel; temporary construction platform and permanent sea wall structure at PS 23; and EPR structure adjacent to Mangere Pump Station (PS23, Kiwi Esplanade, Mangere Pump Station).	1.1 – 1.34, 9.1 – 9.18
40845		
40846		
40848	Discharges to CMA – stormwater discharges from construction works at PS23, Kiwi Esplanade and Mangere Pump Station.	1.1 – 1.34, 5.1 – 5.3
40849	Discharges to CMA – stormwater discharges from construction and permanent works at PS23 and Mangere Pump Station.	1.1 and 1.5, 6.1 – 6.15
40850	Discharges to CMA – overflow discharge from EPR structure at Mangere Pump Station.	1.1 and 1.5, 10.1 – 10.10
Auckland Unitary Plan Operative in Part		
P52303	Construction site related activities, e.g. tunnel dewatering, wheel wash, application of grout and concrete to land etc (Project-wide)	TBC

1.2.3 Lapse Date

Construction works are expected to commence around 2019 and be complete in 2025. However, the project is large and complex and flexibility is required. As a precaution, an extended lapse period of fifteen years from the date of granting of the resource consents (refer s125 RMA) applies.

1.2.4 Other consents and approvals

Watercare recognises that there are a number of additional approvals which are required in order to undertake the Central Interceptor works which are in addition to the existing designation and resource consents. Details of such approvals are provided in the following sub-sections.

1.2.4.1 Outline Plan of Works

Section 176A of the RMA requires the submission of an Outline Plan of Works (OPW) and sets out the requirements for submission of an OPW for works to be constructed on designated land. OPWs will be prepared as appropriate in accordance with s176A (3) of the RMA prior to the commencement of construction.

1.2.4.2 Requiring authority approvals

Some of the construction sites are subject to designations of other Requiring Authorities. Where Requiring Authority approvals are required under sections 176 (1)(b) and 177 (1) of the RMA, these will be sought prior to construction.

1.2.4.3 Other approvals

Watercare intends to apply for a general authority under s44 of the Heritage New Zealand Pouhere Taonga Act 2014 to destroy, damage or modify archaeological sites. Although no known archaeological sites are expected to be affected by the works, this authority will be sought as a precaution in case any unrecorded subsurface remains are exposed during earthworks.

Other approvals or agreements are, or may be, required under the Reserves Act 1977, Public Works Act 1981 and Building Act 2004. Any required processes under these Acts will occur in parallel with the statutory processes under the RMA or at a later date as appropriate. Watercare will follow the process under the Local Government (Auckland Council) Act 2009 and the Local Government Act 2002 for undertaking works on private land.

At a number of sites works will occur in the road or rail reserve. Corridor Access Request (CAR) approvals will be required from Auckland Transport, NZTA and Kiwi Rail for works in roads, motorways, and rail corridors.

1.3 Scope of Application

As noted previously, this application is specific to those sections of the alignment of the main tunnel and Link Sewer C which are outside the previously consented corridor. Accordingly, the scope of this application is limited to these sections of the alignment (as detailed in Section 1.2.2 the remainder of the alignment has existing approvals). In all other respects, the project is authorised by the existing suite of RMA approvals.

The horizontal alignment and vertical cross-section of the detailed design alignment is provided in drawings 2012064.020 to 2012064.033 (Appendix B). Those areas of the revised alignment which are outside the consented corridor are identified in red within these drawings.

Deviation of the tunnel outside the consented alignment occurs in three discrete locations. The location and nature of each of these deviations is outlined as follows:

Western Springs Deviation (Ch 22+480 – 22+900) - The detailed design tunnel alignment passes approximately 40m west of the consented corridor under the motorway and gradually returns to the consented corridor at the north eastern boundary of the MOTAT site. The length of this deviation is

approximately 420m. The depth of the alignment along this section remains the same as that of the consented corridor (approximately 25-30m below surface level).

May Road Deviation (Ch 16+700 to Ch 17+650) - The detailed design tunnel alignment has moved horizontally outside the consented boundary at the May Rd site. The maximum horizontal variance is approximately 75m to the south-west of the consented corridor (circa Ch 17+350). The depth of the alignment along this section remains the same as that of the consented corridor (approximately 65m below surface level).

Link Sewer C Deviation - The revised alignment developed during detailed design is:

- vertically some 14m higher than the consented corridor. As a result the revised depth of the alignment along this section will range from approximately 10-70m below surface level. The shallowest section of the alignment is from CH 0 (PS25) to Ch300 (Miranda Reserve). Beyond there the surface level quickly rises above the tunnel.

- horizontally outside the consented corridor from Ch 0 (PS25) to Ch 100, and from Ch 750 to Ch 3190 (May Road).

Details for the properties directly above the deviations are provided in Appendix C.

1.4 Reasons for Consent

As specified previously, this application is specific to those sections of the tunnel alignment[3] which are outside the consented corridor. Table 1-2 below specifies the reasons for consent which are associated with these sections.

It is noted that there no relevant appeals to the zones, precincts, controls or overlays applying to land along any of the deviation alignment, accordingly all applicable AUP(OiP) provisions are considered operative in relation to the proposal.

Overall, resource consent is being sought as a **Discretionary Activity**[4]. A full rule assessment of those sections of the tunnel alignment which are outside the consented corridor has been prepared in accordance with Schedule 4(3)(a) of the RMA and is provided in Appendix D.

For the avoidance of doubt, Watercare is seeking all necessary consents under the relevant rules (whether specified or not) in relation to those sections of the tunnel alignment which are outside the consented corridor.

[3] The 'tunnel alignment' refers to both the main tunnel and Link Sewer C tunnel.
[4] Although the application could have been unbundled and sought as a Restricted Discretionary Activity in all respects expect the tunnelling works associated with the realignment of the tunnel around Western Springs where it traverses beneath a Site and Place of Significance to Mana Whenua (and is classified a Discretionary Activity under Rule E26.6..3.1 [A117]), for simplicity the *whole application* has been bundled as a Discretionary Activity and a comprehensive AEE provided.

Table 1-2 Central Interceptor Tunnel Alignment Deviations – Reasons for Consent

Activity	Description	Rule	Activity Status
Auckland Unitary Plan Operative in Part (AUP(OiP))			
Dewatering or groundwater level control associated with a groundwater diversion.	Dewatering or groundwater level control is required during construction in association with the diversion of groundwater (see Rule E7.4.1(A28) below).	E7.4.1 (A20)	**Restricted Discretionary Activity**
Diversion of groundwater caused by any excavation.	As the tunnel (both the main tunnel and Link Sewer C tunnel) will have an external diameter of more than 1.5m the proposed diversion of groundwater associated with excavation does not comply with the Standards E7.6.1.10	E7.4.1 (A28)	**Restricted Discretionary Activity**
Earthworks from $10m^2$ to $2500m^2$ and from $5m^3$ to $2500m^3$ within an SEA.	The re-alignment of the tunnel around Western Springs traverses beneath the Significant Ecological Areas Overlay - SEA_T_5288, Terrestrial. The volume of earthworks is expected to be in excess of $5m^3$ (but not exceeding $2500m^3$ at any one time).	E26.6.3.1 (A117)	**Restricted Discretionary Activity**
Earthworks from $10m^2$ to $2500m^2$ and from $5m^3$ to $2500m^3$ within a High Natural Character overlay.	The re-alignment of the tunnel around Western Springs traverses beneath the Outstanding Natural Features Overlay [rcp/dp] - ID 247, Western Springs and lava outcrops. The volume of earthworks is expected to be in excess of $5m^3$ (but not exceeding $2500m^3$ at any one time).	E26.6.3.1 (A117)	**Restricted Discretionary Activity**
Earthworks from $10m^2$ to $2500m^2$ and from $5m^3$ to $2500m^3$ within a Sites and places of significance to Mana Whenua.	The re-alignment of the tunnel around Western Springs traverses beneath the Sites and Places of Significance to Mana Whenua Overlay [rcp/dp] - 8. The volume of earthworks is expected to be in excess of $5m^3$ (but not exceeding $2500m^3$ at any one time).	E26.6.3.1 (A117)	**Discretionary Activity**

Note: *the thresholds for network utilities apply to the area and volume of work being undertaken at any one time at a particular location such that, where practicable, progressive closure and stabilisation of works shall be adopted to maintain the activity within the thresholds.*

2. Existing Environment

The following section provides a description of the existing environment as it relates to those sections of the tunnel alignment which are outside the consented corridor. For further detail on the wider project refer to 'Central Interceptor Main Project Works AEE', Watercare 2012.

2.1 Land Use

Western Springs Deviation – Land use above the Western Springs Deviation is comprised of MOTAT, Western Springs Park, strategic transport corridor (comprised of Great North Road and State Highway 16 North-Western Motorway and a small section of the Chamberlain Park Golf Course).

May Road Deviation – Land use above the May Road Deviation is comprised of suburban residential sites and a number of local parks. These parks include Freeland, and Plantation Reserves. Directly north of the May Road Deviation is an area of light industrial land use which is typified by warehousing and distribution centres and small to medium scale manufacturing.

Link Sewer C Deviation – Table 2-1 provides a breakdown of the land uses associated with each section of Link Sewer C. As the majority of Link Sewer C is within the horizontal plane of the consented corridor, the land use above the tunnel remains the same as that described in the 'Central Interceptor Main Project Works AEE', Watercare 2012 for the original application. Land use above the horizontal deviations to Link Sewer C around PS25 and May Road are generally the same as that above the consented corridor.

Table 2-1 Land Use Description - Link Sewer C Deviation

Section	Approx. Length	Land Use Description
PS 25 to Miranda Reserve - From PS 25 at the western end of Miranda Reserve east to the eastern end of Miranda Reserve.	0.3 km	Land use above this section is comprised of reserve land (Miranda Reserve) and a small number of residential suburban properties. Land use in the surrounding area is characterised as residential suburban.
Miranda Reserve to Whitney St - From eastern end of Miranda Reserve east to Whitney St.	0.6 km	Land use above these sections is comprised of residential suburban properties. Land use in the surrounding area is characterised as residential suburban.
Whitney St to Dundale Ave - From residential/ retail site at Whitney St east to Dundale Ave.	0.6 km	
Dundale Ave to Haycock Ave - From grassed area of road reserve on Dundale Ave south east to Haycock Ave.	0.7 km	Land use above these sections is comprised of residential suburban properties and school (Marshall Laing School). Land use in the surrounding area is characterised as residential suburban.
Haycock Ave to May Road - From residential site on Haycock Ave north east to undeveloped commercial property at May Road in Mount Roskill.	0.9 km	Land use above these sections is comprised of residential suburban properties, reserve land (Nirvana Park), and electrical substation. Land use in the surrounding area is characterised as residential suburban around the majority of this section with an area of light industrial land directly

		north of the May Road site.

2.2 Infrastructure and services

Key infrastructure in the area above the tunnel deviations is described as follows:

- The Western Springs Deviation passes beneath State Highway 16: North-Western Motorway; and
- There are overhead transmission lines in the vicinity of the PS 23 (Frederick Street), PS 25 (Miranda Reserve) and Miranda Reserve sites.

The key infrastructure identified above is also located above the consented corridor.

Key infrastructure is shown on Figure 2-1.

2.3 Geology

Ground and groundwater conditions, geological sections and derivation of geotechnical material parameters expected to be encountered in the project area are discussed in detail in the Geotechnical Interpretive Report (Appendix E). These conditions are generally the same as those identified along the consented corridor (as demonstrated in the geological long sections provided in Appendix B). The following sections provide an overview of these features.

2.3.1 Geological Units

A geological long section, showing the geology along the tunnel alignments, is provided in the drawing set Appendix B (DWG. 2012064.020 - .022). The two geological units of significance in relation to the deviations are described in summary below:

2.3.1.1 East Coast Bays Formation Rock (ECBF)

The ECBF rock is typically extremely weak to weak interbedded siltstones and sandstones. It underlies the entire route. The ECBF rock is generally volcanic-poor however it includes mixed volcanic-rich beds as well.

In some areas ECBF is more fractured than others. Generally ECBF close to explosion craters is expected to be more significantly fractured than material further away. However, route investigations to date close to Mount Albert and Mount Roskill have not found this to be the case.

2.3.1.2 Undifferentiated Tauranga Group Alluvium (TGA)

On the Auckland Isthmus the alluvium is typically derived directly from the weathering and erosion of ECBF. The alluvium typically consists of silts or clays with variable sand content.

The Puketoka Formation sediments are generally alluvial to shallow marine in origin. They occur extensively throughout the low-lying areas adjacent to the Waitemata and Manukau Harbours. They include a wide variety of material types ranging from clays to gravels, though the upper Puketoka Formation is generally silts and clays with variable sand content.

2.3.2 Groundwater Regime

The Auckland Isthmus is characterised by perched transient groundwater levels closer to the surface and a deeper more stable regional groundwater level within the ECBF. Additional groundwater measurements along the route during the detailed design investigations of 2015/2016 indicate that conditions are broadly hydrostatic

in most areas. The ECBF regional groundwater level typically reflects surface topography (in a subdued manner), with levels increasing at gradients in the order of 2-5% from the coast.

Within the ridges, groundwater seepage is typically dominated by vertical seepage patterns (including cascading perched systems), percolating to the deeper regional water table. In gullies seepage from ECBF rock supports stream base flow, or where historic gullies have been in-filled by more recent alluvial or volcanic deposits, groundwater concentrates in directional seepage along the paleo-valleys.

Basalt deposits form surface aquifers within ancient gully systems and are typically permanently saturated only in the lower zones near the coast.

The two geological units of significance in relation to the deviations are described in summary below in terms of their hydrogeological properties:

2.3.2.1 ECBF

This group forms the hydrogeological basement formation in the Auckland area, and has influences on groundwater flows in the Kaawa Formation. Generally, the permeability is considered to be low to very low (averaging 2.7 x 10-2 m/d) (Viljevac 2002). Groundwater movement is likely to be through more permeable beds or distinct fractured zones (such as higher porosity fractured sandstone).

2.3.2.2 TGA

In the Auckland and Manukau areas, this formation comprises a mixture of laterally discontinuous sands, silts and clays with various amounts of pumiceous and organic material. Consequently, groundwater yields from this formation can vary depending on location, heterogeneity and permeability of the aquifer. Generally the Tauranga group are considered to be a regional aquitard confining the Kaawa sediments.

2.3.3 Existing Groundwater Resource

There is a surface aquifer from Western Springs to Mount Albert. Aquifer uses include groundwater for potable supply, groundwater for industrial use, disposal of stormwater and springs for recreational use. Within 280 m of the tunnel alignment there are four consented groundwater takes, for irrigation of golf courses (Auckland Council and Akarana Golf Club), irrigation of a garden centre (Kings Plant Barn), and irrigation, washing and general use at Auckland Zoo.

2.4 Ecology

The deviation to the main tunnel alignment around Western Springs will re-align the tunnel to the north-east of the consented corridor. The new alignment passes beneath a small section of Western Springs Park, while the original alignment was completely beneath MOTAT along this section of the alignment. Western Springs Park is identified as a Significant Ecological Area (SEA) (SEA_T_5288, Terrestrial). The factors attributed to the SEA status are defined as 'Threat Status and Rarity' and 'Uniqueness or Distinctiveness' and are detailed further below in Table 6-1.

Table 2-2 SEA (SEA_T_5288) Factors for assessing ecological value

Threat Status and Rarity	**Sub-factors:** (a) It is an indigenous habitat, community or ecosystem that occurs naturally in Auckland and has been assessed (using the IUCN threat classification system) to be threatened, based on evidence and expert advice (including Holdaway et al. Status assessment of NZ naturally uncommon ecosystems3). (b) It is a habitat that supports occurrences of a plant, animal or fungi that has been assessed by the Department of Conservation and determined to have a national

	conservation status of threatened or at risk; or (i) it is assessed as having a regional threatened conservation status including Regionally Critical, Endangered and Vulnerable and Serious and Gradual Decline. (c) It is indigenous vegetation that occurs in Land Environments New Zealand Category IV where less than 20% remains. (d) It is any indigenous vegetation or habitat of indigenous fauna that occurs within an indigenous wetland or dune ecosystem. (e) It is a habitat that supports an occurrence of a plant, animal or fungi that is locally rare; or (i) it has been assessed by the Department of Conservation and determined to have a national conservation status of Naturally Uncommon, Range Restricted or Relict.
Uniqueness or Distinctiveness	**Sub-factors:** (a) It is habitat for a plant, animal or fungi that is endemic to the Auckland region (i.e. not found anywhere else). (b) It is an indigenous ecosystem that is endemic to the Auckland region or supports ecological assemblages, structural forms or unusual combinations of species that are endemic to the Auckland region. (c) It is an indigenous ecosystem or a habitat that supports occurrences of a plant, animal or fungi that are near-endemic (i.e., where the only other occurrence(s) is within 100km of the council boundary). (d) It is a habitat that supports occurrences of a plant, animal or fungi that is the type locality for that taxon. (e) It is important as an intact sequence or outstanding condition in the region. (f) It is a habitat that supports occurrences of a plant, animal or fungi that is the largest specimen or largest population of the indigenous species in Auckland or New Zealand. (g) It is a habitat that supports occurrences of a plant, animal or fungi that are at (or near) their national distributional limit.

2.5 Outstanding Natural Features

The Western Spring Deviation passes beneath two identified outstanding features. The following sections provide a summary of those features.

2.5.1 Western Springs and lava outcrops

As the alignment which is associated with the Western Springs Deviation is further west than the consented corridor, the new alignment passes beneath the periphery of Western Springs Lake and the associated lava outcrops. Western Springs contains exposures of the natural edge of Auckland's longest lava flow, with excellent examples of columnar jointing, vesicles and small lava tongues, some with pahoehoe surfaces. Natural springs flow from cracks in the lava flow. These features were much more common prior to the urban development of Auckland.

Feature Type: *Small landforms or other features that could be damaged or destroyed by relatively small-scale land disturbance or constructions.*

Key assessment criteria which have been used to define this feature under the AUP(OiP) are as follows:

(a) the extent to which the landform, feature or geological site contributes to the understanding of the geology or evolution of the biota in the region, New Zealand or the earth, including type localities of rock formations, minerals and fossils;

(c) the extent to which the feature is an outstanding representative example of the diversity of Auckland's natural landforms and geological features;

(d) the extent to which the landform, geological feature or site is part of a recognisable group of features;

(e) the extent to which the landform, geological feature or site contributes to the value of the wider landscape;

(g) the potential value of the feature or site for public education;

(i) the state of preservation of the feature or site;

2.5.2 North-west Motorway lava flow, Western Springs

The alignment of the Western Springs Deviation passes beneath the North-west Motorway lava flow, as does that of the consented corridor. This 500m section of motorway cuttings is one of best and most commonly seen cuttings through a basalt lava flow in Auckland. It provides good visual evidence of the route of Auckland's longest lava flow, from Mt St John to Meola Reef via Western Springs. It also contains excellent examples of columnar jointing.

Feature Type: *Natural or man-made exposures that are sufficiently large and robust that small-scale land disturbance or rock sampling will have no significant impact, such as coastal cliffs.*

Key assessment criteria which have been used to define this feature under the AUP(OiP) are as follows:

(a) the extent to which the landform, feature or geological site contributes to the understanding of the geology or evolution of the biota in the region, New Zealand or the earth, including type localities of rock formations, minerals and fossils;

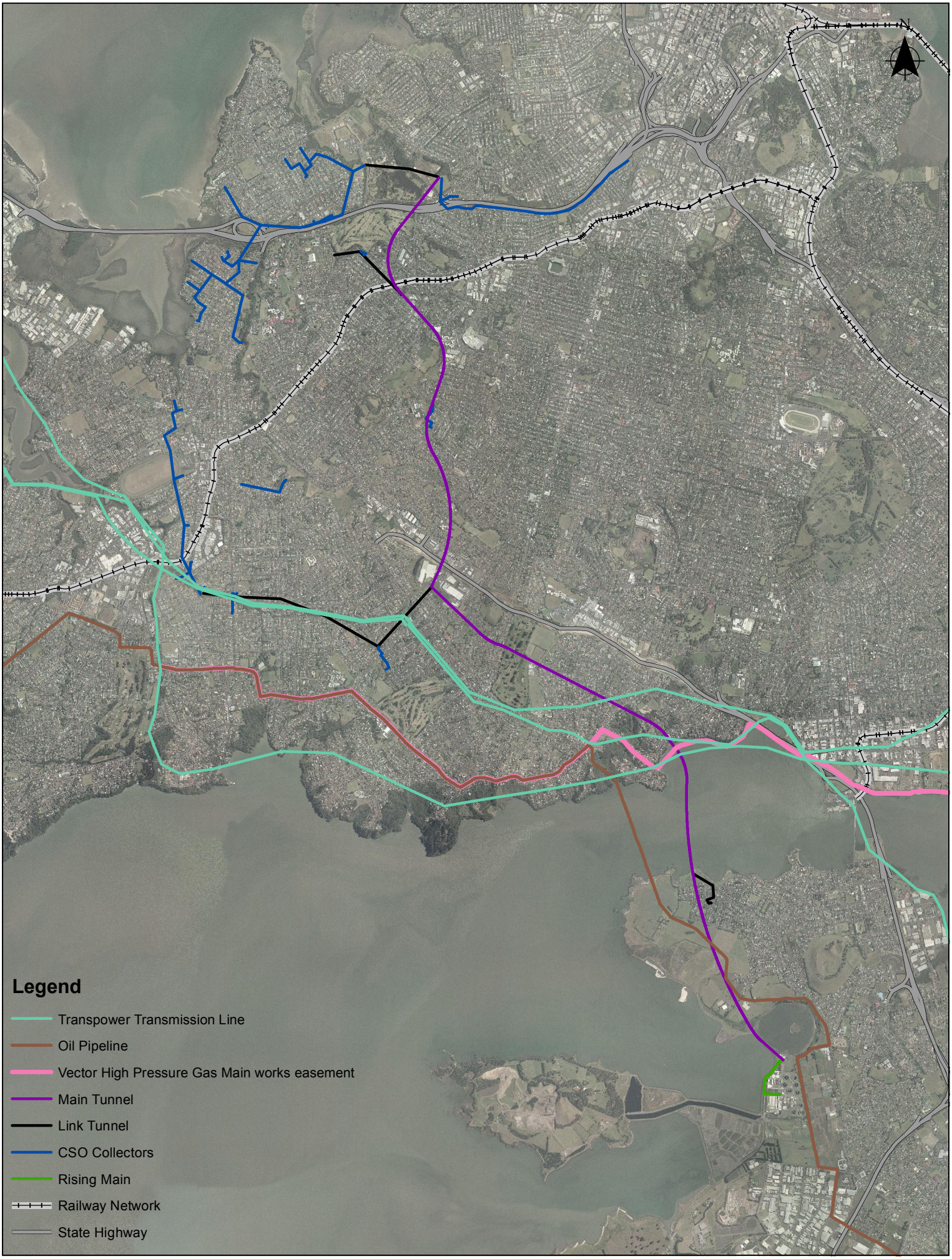
(c) the extent to which the feature is an outstanding representative example of the diversity of Auckland's natural landforms and geological features;

(d) the extent to which the landform, geological feature or site is part of a recognisable group of features;

(g) the potential value of the feature or site for public education;

2.6 Sites and Places of Significance to Mana Whenua

Western Springs main lake (Wai Orea) is an identified place of significance to Mana Whenua. It is understood that the lake has significance to Mana Whenua due to its historic prominence as an eeling location and the more intrinsic values associated with the freshwater spring.



Path: P:\05\38 - Central Interceptor\04 Drawings\GIS\3_Maps\08 Consenting\AEE AUGUST 2012\60102004_08_010_01 CI and Major Infrastructure.mxd

Notes:
This map is confidential and shall only be used for the purpose of this project.
Map features depicted in terms of NZTM projection.

Data Sources:
NZ Topographical Features - LINZ NZ National Topo Dataset 2010
Cadastral Boundaries - LINZ NZ Cadastral Dataset 2011

Printed	2/08/2012		
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Designed	P.Fearon	Drawn	P.Fearon
Checked	N.Beardsworth	Checked	N.Beardsworth

Rev	Description	Date
A	For Information	

Primary Map No. 60102004_08_010_01

CENTRAL INTERCEPTOR
and Major Infrastructure

AEE March 2017

waterCare services limited

Map No: 60102004_08_010_01

Scale: 1:40,000 (A4 size)

0 250 500 1,000 1,500 Meters

Drawing No: FIGURE 2.1

Rev: A

2.7 Zoning and Planning Limitations

Table 2-3 provides detail of the relevant zones, precincts, controls and overlays in relation to each of the deviation alignments. Table 2-4 provides detail of the relevant existing designations in relation to each of the deviation alignments.

2.7.1 AUP(OiP) Appeals

Parts of the Link Sewer C deviation alignment are located on land that is subject to the National Grid Corridor Overlay which is subject to the following appeals:

- ENV-2016-AKL-000218, National Grid Corridor Overlay - seeking reinstatement of management layers,
- CIV-2016-404-002330, National Grid Corridor Overlay - Seeking reinstatement of management layers.[5]

These appeals are specific to the National Grid Corridor Overlay. This overlay has no bearing on the ability to construct or operate the Central Interceptor project works that are the subject of this application. There no other appeals to the zones, precincts, controls or overlays applying to land along any of the deviation alignment, accordingly all other applicable AUP(OiP) provisions are considered operative in relation to the proposal.

[5] An interim decision has been issued by the High Court in relation to this appeal (CIV-2016-404-002330 [2017] NZHC 281).

Table 2-3 AUP(OiP) Zoning, Precincts, Overlays and Controls

Zoning	Precinct	Overlays	Controls
Western Springs Deviation			
Special Purpose - Major Recreation Facility Zone Water Open Space - Informal Recreation Zone Open Space - Sport and Active Recreation Zone Road Strategic Transport Corridor Zone	MOTAT, Precinct	Quality-Sensitive Aquifer Management Areas Overlay [rp] - Western Springs Volcanic Aquifer Significant Ecological Areas Overlay - SEA_T_5288, Terrestrial Lake Management Areas Overlay (Natural and Urban Lake) [rp] - Lake Western Springs, Urban Wetland Management Areas Overlay [rp] - 814, Western Springs Outstanding Natural Features Overlay [rcp/dp] - ID 247, Western Springs and lava outcrops Outstanding Natural Features Overlay [rcp/dp] - ID 132, North-west Motorway lava flow, Western Springs Sites and Places of Significance to Mana Whenua Overlay [rcp/dp] - 8	Macroinvertebrate Community Index [rcp/dp] – Urban Arterial Roads
May Road Deviation			
Business - Light Industry Zone Residential - Mixed Housing Urban Zone Open Space - Informal Recreation Zone	-	Quality-Sensitive Aquifer Management Areas Overlay [rp] - Auckland Isthmus Volcanic Regionally Significant Volcanic Viewshafts And Height Sensitive Areas Overlay [rcp/dp] - Mount Roskill, Height Sensitive Areas National Grid Corridor Overlay - National Grid Corridor	Arterial Roads Macroinvertebrate Community Index [rcp/dp] - Urban

Road			
Link Sewer C Deviation			
Business - Light Industry Zone Residential - Mixed Housing Urban Zone Residential - Mixed Housing Suburban Zone Open Space - Informal Recreation Zone Open Space - Conservation Zone Business - Neighbourhood Centre Zone Road	-	National Grid Corridor Overlay - National Grid Corridor Regionally Significant Volcanic Viewshafts And Height Sensitive Areas Overlay [rcp/dp] - A3, Mount Albert, Viewshafts Significant Ecological Areas Overlay - SEA_T_6011, Terrestrial	Macroinvertebrate Community Index [rcp/dp] – Urban Macroinvertebrate Community Index [rcp/dp] - Native

Table 2-4 AUP(OiP) Designations

Designation	Reference	Requiring Authority
Western Springs Deviation		
State Highway 1: To undertake maintenance, operation, use and improvement to the State Highway network	6718	New Zealand Transport Agency
State Highway 16 - Waterview Connection to Western Springs	6723	New Zealand Transport Agency
May Road Deviation		
Construction, operation and maintenance of wastewater infrastructure	9466	Watercare Services Ltd
Link Sewer C Deviation		
Educational purposes - primary school years 0-8 (Marshall Laing School)	4739	Minister of Education
Electricity transmission	8503	Transpower New Zealand Ltd
Wastewater Purposes - Trunk Pump Station	9436	Watercare Services Ltd
Construction, operation and maintenance of wastewater infrastructure	9466	Watercare Services Ltd

3. Description of Works

The following sections provide detail of the tunnel construction and operation. As this application is specific to the tunnel deviations the description of works provided in this application has been limited to the works directly involved with the construction of these sections. For further detail on the wider project methodology please refer to the 'Central Interceptor Main Project Works AEE', Watercare 2012.

For the avoidance of doubt, the methodology outlined in this application is consistent with the consented methodology for the wider project.

3.1 Design

The overall design proposed for the main project works is a main tunnel that intercepts dry and wet weather flows from the wastewater network between Western Springs and Mangere Bridge. The main tunnel will convey the flows by gravity to the Mangere WWTP where a pump station will then convey the wastewater via rising mains to be treated at the WWTP. Link sewers and local pipelines will connect the existing network to the main tunnel at key locations.

There are 16[6] surface construction sites along the main tunnel and link sewer alignments (refer to Figure 1-2). These sites are located where connections to the existing or proposed network will occur, where a construction base is required for tunnel construction, and/or where permanent access is required for maintenance/inspection purposes. Most sites are required for all three purposes.

3.1.1 Size and Shape

A range of tunnel sizes have been considered for the main tunnel and link sewer tunnels, taking account of hydraulic, operational and economic factors. An internal diameter of 4.5 m is planned for the main tunnel to address future wastewater conveyance capacity needs and provide sufficient storage for an appropriate level of overflow mitigation.

An internal diameter of 2.1 m is planned for the Link Sewer C tunnel.

The gradient planned for the main tunnel is 1 in 1000 from Western Springs to to Mangere WWTP. The gradient of the link sewer tunnels varies. The Link Sewer C gradient ranges from 1 in 550 to 1 in 1000.

3.1.2 Liner

Both the main tunnel and the Link Sewer C tunnels will be fully lined.

A gasketed, precast concrete segment lining system is specified for the main tunnel. This full-perimeter lining system, installed within a Tunnel Boring Machine (TBM) as it moves forward in the main tunnel, will support the ground during construction, minimise groundwater inflows, and maintain the safety of the excavation. Additional corrosion protection will also be installed at particular points where long term corrosion is anticipated to be an issue.

Link Sewer C is planned to consist of either Glassfibre reinforced polyester or precast reinforced concrete jacking pipe.

[6] The existing consents provide for 19 construction sites. However the detailed design no longer requires the construction of Link Sewer A therefore the Motions Road and Western Springs Depot sites are no longer required for this phase of works. Furthermore detailed design provides for a single drive from the Mangere Pump Station to PS23, avoiding the necessity for the Kiwi Esplanade site.

3.1.3 Tunnel Depth and Horizontal Alignment

Drawings 2012064.020 to 2012064.022 (Appendix B) show a long section of the main tunnel and link tunnels. The tunnel alignment and horizontal corridor is shown on Figure 1-2 and 2012064.025 to 2012064.033 (Appendix B).

3.2 Construction

The main tunnel is planned to be constructed using a TBM with segmental concrete lining. An example of a TBM is provided in Figure 3-1. Three primary construction sites will be required along the length of the main tunnel for the launch/retrieval of the TBM. Key construction access sites are also located along the length of the main tunnel to provide access to the TBM during construction.

Figure 3-1 Tunnel Boring Machine used for Project Hobson

Link Sewer C is expected to be micro tunnelled and the construction sites along the length of the tunnels will provide for the launch/retrieval of the Micro Tunnel Boring Machine (MTBM).

The detailed construction method for the works will not be known until a construction contract has been awarded by Watercare. At that time a detailed Construction Management Plan (CMP) will be prepared to provide additional details on the proposed works and management controls. The following sections broadly set out construction issues and provide a framework for the development of management controls for the construction phase of the main project works.

3.2.1 Main Tunnel Construction

The main tunnel is likely to be constructed in two drives:

- Main Tunnel South: a length of 7.8 km between Mangere WWTP and May Road.
- Main Tunnel North: a length of 5.5 km between May Road and Western Springs

The direction of each drive shall be confirmed by the contractor.

Excavation of the main tunnel is specified to be undertaken using a pressurised face TBM (e.g. Earth Pressure Balance (EPB), slurry TBM) to manage risks associated with ground conditions. This type of machine has recently been successfully used in Auckland in similar ground conditions on Project Hobson, Rosedale Outfall and Waterview Connection.

A cutterhead will cut the tunnel profile and excavated material will be transported from the TBM to the shaft using spoil cars, slurry pipes, or a horizontal continuous conveyor belt. Spoil will be removed from the construction shaft via a vertical shaft conveyor or a hoisting system which lifts spoil skips with a crawler or gantry type crane. Several cranes may be required on site at any one time.

The tunnel liner segments are brought into the tunnel via the shaft and transported to the TBM. The segmental precast concrete tunnel liner is brought in by the TBM and progressively placed behind the machine as the TBM moves forward. Tunnel segments will be stored on site, but the manufacture and bulk storage of segments will be at a suitable facility off site.

Approved ground conditioners may be required in order to make excavated material workable and easily removed. Water may also be added to form a “slurry” to aid in cutting.

The EPB TBM maintains a regulated pressure at the face of the excavation. It has the advantage of being able to be operated in “open” (without face pressure) or “closed” (with face pressure) mode depending on the ground conditions. Slurry machines always operate in closed mode. Face pressure is typically applied to stabilise the excavation face in soft ground, or in cohesionless ground that has the potential to flow due to the presence of groundwater. Face pressure can also be applied to balance or partially balance groundwater pressure to prevent or reduce groundwater flows into the excavated face.

Tunnelling operations will occur 24 hours a day 7 days a week. The TBM is expected to advance in the order of 13 to 20 m per day but a conservative average of 12 m per day has been assumed. Actual tunnelling progress will vary from day to day and week to week.

At the end of the tunnel drive the TBM will be retrieved from the shaft.

3.2.2 Link Sewer C Construction

Link Sewer C will likely be constructed using micro tunnelling/pipejacking methods. The micro tunnelling/pipejacking method involves pushing a MTBM forward from a launch/drive shaft to a reception shaft. The pipe stockpile, cranes, and any support equipment and stores will be located at the launch shaft construction site. The reception shaft construction site only needs to provide access for a crane to retrieve the cutter unit or shield.

The MTBM is inserted first, and then pushed forward by hydraulic rams that push off the shaft wall or a reaction pad. At the end of each forward stroke a new pipe is inserted and the process repeated until the cutting unit or shield is retrieved at the reception shaft. Excavated material is transported to the shaft using either spoil cars, a horizontal continuous conveyor belt or as a slurry and removed from the construction shaft via a vertical shaft conveyor or a hoisting system which lifts spoil skips with a crawler or gantry type crane.

If slurry micro tunnelling is undertaken, this involves the addition of water or a bentonite or polymer based mixture at the cutting face to form a slurry. This slurry is pumped from the shaft and requires separation at the surface. If this method is used additional equipment will be required at the launch construction site, including a bentonite mixer and separation plant. The separation plant separates the ground material from the slurry which is then recycled back to the tunnelling face. The separated soil is then deposited in muck bins and loaded onto trucks. The slurry separation system is a “closed loop” and will not require any discharge of water at the construction sites. Unusable slurry will be disposed of to an appropriately authorised facility.

3.2.3 Dewatering

Infiltration of groundwater into the shafts and tunnels is to be primarily controlled through the design and specification of relatively watertight excavation support systems. This reduces water inflows that would otherwise have to be pumped out of the shafts, treated, and disposed of. Some groundwater will need to be removed from the shafts.

Typical groundwater control measures for rock shafts include dewatering and groundwater cut-offs through chemical or permeation grouting and will be used as needed. Groundwater control for excavation through the basalt rock would be accomplished by grouting. The ECBF materials are not expected to require special groundwater controls. Groundwater control methods, if used, will likely be supplemented with other measures such as a sump system to remove groundwater inflows from the excavations and concrete collars to control seepage along the soil/rock contact.

If tunnelling of the northern tunnel begins at Western Springs and the tunnel is driven downhill, pumps and pipe work will need to be carried along with the TBM to keep the tunnel dewatered and avoid collection of water at the low end of the tunnel.

With the proposed construction method, involving an EPB TBM with gasketed segmental lining installed, groundwater inflows during construction are expected to be in the order of 5 to 30 m^3 per day in the area of the construction location. This could increase (by a factor of up to 400) where large zones of highly fractured ECBF are encountered for significant lengths of excavation. Careful operation with the EPB TBM in closed mode could reduce flows to nominal amounts or around 5 to 30 m^3 per day local flow as in more typical ground materials. Groundwater inflows during construction for each of the shafts are expected to range between 10 – 150 m^3 per day.

Groundwater will be pumped out of the tunnels at the construction shafts for treatment prior to discharge. Groundwater that does not require treatment will be discharged directly to stormwater drains. Discharge of treated water will be to either stormwater or sewer, depending on quality. The amount and quality of groundwater will vary from site to site and will depend on the nature of the ground and the method of shaft construction.

3.2.4 Water Treatment

Water used or exposed to any construction process (e.g. wheel wash etc) will be directed to a water treatment facility located on the site. As noted above, groundwater pumped out of the tunnels may treatment facility located on the site. As noted above, groundwater pumped out of the tunnels may also require treatment prior to discharge.

Treatment requirements will be determined by the potential discharge receiving environment. The options are:

- Discharge to the Watercare sewer; or
- Discharge to watercourse or the reticulated stormwater system.

If discharge is to occur to a watercourse or reticulated stormwater, treatment will be undertaken to reduce sediment to acceptable levels for discharge via settlement tanks and if necessary, flocculation. Neutralisation treatment may be required to address pH levels.

3.2.5 Spoil Disposal

Excavated material which is unable to be reused as part of the project works will be disposed of to an authorised site. The spoil disposal sites will be determined by Watercare or the contractor and do not form part of the current consent applications.

Possible sites for spoil disposal may include other construction sites where cleanfill material is required, existing cleanfill sites, or to landfill for any contaminated material.

3.3 Construction Management

For the avoidance of doubt the following construction management framework is consistent with the consented methodology for the wider project.

3.3.1 Construction programme and staging

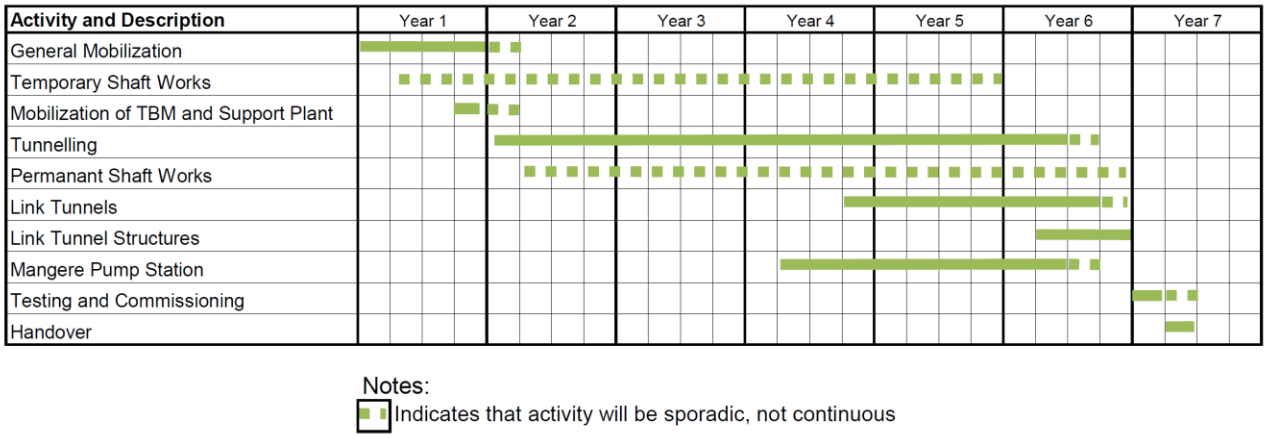
The main construction programme for the Central Interceptor project is currently scheduled to occur between 2019 and 2025. An indicative construction programme is set out below for the main project works, however the timing and staging of works may change as the project proceeds and will depend on the construction methodology adopted.

Construction of the main tunnel and link sewers may extend over about six years, with the first year being spent on general mobilisation activities (e.g. site preparation, main shafts). TBM commissioning and tunnel excavation would occur over the following four to five years. Construction of the Mangere Pump Station would take place during years two to four. Testing and commissioning works may extend into year seven.

Construction activities will occur at the three primary surface sites for an extended period: Mangere for the majority of the construction project duration, and May Road and Western Springs for between one and five years depending on TBM drive direction. The secondary surface sites, involving shafts and sewer connections, will experience construction activity over much shorter periods, typically ranging between12 to 18 months, but may be occupied for a number of years.

The programme below indicates timeframes for construction utilising a single TBM. If an additional TBM is used construction timeframes may be able to be shortened.

Table 3-1 Indicative construction programme for main works



3.3.2 Construction Management Plans

Once a contractor is appointed, and prior to the start of the main construction programme, a construction management plan (CMP) or plans will be prepared which set out the detail of the proposed construction methodology and describe the mitigation measures to be taken to minimise potential adverse effects and ensure compliance with consent conditions.

The construction management plan will address a range of construction issues, including:

Table 3-2 Construction management plan contents

Construction Issue	Likely Content of CMP
Construction management	Sets out details of construction methodology.
Construction Discharge Management Plan	Addresses discharge activities associated with construction, including those by subcontractors or suppliers and describes how surface water and groundwater associated with construction works will be managed to avoid, remedy, or mitigate adverse effects on the environment.
Erosion and sediment control	Sets out details of the proposed erosion and sediment control measures.
Chemical Treatment Management Plan	Management of the discharge of surface runoff from unstabilised construction sites in accordance with the Erosion and sediment control
Other Related Management Plans	
Coastal works construction management	Sets out details of design, construction methodology and management of effects on the environment within the CMA.
Contaminated land management	Sets out details of the construction methodology for works and presents methods for managing and disposing of contaminated soils.
Traffic management	Sets out details of the proposed traffic management at the construction sites.
Dust management	Details methods for minimising and monitoring dust generated by construction activities.
Groundwater and settlement monitoring	Sets out measures for monitoring groundwater drawdown and settlement effects and responding to changes.
Hazardous substances management	Sets out measures for management of hazardous substances, including spill response procedures.

Management plans addressing specific topics listed above will be incorporated in the main construction management plan for the project or prepared as standalone plans as appropriate.

3.3.3 Hours of Operation

Site operational arrangements will likely occur on the following general basis:

- Tunnelling and associated surface activities – 24 hours a day, 7 days a week operations will occur for all tunnelling activities related to the main tunnel works.
- Micro tunnelling, trenching and associated surface activities – this work would normally occur during normal working hours, 7 am to 6 pm, Monday to Friday and 8 am to 6 pm Saturday.

However, in particular circumstances, Watercare may need to undertake microtunnelling works 24 hours a day 7 days a week (or alternative extended hours) to meet construction demands, provided that construction work can be managed to meet construction traffic, noise, and vibration requirements.

- Truck movements – normal working hours, 7 am to 6 pm, Monday to Friday, 8 am to 6 pm Saturday. Special deliveries – as required to address traffic management measures.

General site activities – normal working hours, 7 am to 6 pm, Monday to Friday, 8 am to 6 pm Saturday, and with provision to extend hours during summer daylight savings periods as required.

There may be occasions where it is necessary to continue construction activities outside of usual hours, for example, where it is necessary to complete an activity that has commenced, to tie into the existing network, delivery of large plant or machinery, emergency works, or to tie in with tidal cycles for works in the CMA etc. For works outside of normal hours, appropriate measures will be implemented to ensure construction noise and vibration standards are met where practicable. These measures will be set out in a construction noise and vibration management plan(s).

4. Consultation and Engagement

As detailed in the original application (Section 8.0 of the Original AEE – Part A), an extensive amount of consultation was undertaken prior to lodgement of the original application. Further, the formal avenues of engagement provided by the public submissions, hearing and appeals processes provided a further opportunity for consultation and engagement which has ultimately shaped the final authorised project (which, except as noted, remains unchanged by this application).

4.1 Overview of Central Interceptor Consultation

In summary, consultation has been or will be carried out in the following phases of the project:

- Project inception – confirmation of the need for the project arising from the Three Waters Strategic Plan;
- Project development – concept design, assessment of effects on the environment, statutory process and detailed design phases of the project;
- Project delivery – procurement, pre-construction and construction phases of the project.

Those groups which have been engaged include the following:

- Local boards;
- Auckland Council staff – particularly the Parks, Sports and Recreation, stormwater and regulatory groups;
- Tangata whenua;
- Transport Authorities – Auckland Transport, New Zealand Transport Agency and KiwiRail;
- Network utilities;
- Other agencies – New Zealand Historic Places Trust and Department of Conservation;
- Directly affected landowners;
- Landowners adjacent to construction sites;
- Wider community and interest groups including St Lukes Environmental Protection Society (STEPS) and Mangere Bridge Residents and Ratepayers Association; and
- Watercare Advisory Groups – Maori Advisory Group, Environmental Advisory Group, Mangere Community Liaison Group.

4.2 Heritage New Zealand

There are a number of heritage elements and archaeological sites located around Western Springs Park and the neighbouring MOTAT site, however there are no known sites in the immediate vicinity of the alignment deviations.

Watercare has previously undertaken archaeological investigation (Clough and Associates) along the Central Interceptor alignment, including around Western Springs. This assessment concluded that given the proximity to the shore of Te Wai Orea/ Western Springs Lake and the subsequent traditionally swampy ground conditions, it is considered unlikely that the site was subject to historic occupation by fixed structures. Furthermore, due to the depth of the tunnel it is considered highly unlikely that any unknown archaeological material will be disturbed as a result of the construction or operation of the tunnel.

4.3 Mana Whenua

An established process is in place for Mana Whenua engagement on projects initiated by Watercare. This process includes early notification of works to be undertaken by Watercare which do or are likely to require resource consent. A 'Kaitiaki Managers Project List' is provided on a monthly basis to nominated representatives of all 19 Mana Whenua in the Auckland Council area. A brief summary of each project is included in the list. Mana Whenua are invited to indicate which projects they have an interest in. Further information on the identified project or projects is then provided to those parties, followed by further engagement depending on the responses received.

The 'Central Interceptor – Additional Consents' was included on the Kaitiaki Managers Projects List provided to Mana Whenua in September 2016. Four Mana Whenua entities indicated that they have an interest in this project, being:

- Te Kawerau a Maki
- Ngāti Whātua o Orakei
- Te Rūnanga o Ngāti Whātua
- Te Ahiwaru

In addition Watercare holds quarterly Kaitiaki Managers Forums, which hosts representatives from all 19 Mana whenua at a Managers level. A Central Interceptor project update has been presented at two of these forums, on 11 August 2016 and 8 June 2017.

Information on the wider Central Interceptor Project was provided at the forum meetings, and targeted specific information sent to the Mana Whenua entities which registered an interest via the Kaitiaki list on 24 May 2017. Mana Whenua were invited to provide feedback and request further information, and asked to confirm whether or not a Cultural Impact Assessment (CIA), kaitiaki report or Cultural Values Assessment is required.

Watercare met with Te Rūnanga o Ngāti Whātua on 26 May 2017, and confirmed that on this specific application no further information is required, although the overall project updates were welcomed and encouraged through the Kaitiaki Managers Forum.

No response was received from Te Kawerau a Maki, Ngāti Whātua o Orakei and Te Ahiwaru. A record of correspondence is included as Appendix F. Watercare is committed to ongoing engagement with Mana Whenua in relation to the Central Interceptor Project.

4.4 Additional Properties Intersected by the Tunnel Deviations

The main tunnel and link sewer tunnels will pass under numerous properties. Watercare has rights under Section 181 of the Local Government Act (LGA) to construct works on or under private land necessary for sewage and stormwater drainage, and enter upon the land to inspect, alter, renew, repair, or clean any work constructed. Watercare intends to issue a section 181 notification to all of the property owners (pre and post deviation) 12-18 prior to commencing the works.

The nature of the works and depth of the tunnel mean that, in all cases, surface access to land will not be required and there will be no impact from the works on the site. Watercare is confident that the Central Interceptor works will not cause damage to the land and buildings. Appendix C provides a summary of those additional properties which are intersected by the proposed deviations to the horizontal main tunnel alignment.

5. Assessment of Environmental Effects

The following section provides an assessment of environmental effects which has been prepared in accordance with Schedule 4 (6) and (7) of the RMA.

5.1 Permitted Baseline

The permitted baseline is the concept central to the consideration of the disregard of effects on the environment that are permitted by a plan or have been consented to (*Queenstown Lakes District Council v Hawthorn Estate Limited [2006] CA45/2005*).

Case law has established three categories of activity relevant to the consideration of the permitted baseline (*Lloyd v Gisborne District Council [2005] W106/05, Bayley and Arrigato*):

1. What lawfully exists on the site at present
2. Activities which could be carried out under a granted, but as yet unexercised, resource consent
3. Non-fanciful activities which could be conducted on the site as of right; i.e. without having to obtain a resource consent

The second and third categories are relevant to this application.

As detailed in Sections 1.2.1 and 1.2.2 the project has an existing suite of consents and a designation which provides for the construction and operation of the tunnel, link sewers and associated sites. This includes the earthworks and groundwater diversion necessary for the construction and operation of the Main Tunnel and Link Sewer C within the consented corridor. The proposed alignment deviations which are being sought within this application are within the same general receiving environment as that of the existing consents and designation. The proposed activity and construction methodology is the same. It is appropriate to use the existing suite of consents and designation as a permitted baseline for the consideration of this application.

The Rule Assessment provided in Appendix D provides an assessment of the relevant rules which are associated with the deviations to the alignment of the tunnels outside of the consented corridor. The rule assessment identifies a number of activities which are associated with this proposal which may be undertaken as a permitted activity. Of particular relevance to this assessment, the construction and operation of underground pipes and cables for the conveyance of wastewater is a permitted activity under Rules E26.2.3.1 (A8) and E26.2.3.1 (A49) of the AUP(OiP). Furthermore, earthworks up to 2500m^2 and 2500m^3 for the installation of infrastructure is a permitted activity under Rules E26.5.3.1 (A96) and E26.5.3.1 (A96) of the AUP(OiP)[7]. The thresholds for network utilities apply to the area and volume of work being undertaken at any one time at a particular location. As the construction methodology enables the progressive closure and stabilisation of the underground tunnelling works the permitted activity thresholds can be achieved. These permitted activities appropriately form part of the permitted baseline for the consideration of this application.

5.2 Matters of Discretion

Tunnelling works which traverse beneath the Site and Place of Significance to Mana Whenua at Western Springs are classified as a discretionary activity under the AUP(OiP) with the remainder of the proposed works that are the subject of this resource consent application classified as a restricted discretionary activity. Section 104C(1)(b) of the RMA prescribes that in respect of restricted discretionary activities, Council must only consider those matters over which it has restricted the exercise of its discretion in the AUP(OiP) when considering this application.

[7] Note that this does not include those sections of the alignment which are subject to the SEA, High Natural Character and/or Sites and places of significance to Mana Whenua overlays.

As explained at Section 1.4 of this report, this application has adopted a conservative approach and been bundled as a discretionary activity. However, consideration has been given to the relevant matters of discretion to direct the following assessment of actual or potential environmental effects. Appendix G outlines those matters of discretion to which Council has limited its discretion in the assessment of this application.

5.3 Positive Effects

The Central Interceptor project presents an integrated and cost effective solution for the wastewater network, addressing capacity, asset duplication and overflow mitigation needs, and providing a framework for the ongoing operation of the network for the next 50 years and beyond.

Once completed, the Central Interceptor main project works will provide the following key benefits:

- Positive effects on public health and the environment through the effective operation of the wastewater network generally;
- The provision of capacity in the wastewater network for future growth and development on the Auckland Isthmus for the next 50 years and beyond;
- Asset security through the duplication of the lower section of the ageing Western Interceptor;
- Significant reduction of the major wastewater overflows into the Meola Creek catchment;
- Opportunity to further reduce existing wastewater overflows from the combined sewer system into urban streams and the Waitemata Harbour.

The deviations to the alignment proposed in this application are essential to enable construction of the Central Interceptor. Accordingly, the realisation of the identified positive effects of the wider project are subject to construction and operation enabled by this application.

5.4 Actual and Potential Adverse Effects

The following sections provide an assessment of the actual and potential adverse effects associated with the proposed deviations to the tunnel alignment and the associated physical works.

5.4.1 Settlement Effects

The assessment of potential settlement effects has been informed by the original settlement analysis undertaken as part of the application for the existing consents for the project. In addition, further analysis has been undertaken which is specific to the proposed deviations to the tunnel alignment outside of the consented corridor.

The following technical assessments have been relied on to inform the following assessment:

- ‘Settlement implications due to revision of the Main Tunnel and Link Sewer C Memo’, Watercare 2017 (Appendix H)
- ‘Tunnel, Link Sewers and Shafts – Settlement Assessment’, Watercare 2017 (Appendix I)
- ‘Combined Settlement Report for the Link Sewers’, Watercare 2016 (Appendix J)
- ‘Central Interceptor Project Effect of Tunnels on Groundwater and Surface Settlement’, Watercare 2012 (Appendix K)

Conditions 4.33 of the existing consent RC 40836 set limits for total settlement of 50mm and differential settlement of 1:1000.

Based on the results of the analyses of the tunnel induced ground movements and indirect dewatering induced surface movement, the following conclusions and recommendations are provided.

5.4.1.1 Western Springs Deviation

The geology through this section is shown in Drg 2012061.025 and comprises a variable thickness of competent basalt from surface to the underlying ECBF. The interpreted geological conditions of the revised alignment are essentially the same as for the original alignment and the tunnel is to be developed entirely within ECBF.

Groundwater take is to be managed through this section by the use of closed face operating mode for the tunnel boring machine. The potential implications for groundwater drawdown and induced settlements due to tunnel construction are considered to be no different from those assessed for the original consent. Potential settlements for the revised alignment are predicted to be less than 5mm, which complies with the 50mm limit enabled by the existing resource consent. The potential differential settlement is predicted to be less than 1:2440 and will therefore comply with the consented differential settlement limit of 1:1000.

5.4.1.2 May Road Deviation

The geological section is shown in Drg 2012061.021 and indicates that the tunnel will be developed at least 65m below ground surface in ECBF rock. The overlying materials of the revised alignment are as per the consented alignment except that there is a greater interval of Tauranga Group alluvium from Ch 17+300 to Ch 17+600. However, as the tunnel will be developed in ECBF at considerable depth below surface there are negligible implications for surface settlement as a result of the greater interval of Tauranga Group alluvium.

The detailed design estimates of settlement for the tunnel indicate less than 5mm movement at the surface, which is considered negligible and significantly less than the consented maximum of 50mm. The potential differential settlement is predicted to be less than 1:2440 and will therefore comply with the consented differential settlement limit of 1:1000.

5.4.1.3 Link Sewer C Deviation

The geology along Link Sewer C is shown on drawings Drg 2012004.001, 002 & 003. The ground profile comprises variable thicknesses of basalt and alluvium at surface over ECBF rock. The tunnel will be developed in ECBF rock from May Rd to Miranda Reserve where it will transition into residual soil of the ECBF and Tauranga Group alluvium near PS25.

Four chainages along Link Sewer C have been identified as areas of interest : Ch 0+350, Ch 1+300, Ch 3+050 and Ch 3+200 from the start of Link Sewer C at May Road. The elevations of the revised and original consented Link Sewer C locations are highlighted in the table below:

Table 5-1 Elevations at critical chainages

Chainage	Reduced Level (m)	
	Revised RL	Original Consented RL
350	-5m	-21m
1300	-3m	-19m
3050	1m	-17m
3200	1.5m	-17m

The detailed design calculations included consideration of groundwater drawdown and mechanically induced settlement which may occur during tunnel construction.

The groundwater drawdown settlement for Ch 0+350, Ch 1+300, Ch 3+050 and Ch 3+200 are summarised in table 5-2. The majority of the potential settlement was found to be due to the groundwater drawdown, and the mechanical settlement was found to be a minor (<5mm) component of the total drawdown until Link Sewer C neared the surface (at Ch 3+050 where tunnel was approximately 6m bgl). The groundwater drawdown was greatest at Ch1+300, and this was reflected by having the largest settlement (13mm). Ch 1+300's relatively larger settlement compared to the other two locations was also due to the thicker compressible TGA layer above the tunnel (14m thick compared to 6m at Ch3+200 and no TGA at CH350), as the TGA is known to have a much lower Young's modulus compared to the ECBF residual soils and rock.

Table 5-2 Summary of total and differential settlement of combined settlements

Chainage section	Max settlement (mm)	Max differential settlement
Ch 0+350	7	1 in 12,500
Ch 1+300	14	1 in 6,000
Ch 3+050	7	1 in 875
Ch 3+200	10	1 in 1,100

The implications for groundwater drawdown and induced settlements due to tunnel construction are considered to be no different from those assessed for the original consent. While Link Sewer C will be generally shallower than the consented corridor, there is still sufficient depth to minimise any potential adverse effects of settlement on surface structures. The total settlements along Link Sewer C are predicted to be within the existing consent limit of 50mm. The potential out-of-limit differential settlement at Ch 3050 occurs under open parkland and it is considered to be imperceptible given the maximum ground movement is less than 10mm.

The settlement assessment provided as part of the application for the original suite of consents identified settlement around the shaft site locations as the key risk of groundwater diversion and dewatering. The proposed alignment deviations do not alter the locations of the shafts.

5.4.1.4 Effects of Settlement on Properties and Structures

The potential for settlement to result in damage to structures depends primarily on the differential settlement, not the total settlement. Differential settlement represents the change in ground surface slope between any two given locations that are settling by different amounts. For damage to occur to a structure it must be subject to differential settlement resulting in distortion of the structure. The greatest potential for distortion is at the centre of the trough (typically near the tunnel centre line).

In the proposed locations (where the tunnel deviates from the consented corridor) and with the proposed construction methodology, there is negligible risk of structural damage to buildings and services due to tunnel excavation and operation. The effects of settlement on buildings and other structures above the tunnel alignment will depend on the location of the structure within the settlement zone and on the differential settlements that affect the structure at that location. For damage to occur, the structure must be subject to distortions or tilting associated with differential settlements greater than the structure can tolerate. The historically accepted limit for more than minor damage to sensitive buildings is total settlements of more than 50 mm, with differentials of steeper than 1:1000. The tolerance of services, such as pipelines above the tunnel route, will depend on considerations such as gradient, material, and joint design.

Total and differential settlements predicted for Link Sewer C are generally significantly less than the existing consent limits of 50mm total and 1:1000 differential settlement. Potential differential settlement is within the existing project consent limits with an exception circa Ch 3+050 in an area of parkland, where the exceedance of differential settlement of 1:875 is still expected to be imperceptible.

Given the similar tunnel size, construction method, and geological conditions, the potential surface settlement effects are likely to be of similar magnitude to those from other projects undertaken in the Auckland Isthmus recently. For example, the Hobson Tunnel (tunnel diameter 3.5 m) resulted in mean measured settlements of less than 10 mm and maximum measured settlement of 30 mm. Similar measured settlement values were achieved for the Vector Tunnel and Rosedale Outfall projects, with maximum measured settlements all less than the 50 mm “limit”.

Overall the potential surface effects of settlement are anticipated to be negligible.

5.4.2 Groundwater Effects

As the proposed construction methodology and tunnel design remains unchanged from that provided by the existing Central Interceptor approvals, the conclusions with regard to groundwater effects provided in the ‘Central Interceptor Main Project Works AEE’, Watercare 2012 and ‘Central Interceptor Project Effect of Tunnels on Groundwater and Surface Settlement’, Watercare 2012 are directly applicable to this application.

The following sections provide assessment based on the conclusions drawn from the above referenced documents.

5.4.2.1 Effects on Users of Groundwater

Four groundwater users have been identified close to the proposed tunnel alignment - within 200 m of the main tunnel. All these users take water from high capacity basalt surface aquifers. Analyses indicate that groundwater drawdown within the ECBF as a result of tunnelling is very unlikely to have a measureable effect on flows in the aquifers, and by inference on the existing groundwater users. Observations from the monitoring of actual draw down that occurred during the Vector tunnel project support this finding.

The main tunnel alignment deviation passes beneath the periphery of Western Springs Lake. However, as the tunnelling is unlikely to measurably affect flows in the aquifers it is also unlikely to affect waterbodies in the catchment.

The potential for seawater intrusion in aquifers has been considered and the modelling shows that the potential to establish an inland hydraulic gradient is extremely low. In the unlikely event of temporary sea water intrusion due to construction, effects on groundwater users are not expected. Groundwater users in the northern and central zones typically draw water from the surface aquifers in basalt flows and these aquifers would not be affected even in the event that such temporary sea water intrusion occurred, as they are well above sea level. Where water is extracted from deep ECBF bores, they are significantly inland from the coast and would not be expected to be affected by temporary inland migration of the sea water/fresh water boundary.

5.4.2.2 Effect on Groundwater Quality

The tunnels will be only partially full for most of the time the tunnel is in operation and the internal pressure will be lower than external groundwater pressure, therefore groundwater will tend to seep from the surrounding ground into the tunnel through the low permeability liner rather than out of the tunnel. Under these normal conditions there is no potential for wastewater to flow out of the tunnel and mix with groundwater.

Accordingly, the potential for an adverse effect on regional groundwater quality is considered negligible.

5.4.3 Vibration Effects

The vertical alignment of the main tunnel and Link Sewer C is generally located in ECBF ground conditions along the route, maintaining clearance beneath the strong basalt lava flows and remote from any known volcanic vents.

In the ECBF rock the TBM equipment will generally produce low level vibrations that would be expected to attenuate quickly and be below the perception threshold within 10 m for most people. The main tunnel is generally at a depth of over 25 m so there is unlikely to be any vibration effects on properties above the tunnel from tunnel boring. The rate of excavation is also expected to be high, averaging around 12 m per day. The time that any sensitive receiver would be subject to any vibration is therefore very short.

Part of the Link Sewer C tunnel is expected to be excavated within weak ECBF rock. As for the main tunnel construction, the micro tunnelling methods proposed to be used for the excavation of these tunnels are expected to generate only low levels of potential vibration.

Accordingly, the potential vibration effects due to tunnelling are temporary and expected to be less than minor.

5.4.4 Effects on Existing Infrastructure

As noted in Section 2.2, infrastructure in the area above the tunnels includes SH 16, and overhead high voltage transmission lines. Due to their depth, the main tunnel and Link Sewer C are unlikely to occupy space in close proximity to other infrastructure and services. Potential settlement effects are discussed earlier and there is considered to be a negligible risk of structural damage. Notwithstanding the negligible risks of effects on existing infrastructure Watercare continues to engage with network utility operators and transport authorities with regard to the Central Interceptor project.

5.4.5 Effects on Land Uses above Tunnel Deviations

Due to the horizontal deviations to the tunnel alignment, the tunnel will pass under a number of newly affected properties in the Auckland Isthmus (see Appendix C for property details).

The potential settlement effects on these properties have been assessed at section 5.4.1.4. Due to the depth of the tunnels (at least 10m and generally greater than 20m in depth), the use and enjoyment of property above the alignment will not be affected.

5.4.6 Maori and Cultural Heritage Effects

Mana whenua have a strong historical and cultural relationship with the land, water and harbours traversed by the Central Interceptor scheme. As noted earlier in Section 4.3 of this report, Watercare continues to engage with iwi to discuss the wider Central Interceptor project and including the proposed deviations to the tunnel alignment.

5.4.7 Ecology, Natural Character and Sites of Significance to Mana Whenua

As specified in Table 2-3, the Western Springs Deviation passes beneath the following overlays:

- Outstanding Natural Features Overlay [rcp/dp] - ID 247, Western Springs and lava outcrops
- Outstanding Natural Features Overlay [rcp/dp] - ID 132, North-west Motorway lava flow, Western Springs
- Sites and Places of Significance to Mana Whenua Overlay [rcp/dp] – 8
- Significant Ecological Areas Overlay - SEA_T_5288, Terrestrial

Each of these overlays is centred around Western Springs Pond. The tunnel passes beneath the southernmost shoreline of the pond and therefore intersects the periphery of each of these overlays.

The tunnel within this section of the alignment is at a depth of approximately 25-30m below surface level. There are no surface works proposed within this section, the closest being at the Western Springs Site approximately 300m north east of this area (activities which have existing approval and are not the subject of this application)

As discussed in Section 5.4.1 any surface effects as a result of settlement are likely to be negligible. Furthermore, as discussed in Section 5.4.2 any long term effects on groundwater are likely to be negligible. Accordingly, any associated effects on the ecological and natural features will also be negligible.

5.5 Mitigation and Monitoring

A number of measures are proposed to mitigate potential adverse effects and these differ for each construction site. Prior to commencement of works, a construction management plan or plans will be prepared which will address construction issues and mitigation measures including groundwater and settlement.

Mitigation measures more specific to the proposed deviations from the tunnel alignment are provided in the following sections.

5.5.1 Groundwater and settlement

The effects of the proposed works on groundwater and ground settlement will be largely managed through the use of appropriate construction methodology:

- Use of an Earth Pressure Balanced TBM or similar methodology (and/or ensure a suitably water tight liner is installed quickly following excavation) will help to limit groundwater effects during construction where the main tunnel is excavated in high permeability ECBF;
- Installation of tunnel liner to minimise groundwater infiltration into the tunnel;
- Monitoring (refer Section 5.5.2).

5.5.2 Monitoring

Monitoring measures, and contingency procedures and measures, will be included in the relevant sections of the CMP.

Noise and vibration levels will be measured during critical phases of construction.

Groundwater and settlement monitoring will be undertaken to measure the effects that construction has on the groundwater system around the tunnels and on ground surface levels above the tunnels.

The CMP will contain contingency procedures in the event that groundwater/settlement responses behave differently than expected or approach/ exceed set trigger levels. Contingency measures will be identified and implemented as necessary.

6. Statutory Context and Assessment

The RMA sets out the legal framework for the sustainable management of natural and physical resources in New Zealand. The directly relevant sections of the RMA in relation to the assessment of the proposed deviations to the tunnel alignment are as follows:

- Part 2 – Purpose and principles: sections 5 – 8 which establish the overriding purpose of the RMA and matters which all decision makers and persons exercising powers must provide for or have particular regard to; and
- Part 6 – Resource consents: s95 which prescribes whether an application must be limited or publicly notified, s104 which prescribes matters to be taken into account when considering resource consent applications and sections 105 and 107 which relate to discharge permits.An assessment against these parts of the RMA is presented on the following sections. In all cases, the assessment is based on the information presented earlier in this report and the accompanying technical reports.

6.1 Part 2 Purpose and Principles

6.1.1 Section 5 – Purpose

Section 5(1) states that the purpose of the RMA is to promote the sustainable management of natural and physical resources, with sustainable management defined in s5(2).

As previously identified, the proposed deviations of the tunnel alignment are necessary to enable the delivery of the Central Interceptor project. Construction and operation of the overall Central Interceptor will have significant positive effects, and any adverse effects of the proposed deviations will be negligible when compared with the existing consented alignment. Overall, the project (incorporating tunnel alignment deviations) will achieve the purpose of the RMA.

The reasons for this assessment are summarised below:

6.1.2 Section 6 – Matters of National Importance

Matters of national importance, which are to be recognised and provided for, are set out in s6 of the RMA. Relevant matters are:

> *(b) the protection of outstanding natural features and landscapes from inappropriate subdivision, use, and development:*
>
> *(c) the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna:*
>
> *(d) the maintenance and enhancement of public access to and along the coastal marine area, lakes, and rivers:*
>
> *(e) the relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga:*

Through reducing wastewater overflows the Central Interceptor project will address one of the key concerns of tangata whenua groups, namely water quality. Watercare has and will continue to engage with iwi with an interest in the area to help identify any issues of importance to tangata whenua in relation to the project and associated construction works.

Reducing wastewater overflows into the natural environment will not only help to preserve the natural character of streams and the coastal environment, but also contribute to the opportunity to increase the quality of those environments in the future.

6.1.3 Section 7 – Other Matters

Section 7 sets out other matters to which particular regard must be had when exercising functions and powers under the RMA. The following matters are relevant to the project:

(a) kaitiakitanga;

(aa) the ethic of stewardship;

(b) the efficient use and development of natural and physical resources;

(c) the maintenance and enhancement of amenity values:

(d) intrinsic values of ecosystems;

(f) maintenance and enhancement of the quality of the environment.

Having regard to these matters, the following points are noted:

- Watercare has and will continue to engage with tangata whenua to help identify and address any potential effects of the project on tangata whenua.
- The planning and design process for the Central Interceptor project has considered the efficient use and development of natural and physical resources and has resulted in the Central Interceptor main project works as the best practicable option.
- The Central Interceptor project will help to ensure the efficient use and development of natural and physical resources by providing capacity to support growth within the existing urban Auckland area and through improving asset security of the regionally significant wastewater network infrastructure.
- The Central Interceptor project will have significant positive effects on amenity values and on the values of stream ecosystems by reducing overflows of wastewater to the environment. This will help to maintain and enhance the quality of the environment and protect the intrinsic values of ecosystems.
- The proposed deviations to the alignment are essential to providing for the construction of the wider Central Interceptor project.

6.1.4 Section 8 – Treaty of Waitangi

Section 8 requires those exercising powers or functions under the RMA to take into account the principles of the Treaty of Waitangi.

As outlined in Section 4.3of this report, Watercare has and continues to engage with iwi to help to identify any potential effects of the project on tangata whenua or cultural heritage matters.

6.2 Part 6 Resource consents

6.2.1 Section 95A and 95D - Public Notification

When considering the application for public notification under Section 95A, the Consent Authority is required to decide under Section 95D whether the activity will have or is likely to have adverse effects on the environment that are more than minor.

A consent authority that is deciding, for the purpose of section 95A(2)(a), whether an activity will have or is likely to have adverse effects on the environment that are more than minor—

(a) must disregard any effects on persons who own or occupy—
(i) the land in, on, or over which the activity will occur; or

(ii) any land adjacent to that land; and

(b) may disregard an adverse effect of the activity if a rule or national environmental standard permits an activity with that effect; and

(c) in the case of a controlled or restricted discretionary activity, must disregard an adverse effect of the activity that does not relate to a matter for which a rule or national environmental standard reserves control or restricts discretion; and

(d) must disregard trade competition and the effects of trade competition; and

(e) must disregard any effect on a person who has given written approval to the relevant application.

As noted in Section 5.4 of this report, the proposed tunnel alignment deviations will not have adverse effects on the environment that exceed between negligible and less than minor. The original application for the existing resource consents was publicly notified at the request of Watercare. The purpose for requesting public notification was associated with the significant extent of the wider project and associated public interest. No submissions were received with respect to the main tunnel or link sewer works with the majority of submissions relating to specific surface sites and the wastewater discharges.

As previously identified, by contrast this application is discrete in nature – relating to three locations where there are proposed tunnel alignment deviations. This application does not substantially affect the wider project. Accordingly, Watercare does not request that this application be notified.

There are no rules or national environmental standards that require (or preclude) public notification and no special circumstances exist that warrant notification.

Therefore Council need not publicly notify this application.

6.2.2 Section 95B & S95E - Limited Notification

An application must be limited notified if the activity's adverse effects on a person are minor or more than minor (but not less than minor).

Based on the assessment in Section 5.4.1.4, the potential adverse effects on persons in, on or over the land or adjacent properties will be nil to less than minor. While the tunnel will be located beneath a number of properties which were not previously within the footprint of the consented corridor, any adverse effects on these properties have been demonstrated to be less than minor, therefore the owners and occupiers of these properties are not considered to be 'affected parties' within the context of the RMA.

Property access arrangements sit outside of the RMA process. Any matters relating to property rights are separate from the RMA process and will be procured where necessary under the relevant legislation. Accordingly these matters do not need to be considered within to Section 95B and 95E of the RMA.

Therefore, pursuant to Section 95B and 95E, the application does not require limited notification to any persons.

6.2.3 Notification Summary

Watercare does not request public notification of this application and no customary rights holders or title groups are considered adversely affected as the proposal does not interfere with any customary rights or titles. Furthermore, there are no special circumstances that warrant the public notification of this application nor are there any identified adverse effects on persons to an extent that is minor or more than minor.

Accordingly, this application can proceed **without public or limited notification**.

6.2.4 Section 104 Consideration of resource consent applications

Section 104(1) of the RMA requires a consent authority, when considering an application for resource consent, to have regard to any actual and potential effects on the environment of allowing the activity and the relevant provisions of statutory documents, along with any other relevant matters.

Section 5.0 of this report provides an AEE with regard to the proposed activity. The AEE concludes that any adverse effects will be nil to less than minor.

The following sections of this report provide an assessment of the physical works associated with the proposed tunnel alignment deviations against the relevant provisions of the applicable planning documents. In summary the proposed works give effect to or are considered to be generally consistent with the relevant objectives, policies and assessment criteria of the relevant statutory and non-statutory documents referred to in s104(1)(b) of the RMA.

Accordingly, the resource consents can be granted under s104B of the RMA.

6.2.5 Section 108 Conditions

Section 108 states that except where otherwise expressly provided for a resource consent may be granted on any reasonable condition that the consent authority considers appropriate.

As the construction methodology and design principles of the proposed tunnel deviations is unchanged from the existing project resource consents it is considered appropriate to apply the same set of conditions to this application. This approach enables the continued holistic and consistent management to the Central Interceptor project – irrespective of relatively isolated changes (in tunnel alignment) arising from detailed design. The final condition set associated with the existing consent is provided in Appendix A.

As the proposed tunnel deviations and associated works are part of the wider Central Interceptor project, providing a uniform condition set will also facilitate ease of compliance and compliance monitoring across the project.

6.3 Auckland Unitary Plan – Operative in Part 2016

The AUP(OiP) provides a unitary plan for Auckland and includes objectives, policies and provision regulating activities across the region. The AUP(OiP) controls diversion of groundwater and dewatering, and earthworks. The AUP(OiP) became operative in part on 15 November 2016 including those proposed in this application. All provisions of the AUP(OiP) which are relevant to this application are now operative.

The following sections provide an assessment of the relevant objectives and policies and assessment criteria.

6.3.1 Diversion of Groundwater and Dewatering

Table 6-1 summarises the key themes of the relevant objectives and policies of the AUP(OiP).

Table 6-1 AUP(OiP) – objectives and policies key themes

Relevant objectives	Relevant policies	Key Themes
D8.2. (1) & (3) E2.2. (1) – (4) E3.2. (1)	D8.3. (1), (3) & (4) E2.3. (23) E3.3. (1) – (6)	Overall, the objectives and policies of the AUP(OiP) as they relate to groundwater diversion and discharge seek to manage water resources to ensure that surface water and groundwater are maintained to meet current and future water needs for social, cultural and economic purposes. The most relevant objectives and policies in relation to the diversion of groundwater and dewatering seek to prevent or minimise the adverse effects from construction, maintenance, investigation and other activities on groundwater and the use of groundwater. There are also provisions which recognise the significance of major infrastructure and the associated impact associated with its construction and operation.

As outlined in Section 5.0 of this report any adverse effects associated with the diversion of groundwater and dewatering will be nil to less than minor as best practice construction management is proposed to continue to be implemented (as with the rest of the authorised project) in relation to the proposed tunnel alignment deviations. Accordingly, the proposed diversion of groundwater and dewatering is consistent with the relevant objectives and policies of the AUP(OiP).

The relevant assessment criteria are provided in Appendix L. The assessment of environment effects provided in Section 5 is considered to adequately cover the relevant assessment criteria in relation to the E7 Taking, using, damming and diversion of water and drilling. Table 6-4 provides an assessment of the relevant assessment criteria in relation to the assessment of environmental effects provided in Section 5.0.

Table 6-2 AUP(OiP) – Diversion of Groundwater and Dewatering: Assessment Criteria

Criteria	Assessment
E7.8.2. (1) (a)	This criterion relates to Mana whenua values which are assessed in Section 5.4.6.
E7.8.2. (1) (b), E7.8.2. (2), E7.8.2. (3), E7.8.2. (4), E7.8.2. (10) & E7.8.2. (11)	These criteria relate to hydrology and groundwater issues which are assessed in Section 5.4.2.
E7.8.2. (5) & E7.8.2. (6)	These criteria relate to the mitigation and monitoring of hydrology and groundwater issues which are assessed in Section 5.5.1.
E7.8.2. (9)	These criteria relate to the objectives and policies relating to hydrology and groundwater issues which are assessed in Section 6.3.1.
E7.8.2. (7) & E7.8.2. (8)	These criteria are not applicable as the proposal does not exceed allocation limits.

6.3.2 Earthworks

Table 6-3 summarises the key themes of the relevant objectives and policies of the plan.

Table 6-3 AUP(OiP) – objectives and policies key themes

Relevant objectives	Relevant policies	Key Themes
D8.2. (1) & (3) D9.2. (1) – (2) D11.2. (1)	D8.3. (1), (3) & (4) D9.3. (1) – (4) D11.3. (1)	Overall, the objectives and policies of the AUP(OiP) as they relate to earthworks seek to manage the adverse effects associated with earthworks to minimise and avoid where possible any adverse on significant elements of the natural and cultural environment.
D21.2. (1) & (2) E26.2.1. (1) – (5) & (9)	D21.3. (10 – (11) E26.2.2. (1), (2), (4) – (6), (9) & (10)	The most relevant objectives and policies in relation to earthworks for the provision of infrastructure recognise the importance of regionally significant infrastructure and seek to ensure that any adverse effects associated with the construction and operation of such infrastructure is managed to be less than minor.

As outlined in Section 5.0 of this report any adverse effects associated with the construction discharge will be nil to less than minor as best practice construction management is proposed to be implemented. Accordingly, the construction discharge is consistent with the relevant objectives and policies of the AUP(OiP).

The relevant assessment criteria are provided in Appendix L. The assessment of environment effects provided in Section 5 is considered to adequately cover the relevant assessment criteria in relation to the E26 Infrastructure. Table 6-4 provides an assessment of the relevant assessment criteria in relation to the assessment of environmental effects provided in Section 5.0.

Table 6-4 AUP(OiP) – Earthworks: Assessment Criteria

Criteria	Assessment
E26.5.7.2.(1) (c), E26.5.7.2.(1) (e), E26.5.7.2.(2) (e), E26.6.7.2.(1) (k), E26.6.7.2.(2) (h) E26.6.7.2.(1) (b), E26.6.7.2.(1) (c), E26.6.7.2.(2) (c), E26.6.7.2.(2) (g)	These criteria relate to Mana whenua and ecological values which are assessed in Section 5.4.6.
E26.5.7.2.(1) (f), E26.5.7.2.(1) (g), E26.6.7.2.(2) (d)	These criteria relate to the mitigation and monitoring which are assessed in Section 5.5.
E26.5.7.2.(2) (h) & E26.5.7.2.(2) (k), E26.6.7.2.(1) (e), E26.6.7.2.(1) (f), E26.6.7.2.(1) (g), E26.6.7.2.(1) (h), E26.6.7.2.(2) (i) E26.6.7.2.(2) (k) E26.6.7.2.(2) (b), E26.6.7.2.(2) (j)	These criteria relate to the positive effects and necessity of the works which are assessed in Section 5.3.
E26.6.7.2.(1) (d)	This criterion relates to the hydrological effects which are assessed in Section 5.4.2.
E26.6.7.2.(2) (e), E26.6.7.2.(2) (f)	These criteria relate to the settlement effects which are assessed in Section 5.4.1.

7. Conclusion

This resource consent application and AEE has been prepared to authorise physical works associated with three discrete sections of the Central Interceptor main tunnel and Link Sewer C tunnel where the alignment following detailed design is outside the previously consented corridor.

The proposed tunnel alignment changes can be summarised as follows:

- **Western Springs Deviation** (Ch 22+480 – 22+900) - the tunnel alignment passes approximately 40m west of the consented corridor under the SH16 motorway and gradually returns to the consented corridor at the north eastern boundary of the MOTAT site. The length of this deviation is approximately 420m. The depth of the alignment along this section remains the same as that of the consent corridor (approximately 25-30m below surface level).

- **May Road Deviation** (Ch 16+700 to Ch 17+650 (May Rd site)) - the tunnel alignment has moved horizontally outside the consented corridor . The maximum horizontal variance is approximately 75m to the south-west of the consented corridor (circa Ch 17+350). The depth of the alignment along this section remains the same as that of the consent corridor (approximately 65m below surface level).

- **Link Sewer C Deviation** - the revised alignment is vertically some 14m higher than the consented corridor and horizontally outside the consented corridor in discrete locations. . As a result the revised depth of the alignment along this section will range from approximately 10-70m below surface level. The shallowest section of the alignment is from CH 0 (PS25) to Ch300 (Miranda Reserve). Beyond there the surface level quickly rises above the tunnel.

The tunnel itself is a permitted activity, as are the earthworks required to construct it. Elements of the physical works associated with the proposed tunnel alignment deviations require resource consent and have been bundled as a Discretionary Activity under the AUP(OiP).

The existing project authorisations under the RMA remain unchanged by this application and continue to apply for the remainder of the route.

The key findings of this report are that the overall actual or potential adverse effects of the proposed deviations on the environment are between nil and less than minor and no persons are adversely affected.

Overall, subject to Section 104B and Part 2 of the RMA there are no impediments to granting this resource consent on a on a non-notified basis and subject to the same conditions imposed on the existing project consents.

Appendix A. Central Interceptor Existing Consent Condition

Appendix B. Tunnel Deviation Plans

Appendix C. Property Details

Appendix D. Rule Assessment

Appendix E. Geotechnical Interpretive Report

Appendix F. Mana Whenua Correspondence

Appendix G. Matters of Discretion and Relevant Criteria

Appendix H. Settlement implications due to revision of the Main Tunnel and Link Sewer C Memo

Appendix I. Tunnel, Link Sewers and Shafts – Settlement Assessment

Appendix J. Combined Settlement Report for the Link Sewers

Appendix K. Central Interceptor Project Effect of Tunnels on Groundwater and Surface Settlement

Appendix L. Assessment Criteria