NZ TRANSPORT AGENCY
WAKA KOTAHI

Roads of national significance

16 20

Western Ring Route – Waterview Connection

Assessment of Environmental Effects Parts A-D

Beca

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Glossary of Abbreviations

Term	Definition
AADT	Average Annual Daily Traffic
AAQG	New Zealand Ambient Air Quality Guidelines
ACC	Auckland City Council
ACC CWF	Auckland City Council Cycling and Walking Framework 2007
ACC GMS	Auckland City Council Growth Management Strategy 2003
ACC LTCCP	Auckland City Council Long Term Council Community Plan
ACC OSF	Auckland City Council Open Space Framework
ACEDS	Auckland City Economic Development Strategy 2008
AEE	Assessment of Environmental Effects
AHB	Auckland Harbour Bridge
AKA	Auckland Kindergarten Association
AMA	Auckland Motorway Alliance
AQNES	Air Quality National Environmental Standards
ARC	Auckland Regional Council
ARGS	Auckland Regional Growth Strategy

Term	Definition
ARLTS	Auckland Regional Land Transport Strategy
ARP:C	Auckland Regional Plan: Coastal
ARP:SC	Auckland Regional Plan: Sediment Control
ARPS	Auckland Regional Policy Statement
ARTA	Auckland Regional Transport Authority
ASHS	Auckland State Highway Strategy
ASMP	Archaeological Site Management Plan
ASRL	Avondale Southdown Rail Line
ATMS	Advanced Traffic Management System
ATP	Auckland Transport Plan
Auckland District Plan	Operative Auckland City District Plan (Isthmus Section) 1999
AWHC	Additional Waitemata Harbour Crossing
AWR	Alan Wood Reserve
BPO	Best Practicable Option
CAQMP	Construction Air Quality Management Plan
CAU	Census Area Unit
CBCPMP	Concrete Batching and Crushing Plant Management Plan
CBD	Central Business District

Term	Definition
CCTV	Closed Circuit Television
CEMP	Construction Environmental Management Plan
CMA	Coastal Marine Area
CMJ	Central Motorway Junction
CNVMP	Construction Noise and Vibration Management Plan
CO	Carbon Monoxide
Condition	Refers either to Designation Condition or Resource Consent Condition
COPTTM	Code of Practice for Temporary Traffic Management
CPA 1	Coastal Protection Area 1
CPA 2	Coastal Protection Area 2
CPTED	Crime Prevention Through Environmental Design
CSMP	Contaminated Soil Management Plan
CST option	Combined Surface and Tunnel option
CTMP	Construction Traffic Management Plan
CT	Chapman Tripp
dB	Decibels
DIN 4150-3:1999	German Standard Structural Vibration - Part 3: Effects of Vibration on Structures
DoC	Department of Conservation

Term	Definition
DT	Driven Tunnel
ECBF	East Coast Bays Formation
ECOMP	Ecological Management Plan
EDS	Economic Development Strategy
EPA	Environmental Protection Authority
ERC	Environmental Response Criteria
ESCM	Erosion and Sediment Control Methodology
ESCP	Erosion and Sediment Control Plan
ACFPF	Auckland City Future Planning Framework 2008
GMA	General Management Area
GNR	Great North Road
GPS	Government Policy Statement on Land Transport Funding
GWMP	Groundwater Management Plan
HCV	Heavy Commercial Vehicle
HGMPA	Hauraki Gulf Marine Park Act 2000
HNZ	Housing New Zealand
HOV	High Occupancy Vehicle
HPA	Historic Places Act 1993

Term	Definition
HSMP	Hazardous Substances Management Plan
LCN	Local Transit Network
LGAAA	Local Government (Auckland) Amendment Act 2004
LTMA	Land Transport Management Act 2003
LTMAA	Land Transport Management Amendment Act 2008
MDD	Marine Deposit Displacement
MfE	Ministry for the Environment
MHWS	Mean High Water Springs
MMMR	Motu Manawa (Pollen Island) Marine Reserve
MoC	Ministry of Conservation
MoE	Ministry of Education
MPL	Managed Priority Lane
MUL	Metropolitan Urban Limit
MUZ	Mixed Use Zone
NAL	North Auckland Line (Railway) (also referred to as the Western Line)
NES	National Environmental Standards
NIMT	North Island Main Trunk Line (Rail)
NLTP	National Land Transport Programme

Term	Definition
NMP	Noise Management Plan
NO_2	Nitrogen Dioxide
NOR(s)	Notice(s) of Requirement(s)
NSHS	National State Highway Strategy
NZCPS	New Zealand Coastal Policy Statement
NZHPT	New Zealand Historic Places Trust
NZRC	New Zealand Railways Corporation
NZS 6803	NZS 6803:1999 Acoustics – Construction noise
NZS 6806	NZS 6806:2010 Acoustics – Road-traffic noise – New and altered roads
NZTA	New Zealand Transport Agency
NZTS	New Zealand Transport Strategy
NZUDP	New Zealand Urban Design Protocol
OMCS	Operations Management Control System
OPW	Outline Plan of Works
OSMP	Operational Stormwater Management Plan
PARP:ALW	Proposed Auckland Regional Plan: Air Land Water
PG	Parnell Grit
PMCS	Plant Monitoring and Control System

Term	Definition
PPC6	Proposed Plan Change 6 to Auckland Regional Policy Statement
PPM	NZTA Planning Policy Manual
The Project	Western Ring Route: Waterview Connection Project (SH16-20) which is the Proposal subject to all Resource Consents and Notices of Requirement as described in the Assessment of Environmental Effects, Plans and Technical Reports.
PSAR	Preliminary Scheme Assessment Report
PTNP	Passenger Transport Network Plan
PVS	Peak Vector Sum
PWA	Public Works Act 1981
QTN	Quality Transit Network
RA	Reserves Act 1991
RAQT	Auckland Regional Air Quality Targets
RMA	Resource Management Act 1991
RMP	Reserve Management Plan
ROLDPBEA	Reserves and Other Lands Disposal and Public Bodies Empowering Act 1915
RoNS	Road of National Significance
RSVF(s)	Regionally Significant Volcanic Feature(s)
RTN	Rapid Transit Network
SCPA	Sediment Control Protection Area

Term	Definition
SEMP	Settlement Effects Management Plan
SEV	Stream Ecological Valuations
SHx	State Highway (number)
SHF	State Highway Forecast
SIA	Social Impact Assessment
SO_2	Sulphur Dioxide
SRL	Southdown Rail Line
SSTMPs	Site Specific Traffic Management Plans
SWTC	Southwestern Transport Corridor
SWTCS	South Western Transport Corridor Strategy Study
TDM	Travel Demand Management
TEP	Transit Environmental Plan 2008
TGA	Tauranga Group Alluvium
TIA	Traffic Impact Assessment
TMPGG	Traffic Management Project Governance Group
TP10	ARC Technical Publication Number 10: Stormwater Management Devices Design Guideline Manual
TP90	ARC Technical Publication Number 90: Erosion and Sediment Control Guidelines for Land Disturbing Activities
TSMP	Temporary Stormwater Management Plan

Term	Definition
TSP	Total Suspended Particle
UDLP	Urban Design Landscape Plans
UPS	Uninterruptible Power Supply
VKT	Vehicle Kilometres Travelled
VMS	Variable Sign Message
vpd	Vehicles Per Day
vph	Vehicles Per Hour
Waitakere District Plan	Operative Waitakere City District Plan 2003
WCC	Waitakere City Council
WCC LTCCP	Waitakere City Council Long Term Council Community Plan
WCC POSS	Waitakere City Council Draft Parks and Open Space Strategy
WCC WCS	Waitakere City Council Walking and Cycle Strategy
WDHB	Waitemata District Health Board
WHCS	Waitemata Harbour Crossing Study 2008
WHO	World Health Organisation
WPG	Weathered Parnell Grit
WRR	Western Ring Route
WSL	Watercare Services Limited

Glossary of Terms

Term	Definition
AEP (Annual Exceedance Probability) Storm Event	The probability of exceeding a given storm discharge or flood level within a period of one year. For example Equivalent return period terms 1% AEP = 1 in 100 year.
Accretion	Natural accumulation of marine sediment within Coastal Marine Area that results in the formation of new land.
Alan Wood Reserve	A reserve of approximately 9ha in Auckland City adjacent to Hendon Avenue. Community reference to this area also commonly includes other open space land contiguous with this area (e.g. the land designated and owned by the Crown for Railway purposes and the undeveloped residential land at 25 Valonia Street however these areas are not included in the 9ha of reserve cited above).
Alan Wood Reserve Air Monitoring Site	An air monitoring site located within the southern end of Alan Wood Reserve.
Alignment	The route or position of an existing or proposed motorway.
Ambient Air	The air outside buildings and structures. It does not refer to indoor air, air in the workplace, or to contaminated air as discharged from a source.
Ambient Sound	The total sound existing at a specified point and time associated with a given environment. The ambient sound is usually a composite of sounds from several sources, near and far.
Amenity	Defined in section 2 of the RMA as those natural or physical qualities and characteristics of an area that contribute to people's appreciation of its pleasantness, aesthetic coherence, and cultural and recreational attributes.
Archaeological site	Defined in Section 2 of the Historic Places Act 1993 as any place in New Zealand that - (a) Either- • Was associated with human activity that occurred before 1900; or • Is the site of the wreck of any vessel where that wreck occurred before 1900; and (b) Is or may be able through investigation by archaeological methods to provide evidence relating to the history of New Zealand.
Auckland Council	The new unitary authority to replace the eight existing councils in the Auckland Region as of 1 November 2010.

Term	Definition
Avondale Southdown Rail Designation	Designation G08-05 – Railway Purposes Avondale Southdown Line, in the Operative City of Auckland District Plan (Isthmus Section). The designation allows for the construction and operation of the rail line (freight and potentially passenger) linking from the North Auckland Line (Avondale) to Southdown (Onehunga) and rail stations along this corridor. Reference in the context of the Project relates primarily to the portion of this designation extending from the Maioro Interchange (SH20 Mt Roskill termination) to the North Auckland Line (at New North Road).
Best Practicable Option	Defined in section 2 of the RMA. In relation to a discharge of a contaminant or an emission or noise, this means the best method for preventing or minimising the adverse effects on the environment having regard to: • The nature of the discharge or emission and the sensitivity of the receiving environment to adverse effects; and • The financial implications, and the effects on the environment of that option when compared with other options; and • The current state of technical knowledge and the likelihood that the option can be successfully applied.
Bio-filter Strip	A hybrid storm water treatment device combining the vegetated filter strips and infiltrated drains.
Brickworks Site	The former Auckland Brick and Tile Company brickworks and wharf site at Te Atatu.
Bulking Factor	Change in volume of material that will be created by excavation. The bulking factor is defined as: Volume after excavation/Volume before excavation.
Carrington Road Bridge	The bridge located on Carrington Road spanning SH16.
Causeway Bridge	The bridge structures located along the State Highway 16 Causeway iIdentified in NZTA Highway Information as the Rosebank Bridges).
Chamberlain Park	The public golf course located in Auckland City adjacent to SH16 and St Lukes Road.
Coastal Marine Area	Defined in section 2 of the RMA. The foreshore, seabed, and coastal water, and the air space above the water- (a) of which the seaward boundary is the outer limits of the territorial sea: (b) of which the landward boundary is the line of mean high water springs, except that where that line crosses a river, the landward boundary at that point shall be whichever is the lesser of— (i) 1 kilometre upstream from the mouth of the river; or (ii) the point upstream that is calculated by multiplying the width of the river mouth by 5.

Term	Definition
Contaminant	Defined in section 2 of the RMA. Includes any substance (including gases, odorous compounds, liquids, solids, and micro-organisms) or energy (excluding noise) or heat, that either by itself or in combination with the same, similar, or other substances, energy, or heat— (a) when discharged into water, changes or is likely to change the physical, chemical, or biological condition of water; or (b) when discharged onto or into land or into air, changes or is likely to change the physical, chemical, or biological condition of the land or air onto or into which it is discharged
Cowley Street Air Monitoring Site	A monitoring site located on Cowley Street.
Culvert	A pipe designed to convey water under a structure (such as a road).
Cut and Cover Tunnelling	A method of construction of tunnels where a trench is excavated and roofed over. The Project comprises some 0.5km of cut and cover tunnel.
dBA	A measurement of sound level which has its frequency characteristics modified by a filter (A-weighted) so as to more closely approximate the frequency bias of the human ear.
Deep tunnels	The part of the tunnels excavated below surface to a minimum depth of 11m to the crown of the tunnel, and a maximum depth of 65m to the tunnel invert, for approximately 2km.
Designation	Defined in section 2 and section 166 of the RMA. Provision made in a district plan to give effect to a requirement made by a requiring authority under section 168 or section 168A or clause 4 of Schedule 1.
Discharge	As defined in section 2 of the RMA, includes emit, deposit and allow to escape.
Diversion of Stormwater	Redirecting stormwater from its existing course of flow; causing it to flow by a different route.
Do Nothing Approach	Term used in the context of a comparison between the effects of a project and the effects that would occur if the project was not undertaken (i.e. for the comparative evaluation of the effects 'with and without' the project).
Drained Tunnel	A drained tunnel lining drains the ground to reduce loads upon itself. This is achieved by using drainage measures such as a geotextile membrane to divert water to a longitudinal drain located at the base of the tunnel. The drainage measures limit the development of water pressures acting on the lining. This has the benefit of reducing loads on the final tunnel lining, but results in permanent drainage of the surrounding ground.
The Drystone Wall	A 130m long drystone wall in Point Chevalier constructed in the mid 1800's which extends into the CMA adjacent to the SH16 Causeway.

Term	Definition
Excavated Tunnel	Tunnel formed underground without disturbance of the surfav
Effect	Defined in section 3 of the RMA. The term effect includes: • Any positive or adverse effect; and • Any temporary or permanent effect; and • Any past, present, or future effect; and • Any cumulative effect which arises over time or in combination with other effects regardless of the scale, intensity, duration, or frequency of the effect, and also includes- • Any potential effect of high probability; and • Any potential effect of low probability which has a high potential impact.
Emergency Exhaust	Outlet from which smoke is discharged to the atmosphere from a dedicated smoke extraction duct system located in the crown of the tunnel. Used only in the event of an emergency and not part of the operational ventilation system for the tunnels.
Erosion Control	Methods to prevent or minimise the erosion of soil, in order to minimise the adverse effects that land disturbing activities may have on a receiving environment.
Fish Passage	The movement of fish between the sea and any river, including upstream or downstream in that river.
Grade Separated Interchange	The layout of roads (or rail) where one road crosses over/under the other at a different height.
Grassed Filter Strips	Uniformly graded and densely vegetated strips of grass designed to treat stormwater runoff by filtration, infiltration, adsorption and biological uptake.
Grassed Swales	Grassed Swales are vegetated channels used transport stormwater runoff. They also can temporarily hold quantities of runoff and allow it to infiltrate into the soil.
Great North Road – cut cover area	From the Great North Road Interchange, the alignment will be two cut-cover tunnels (some 2.5m apart) beneath Great North Road to connect to the deep tunnel at Sector 8.
Great North Road Interchange	An existing grade separated interchange between Great North Road and SH16 in the vicinity of Waterview / Point Chevalier, Auckland.
Groundwater	Natural water contained within soil and rock formations below the surface of the ground.

Term	Definition
Harbourview Orangihina Park	An 84ha site located on the eastern shore of Te Atatu Peninsula immediately adjacent to the Te Atatu Interchange. The southern part of the Park is occupied by the Te Atatu Pony Club.
Harbutt Reserve	An Auckland City Council reserve approximately 6ha in size located on Harbutt Avenue.
Hendon Park	A 1.6ha area of reserve land adjacent to Hendon Road. The southern boundary adjoins the Avondale Southdown Rail Designation.
Hendon Park Bridge	A pedestrian / cycle bridge crossing of Oakley Creek, SH20 and the rail corridor land providing connection from Owairaka to New Windsor (e.g. Hendon Park to Valonia Street) in Sector 9.
Heritage Site	A site that contributes to an understanding and appreciation of New Zealand's history and cultures. A heritage site can be derived from archaeological, architectural, cultural, historic, scientific and technological fields.
Industrial Area – Richardson Road	An area zoned as Mixed use adjacent to Richardson Road and currently occupied by a range of light industrial activities.
Industrial Area – Rosebank Road	One of the large Industrial/Commercial areas in West Auckland located on the Rosebank Peninsula and zoned for Business Activity.
Jack Colvin Park	A 4ha Recreation Reserve adjacent to the Te Atatu Roundabout and occupied by the Te Atatu Rugby League Club.
L_{eq}	The time averaged sound level (on a log/energy basis) over the measurement period (normally A-weighted).
L_{10}	The sound level which is equalled or exceeded for 10% of the measurement period. L10 is an indicator of the mean maximum noise level and is used in New Zealand as the descriptor for intrusive noise (normally A-weighted).
L_{95}	The sound level which is equalled or exceeded for 95% of the measurement period. L95 is an indicator of the mean minimum noise level and is used in New Zealand as the descriptor for background noise (normally A-weighted).
L_{max}	The maximum sound level recorded during the measurement period.
Land Disturbing Activity	Any disturbance to the ground surface that may result in soil erosion through the action of wind or water.
Leachate	Liquid that has infiltrated through or emerged from solid waste and that contains dissolved and/or suspended chemical liquids and/or solids and/or gases.

Term	Definition
Maioro Street Interchange	A diamond interchange proposed for the SH20 Motorway connection at Maioro Street in New Windsor.
McCormick Green	A 1.5ha Recreation Reserve south of and adjacent to the Te Atatu Interchange.
Meola Creek	A meandering creek running from St Lukes to Point Chevalier via Great North Road, SH16 and Chamberlain Park discharging to the Waitemata Harbour north of Meola Road.
Mg/m³	Milligrams (10-3) per cubic metre. Conversions from mg/m³ to parts per volume concentrations are calculated at 25 degrees Celsius as recommended by the Ministry of the Environment.
Motorway	Motorway means a motorway declared as such by the Governor-General in Council under section 138 of the PWA or under section 71 of the Government Roading Powers Act 1989.
Motu Manawa (Pollen Island) Marine Reserve	A Marine Reserve created 12 October 1995 to protect 500 hectares of estuarine habitat in the upper reaches of the Waitemata Harbour, being Part Bed of the Waitemata Harbour, situated in Block XV, Waitemata Survey District, and Block III, Titirangi Survey District, as shown marked A and B on SO Plan 68062, lodged in the office of the Chief Surveyor for the North Auckland Land District.
Natural Ground Level	The existing ground level of the land before any filling, excavation or construction activity.
New Zealand Railways Corporation	New Zealand Railways Corporation is the state owned enterprise that manages the rail and ferry businesses owned by the New Zealand Government. Although New Zealand Railways Corporation is the legal name for the organisation (and the name of the Requiring Authority), KiwiRail is the trading name.
Noise Mitigation	An activity or structure which reduces/mitigates the impact or effect of noise.
NOx	Oxides of nitrogen – a suite of gaseous contaminants that are emitted from road vehicles and other sources. Some of the compounds can react in the atmosphere and, in the presence of other contaminants, convert to different compounds (e.g., NO to NO2).
Northwestern Cycleway	A dedicated cycleway adjacent to the Northwestern Motorway, extending from Auckland's CBD and connecting to the Te Atatu Cycleway. In the context of this Project refers to the section of this cycleway between St Lukes Road and the Te Atatu Interchange.

Term	Definition
Northwestern Motorway	That section of State Highway 16 which is declared motorway extending from Central Motorway Junction to its connection with State Highway 18 at Westgate.
Oakley Creek	A meandering stream that runs from Mt Albert to Waterview via Underwood Reserve, Alan Wood Reserve, and Oakley Creek Reserve. Oakley Creek discharges to the Coastal Marine area south of SH16 at the Great North Road interchange.
Oakley Creek Bridge (SH20)	A bridge crossing Oakley Creek by the SH20 carriageway in the vicinity of Hendon Park, Sector 9.
Oakley Creek Esplanade Reserve	An Auckland City reserve located between Great North Road and Unitec.
Oakley Inlet	That part of the estuary outside of the Motu Manawa (Pollen Island) Marine Reserve and identified as Coastal Protection Area 1 extending from the mouth of the Oakley Creek to the Causeway Bridge.
Oakley Inlet Heritage Area	An area of heritage sites, including the Star Mill and Garrett Tannery sites located on the Oakley Inlet, defined in Plan F.9: Oakley Inlet Heritage Area.
Overflow	A discharge from a combined sewer or wastewater network resulting from the flows being greater than the conveyance capacity within the network.
Overland Flow Path	The natural flow path of stormwater over ground.
Patiki Cycleway Bridge	A dedicated cyclist/pedestrian overpass at the Patiki Road On-Ramp.
Patiki Off-Ramp Bridge	An Off-Ramp Bridge providing a connection from Patiki Road heading east to Auckland City.
Pedestrian/Cycle Way	A dedicated facility for the use of pedestrians and cyclists.
Phyllis Reserve	A recreation reserve in Auckland City of approximately 7ha. The reserve is dominated by sports fields and is leased and occupied by the Metro Mt Albert Sports Club (amongst others).
Pier	Vertical support structure for a bridge.
PM10 PM2.5 PM1	Fine particulate matter with an equivalent aerodynamic diameter of less than 10, 2.5 or 1 micrometres respectively. Fine particulates are predominantly sourced from combustion processes. Vehicle emissions are a key source in urban environments.

Term	Definition
Pollen Island	An estuarine shellbank Island to the north of the Rosebank Peninsula and within the Motu Manawa Marine Reserve.
Pollen Island Drainage Channel	Main channel that drains the estuarine area between Pollen Island and the Rosebank Peninsula.
Portal	The entrance way to a tunnel where a road enters or emerges.
Rain gardens	Uniformly graded soil media planting area and vegetated strip designed to treat stormwater runoff by filtration, infiltration, adsorption and biological uptake.
Reclamation	As defined in the Auckland Regional Plan: Coastal. Any permanent filling of an area previously inundated by coastal water either at or above mean high water spring mark, whether or not it is contiguous with the land, so that the filled surface is raised above the natural level of MHWS, and thus creates dry land, removed from the ebb and flow of the tide.
Roadheader	A piece of excavating equipment consisting of a boom-mounted cutting head, a loading device usually involving a conveyor, and a crawler travelling track to move the machine forward into the rock face.
Rosebank Interchange	A grade separated interchange providing a connection from Rosebank Road east to Auckland City and from west Auckland to Rosebank Road from SH16.
Rosebank Park Domain	A Recreation Reserve adjacent to the Rosebank Peninsula occupied by the Auckland Kart Club and Auckland Speedway Riders Club.
Sand Filters	Filtration device designated to treat storm water.
Sector 1	That part of the Project that extends from the eastern abutments of the Henderson Creek Bridge to western abutment of the Whau River Bridge including the Te Atatu Interchange.
Sector 2	That part of the Project that includes work and structures over and within the Whau River and adjacent estuarine area of CMA.
Sector 3	That part of the Project that includes the landward (southern) component of the Rosebank Peninsula including Patiki Road and the Rosebank Park Domain.
Sector 4	That part of the Project that requires reclamation including along the Rosebank Peninsula and the Causeway between Rosebank Peninsula and Waterview. This sector includes parts of Traherne Island.
Sector 5	That part of the Project occupied by the SH16/SH20 Interchange from the Waterview Reserve to SH16.

Term	Definition
Sector 6	That part of the Project that includes the additional lanes on the existing Northwestern Motorway, between the Great North Road Interchange and St Lukes Interchange (on SH16).
Sector 7	That part of the Project that refers to the 'cut and cover' of tunnel from the northern portal at (Waterview Reserve), crossing beneath Great North Road to connect with the excavated tunnel (Sector 8).
Sector 8	That part of the Project that refers to the section of the Project extending northward from the Alan Wood Reserve (southern portal) beneath 'Avondale Heights' (the excavated section).
Sector 9	That part of the Project that refers to the southern tunnel portal in Alan Wood Reserve area (in the vicinity of Range View Road) southward to include the open or surface carriageway and pedestrian / cycleway (and associated mitigation works), through to the bridging of SH20 under Richardson Road and works associated with construction of the Maioro Street Interchange north facing ramps.
Sediment Control	Capturing sediment that has been eroded and entrained in overland flow before it enters the receiving environment.
Sediment Plume	Visible dispersal of sediment within a body of water.
Settlement	The gradual sinking of the ground surface as a result of the compression of underlying material.
SH20 Pedestrian/Cycle way	A pedestrian/cycle way alongside SH20 providing connection from Hillsborough to Maioro Road (extended through Sector 9 of the Project).
SH20 Mt Roskill section	The recently completed section of SH20 that extends from the old terminus of SH20 at Hillsborough Road through to Maioro Street (where the Project will start).
Star Mill/Tannery	The Star Mill/Garrett Brothers Tannery archaeological site, identified by the New Zealand Archaeological Association site number R11/2191.
Strata	Layer of rock or soil with internally consistent characteristics that distinguishes it from contiguous layers.
Te Atatu Boating Club	The Te Atatu Boating Club is a recreational boating organisation which operates and maintains a wharf, all weather/all tide ramps and launching facilities, dinghy pontoons, boarding areas and hardstand facilities with boat maintenance area and painting shed on the banks of the Whau River.
Te Atatu Interchange	Grade separation intersection at Te Atatu that provides a connection between the State Highway and the local road.

Term	Definition
Tensile Strain	Strain at which a material breaks due to subjection by an external force.
Traherne Island	A small Island to the east of the Rosebank Peninsula and bisected by the Northwestern Motorway.
Tunnel Portal Locations	The general location of the northern portal is at the southern end of Waterview Reserve. The general location of the southern portal is within Alan Wood Reserve.
µg/m³	Micrograms (10-6) per cubic metre. Conversions from µg/m³ to parts per volume concentrations (i.e. ppb) are calculated at 25 degrees Celsius.
Underpass	A grade separation where a carriageway passes under another. For example, for the Project, this relates to SH20 passing beneath Great North Road and a pedestrian / cycle way passing beneath the SH16 carriageway (Te Atatu).
Underwood Park	A 4ha Auckland City Reserve located in Owairaka with frontages to Richardson Road, Wainright Road and Beagle Avenue.
Ventilation Stack	A structure which channels air emissions to a height in the atmosphere which is suitable to disperse the emissions and result in an acceptable ambient air quality.
Waterview Pedestrian/ Cycle way	A commuter pedestrian/cycle way connecting the existing SH20 cycleway at Maioro Street to the Northwestern Cycleway (parallel to SH16).
Waterview Reserve	An Auckland City Reserve located at the mouth of the Oakley Creek with frontage to Cowley and Herdman Streets (also known as “Oakley Park”).
Western Ring Route (WWR)	A strategic highway route which provides an alternative to SH1 as a regional route for traffic crossing greater Auckland. The WWR requires the completion of missing links and new lanes to combine the Southwestern (SH20), Northwestern (SH16) and Upper Harbour (SH18) highways into a continuous 48km motorway. The WWR will link the North Shore, Waitakere, Auckland and Manukau cities.
Wetland	Vegetated stormwater treatment devices designed to remove a range of contaminants, providing superior water quality treatment to wetponds with increased filtering and biological treatment performance.
Wetpond	Ponds designed for peak flow attenuation and efficient water quality treatment.
Whau River Bridge(s)	Existing bridges over the Whau River with an adjoining cyclist/pedestrian bridge heading west.

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F.15	Coastal Discharges	20.1.11-3-D-N-943-100, 101, 103 to 106, 109, 301
F.16	Urban Design & Landscape Plans	20.1.11-3-D-L-810-200 to 228 (and planting schedules)
F.17	Noise Walls / Mitigation	20.1.11-3-D-N-918-100 to 103, 108-111, 113, 117-119
F.18	Reclamation Extent	20.1.11-3-D-C-520-100, 101, 103 to 108
F.19	Lane Marking & Sign Location	20.1.11-3-D-C-915-100 to 119
F.20	Cycleway Overview	20.1.11-3-D-N-916-140 to 144

Part G: Technical Reports		
Report No.	**Technical Report Name**	**Prepared by**
Technical Assessment Reports		
G.1	Assessment of Air Quality Effects	Beca/NIWA
G.2	Assessment of Archaeological Effects	Clough & Associates
G.3	Assessment of Avian Ecological Effects	Bioresearches
G.4	Assessment of Coastal Processes	Tonkin & Taylor/NIWA
G.5	Assessment of Construction Noise Effects	Marshall Day Acoustics
G.6	Assessment of Freshwater Ecological Effects	Boffa Miskell
G.7	Assessment of Groundwater Effects	Beca
G.8	Assessment of Herpetofauna Ecological Effects	Bioresearches
G.9	Assessment of Land and Groundwater Contamination	Beca
G.10	Assessment of Lighting Effects	Beca
G.11	Assessment of Marine Ecological Effects	Boffa Miskell
G.12	Assessment of Operational Noise Effects	Marshall Day Acoustics
G.13	Assessment of Ground Settlement Effects	Beca
G.14	Assessment of Social Effects	Beca
G.15	Assessment of Stormwater and Streamworks Effects	Tonkin & Taylor/ Aurecon
G.16	Assessment of Temporary Traffic Effects	Beca
G.17	Assessment of Terrestrial Vegetation Effects	Bioresearches
G.18	Assessment of Transport Effects	Beca
G.19	Assessment of Vibration Effects	Marshall Day Acoustics
G.20	Assessment of Visual and Landscape Effects	Stephen Brown Environments
G.21	Construction Environmental Management Plan (CEMP)	Beca
G.22	Erosion and Sediment Control Plan (ESCP)	Ridley Dunphy Environmental / Aurecon
Technical Supporting Reports		
G.23	Coastal Works	Aurecon
G.24	Geotechnical Interpretive Report	Tonkin and Taylor
G.25	Traffic Modelling Report	Beca
G.26	Operational Model Validation Report	Beca
G.27	Stormwater Design Philosophy Statement	Tonkin and Taylor
G.28	Geotechnical Factual Report – 500 Series	Beca
G.29	Geotechnical Factual Report – 700 Series	Beca
G.30	Assessment of Associated Sediment and Contaminant Loads	NIWA

1. Introduction

Overview:

This Chapter provides an introduction to the NZTA (as the Requiring Authority and Consent Applicant); the Waterview Connection Project ('the Project'), and the structure and purpose of the remainder of this Report: the Assessment of Environmental Effects (AEE).

1.1 NZ Transport Agency

The NZ Transport Agency (the NZTA) a Crown entity. The NZTA's objective is to contribute to an integrated, safe, responsive, affordable and sustainable land transport system. One of the NZTA's five strategic priorities, as defined in its Statement of Intent 2010/11, is planning for and delivering Roads of National Significance (RoNS).

The NZTA is responsible for planning and delivering the RoNS

1.2 The Western Ring Route

The Western Ring Route (WRR) comprises the State Highway 20 (SH20), State Highway 16 (SH16) and State Highway 18 (SH18) corridors and, once completed, will consist of 48km of motorway linking Manukau, Auckland, Waitakere and North Shore. The Western Ring Route (WRR) is identified on Figure 1.1 of this AEE.

The Western Ring Route is a key strategic route for the Auckland Region

The strategic importance of the WRR is to provide an alternative route through the Auckland Region to reduce dependency on State Highway 1 (SH1), particularly through the Auckland Central Business District (CBD) and across the Auckland Harbour Bridge. The WRR will also provide for economic growth, unlocking potential for development along its length by improving trip reliability and access from the west to the south of the Region, and from the CBD to the southern Auckland isthmus and airport.

The recent completion of the Manukau Harbour Crossing and Mt Roskill Extension Projects on SH20 means that this highway now extends from Manukau in the south to New Windsor in the north, terminating at an interchange with Maioro Street and Sandringham Road.

1.2.1 The Western Ring Route Road of National Significance

Completing the WRR is one of the seven RoNS

In 2009, the Government identified the RoNS as seven of New Zealand's most important transport routes that require significant development to reduce congestion, improve safety and support economic growth. The RoNs are identified as critical roads to ensuring that transport users have access to significant markets and areas of employment and economic growth. The Western Ring Route (WRR), from Westgate to St Lukes Interchange (SH16) and from Great North Road Interchange to Maioro Interchange (SH20) is identified as a RoNS (key projects of the WRR RoNS are set out in Section 3.6 of this AEE). The WRR RoNS is highlighted on Figure 1.1.

1.3 The Waterview Connection

This Project completes the final link in the WRR

The Waterview Connection Project ('the Project') is a key to complete the missing link in the WRR; by establishing a high-quality motorway connection between SH16 and SH20. The Project will be the largest roading project undertaken to date in New Zealand. The location of the Waterview Connection on the WRR is highlighted in Figure 1.1.

New State Highway from SH20 to connect to SH16

Through the Project, the NZTA proposes to designate land and obtain resource consents in order to construct, operate and maintain:

1. The motorway extension of SH20 from Maioro Street (New Windsor) to connect with SH16 at the Great North Road Interchange (Waterview). This includes construction of the majority of SH20 in this section via 'deep tunnels[1]' and improved connectivity at the Maioro Street Interchange.

Improved capacity and resilience works on SH16, including QTN provision

2. The upgrading of the Northwestern Motorway (SH16) to improve the resilience of the WRR and wider transport network; raising the causeway on SH16 between the Great North Road and Rosebank Interchanges (in response to historic subsidence of the causeway and to "future proof" it against sea level rise). In addition, the Project provides for increased capacity on the SH16 corridor, compatible with the strategic corridor. These works include additional traffic lane capacity between the St Lukes Interchange and Henderson Creek, works to improve the functioning and capacity of the Te Atatu Interchange, and improvements to the provision of bus lanes (Quality Transport Network (QTN).

[1] Throughout this AEE, the reference to 'deep tunnels' is to the tunnels constructed from below ground, through open face excavation (as compared to the 'cut-cover' tunnels at the portals). Further description is provided in the Glossary to this AEE and in the description of construction in Chapter 5.

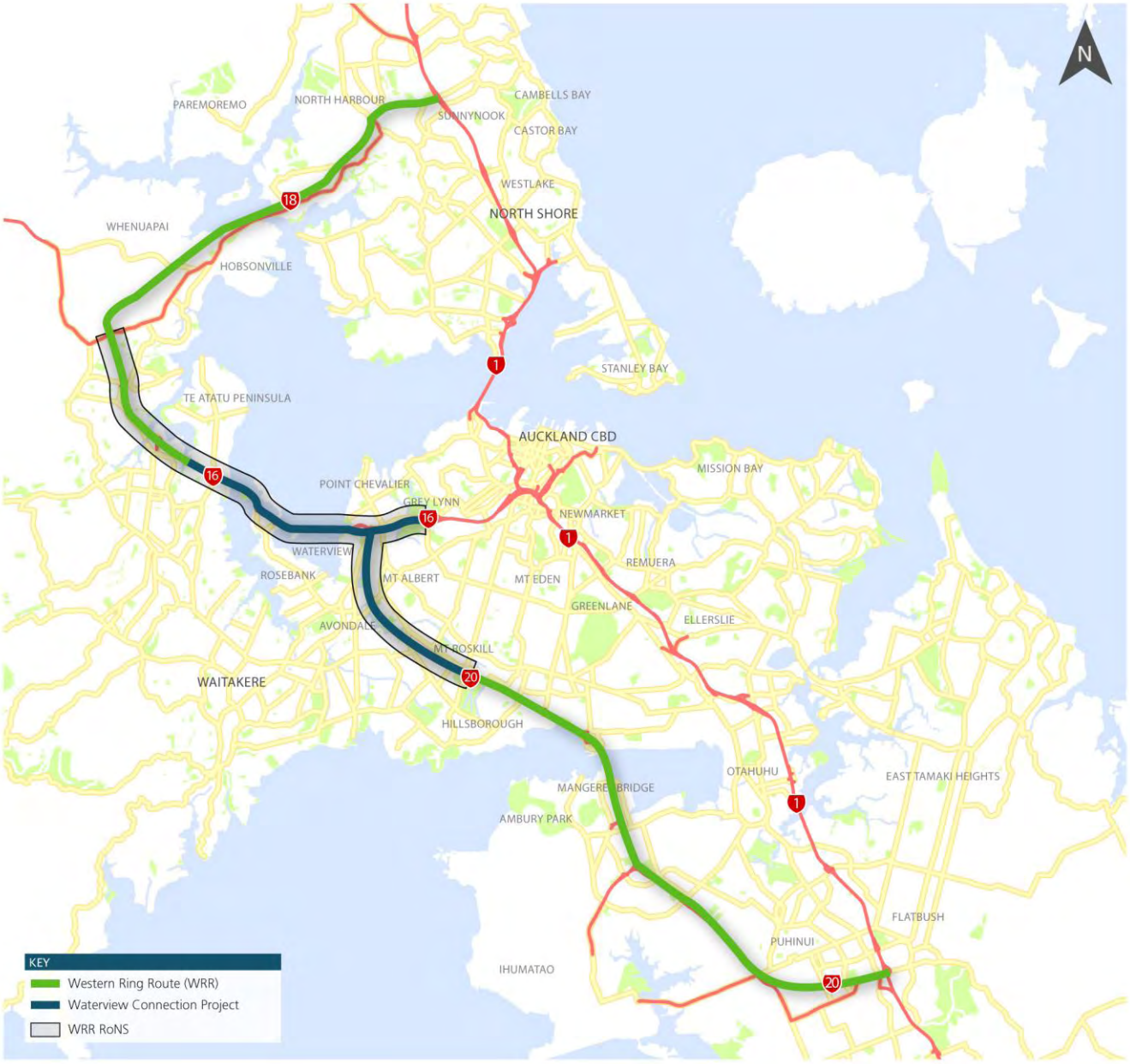

Figure 1.1: Western Ring Route and Waterview Connection Project

As well as the improvements to SH16 and SH20, the Project will upgrade the pedestrian/cycle way on the existing SH16 corridor and provide for pedestrian/cycle ways adjoining surface sections of SH20. The key components of the Waterview Connection Project are set out in Section 2.1 of this AEE.

1.4 Notices of Requirement and Resource Consents

The Waterview Connection is a Proposal of National Significance

The Project is being lodged with the Environmental Protection Authority (EPA) requesting that the Ministers for the Environment and Conservation make a direction that the Notices of Requirement and resource consents be referred to a Board of Inquiry, as the Project is a Proposal of National Significance (pursuant to Part 6AA of the Resource Management Act 1991 ('RMA'). The Project requires designations under both the Auckland City and Waitakere City District Plans and resource consents under the Auckland Regional Council's Regional Plans.

1.4.1 Notices of Requirement

Designations sought in both the Auckland and Waitakere District Plans

The NZTA is a Requiring Authority as defined in Section 166 of the Resource Management Act 1991 (RMA or the Act). As such the NZTA has a mandate to seek to designate land for the State highway network in accordance with its functions.

The Project is the subject of Notices of Requirement (NORs) to designate land both as new designations (Section 168(2) of the RMA) and as alterations to existing designations (Section 181(1) of the RMA). Designations are required in both the Auckland City and Waitakere City District Plans. The designations will provide for activities needed to construct, maintain and operate the Project. If confirmed, no further land use consents will be required under the District Plans within these designated areas (pursuant to section 176 of the RMA). Furthermore, the elements of the Project subject of an Outline Plan of Works[2] are incorporated into the documentation supporting the NORs and applications for resource consent. Accordingly, it is considered that no Outline Plan(s) of Works need be submitted prior to the commencement of construction[3].

A description of the NORs for designation, explanation of their division and map showing their physical extent is provided in Chapter 7 of this AEE. In overview, Figure 1.2 highlights the geographic areas relevant for each of the NORs in relation to the Project[4].

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2 Pursuant to section 176A(3) of the RMA.

3 As provided for in Section 176A(2) of the RMA.

4 The 'Sectors' referred to in this figure are used in the remainder of this AEE to describe and assessment the effects of the Project in these areas.

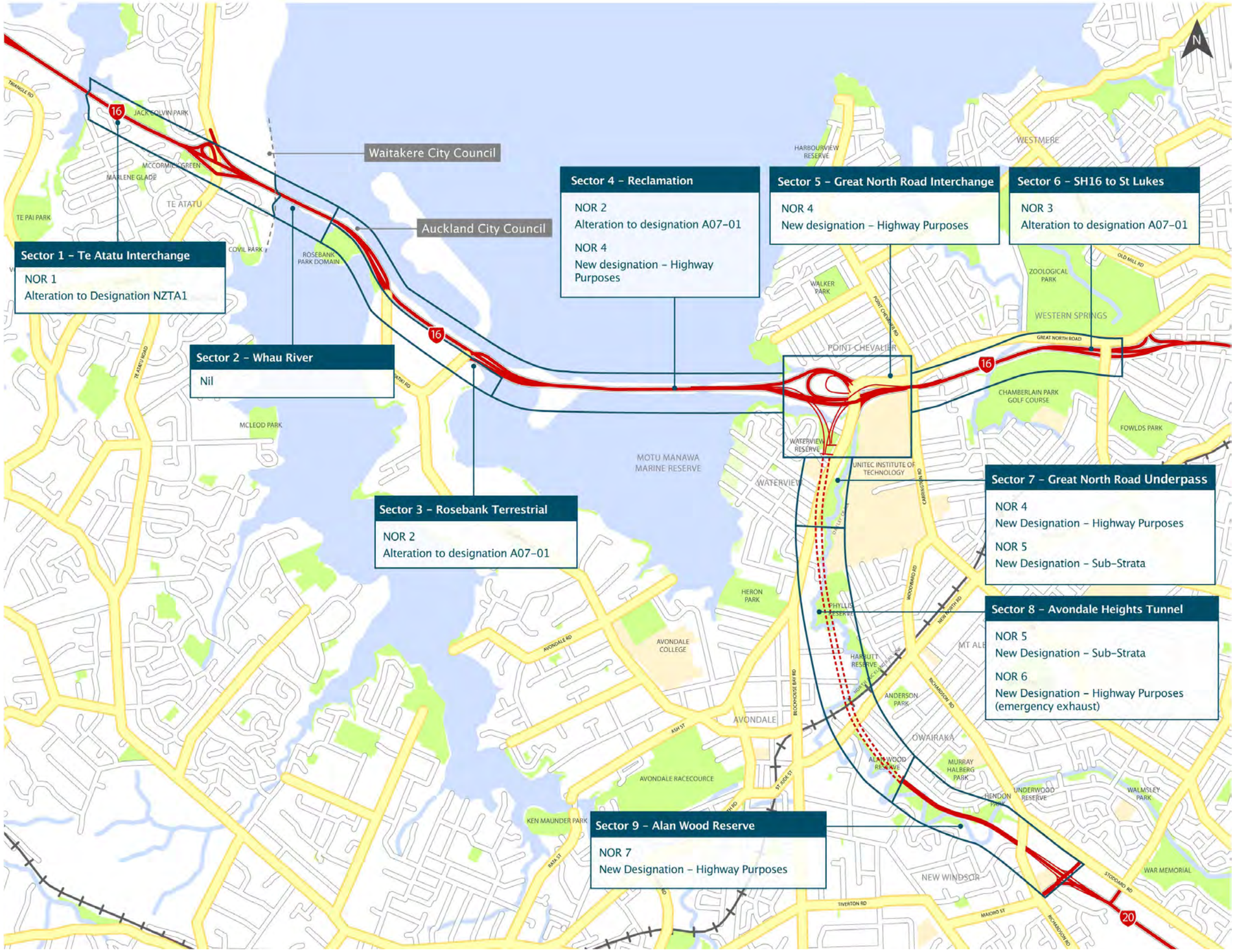


Figure 1-2: Waterview Connection: Summary of NORs sought

1.4.2 Resource Consents

Consents are sought from the Regional Council for construction and operation

For those activities not covered by the District Plan, resource consents are also required to enable construction, maintenance and operation of the Project. In particular, regional consents are required under the Auckland Regional Plans in relation to works in the coastal marine area (e.g. for reclamation, occupation and discharge), for works to divert and discharge surface water, stormwater and groundwater, for the disturbance of contaminated sites, for works within watercourses (e.g. reclamation, occupation and discharge), and for land use activities (e.g. earthworks or land disturbance activities).

Land use consents are sought under s89(2) of the RMA

In addition, resource consent (land use) is also required from the Auckland City Council under their District Plan, for an activity on land which is proposed to be created by reclamation (pursuant to section 89(2) of the RMA). Further detail on those consents is provided in Chapter 7 of this AEE.

1.5 Documentation and Structure of Reporting

1.5.1 Overview of Documentation

The AEE documentation is over a number of volumes

The full suite of reports for the AEE are contained in a number of volumes. The prescribed forms for the relevant resource consent applications and NORs are compiled in this document under the heading, **Waterview Connection Project – Notices of Requirement and Consent Application Forms**.

Other volumes include the overall AEE report and supporting Plans. In summary, the Contents of the AEE is structured as follows:

- **Part A** – Project Description and Objectives
- **Part B** – Statutory and Strategic Matters
- **Part C** – Existing Environment
- **Part D** – Project Assessment (Volume I and II)
- **Part E** – Appendices
- **Part F** – Plans and Supporting Drawings

The remaining volumes comprise the various technical assessment reports and supporting technical reports (these are referred to as **Part G** of the Plan). The Table of Contents at the front of this volume sets out the overall structure of these various parts of the AEE.

The contributors to the AEE and all the supporting technical reports are provided in the Preface Section of this AEE.

1.5.2 Purpose of the AEE

This AEE supports the NORs and resource consent applications

This AEE has been prepared in support of both the NORs and the applications for resource consent lodged with the Environmental Protection Authority. In accordance with the requirements of the RMA[5], this report provides the following information:

- A description of the Project – the Waterview Connection Project (Part A – Chapters 2 and 4);
- The objectives of the NZTA for which the designations are being sought (Part A – Chapter 3);
- A description of the relevant provisions of national policy statements, the regional policy statement, regional and district plans and proposed plans (Part B – Chapter 6) and an assessment of the Project against these planning documents (Part D – Chapter 23);
- A description of the existing physical and social environment through which the Project will be constructed and within which it will operate (Part C – Chapter 8);
- Identification of the communities and persons potentially affected by the Project (Part C – Chapter 8), the consultation undertaken and the responses made to the views expressed in the consultation (Part D – Chapter 10);
- An assessment of the alternatives considered including alternative locations or methods for undertaking the Project (Part D – Chapter 11);
- An assessment of the actual or potential effects on the environment of the proposed activity, including consideration of the use of hazardous substances and installations (Part D – Chapters 12 to 22);
- A description of the nature of the discharge of contaminants, the sensitivity of the proposed receiving environment to adverse effects, the alternative methods of discharge, including discharge into any other receiving environment (Part D – Chapters 12 to 22);
- A description of the mitigation measures (including safeguards and contingency plans) proposed to be undertaken to assist in preventing or reducing the expected adverse effects and the monitoring proposed (Part D – Chapter 24).

[5] See particularly section 171 relating to designation and the 4th Schedule relating to an Assessment of Environmental Effects of the RMA.

1.5.3 Formatting of the AEE

To assist in use of this report, each section of this report has been structured in a consistent format. These elements are highlighted on an 'example page' from the AEE, in Figure 1.3 below.

Consistent structure used for each section of the report

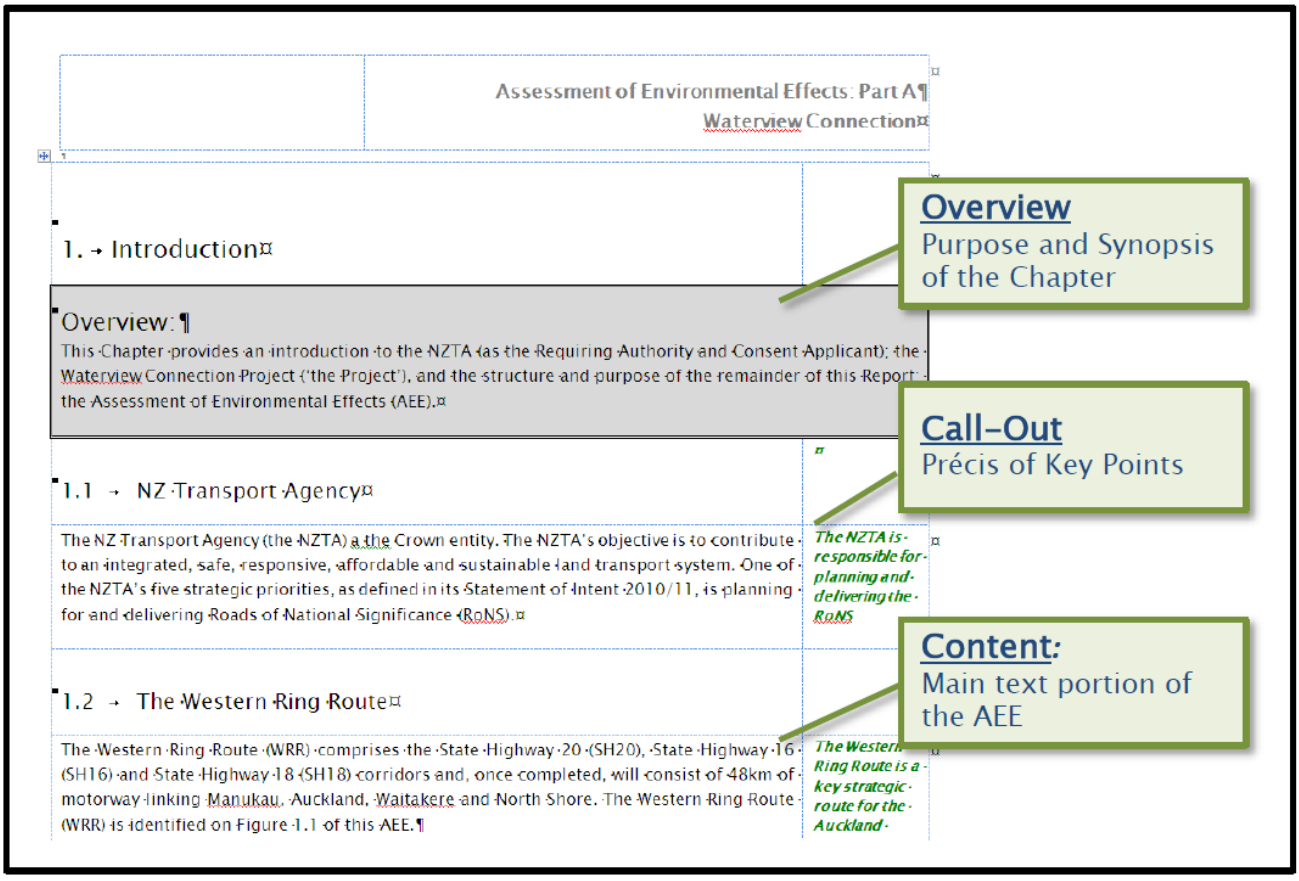


Figure 1.3: Structure of Text in the Chapters of the AEE

2. The Proposal: Waterview Connection Project

Overview

In late 2009 the NZTA confirmed its intention that the 'Waterview Connection Project' would be lodged with the Environmental Protection Authority as a Proposal of National Significance. The Project includes works previously investigated and developed as two separate projects: being the SH16 Causeway Project and the SH20 Waterview Connection.

The key elements of the Waterview Connection Project are:

- Completing the Western Ring Route (by linking SH20 to SH16);
- Improving resilience of the SH16 causeway between the Great North Road and Rosebank Interchanges to correct historic settlement and "future proof" it against sea level rise;
- Providing increased capacity on the SH16 corridor (between the St Lukes and Te Atatu Interchanges) to accommodate the SH20 connection and provide balance with the wider strategic network;
- Providing a new section of SH20 (through a combination of surface and tunnelled road) between the Great North Road and Maioro Street Interchanges;
- Providing and maintaining a cycleway adjoining the surface carriageways of the Project; and
- Providing for bus shoulders (Quality Transport Networks) on SH16.

2.1 Summary of Project Work

The Project has been described and assessed in geographic "sectors"

The Project has been described and assessed in geographic Sectors, which are depicted in Figure 2.1. The following provides a summary of the Project proposed for each of the Sectors identified:

Improved capacity on SH16

Between Te Atatu and St Lukes Interchanges the following key elements of work will be undertaken on SH16:

- Significant improvements and reconfiguration of the Te Atatu Interchange to accommodate additional lanes and to provide a shoulder for bus priority and other High Occupancy Vehicles (HOVs) (Sector 1);
- A shared use cycle and pedestrian way running parallel to the motorway from Te Atatu (Henderson Creek) to the Great North Road Interchange (Sectors 1 through 5);

- Enlargement of the existing Whau River Bridge to accommodate additional lanes and a separate dedicated cycle/pedestrian bridge (Sector 2);
- Reconfiguration of the existing Rosebank on and off ramps to improve traffic merging on and off these ramps (Sectors 3 and 4);
- One additional lane (in each direction) between the Te Atatu and Rosebank Interchanges to provide four lanes east and westbound and a bus shoulder in each direction (Sectors 1 to 4);
- Two additional westbound lanes between Great North Road Interchange and Rosebank Road Interchange to create a total of five westbound lanes plus a dedicated bus shoulder (Sectors 3 and 4);
- One additional eastbound lane between Rosebank Road Interchange and Great North Road Interchange, to create a total of four eastbound lanes plus a dedicated bus shoulder (Sectors 3 and 4);
- Replacement of the grade-separated cycle/pedestrian bridge in the Patiki Interchange (Sector 3);

Improved North-western cycleway

- Widening of the existing Causeway and Causeway Bridge[1] to accommodate additional lanes and a separate cycle/pedestrian bridge (Sector 4);
- The existing causeway between Rosebank Peninsula and the Great North Road Interchange will be enlarged by additional reclamation (Sector 4);

Improved resilience of the State highway network

- In conjunction with the reclamation, the causeway height will be increased to protect the State highway against inundation and to "future proof" it against predicted sea level rise in the future (Sector 4); and
- Additional lanes, a cycleway and a bus priority lane will be provided between the Great North Road Interchange and the St Lukes Interchange (Sector 6).

SH16 and SH20 connection

For SH20, between Great North Road Interchange (with SH16) and Maioro Street Interchange, a new State highway alignment will be provided over a length of approximately 5km and capacity for up to three traffic lanes in each direction. The following key elements of work will be undertaken:

New SH20 connection to SH16

- A new interchange will be built at the 'Great North Road Interchange' to provide motorway-to-motorway connections between SH16 and SH20 (both west and east bound movements) (Sector 5);
- At the Great North Road Interchange, the existing connections between Great North Road and SH16 will be maintained (Sector 5);
- Realignment but retention of the Northwestern Cycleway through the Great North Road Interchange (Sector 5);

[1] There are two bridge structures included within the Causeway Bridge.

- The Project provides future capacity for up to three traffic lanes in each direction on SH20, separated by either central median barrier or separate tunnel construction[2];
- A cycleway extension to the existing 'SH20 Cycleway' (that terminates at the Maioro Street Interchange) will be provided adjoining the carriageway where the motorway is at-grade (Sector 9);

SH20 Cycleway extension

- From the Great North Road Interchange, the alignment will comprise two cut-cover tunnels beneath Great North Road transitioning into two to connect to the open-face excavation tunnels ('deep tunnels') (Sector 7);
- The construction of the two deep tunnels (one in each direction) from the cut-cover tunnel beneath Great North Road through to the Alan Wood Reserve (Sector 8);
- From the Alan Wood Reserve the carriageway emerges 'at-surface' over a length of around 1800m, to connect to SH20 at the Maioro Street Interchange (Sector 9). One kilometre of the Project in this sector is new motorway from the tunnel portals to the Richardson Road Bridge.
- Richardson Road will be bridged 'at grade', with the State highway cut beneath and new north-facing ramps will be built at the Maioro Street Interchange to provide local traffic access to SH20 (Sector 9); and

Full diamond interchange at Maioro Street

- The design of the State highway has not precluded the future Avondale to Southdown Rail Line and has maintained a land corridor of sufficient width (e.g. for double track with electrification), from the Maioro Street Interchange to the southern tunnel portal in Alan Wood Reserve (Sector 9).

Opportunity for future Avondale to Southdown Rail Line maintained

2.2 A Proposal of National Significance

The Project is considered to be of national significance3 for the following reasons:

The Project is a Proposal of National Significance

- The Project, particularly works associated with the extension of SH20 in Waterview but also the works at Te Atatu Interchange, has aroused widespread public interest regarding its actual or likely effects on the environment, particularly regarding social impacts (impacts on the built environment);
- The Project involves use of significant physical resources; the existing State Highway (16);

[2] At opening, the tunnel sectors (Sectors 7 and 8) will be three lanes in each direction and the open road sector (Sector 9) will be constructed with two lanes in each direction (with a lane drop at the southbound off-ramp at Maioro Street Interchange and a lane gain northbound from the Interchange).

[3] In accordance with the considerations set out in section 142 of the RMA

- The Project involves use and impacts on significant natural resources; the Coastal Marine Area, which is a national marine reserve;
- The Project is a network utility operation that extends over more than one jurisdictional boundary (with designations required in the Waitakere and Auckland District Plans and consents funder the Auckland Regional Council's Regional Plans); and
- The Project will assist the Crown in fulfilling its functions to provide national infrastructure for the social and economic wellbeing of the country.

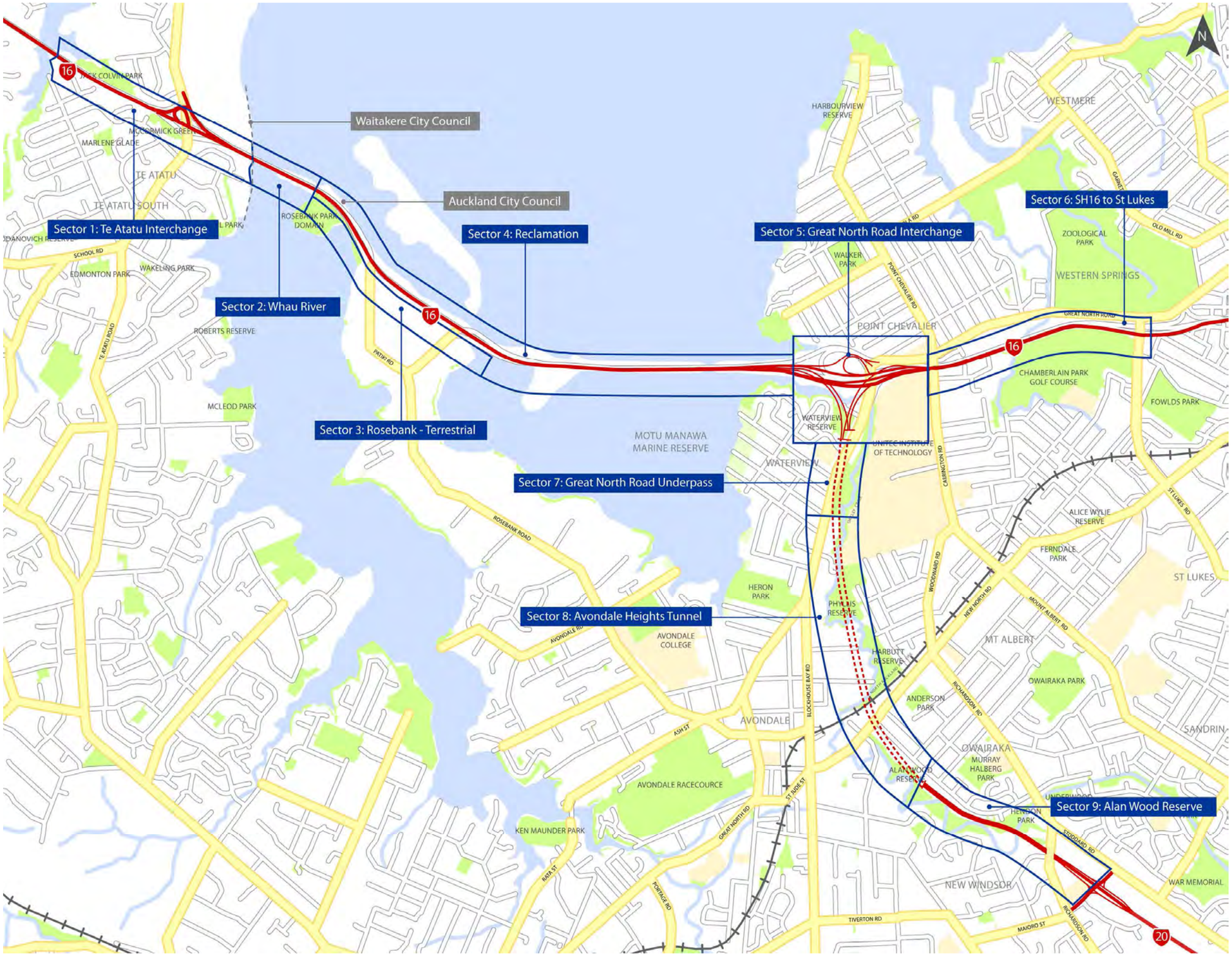


Figure 2.1: Sector Diagram

3 Objectives

Overview

The Waterview Connection Project is the final critical link in the WRR and its completion will have a number of significant benefits locally, regionally and nationally. The objectives of the WRR and more specifically of the Waterview Connection reflect the economic and transportation outcomes the NZTA require from the Project.

The objectives for the Project are:

1. To contribute to the region's critical transport infrastructure and its land use and transport strategies,
2. To improve accessibility for individuals and businesses and support regional economic growth and productivity,
3. To improve resilience and reliability of the State Highway network,
4. To support mobility and modal choices within the wider Auckland Region, and
5. To improve the connectivity and efficiency of the transport network.

3.1 The NZ Transport Agency

The New Zealand Transport Agency's objective is defined under section 94 of the Land Transport Management Act 2003 (LTMA) as '... *to undertake its functions in a way that contributes to an affordable, integrated, safe, responsive, and sustainable land transport system'.*

The NZTA's objective is to contribute to an affordable, integrated, safe, responsive, and sustainable land transport system

The functions of the NZTA are defined in section 95(1) of the LTMA. The functions of the NZTA, of relevance to the Project, include:

(a) to promote an affordable, integrated, safe, responsive, and sustainable land transport system:

(c) to manage the State highway system, including planning, funding, design, supervision, construction, and maintenance and operations, in accordance with this Act and the Government Roading Powers Act 1989...

In undertaking these functions, the NZTA is required to exhibit a sense of social and environmental responsibility, use revenue in a way that seeks value for money, and ensure that revenue and expenditure are accounted for in a transparent manner (section 96).

3.2 The Western Ring Route (WRR)

The NZTA sets out its strategies and priorities in delivering its functions. The NZTA identified its priority to plan and deliver the Roads of National Significance (including the Western Ring Route) as a priority in its *20010/2013 Statement of Intent*[1].

The NZTA has identified 5 objectives for the Western Ring Route

The NZTA has identified the following five for the Western Ring Route:

1. To enhance inter regional and national economic growth and productivity;
2. To provide an alternative route through the region that reduces dependency on SH1 and the Auckland Harbour Bridge and unlocks the growth potential of development nodes along the length of the corridor;
3. To deliver improved trip reliability for travel from the west to the south, from the north to the southern isthmus and in particular from the CBD to the southern Auckland isthmus and airport;
4. To provide for current and future traffic demands by providing new transport capacity for the fast-growing western suburbs of Auckland and linking them with the airport and other important growth destinations within the central and southern isthmus; and
5. To enhance the efficiency of the overall network of roads in Auckland by separating local and regional traffic, bringing particular benefits to commuters, transport carriers and residents of adjacent local streets.

3.3 Objectives for the Project

5 objectives for the Waterview Connection Project

The Waterview Connection Project is the link needed to complete the WRR, providing for works on both SH16 and SH20.

The NZTA has confirmed the following objectives for the Project:

1. To contribute to the region's critical transport infrastructure and its land use and transport strategies:
   - by connecting SH16 and SH20 and completing the Western Ring Route
   - by improving the capacity and resilience of SH16
2. To improve accessibility for individuals and businesses and support regional economic growth and productivity:
   - by improving access to and between centres of future economic development

[1] NZ Transport Agency Statement of Intent 2010/2013, the NZ Transport Agency (March 2009).

3. To improve resilience and reliability of the State highway network:
   - by providing an alternative to the existing SH1 corridor through Auckland that links the northern, western and southern parts of Auckland
   - by securing the SH16 causeway against inundation
4. To support mobility and modal choices within the wider Auckland Region:
   - by providing opportunities for improved public transport, cycling and walking
   - by protecting opportunities for future passenger transport development (e.g. rail); and
5. To improve the connectivity and efficiency of the transport network:
   - by separating through traffic from local traffic within the wider SH20 corridor.

3.4 Regional and Economic Context

The remainder of this section sets out the regional and economic context of the Project and the benefits it delivers for the region.

3.4.1 Auckland Regional Growth and Land Transport

Auckland is critical for the nation's population and economic growth

The Auckland Regional Growth Strategy (ARGS) projects significant growth in the Region, with current estimates indicating a population of two million people by 2031 (this is an increase of over 40% from the 2006 population)[2]. This growth is responded to in the strategic planning for the Region, for example the Auckland Regional Land Transport Strategy 2010-2040 (ARLTS).

Auckland plays a vital role in the national economy. It represents nearly some 35% of the national GDP[3] (compared to 33% of the nation's population). The ports in the Region cater for some 35% of the value of the country's imports and exports. For freight transported by air this is in excess of 80%[4]. While it is clear that the Region is a critical economic hub, it also has critical linkages to neighbouring regions and a role in their wider population and economic growth (e.g. Waikato and Northland).

[2] In 2041 the population of the Region is estimated to be 2.1million, 40% of the national population.

[3] Auckland Regional Council, Monitor Auckland: http://monitorauckland.arc.govt.nz/, February 2010

[4] Trade and Enterprise New Zealand, March 2010, http://business.newzealand.com/common/files/New-Zealand-ports-and-airports.pdf)

Because of its geographical constraints (with the Isthmus and two harbours squeezing land transport networks into a north to south pattern and limited by the current crossings of the Waitemata Harbour), Auckland already faces transportation challenges.

An effective and reliable land transport system is critical to supporting the Region's social, economic and cultural wellbeing, and the wider New Zealand economy. Business surveys have identified that transport is the number one priority for their business operations and Aucklander's consistently report (e.g. in consultation on the Long Term Council Community Plans) that traffic congestion, travel times, and poor public transport services are key concerns.

The Auckland Regional Land Transport Strategy recognises that a multifaceted approach to transport is needed for the Region. The Strategy seeks to provide balanced levels of access with investment in public transport, completion of the strategic roading system and in behaviour change measures.

The WRR will enable more efficient movement of people, goods and services supporting growth.

Completing the Western Ring Route has been identified by the Region, as a key component of the land transport strategy; to enable more efficient movement of people, freight and other goods and services in Auckland, through the Auckland Regional Land Transport Strategy 2010 – 2040.

3.4.2 Auckland Regional Land Transport Strategy 2010-2040

The Auckland Regional Land Transport Strategy (ARLTS) recognises the completion of the WRR and the Waterview Connection as key elements of the strategic land transport network (as defined in Map 4 of the ARLTS).

The ARLTS recognises completion of the WRR as a critical component of the region's land transport network

The Objectives and Policies of the ARLTS include provision for new capacity in the network to accommodate growth (including passenger transport, freight and road capacity). In particular, Policy Category 6 seeks to *selectively increase the capacity of the road network where alternative management options are not sufficient to address growth in travel demand.*

Within this, Policy 6.2 identifies the specific road network capacity improvements sought in the ARLTS and includes the Western Ring Route. The ARLTS states that:

> *The Western Ring Route ... provides a strong connection between the North Shore, West Auckland and South Auckland and also provides an alternative north – south route through the region from a little south of Albany to Manukau City Centre. ... Completion of the Western Ring Route is scheduled for completion within the first 10 years of this strategy.*

In addition, the ARLTS identifies the Quality Transport Network (QTN) for the Region (as set out in the Auckland Regional Passenger Transport Plan (2006/2016)). This Project provides for the development of the QTN (through the provision of bus shoulders on SH16) and creates opportunity for future QTN (e.g. by the improved capacity on Great North Road).

3.5 Designing for Network Continuity

The Project capacity provides for network continuity on SH20 and SH16

The NZTA has been developing the WRR through a number of separate projects for over 10 years. While the majority of these projects have been completed, others are currently under construction. The Waterview Connection is the key 'missing link' in the WRR. The other upgrades identified include the combined State Highway 16 improvements (discussed below) and the Constellation to Albany upgrades remain.

To ensure that the benefits of the WRR are realised on completion of these remaining sections, the NZTA has been planning for both short term and long term lane requirements along the length of the WRR. To date the WRR has primarily been designed as a four-lane facility. However, design has also sought accommodation of six lanes in parts, depending on traffic demand and future policy decisions

The six lane provision identified for SH20 has been based on achieving this network continuity and ties into the recently completed Mt Roskill section of SH20, which also provides for up to six lanes in the future.

The capacity of the SH16 portion of the Project has been confirmed to ensure that the additional capacity being provided by the new connection of SH20 is able to be safely accommodated into the network, while also addressing the existing issue of congestion on the State Highway 16. To achieve this, an additional lane is proposed in both directions east of the Great North Road Interchange. This gives a cross section of eight lanes on SH16 up to St Lukes Road to tie into the eight lanes that currently exist (eastbound).

To the west of Great North Road Interchange an additional lane will also be provided in both directions. This will provide for eight lanes through to the Te Atatu Interchange, which will then have a lane drop (westbound) and conversely a lane gain (eastbound). From Henderson Creek, the Project will tie into the six lanes that are being provided for under separate projects (see section 3.6.1 below). The exception to this is westbound on the Causeway between Great North Road Interchange and Rosebank Road Interchange which will have two additional lanes, bringing the total to five, in order to safely provide for the weaving and merging that is anticipated once SH20 joins SH16.

The existing and long term WRR lane provision is shown in Figure 3.1.

Figure 3.1: Wider Network Capacity

3.6 Integration with Other Projects

In considering and designing for the Waterview Connection, consideration has been given to the wider WRR and to other key regional land transport projects.

3.6.1 Western Ring Route Projects

There has been significant investment and development of the WRR to date. Since 1998, the NZTA has significantly progressed or completed development of eight (8) other WRR projects (representing a capital value in excess of $1billion). Recently completed projects include SH20 Mangere Motorway Extension, SH20 Puhinui Road Grade Separation, SH18 Upper Harbour Bridge Duplication, SH18 Greenhithe Deviation, SH20 Mt Roskill Extension and most recently the SH20 Manukau Harbour Crossing.

Other key projects that continue to progress for the WRR include:o

The NZTA is progressing other elements of the WRR

SH16/18 Hobsonville Deviation
The Hobsonville Deviation project consists of two elements:

- A deviation of SH18 for approximately six (6) kilometres, as a four-lane motorway from the end of the Northwestern Motorway at Hobsonville Road to the western end of Upper Harbour Bridge in Hobsonville; and

- An extension of SH16 to Brigham Creek consisting of a three (3) kilometre, two-lane extension of SH16 north of the Northwestern Motorway (from Hobsonville Road to Brigham Creek Road).

Construction of this project commenced in 2008 and is due for completion in 2011/12.

Lincoln Road to Westgate

Huruhuru Road Bridge to Westgate (SH16)
This element of the WRR provides for additional lane capacity on SH16 between the Huruhuru Road Bridge and a point just west of the Royal Road Interchange. The alteration to designation and district and regional council consents required for construction of this project were lodged in July 2010 with the relevant consenting agencies.

Selwood Road Bridge Replacement (SH16)
This project involves the replacement and widening of the existing Selwood Road Bridge over SH16 to allow for increased capacity and to increase height clearance of the motorway below. Works for this project will be within the existing designation and an Outline Plan of Works and construction consents were lodged in August 2010. Construction is expected to commence in late 2010.

Lincoln Road Interchange

Henderson Creek to Huruhuru Road Bridge (SH16)

This element of the WRR provides for additional lane capacity on SH16 between the eastern abutments of Henderson Creek (adjoining the Waterview Connection Project) and the Huruhuru Road Bridge. The alteration to designation and regional council consents required for construction of this project were lodged with Waitakere City Council (WCC) and Auckland Regional Council (ARC) in June 2010. It is anticipated that construction of this project will commence in the 2010/11 construction season (in advance of the Waterview Connection Project).

SH20 Maioro Street Interchange (SH20)

This component of the WRR involves upgrading the Maioro Interchange at the termination of the existing SH20 (Mt Roskill), to provide a half-diamond intersection (replacing the existing round-about) and a local road connection over the State highway. This work will improve the functioning of the interchange and provide for ramp metering on the southbound on-ramp. The Mairo Street bridge also extends this road and connects it to Stoddard Road, providing local connections for pedestrians, cyclists and vehicles. Construction has commenced and is expected to be complete in early 2011.

Manukau Harbour Crossing (SH20)

The Manukau Harbour Crossing Project involves doubling the traffic capacity of SH20 between Queenstown Road and Walmsley Road. It includes duplicating the Mangere Bridge to provide four traffic lanes in each direction across the Manukau Harbour and widening SH20. This project was will completed in August 2010.

SH20 / SH1 Manukau Extension

The Manukau Extension Project forms a 4.5km section of the WRR linking SH20 Puhinui Interchange through to SH1. As well as a triple level interchange between SH20 and SH1 at Manukau, this project includes new interchanges with SH20 and the local road network at Cavendish Drive and Lambie Drive. Construction of this component of the WRR began in June 2006 and is expected to be completed in late 2010.

3.6.2 Avondale to Southdown Rail Line

The Avondale – Southdown Rail Line is a future strategic route in the ARLTS

The Avondale to Southdown Rail Line is a corridors that provides for a future south-western rail link through the suburbs of Onehunga and Mount Roskill, to connect the North Auckland Rail line between the Avondale and Mt Albert Stations. There remains a commitment for development of the Avondale to Southdown Rail Line and this route is identified as a future strategic route (passenger and freight) in the ARLTS.

In response to this, and in a manner consistent with the earlier extension of SH20 in Mt Roskill Extension, the land corridor for a future rail line has been maintained in the Project design.

4. Project Description (Operation)

Overview

This summary Project description provides the basis for the assessment of environmental effects. It includes a description of the key physical elements of the Waterview Connection Project and how the State highway will be operated, once construction is complete.

4.1 Introduction

This section of the AEE provides a brief description and overview of the transport elements of the Project (Sections 4.2 and 4.3) followed by a description of the Project within each of the nine sectors (Section 4.4).

This Project description is based on a number of source documents which, for the purpose of clarity are cited here with a brief description. These source documents will continue to inform subsequent phases of Project design and development, including procurement, detailed design and construction.

4.1.1 Design Philosophy Statements

Design Philosophy Statements have been produced for key elements of the Project. These statements provide: an overview of the design parameters and standards being used for each key element of the Project, identify design constraints; and specify assumptions made in the Project design process. Where relevant, these statements also provide commentary on variations from standards and consideration of design alternatives.

Five design philosophy statements have been prepared for the Project. These relate to the following:

- Bridge Design – Design Philosophy Statement – Bridges, Viaducts and Structures[1];
- Geotechnical Design – Geotech Design Philosophy Statement[2];
- Roads – Road Alignment Design Philosophy Statement[3];

There are a number of reports that have informed the Project Description

1 Beca: July 2010. Design Philosophy Statement – Bridges, Viaducts and Structures

2 Tonkin & Taylor: May 2010. Geotechnical Design Philosophy Statement

3 Beca/Aurecon: June 2010. Road Alignment Design Philosophy Statement

- Stormwater – Stormwater and Streamworks Design Philosophy Statement (contained in Part G.27); and
- Tunnels –Design Philosophy Statement – Avondale Heights Tunnel[4].

4.1.2 Urban and Landscape Design Framework

The U&LDF provides guidance on landscape and urban design principles for the area.

The NZTA has also worked with stakeholders to develop an Urban and Landscape Design Framework (U&LDF). The overall purpose of the (U&LDF) is to:

- Demonstrate how the design of the Project supports the NZTA's strategic commitment to high quality urban design outcomes; and
- Demonstrate alignment between the NZTA and other agencies (e.g. the Waitakere and Auckland City Councils, Housing New Zealand and others) in their planning, transport and urban design initiatives for the area. (In this regard, the U&LDF reflects a wider strategic direction and has a longer term urban and landscape design vision than just the Project.)

The U&LDF sets out an overall urban design concept which includes the Project but also integrates this with wider aspirations and plans for public land in the surrounding area. The plans and drawings contained within the U&LDF provide a vision for the integration of the Project with wider land use and development. It provides details and concepts which have been used in this AEE to assess the Project and, where appropriate, in the recommendation of mitigation for the Project (in other words, it has informed design concepts for mitigation planning).

The U&LDF has been a source document which has informed elements of the Project design and will continue to do so beyond the scheme design which is submitted as part of this statutory process. As such the U&LDF will not be included within this AEE. By providing clarity on the expected design outcomes, the U&LDF will promote consistent design quality throughout the development and delivery of the Project.

Drawing from the U&LDF, the urban and landscape plans have been prepared for the Project. These are included in Part F of the AEE: *Drawings and Plans* as part of the suite of mitigation plans for the Project (e.g. for landscaping, noise walls, design and appearance of the ventilation building).

[4] Tonkin & Taylor: June 2010 Design Philosophy Statement – Avondale Heights Tunnel

4.1.3 Further Project Description Information in the AEE

Part F includes Plans and Scheme Designs for the Project

Throughout this Chapter cross references are made to Technical Assessment Reports and Plans where further information describing the Project is available. In particular, the following additional information references are highlighted:

- Part F of the AEE contains Plans and Drawings:
    - F.1: Operation Scheme Plans, further describe the proposed physical works of the Project;
    - F.16: Urban Design and Landscape Plans, further detail the proposed landscaping for the Project;
    - F.17: Noise Wall Plans further detail the noise walls, location and design for relevant areas of the Project;

4.2 State Highway Overview Description

4.2.1 Capacity and Resilience Works on State Highway 16

Increased capacity on SH16

On SH16, the Waterview Connection Project will provide for increased capacity and enhancements from Te Atatu through to St Lukes.

Improved security of SH16

The surface (ground level) of the causeway between Rosebank Road Interchange and the GNR Interchange will be raised by approximately 1.5m above its current level. This will improve the security of SH16, allowing for future climate change and associated sea level rise predictions (consistent with the estimates of the Intergovernmental Panel on Climate Change (IPCC)).

4.2.2 State Highway 20 Alignment and Future Capacity Works

Completing the WRR

On SH20, the Project will extend SH20 from its current termination at the Maioro Street Interchange, and connect it with SH16 at the GNR Interchange (at Waterview/Point Chevalier).

The Project is approximately 5.5km long

The new section of SH20 is approximately 5km in length and passes through or beneath the suburbs of Owairaka, Avondale and Waterview.

Capacity for three traffic lanes in each direction on SH20

The Project provides three traffic lanes in each direction, separated by either a central median barrier or as separate tunnels. Further detail on cross sections of the Project are provided for in the relevant Sector descriptions below (Section 4.4).

4.2.3 Interchanges

The following existing and new interchanges are provided in the Project[5]:

- Te Atatu Interchange – Provides a full interchange connection from SH16 to and from Te Atatu Road.
- Rosebank and Patiki Interchanges – Provides a full interchange connection to and from Rosebank Peninsula to SH16.
- GNR Interchange – Provides full interchange connections from SH16 to and from GNR and will be upgraded for motorway to motorway connections between SH20 and SH16.
- Maioro Street Interchange – Will be upgraded as a full interchange to and from SH20 to Maioro Street/Stoddard Road

Further detailed descriptions of these interchanges are provided in the Sector descriptions (Section 4.4)

4.2.4 Traffic Flows

The Waterview Connection will take traffic off local roads and other congested State highways by providing additional capacity on SH16 and a direct route onto SH20,

The *Assessment of Transport Effects* contained within Part G.18 compares 2006 traffic flows on SH16 with the Project in place ('with Project') and with a "do minimum' scenario (which refers to the transport network without the Project). The traffic assessment, provided in Section 13.2 of this report details how this traffic has been diverted from the local road network and assesses the predicted traffic flows against the capacity of the Project.

The Project takes traffic off local roads and other congested State Highways See Chapter 13 for an assessment of local traffic changes

This comparison shows that at 2016 (proposed year of opening), around 148,400 vehicles per day (vpd) are expected to be using SH16, which is up to 22% more vpd with the Project, compared to without the Project. By 2026, as many as 156,000 vehicles are expected to be using sections of SH16, which is up to 26% more than without the Project.

In 2016 (proposed year of opening), the SH20 Waterview Connection is forecast to attract 70,000 vehicles per day (vpd), and by 2026, this number is expect to rise to 83,000 vpd. The traffic assessment (Section 13.2) provides detail on how these traffic flows impact the wider transport network (e.g. reducing local traffic volumes).

[5] It is noted that a central interchange had also been investigated for the Waterview Connection on SH20 but is not provided for. This is discussed further in Chapter 11 of the AEE.

4.2.5 Other Transport Modes

4.2.5.1 Cycleway Route Description

Northwestern Cycleway

The existing Northwestern Cycleway will be upgraded and extended

The Project includes improvements and extensions to the existing "Northwestern Cycleway" alongside SH16 to provide a dedicated pedestrian/cycle way running alongside the westbound carriageway of SH16, from Te Atatu Road to GNR Interchange. The existing facility will be upgraded to a generally continuous width of 3m (there are small areas of greater and lesser width).

SH20 Cycleway

The SH20 Cycleway will be extended and improved in places

In addition to the Northwestern cycleway described above, the Project provides some surface elements of new and improved cycleway to and from the existing SH20 cycleway at the Maioro Street Interchange through those sections where SH20 is at surface (eg. Sector 9). This pedestrian/cycle way is referred to as the 'SH20 Cycleway' in this AEE.

4.2.6 Providing for the Avondale to Southdown Rail Line

The Project maintains opportunity for the Avondale – Southdown Rail Line

As noted, there is a corridor for a future rail line in the Project area, provided for by the existing designation *G08-05 – Railway Purposes Avondale Southdown Line* in the Auckland City Council District Plan – Isthmus Section. This railway line has been planned since 1958. Current regional land transport planning indicates that the line may be used for both freight services and for passenger rail. There is no confirmed date for implementation of this rail line.

In order to accommodate both the future Avondale to Southdown Rail Line and the SH20 extension, the design of the Project provides sufficient land for a future rail line (with double tracking and electrification and maintaining service/maintenance access). The rail corridor is provided on the north-eastern side of the SH20 alignment (consistent with the design assumptions used for the SH20 Mt Roskill project into which this Project connects). At the southern tunnel portal, the Project design allows for rail to cross over the tunnel. From this point, it is assumed that the rail will link to the North Auckland Rail Line within the existing Avondale to Southdown Rail Line designation.

While there is no confirmed date for implementation of the rail line, where practicable, the Project has sought to enable and not preclude future rail development. As an illustration, the design of structures (e.g. the Richardson Road bridge), has incorporated sufficient space to accommodate the rail line in the future.

4.3 Coastal Works Summary

It is proposed to widen the existing Causeway from 50-60m to 70-75m from one side of Mean High Water Springs to the other side. The existing carriageway will be widened from 30m to 45m and will include additional 7m stormwater filter treatments.

The pedestrian/cycle way will be increased from the existing 2.4m-2.6m variable width (with a 'pinch-point' width of 1.8m over the Causeway Bridge) to a consistent 3m width in line with recommended safety standards.

Table 4.1 summarises the areas of reclamation, permanent occupation and temporary occupation required to undertake the coastal works.

Table 4.1: Approximate Areas of Reclamation, Permanent Occupation and Temporary Occupation

Area Type	Approximate Area (ha)
Reclamation	4.71
Permanent Occupation	4.15
Temporary Occupation	6.63

4.4 Physical Description – Project Sectors

For the purpose of a detailed Project description, the alignment has been broken into nine sectors.

Further detail can be found in the Operation Scheme Plans contained in Part F.2. The Project will be in general accordance with these scheme plans. Table 4.2 lists the sectors described in the remainder of this section along with their drawing page references from the Scheme Design Drawings.

The description of the Project by Sector is followed by a summary of the Project as it relates to the Coastal Marine Area, provided in Section 4.5 of this AEE.

Table 4.2: Scheme Design Drawing References for each Sector

Sector	Drawing Sheets
Sector 1 – Te Atatu Interchange	20.1.11-3-D-N-910-101 20.1.11-3-D-N-910-102
Sector 2 – Whau River	20.1.11-3-D-N-910-103
Sector 3 – Rosebank – Terrestrial	20.1.11-3-D-N-910-103 20.1.11-3-D-N-910-104 20.1.11-3-D-N-910-105

Sector	Drawing Sheets
Sector 4 – Reclamation	20.1.11-3-D-N-910-103 20.1.11-3-D-N-910-104 20.1.11-3-D-N-910-105 20.1.11-3-D-N-910-106 20.1.11-3-D-N-910-107 20.1.11-3-D-N-910-108
Sector 5 – GNR Interchange	20.1.11-3-D-N-910-108 20.1.11-3-D-N-910-109 20.1.11-3-D-N-910-110 20.1.11-3-D-N-910-113
Sector 6 – SH16 to St Lukes	20.1.11-3-D-N-910-110 20.1.11-3-D-N-910-111 20.1.11-3-D-N-910-112
Sector 7 – GNR Underpass	20.1.11-3-D-N-910-113 20.1.11-3-D-N-910-114
Sector 8 – Avondale Heights Tunnel	20.1.11-3-D-N-910-114 20.1.11-3-D-N-910-115 20.1.11-3-D-N-910-116 20.1.11-3-D-N-910-117
Sector 9 – Alan Wood Reserve	20.1.11-3-D-N-910-117 20.1.11-3-D-N-910-118 20.1.11-3-D-N-910-119

4.4.1 Sector 1 – Te Atatu Interchange

4.4.1.1 General Description

Significant improvements to the Te Atatu Interchange are proposed

Significant improvements to the Te Atatu Interchange within Sector 1 are proposed. These include enlargement and reconfiguration of the on and off ramps to accommodate additional lanes after on and off ramps and to provide for bus shoulders and priority for buses and other High Occupancy Vehicles.

One additional lane in each direction is proposed to provide three lanes on the SH16 carriageway westbound (to west Auckland) through the Te Atatu Interchange and four lanes eastbound (to central Auckland) from the proposed eastbound onramps.

The existing pedestrian subway that runs underneath the existing eastbound off-ramp from Te Atatu Bridge to Te Atatu Road near Titoki Street (and vice versa) is to be removed and replaced with an improved underpass facility. In addition, a series of at-grade pedestrian crossings located across the Interchange will be provided. The pedestrian crossings have been located to align with current informal crossing points and to fit in with Interchange signals.

Four residential properties currently have private access immediately south of the Te Atatu Interchange (on Te Atatu Road). One dwelling is to be removed and the access to the remaining three dwellings will be reconfigured onto Royal View Road.

See F.2: *Operation Scheme Plans*, Part F of this AEE, for further details on the general Project arrangement in this Sector. Figure 4.1 below shows the extent of Sector 1.

4.4.1.2 Land Requirements

Land is required for the SH16 works in this Sector

To provide for the Project, including improvements to the Te Atatu Interchange, the upgraded underpass and the pedestrian/cycle way, additional land (beyond that already used by the State highway) is required. This land is a mix of land within the existing designation, residential and reserve/open space land and a small area of reclamation of the Coastal Marine Area (CMA).

Residential land is required from the end of Marewa Street, Milich Terrace, McCormick Road, Te Atatu Road, the northern side of Alwyn Avenue and the southern side of Titoki Street. Details on the area and properties affected in Sector 1 are provided in the Schedule of Properties associated with the alteration of designation (NOR 1).

The reserve or open space land required for the Project includes:

- Part of McCormick Green which will include an upgrade of the pedestrian/cycle way – approximately 0.2ha will be required from McCormick Green;
- Part of Harbourview-Orangihina Park will be used for construction laydown (see Section 5.9.1.4). Following construction, approximately 0.8ha will be taken from the edge of the area; and
- An area of around 0.7ha will be required from Jack Colvin Park to contain the permanent stormwater treatment wetland.

In addition to the above, a small area of the CMA will be reclaimed to facilitate the stormwater wetland in the northwestern corner of Jack Colvin Park. Overall, the reclamation area will be approximately 0.1ha.

Detail on the extent of impact and the properties affected by the Project designation in Sector 1 is provided in the Schedule of Properties for NOR 1.

Figure 4.1: Sector 1

Figure 4.2: Visual of proposed view from Alwyn Avenue looking north

Source: BuildMedia Limited 2010 (See *Assessment of Visual and Landscape Effects* in G.20)

4.4.1.3 Interchanges and Local Connections

The following provides a description of the lanes and configuration of the Te Atatu Interchange:

- Three lanes are provided in both a westbound direction and in an eastbound direction;
- Two lanes will come off the westbound carriageway forming a westbound off-ramp and will develop into two left hand turning lanes and two right hand turning lanes. This westbound off-ramp will be lengthened to provide additional safety and capacity. The westbound bus shoulder will continue onto the off-ramp and merge with traffic turning into Te Atatu Road. Similarly one lane will come off the eastbound carriageway forming the eastbound off-ramp and will develop into one left hand turning lane and two right hand turning lanes. No bus shoulder is provided at this off ramp and buses will be required to merge with traffic further west along the Motorway;
- An additional eastbound on ramp is proposed – an eastbound loop on-ramp taking traffic from Te Atatu Road (south) and an eastbound on-ramp taking traffic from Te Atatu Road (north);
- The eastbound loop on-ramp will include one lane entering into the loop from Te Atatu Road (south) with ramp metering developing into two lanes and merging back into one lane when they join the three lane carriageway as a lane gain resulting in four eastbound lanes. This is to assist in generating additional capacity for queued vehicles on Te Atatu Road;
- The eastbound on-ramp will include one lane entering into the on-ramp and with ramp metering developing into two lanes, merging back into one lane at the four lane carriageway. Priority laning is proposed at this on-ramp for Heavy Commercial Vehicles, buses, taxi's and High Occupancy Vehicle (to bypass the ramp metering); and
- The westbound on-ramp includes one lane entering into the on-ramp and with ramp metering developing into two lanes, merging back into one lane at the three lane carriageway.

Te Atatu Road (between Titoki Street and Alwyn Avenue) will be upgraded to accommodate an additional northbound traffic lane and pedestrian/cycle way.

As part of the improvement work at Te Atatu Interchange, major work will also be undertaken to improve two substandard vertical curves at the approach and under the Te Atatu Interchange bridge. The motorway will be lowered by approximately 370mm to achieve minimum clearance standards under the Interchange Bridge and safe stopping distances.

4.4.1.4 Traffic Volume and Flows

The *Assessment of Transport Effects* Technical Report G.18 shows that with the Project in place, the Te Atatu Interchange will have the increased capacity to take 46,400 vpd (eastbound) and 47,300 vpd (westbound) in 2016, an increase of 13% and 14% respectively (compared to without the Project). By 2026, an even greater number of vehicles will use the Interchange with the Waterview Connection improvements in place, of up to 20% over without the Project.

The traffic assessment (Section 13.2) provides detail on how these traffic flows impact the wider transport network (e.g. reducing local traffic volumes) and assesses the levels of service and design capacity.

4.4.1.5 Key Structures

The key structures (for which a design is provided in Plan F.8 *Plans of Structures*) in Sector 1 are:

New bridge decks at Te Atatu Interchange

- The Te Atatu Road northbound bridge. The deck of the Te Atatu Road northbound bridge will be replaced and widened to accommodate the three northbound lanes;
- The Te Atatu Road southbound bridge. This will be extended to accommodate the three southbound traffic lanes and support the footbridge. The existing footpath will be removed to achieve the three lanes and provided as part of a new bridge on the eastern side of the Interchange;
- The existing Te Atatu Road pedestrian/cycle bridge on the western side of Te Atatu Interchange. The bridge will be reduced in width from 4m to 3.3m to allow for the widening of the northbound bridge. The pedestrian barrier will be replaced with a new 1.4m high barrier complying with requirements for cyclists;
- A new pedestrian/cycle bridge on the eastern side of the Te Atatu Interchange; and
- A new subway to the north of Te Atatu Interchange. The existing subway will be demolished and replaced with a new 5m wide, 2.5m high and 45m long box culvert structure.

Upgrading of the subway

Further detail on the proposed structures in this Sector is provided in F.8 *Plans of Structures*, Part F of this AEE.

4.4.1.6 Drainage and Stormwater Treatment

Stormwater treatment in Sector 1 will be provided by a wetland and two treatment swales. During construction, stormwater will be managed by maintaining sediment discharge controls. Permanent treatment devices will be constructed and ready for use when additional impervious areas are commissioned. In addition, a temporary stormwater pond will treat runoff from the construction yard.

Improved stormwater treatment

Detail on the proposed stormwater design is provided in Technical Report G.27 *Stormwater Design Philosophy Statement.*

4.4.1.7 Pedestrian/Cycle Way and Other Integration Elements

Upgraded pedestrian/ cycle way

A dedicated 3m pedestrian/cycle way will be provided alongside the westbound carriageway towards Te Atatu Road where an at-grade crossing will be provided to connect to the existing pedestrian/cycle way in McCormick Green. This existing cycleway will be extended alongside the westbound carriageway at the bottom of McCormick Road and continue through to Henderson Creek. An upgrade of the existing pedestrian/cycle way through McCormick Green will be undertaken as part of the overall improvements.

4.4.1.8 Noise Mitigation

Three separate noise barriers will be located within Sector 1.

- A noise barrier located on the northern side of SH16 to the western side of Te Atatu Road. The noise wall will be 2.5m in height for a length of approximately 550m;
- A noise barrier located on the southern side of SH16 to the western side of Te Atatu Road. The noise barrier will range from 2.5m-3.5m high and will run for a length of approximately 800m from the western side of Te Atatu Road to Henderson Creek; and
- A noise barrier located on the southern side of SH16 to the eastern side of Te Atatu Road (Alwyn Avenue side). The noise wall will range from 2m – 3m in height and will run for a length of approximately 400m from the eastern side of Te Atatu Road to the western end of Alwyn Avenue.

Open Grade Porous Asphalt (OGPA) will be used for the surface paving of the motorway this will provide incidental mitigation for noise.

Detail on the dimension and location of the proposed noise walls is provided in the plans F.17 *Noise Walls*, Part F of this AEE.

4.4.1.9 Street Furniture

Standard signage, lighting and street furniture for interchanges of this size will be used in this Sector. Lighting will be positioned down the side verges of each lane (as is provided currently).

4.4.1.10 Other Urban Design and Landscape Reinstatement Elements

Landscaping and design proposed

Key urban and landscape design components of this Sector are provided in F.16 *Urban Design and Landscape Plans*. In addition to elements already described, the Project will include the following features:

- Landscaping, escarpment and coastal planting and will include a predominant locally sourced tree species of pohutukawa;
- Pre-cast concrete mounted noise walls on semi-concealed steel posts, earth mounds and associated planting;
- A distinctive new barrier treatment for the Te Atatu bridge to unify the bridge group and contribute positively to the local identity and sense of place;
- Concrete retaining panels, to match those further north (on SH18) with exposed dark aggregate and subtle horizontal corrugations to complement the harbour landscape; and
- Reinstatement works for Jack Colvin Park, including stormwater pond and associated planting, landscaping, fencing, carparking, pedestrian bridge.

Further details on these elements are provided in F.16 *Urban Design and Landscape Plans*, Part F of this AEE.

4.4.1.11 Coastal Occupation and Reclamation

A small area of reclamation is proposed for a portion of the inter-tidal area of the Pixie Stream. In addition, occupation of the CMA is required for the rock wall revetment of the reclamation. This area is required to develop an operational stormwater wetland to treat stormwater.

The extent of reclamation is shown on Sheet 101 of F.18 *Reclamation Extents*, the extent of permanent occupation is shown on Sheet 101 of F.12 *CMA Permanent Occupation Plan* and the extent of temporary occupation is shown on Sheet 101 of F.13: *CMA Temporary Occupation Plan* contained within Part F of this AEE.

Stormwater outfall structures and operational discharges to the CMA, in the inter-tidal area of the Pixie Stream, will be reconstructed. The proposed permanent outfall structures in the CMA are located on Sheet 1 of F.15 *Coastal Discharges*, Part F of this AEE. Table 4.3 summarises the areas of reclamation, permanent and temporary occupation required to provide for the stormwater wetland.

Table 4.3: Approximate Areas of Reclamation, Permanent Occupation and Temporary Occupation for Sector 1

Area Type	Approximate Area (ha)
Reclamation	0.10
Permanent Occupation	0.01

Area Type	Approximate Area (ha)
Temporary Occupation	0.05

4.4.2 Sector 2 – Whau River

4.4.2.1 General Description

Widened crossing of Whau River

Sector 2 will mainly involve works to enlarge SH16 between Patiki Road Interchange and the Whau River Bridge and in particular within the CMA to enlarge the existing Whau River Bridge in order to accommodate additional lanes. The existing cycleway will be removed and a separate pedestrian/cyclist way will be provided alongside the westbound carriageway.

The existing Whau River Bridge will be widened by 7.5m for the eastbound carriageway and 8m for the westbound carriageway. Four lanes will be provided eastbound and four lanes westbound. Bus shoulder lanes will continue from the Te Atatu Interchange along both sides of the carriageway over the Whau River.

See F.2 *Operation Scheme Plans*, Part F of this AEE, for further details on the general Project arrangement in this Sector. Figure 4.3 below shows the extent of Sector 2.

4.4.2.2 Land Requirements

To provide for the Project in Sector 2, land will be required beyond the designation. This is largely an area of reclamation from the CMA as follows:

- 0.12ha reclamation required for the western bridge abutments; and
- 0.13ha reclamation required for the eastern bridge abutments.

Reclamation is also required on the southern side of SH16 from Patiki Road Interchange to Whau River within this Sector comprising:

- 0.05ha to the north of the motorway to accommodate the additional westbound traffic lane, additional westbound bus-shoulder, increased footpath/cycle way width and stormwater treatment devices; and
- 0.11ha to the south of the motorway between Whau River and Rosebank Park Domain to accommodate the additional westbound traffic lane, additional westbound bus-shoulder, increased footpath/cycle way width, improvements to the Rosebank Park Domain access road and stormwater treatment devices.

Figure 4.3: Sector 2

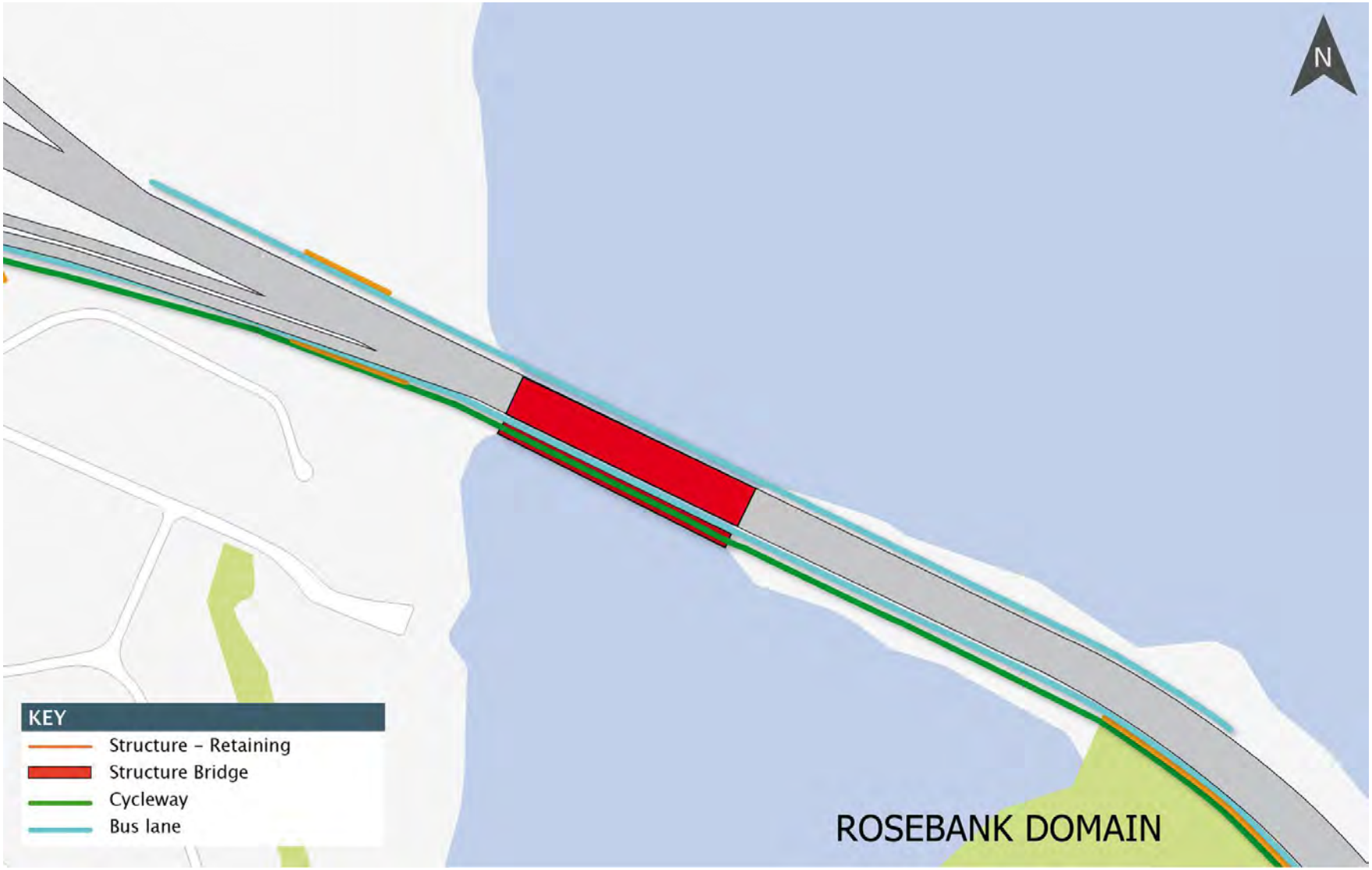


Figure 4.4: Visual of widened Whau River Bridge

Source: BuildMedia Limited 2010 (See *Assessment of Visual and Landscape Effects* in G.20)

4.4.2.3 Traffic Volume and Flows

The *Assessment of Transport Effects* Technical Report G.18, compares the Project with the 'do minimum' (or without Project) scenario for SH16 (eastbound and westbound). This shows that at 2016, up to 118,500 vehicles per day (vpd) are expected to be using SH16, which is an increase of up to 10% compared to "without the Project". By 2026, as much as 132,500 per day are expected to be using sections of SH16, which is an increase of up to 15% compared to without the Project.

The traffic assessment provides detail on how these traffic flows impact the wider transport network (e.g. reducing local traffic volumes) and capacity of SH16 (see Chapter 13 in particular).

4.4.2.4 Key Structures

The key structures (for which a design is provided in Plan F.8 *Plans of Structures*) in Sector 2 include:

- Whau River Bridge, which will be widened by 7.25m and 8m for the eastbound and westbound carriageways respectively. The spans of the new bridge widening will match the existing;
- Pedestrian/cycle bridge – The new 3.0m bridge will be located 8m south of the westbound carriageway and will be constructed with spans matching the existing Whau River Bridge pier locations;
- Some reclamation (0.41ha) within the CMA will be required for the abutments of the widened Bridge motorway widening; and
- Outlet structures, comprising two rock lined channels, to the CMA.

Further detail on the proposed structures in this Sector is provided in F.8 *Plans of Structures*, Part F of this AEE.

4.4.2.5 Drainage and Stormwater Treatment

Stormwater treatment will be provided by two cartridge filter vaults and two bio- filter strips. These devices will be designed to treat the existing and new impervious areas. The outfall will be to the CMA reach of Whau Creek.

Improved stormwater treatment

In these areas the runoff will flow from the motorway across the grass filter strips and discharge through rock revetment to the CMA.

Two cartridge filter vaults are proposed to treat the stormwater from the Whau Bridge and an area immediately west of the west abutment (in Sector 1). Stormwater from these areas of motorway will be intercepted with kerbing, piped across the bridge.

Detail on the proposed stormwater design is provided in Technical Report G.27 *Stormwater Design Philosophy Statement.*

4.4.2.6 Pedestrian/Cycle Way and Other Integration Elements

Improved pedestrian/ cycle way

The existing cycleway along the Whau River Bridge is to be removed and replaced with a new dedicated 3m pedestrian/cycle way bridge located approximately 8m south of the widened westbound bridge. A dedicated bus shoulder will be located on both the eastbound and westbound carriageway.

4.4.2.7 Street Furniture

Standard signage and street furniture for motorways will be used in this Sector. High mast central median lighting is proposed between the lanes (and bridge structures).

4.4.2.8 Other Urban Design and Reinstatement Elements

Key urban and landscape design components of this Sector are provided in Plans. In summary these provide for the following:

- Design of the dedicated cycle/pedestrian bridge alongside the Whau River Bridge;
- Whau River Bridge barrier treatment;
- Concrete retaining panels to match those further on SH18 with exposed dark aggregate and subtle horizontal corrugations to complement the harbour landscape; and
- Saltmarsh species planted within the new 'riprap' boulders forming the coastal armour on the southern edge of the motorway. Coastal harbour species will be planted in strategic locations along the northern edge of the motorway.

Further details on these elements are provided in F.16 *Urban Design and Landscape Plans*, Part F of this AEE.

4.4.2.9 Coastal Occupation and Reclamation

Permanent works and occupation of the CMA in this Sector include reclamation and structures associated with the Whau River Bridge and outfalls at the bridge abutments and along the causeway. A smaller area of reclamation is also proposed in the Whau River. In addition, occupation of the CMA is required for the rock wall revetment of the reclamation and for the existing causeway reclamation.

The extent of reclamation is shown on Sheet 103 of F.18 *Reclamation Extents*, the extent of permanent occupation is shown on Sheet 103 of F.12 *CMA Permanent Occupation Plan* and the extent of temporary occupation is shown on Sheet 103 of F.13 *CMA Temporary Occupation Plan* contained within Part F of this AEE.

Stormwater outfall structures and operational discharges to the CMA will also be required. The location of these is shown in the Sheets 3 and 4 of F.15 *Coastal Discharges*, Part F of this AEE.

Table 4.4 summarises the areas of reclamation, permanent and temporary occupation required to provide for the stormwater wetland.

Table 4.4: Approximate Areas of Reclamation, Permanent Occupation and Temporary Occupation for Sector 2

Area Type	Approximate Area (ha)
Reclamation	0.42
Permanent Occupation	1.11
Temporary Occupation	0.6

4.4.3 Sector 3 – Rosebank (Terrestrial)

4.4.3.1 General Description

Sector 3 involves the minor re-configuration of the existing Rosebank Interchange and the widening of SH16 to provide four lanes in both direction and provision of a dedicated bus shoulder on both the eastbound and westbound carriageways where it does not conflict with existing bridge piers. A new Patiki Cycle Bridge is also proposed. To accommodate the widening of the carriageway and retaining structures, some reclamation is required. The existing access road into the Rosebank Park Domain will be realigned as part of the improvements.

See F.2 *Operation Scheme Plans*, Part F of this AEE, for further details on the general Project arrangement in this Sector. Figure 4.5 below shows the extent of Sector 3.

4.4.3.2 Land Requirements

Land is required for the Project in this Sector

To provide for the Project in this Sector, additional land (beyond that already used by the State highway) is required. The land required is a mixture of commercial/industrial and reserve/open space. In summary, land beyond the existing designation includes:

- Commercial Land: The alteration to the designation affects some six land titles. The requirement from each property is confined to small sections of land (which will not affect the viability of the commercial operations) adjacent to the existing motorway to accommodate the additional westbound traffic lane and pedestrian/cycle way. The NOR plans provide detail on land required for the Project; and
- Reserve Take: The alteration to the designation affects Rosebank Park Domain. The area required is 1.4ha (but includes land for improved access to the Domain).

Detail on the extent of impact and the properties affected by the Project designation in Sector 3 is provided in the Schedule of Properties for NOR 2.

4.4.3.3 Interchanges and Local Connections

Changes are proposed to the Rosebank Interchange Bridge and Patiki off-ramp bridge. These are minor due to the existing size and form of the bridge, which restricts improvements without major structural works (which are not necessary for the capacity).

The changes include lowering of the westbound on-ramp at Patiki Road to provide greater clearance under the new pedestrian/cycle way bridge. This on-ramp comprises one lane developing into two lanes with ramp metering, merging back into one lane at the four lane Motorway.

4.4.3.4 Traffic Volumes and Flows

The *Assessment of Transport Effects* Technical Report G.18, compares the Waterview Connection Project with the "do minimum' (without the Project) scenario for SH16. This shows that at 2016, up to 120,200 vehicles per day (vpd) are expected to be using SH16 within this Sector. By 2026, as much as 133,100 per day are expected to be using sections of SH16, which equates to an increase of as much as 17% compared to without the Project.

The traffic assessment (Section 13.2) provides detail on how these traffic flows impact the wider transport network (e.g. reducing local traffic volumes) and the design capacity of SH16).

4.4.3.5 Key Structures

The key structures (for which a design is provided in Plan F.8 *Plans of Structures*) in Sector 3 include:

- Rosebank Road Interchange On-Ramp Bridge. No works are proposed to the existing bridge other than the on-ramp being realigned to accommodate the improved lane configuration;
- Rosebank Road Interchange Off-Ramp Bridge. No works are proposed to the existing bridge other than the off-ramp being realigned to accommodate the improved lane configuration;
- Patiki Road Interchange Off-Ramp Bridge. No works are proposed to the existing bridge other than the off-ramp being realigned to accommodate the improved lane configuration; and
- A new 3.0m wide pedestrian/cycle bridge will be provided over Patiki Road on-ramp. The existing cycleway bridge will be demolished as part of the proposed works.

Further detail on the proposed structures in this Sector is provided in F.8 *Plans of Structures*, Part F of this AEE.

4.4.3.6 Drainage and Stormwater Treatment

Improved stormwater treatment

The two existing settlement tanks installed as part of the original Rosebank/Patiki upgrade that provide existing treatment to stormwater runoff from the existing Rosebank ramps will be demolished.

Stormwater treatment will be provided by five proprietary filter cartridge vaults. During construction, management of stormwater will be achieved by maintaining sediment controls and by constructing the permanent treatment devices to be ready for use when additional impervious areas are commissioned. In addition, three cartridge filter vaults will be used during construction to treat stormwater from the Rosebank on and off ramp, and Patiki Road off ramp. Detail on the proposed stormwater design is provided in Technical Report G.27 *Stormwater Design Philosophy Statement*.

Figure 4.5: Sector 3

4.4.3.7 Pedestrian/Cycle Way and other Transport Network Integration Elements

The existing cycleway alongside the westbound carriageway will be upgraded to a generally 3m wide pedestrian/cycle way (2m wide between Rosebank Interchange and Patiki Road to avoid the edge of the industrial land). The pedestrian/cycle way will link underneath the existing westbound off-ramp at Rosebank Interchange and continue between the industrial land and the westbound carriageway (as it currently does). A new link will be provided onto Patiki Road to connect with the local roading network. The pedestrian/cycle way will continue alongside SH16 pass underneath the Patiki Road eastbound off-ramp and over the westbound on-ramp along the new bridge.

A dedicated bus shoulder will be located on both the eastbound and westbound carriageway within Sector 3 except on the approaches to the Rosebank and Patiki Interchange on and off ramps.

4.4.3.8 Street Furniture

Standard signage and street furniture for motorways will be used in this Sector. High mast central median lighting is proposed between the lanes.

4.4.3.9 Other Urban Design and Landscape Elements

Key urban and landscape design elements proposed include:

- Replace cycle way overbridge at Patiki Interchange with a more attractive design which avoids the widened motorway and Patiki Road on-ramp;
- Existing timber boardwalk to be widened and provided with guardrail;
- At the Rosebank Interchange, the interchange bridge barrier treated to enhance appearance;
- Concrete retaining panels to match those further north (on SH18) with exposed dark aggregate and subtle horizontal corrugations to complement the harbour landscape;
- Raised cycle way on retaining wall at Rosebank Domain, providing for separation of the cycle way with motor vehicle traffic; and
- Harbour coastline planting on the northern side of the motorway replacing existing weed species.

Further details on these elements are provided in F.16 *Urban Design and Landscape Plans*, Part F of this AEE.

4.4.4 Sector 4 – Reclamation

4.4.4.1 General Description

Sector 4 will involve works mainly within the CMA to raise the Motorway carriageway in order to protect against sea inundation and settlement and to widen the existing cause way (and Causeway Bridge) to accommodate additional lanes.

The carriageway will be raised by approximately 1.5m above the current level. This will provide sufficient defence against increasing tidal intrusion, whilst allowing sufficient clearance over SH16 by the Rosebank eastbound on-ramp.

Westbound the existing carriageway will be widened from three lanes and a shoulder to five lanes and a bus shoulder, while eastbound, the existing carriageway will be increased from three lanes and a shoulder to four lanes and a bus shoulder.

The existing pedestrian/cycle way will be upgraded and increased to 3m wide. A new pedestrian/cycle way bridge will be provided alongside the westbound carriageway of the Causeway Bridge over the inlet channel.

Reclamation is required within Sector 4 to accommodate the improvements and coastal protection works. See F.2: *Operation Scheme Plans*, Part F of this AEE, for further details on the general Project arrangement in this Sector. Figure 4.6 below shows the extent of Sector 4.

4.4.4.2 Land Requirements

The Project requires reclamation of the CMA

To provide for the Project in Sector 4, area of reclamation from the CMA is required. The total area required is 4.20ha and can be broken down as follows:

- 0.33ha to the north of the motorway between Whau River Bridge and Rosebank Interchange to accommodate the additional eastbound traffic lane, additional eastbound bus-shoulder, the new Patiki pedestrian/cycle way bridge and stormwater treatment devices;
- 0.10ha to the south of the motorway between Rosebank Park Domain and Patiki Interchange to accommodate the upgrades to the existing access into Rosebank Park Domain;
- 1.48ha to the north of the motorway between Rosebank Road and GNR Interchanges to accommodate the additional eastbound traffic lane, increased eastbound bus-shoulder width, stormwater treatment devices, coastal protection crest, service berm and the additional road elevation required to futureproof against sea-level rise; and
- 2.3ha to the south of the motorway between Rosebank Road and GNR Interchanges to accommodate the two additional westbound traffic lanes, increased westbound bus-shoulder width, increased pedestrian/cycle way width, stormwater treatment devices, coastal protection crest and the additional road elevation required to future proof against sea-level rise.

Figure 4.6: Sector 4

Figure 4.7: Visual of widened Causeway from Howlett Street Walkway

Source: BuildMedia Limited 2010 (See *Assessment of Visual and Landscape Effects* in G.20)

4.4.4.3 Traffic Volumes and Flows

The *Assessment of Transport Effects* Technical Report G.18 compares the Waterview Connection Project with the "do minimum' (without the Project) scenario for SH16. This shows that at 2016, up to 120,200 vehicles per day (vpd) are expected to be using SH16. By 2026, as much as 133,100 per day are expected to be using sections of SH16, which is an increase of up to 17% compared to without the Project. The traffic assessment (Section 13.2) provides detail on how these traffic flows impact the wider transport network (e.g. reducing local traffic volumes) and design capacity of SH16.

The traffic assessment in Chapter 13 (Section 13.2) provides detail on how these traffic flows impact the wider transport network (e.g. reducing local road traffic volumes) and the levels or service and design capacity of SH16.

4.4.4.4 Key Structures

The key structures (for which a design is provided in Plan F.8 *Plans of Structures*) in Sector 4 include:

- The Causeway Bridge, which will be widened by 5.6m and 9m for the eastbound and westbound carriageways respectively. The spans of the new bridge widening will match the existing;
- A new 3.0m wide pedestrian/cycle bridge, located 8m to the south of the westbound carriageway. The pier locations will align with the existing Causeway Bridge. To reduce throttling effects of the widened Causeway the western and eastern spans of the new bridge have been increased, when compared to the existing Causeway Bridge. This allows for a more gentle earthwork profile to the southern lagoon exit;
- A new 3.0m pedestrian/cycle bridge at Patiki Interchange;
- Reclamation (approximately 4.21ha) within the CMA; and
- Stormwater Outlet structures to the CMA.

Further detail on the proposed structures in this Sector is provided in F.8 *Plans of Structures*, Part F of this AEE.

4.4.4.5 Drainage and Stormwater Treatment

Stormwater treatment in Sector 4 will be provided by a combination of cartridge filter vaults and bio-filter strips.

Improved Stormwater treatment

During construction, management of stormwater will be maintained for areas equivalent to those for which treatment is currently provided, by the use of filter trenches, during all stages of the construction process.

In other areas erosion and sediment discharge controls will be maintained, with permanent treatment devices to be ready for use when additional impervious areas are operational.

Detail on the proposed stormwater design is provided in Technical Report G.27 *Stormwater Design Philosophy Statement.*

4.4.4.6 Pedestrian/Cycle Way and Other Integration Elements

Improved pedestrian/ cycle way

The existing cycleway along the westbound carriageway will be upgraded to a consistent 3m width in this sector and a new 3m wide pedestrian/cycle way bridge will be constructed to replace the existing crossing over the inlet channel.

Dedicated bus shoulders will be provided on the westbound carriageway, terminating just before the westbound off-ramp at Rosebank Interchange and commencing again after the off-ramp. The bus shoulder along the eastbound carriageway terminates just before the eastbound on-ramp and commences again after Traherne Island. It terminates at the Causeway Bridge again and buses merge into the general traffic lanes.

4.4.4.7 Street Furniture

Standard signage and street furniture for motorways will be used in this Sector. Lighting columns 20m in height will be located within the central median of the Causeway.

4.4.4.8 Other Urban Design and Landscape Elements

Drawings 20.1.11-3-D-L-810, of Part E provide a plan of the urban design and landscape elements

Key urban and landscape design components proposed in this Sector include:

- Retaining open views by minimising the use of safety barriers;
- Landscaping planting to be undertaken; and
- Saltmarsh species to be planted on southern side of Causeway into new 'riprap' boulders forming the coastal rock armour wall.

Further details on these elements are provided in F.16 *Urban Design and Landscape Plans*, Part F of this AEE.

4.4.4.9 Coastal Occupation and Reclamation

Permanent works and occupation of the CMA in this Sector include reclamation of the causeway and structures associated with the Causeway Bridge and stormwater outfall structures.

The width of the existing Causeway is between 50m and 60m and (this is generally described as the distance between the CMA boundaries (Mean High Water Springs (MHWS)) from one side to the other). Following construction, the width will be between 70m and 75m (i.e, an increase in width of 20m to 25m). This causeway reclamation comprises the following:

- Sealed carriageway (approximately 45m in width);
- Stormwater bio-filter strips (7m in width on each side);
- Pedestrian / Cycle way (approximately 3m in width); and
- Rock Armour Crest (seaward) (approximately 3m in width).

The extent of reclamation is shown on Sheet 104-108 of F.18 *Reclamation Extents*, the extent of permanent occupation is shown on Sheet 104-108 of F.12:*CMA Permanent Occupation Plan* and the extent of temporary occupation is shown on Sheet 104-108 of F.13: *CMA Temporary Occupation Plan* contained within Part F of this AEE.

Stormwater outfall structures and operational discharges to the CMA will also be required. The location of these is shown in the Sheets 3 and 4 of F.15: *Coastal Discharges*, Part F of this AEE.

Table 4.5 summarises the areas of reclamation, permanent and temporary occupation required to provide for the stormwater wetland.

Table 4.5: Approximate Areas of Reclamation, Permanent Occupation and Temporary Occupation for Sector 4

Area Type	Approximate Area (ha)
Reclamation	4.21
Permanent Occupation	2.68
Temporary Occupation	5.66

4.4.5 Sector 5 – Great North Road Interchange

4.4.5.1 General Description

New motorway to motorway connections at GNR

A new interchange will be built at the 'Great North Road' (GNR) Interchange to provide motorway-to-motorway connections for SH16 and SH20. Figure 4.8 provides an overview of the Project in this Sector.

Currently the Interchange provides for connectivity between GNR and SH16. The GNR Interchange will increase functionality by providing motorway to motorway connection between SH16 and SH20. This will allow for all vehicle movements travelling East and West to/from SH20:

- The proposed Interchange will retain the existing functionality of GNR to SH16, including the right-turn movement from the westbound ramp (from City) to GNR.

See F.2: Operation Scheme Plans, Part F of this AEE, for further details on the general Project arrangement in this Sector.

4.4.5.2 Land Requirement

Land is required for the Project

To provide for the proposed works in this Sector, additional land (beyond that already used by the State highway) is required for the proposed ramps (to connect SH20 to SH16 at the GNR Interchange) and to accommodate a stormwater wetland pond. This land is a mix of land within the existing designation, residential and reserve/open space land. Land required beyond the existing designation includes that summarised below:

Residential land is required from the entire length of Cowley Street, the northern end of Herdman Street (between GNR and Waterbank Crescent), the eastern end of Waterbank Crescent and the western side of GNR between Herdman and Cowley Streets. Detail on the extent and properties affected for Sector 5 are provided in the Schedule of Properties associated with NOR 3 and 4.

The Reserve or open space land required for the Project includes:

- Waterview Reserve – approximately 1.9 ha will be required from this open space area for the proposed GNR Interchange improvements and a wetland pond (including a 30m wide buffer provided to screen the motorway structures from the retained open space area). Approximately 0.6ha of Waterview Reserve is returned following construction.
- A further 2.5 ha open space replacement land is proposed around the perimeter of Waterview Reserve, Saxon Reserve, Cowley Reserve and Waterview Esplanade. The designation proposes reinstatement of open space and recreation faciltities, detailed further in Chapter 18 of this AEE.

Detail on the extent of impact and the properties affected by the Project designation in Sector 5 is provided in the Schedule of Properties for NOR 3 and 4.

Figure 4.8: Sector 5

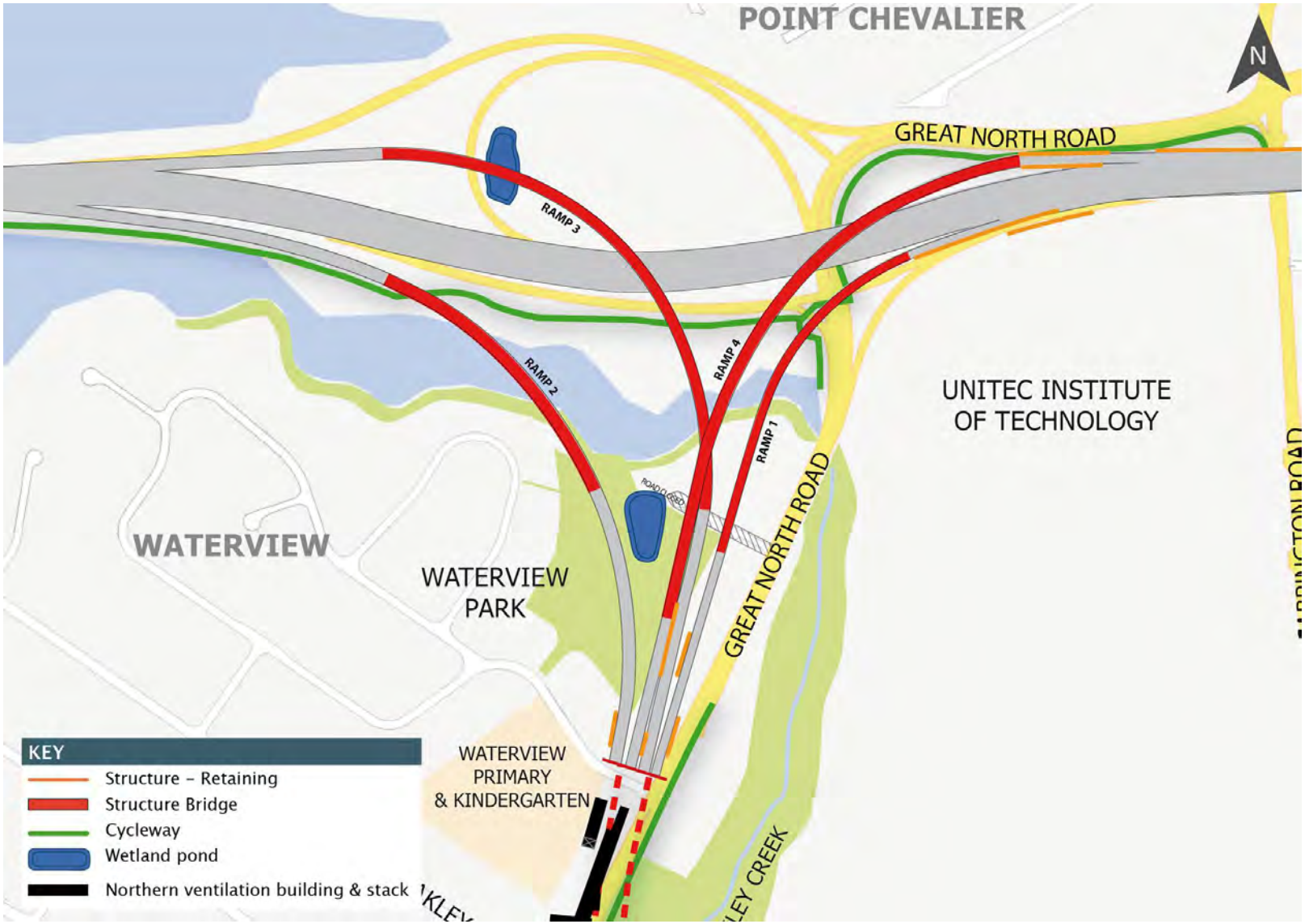


Figure 4.9: Visual of Great North Road Interchange SH20 Ramps – from Waterbank Crescent

Source: BuildMedia Limited 2010 (See *Assessment of Visual and Landscape Effects* in G.20)

Figure: 4.10 Visual of Interchange of Great North Road (Beneath existing pedestrian/cycle way bridge)

Source: BuildMedia Limited 2010 (See *Assessment of Visual and Landscape Effects* in G.20)

4.4.5.3 Interchanges and Local Connections

Interchanges

At the GNR Interchange four new ramps will be constructed to connect SH20 to SH16 (shown conceptually on Fig. 4.9. These include:

- A two lane westbound ramp (Ramp 2) that will take traffic from the tunnel (SH20) towards Waitakere (SH16);
- A two lane southbound ramp (Ramp 3) that will take traffic from Waitakere (SH16) towards Maioro Street, the Airport and the south;
- A two lane eastbound ramp (Ramp 4) for traffic emerging from the tunnel (SH20) that merges to a single lane before connecting with SH16 towards the city in the vicinity of the Carrington Road Bridge; and
- A single lane southbound ramp (Ramp 1) will take traffic coming from the City (SH16) and connect with SH20 towards Maioro, the Airport and the south.

Local Connections

GNR remains, with all connection to SH16 retained. Local road impacts include a permanent closure of GNR access to Cowley Street.

4.4.5.4 Traffic Volumes and Flows

The *Assessment of Transport Effects* Technical Report G.18 shows the expected traffic volumes on the Waterview Connection east and west facing ramps. The traffic assessment (provided in Section 13.2 of this AEE) provides detail on how these traffic flows impact the wider transport network (e.g. reducing local traffic volumes) and the levels of service and design capacity on SH20.

The traffic assessment in Chapter 13 (Section 13.2) provides detail on how these traffic flows impact the wider transport network (e.g. reducing local road traffic volumes) and the levels or service and design capacity of SH16 and SH20.

4.4.5.5 Key Structures

The key structures (for which a design is provided in Plan F.8 *Plans of Structures*) in Sector 5 include:

- Four new ramps and associated embankments that will cross above the existing connections between GNR and SH16. The four new ramps are viaduct structures with overall lengths of between 245m and 550m as summarised in Table 4.6;

- The four ramps will traverse Oakley Inlet with varying sizes of each ramp occupying the CMA as summarised in Table 4-6 below. The area of permanent habitat loss from the location of piles is estimated to be 20m2 of intertidal habitat;
- New bridge over the CMA to reinstate pedestrian connection in the Oakley Inlet Heritage areas, (see F.8: Plans of Structures); and
- Stormwater will be collected from the ramps and the adjacent motorway carriageway and drained to wetland ponds and/or filter cartridges on the northern and southern sides of Oakley Creek, eventually discharging via outlets to Oakley Creek.

Further detail on the proposed structures in this Sector is provided in F.8 *Plans of Structures*, of this AEE.

Table 4.6: Description of Interchange Structures – Sector 5

Structure	Connection	Length
Ramp 1	SH16 WB to SH20 SB	315m
Ramp 2	SH20 NB to SH16 WB	245m
Ramp 3	SH16 EB to SH20 SB	485m
Ramp 4	SH20 NB to Sh16 EB	550m

4.4.5.6 Drainage and Stormwater Treatment

Improved Stormwater Treatment

Stormwater treatment within Sector 5 will be provided by a combination of treatment devices; two wetlands, a treatment swale, three cartridge filters and two lengths of bio-filter strips (continued from Sector 4).

During construction, management of stormwater will be maintained for areas for which treatment is currently provided, and treatment will be provided for construction yards. Elsewhere erosion and sediment discharge control measures will remain in place throughout construction. More detail on this is provided in Technical Report G.15 *Assessment of Stormwater and Streamworks Effects.*

Detail on the proposed stormwater design is provided in Technical Report G.27 *Stormwater Design Philosophy Statement.*

4.4.5.7 Pedestrian/Cycle Way and Other Integration Elements

The cycle way in this Sector is adjacent to the westbound SH16 carriageway and follows the edge of the CMA. The existing cycle way bridge across GNR will be retained and the alignment reconfigured to avoid piers on the Ramps.

Where the northbound motorway to motorway connection joins SH16 westbound, the cycle way will leave the causeway alignment to pass beneath the last span of Ramp 2 and cross over

the edge of the archaeological area on the north bank of Oakley Creek and continue eastward. It will then join the existing Northwestern cycleway route, which will not be modified on the eastern side of the Interchange.

The design provides an extension of the walkable coastal route for local residents, and also access to the Historic Star Mill site and surrounding archaeological area, which will be beneath the ramps. The walkway will provide for a low pedestrian bridge crossing of the CMA to connect the heritage area with Waterview Reserve. Shown on the plans F.9 *Oakley Creek Inlet Heritage Plans.*

4.4.5.8 Noise Mitigation

A combination of a low noise road surface (e.g double layered OGPA) combined with 1.1m high safety edge barriers on ramps is proposed.

Detail on the dimension and location of the proposed noise barriers are provided in the plans F.17 *Noise Walls / Mitigation*, Part F of this AEE.

4.4.5.9 Street Furniture

The light poles in the Interchange will be 20m high mast poles. They will be located in strategic positions to best provide uniform lighting over the more complex parts of the interchange. Single sided 10m or 12m high poles will be used on the outlying ramps with a special photometric which can throw the light along a single lane ramp.

4.4.5.10 Other Urban Design and Landscape Elements

Key urban and landscape design components proposed in this Sector include:

Reserve reinstatement and improved walkways to and along the CMA

- Interpretation of the history and reinstatement of public access to the Star Mill, tannery and surrounding archaeological sites (a regionally significant archaeological area);
- To the north of the Interchange an 'urban forest' will be created, including earth mounding and sculpting to visually counterbalance the Interchange structures, while providing screening from the elevated residential catchment of Pt Chevalier to the north;
- Planting, landscaping and ecological restoration along the Interchange itself and along the riparian Oakley Creek tidal mouth;
- Following construction, the area of land within the GNR Interchange and in the vicinity of Waterview Reserve that is not required for permanent works will be reinstated as open space;

- Ramp barrier design will build on the volcanic theme of the other structures on the Project; and
- The Waterview ramps will be designed to optimise both an aesthetic and environmental outcome by presenting a coherent appearance, especially from underneath, as viewed from the pedestrian/cycle way which links through the sensitive coastal environment and the heritage sites.

Further details on these elements are provided in F.16 *Urban Design and Landscape Plans*, Part F of this AEE.

4.4.5.11 Coastal Occupation and Reclamation

Permanent works and occupation of the CMA in this Sector include structures associated with the GNR Interchange and the proposed pedestrian bridge in the Oakley Inlet Heritage Area. These are described in Section 4.4.5. The proposed structures and permanent occupation area is shown on Plans Sheet 9 of F.12 *CMA Permanent Occupation Plan*, Part F of this AEE.

Existing and new stormwater outfall structures are also proposed for treated stormwater from SH16 and the GNR Interchange. Two outfalls are proposed in the Oakley Inlet and one to the north, to the CMA adjoining Eric Armishaw Park.

The extent of permanent occupation is shown on Sheet 109 of F.12 *CMA Permanent Occupation Plan* and the extent of temporary occupation is shown on Sheet 109 F.13: *CMA Temporary Occupation Plan* contained within Part F of this AEE

Table 4.7 summarises the areas of permanent and temporary occupation required to provide for the stormwater wetland.

Table 4.7: Approximate Areas of Reclamation, Permanent Occupation and Temporary Occupation for Sector 5

Area Type	Approximate Area (ha)
Reclamation	N/A
Permanent Occupation	0.35
Temporary Occupation	0.32

4.4.6 Sector 6 – SH16 to St Lukes Interchange

4.4.6.1 General Description

SH16 will be widened through this Sector to provide an additional lane in both directions resulting in an eight lane carriageway between the St Lukes Interchange and the GNR Interchange. See F.2 *Operation Scheme Plans*, Part F of this AEE, for further details on the general Project arrangement in this Sector. Figure 4.11 shows the extent of the boundaries for Sector 6.

4.4.6.2 Land Requirements

Land is required for the Project

In this Sector, additional land (beyond that already used by the State Highway) is required to provide for an additional lane in each direction on the motorway and to provide for a stormwater wetland pond. There is a mix of landuse within the existing designation, residential and reserve/open space land. The designation directly affects:

One vacant residential parcel at 1074 GNR which is required for a wetland pond – this site is zoned for both residential and open space purposes;

Residential land at 23 Parr Road South, and 1102 and 1036 GNR. Detail on the extent and properties affected for Sector 6 are provided in the Schedule of Properties associated with NOR 5.

The Reserve or open space land required for the Project includes:

- Approximately 0.1ha of the western side of the Western Springs Gardens; and
- Approximately 0.2ha of the vacant open space land at 1074 GNR required for a stormwater pond. This site is currently privately owned and not accessible to the public.

Detail on the extent of impact and the properties affected by the Project designation in Sector 6 is provided in the Schedule of Properties for NOR 5.

4.4.6.3 Interchanges and Local Connections

This section of work will not affect the existing interchanges or local connections.

4.4.6.4 Traffic Volumes and Flows

The Assessment of Transport Effects Technical Report G.18 compares the Waterview Connection Project with the "do minimum' or without the Project scenario for SH16, for the years 2016 (expected year of opening) to 2026. This shows that at 2016, up to 139,200 vehicles per day (vpd) are expected to be using SH16. By 2026, up to 147,300 vehicles per day are expected to be using sections of SH16 within this Sector, an increase in traffic flows by as much as 27% over without the Project.

The traffic assessment (Section 13.2) provides detail on how these traffic flows impact the wider transport network (e.g. reducing local traffic volumes) and the levels of capacity on SH16.

The traffic assessment in Chapter 13 (Section 13.2) provides detail on how these traffic flows impact the wider transport network (e.g. reducing local road traffic volumes) and the levels or service and design capacity of SH16.

Figure 4.11: Sector 6

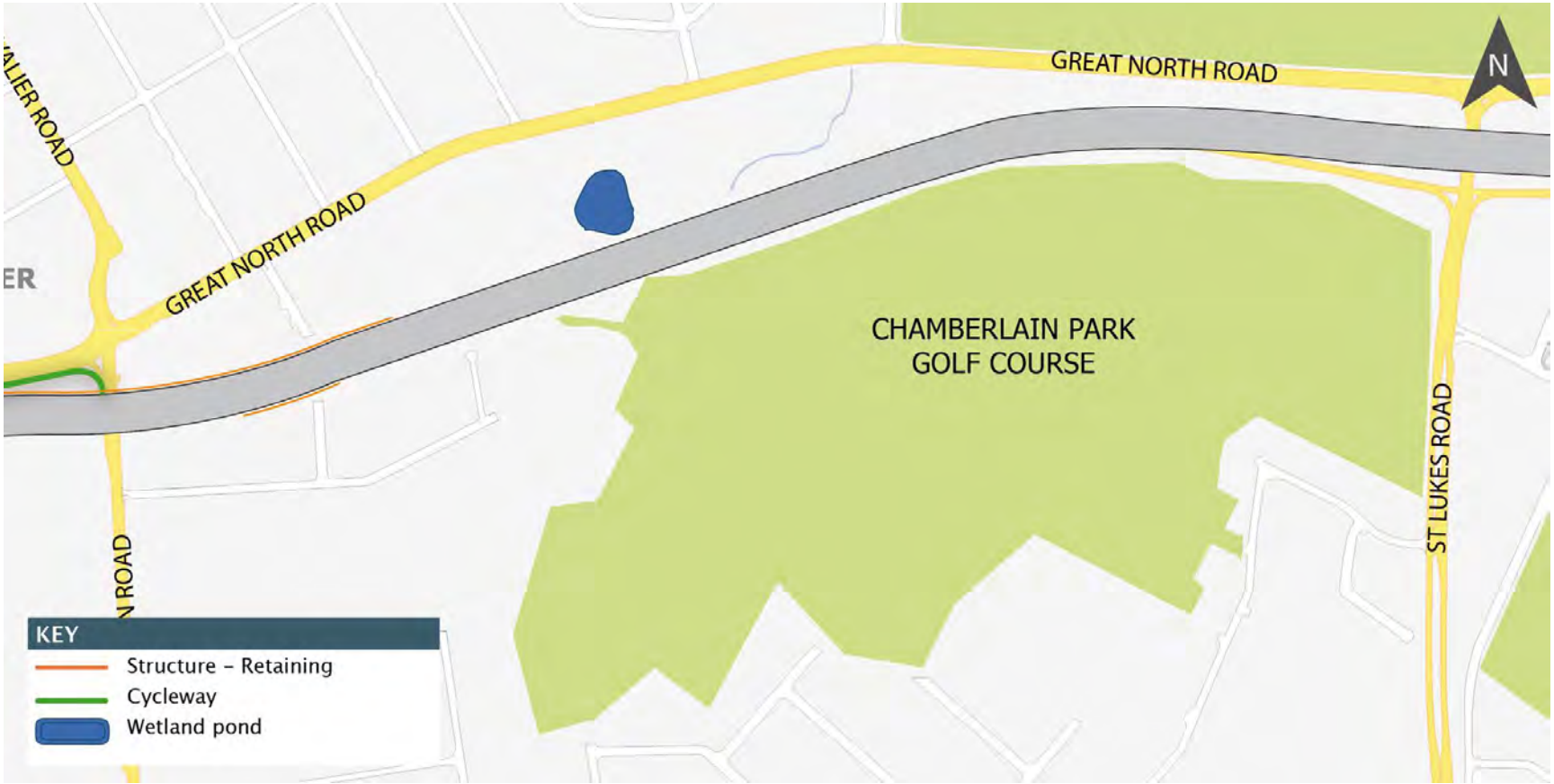


Figure 4.12: Visual of proposed wetland pond at 1074 Great North Road (looking towards SH16)

Source: BuildMedia Limited 2010 (See *Assessment of Visual and Landscape Effects* in G.20)

4.4.6.5 Key Structures

The key structures (for which a design is provided in Plan F.8 *Plans of Structures*) in Sector 6 include:

- Retaining walls and embankments.

Further detail on the proposed structures in this Sector is provided in F.8 *Plans of Structures,* Part F of this AEE.

4.4.6.6 Drainage and Stormwater Treatment

Improved stormwater treatment proposed

Stormwater treatment and extended detention will be provided by a wetland in Sector 6. During construction, management of stormwater will be achieved by constructing the permanent treatment wetland to be ready for use when additional impervious areas are commissioned. Elsewhere erosion and sediment discharge control measures will remain in place throughout construction.

Detail on the proposed stormwater design is provided in Technical Report G.27 *Stormwater Design Philosophy Statement.*

4.4.6.7 Pedestrian/Cycle Way and Other Integration Elements

No additional walking and cycling facilities are to be provided within this Sector. The Northwestern cycleway will continue in its current location, alongside the westbound carriageway. Cyclists and pedestrians will use the existing crossing over Carrington Road and continue along Sutherland Road to the dedicated pedestrian/cycle way between the motorway and Chamberlain Park Golf Course.

The pedestrian/cycle way will continue across the facilities at the St Lukes Interchange and continue along the current pedestrian/cycle way beyond the extent of this Project.

4.4.6.8 Noise Mitigation

Two separate noise barriers will be located within S6. These are:

- A noise barrier located on the southern side of SH16. The wall will range from 2m – 4m in height and run for a length of approximately 420m; and
- A noise barrier (bund where possible) located on the northern side of SH16. The wall wall/bund ranges from 2-6m in height and will run for a length of approximately 325m.

Detail on the dimension and location of the proposed noise walls is provided in the plans F.17 *Noise Walls*, Part F of this AEE.

4.4.6.9 Street Furniture

The lighting of this section of the motorway is to be upgraded to a central median arrangement up to the St Lukes Road overbridge. This will be achieved with median-mounted poles, at approximately 80m spacing.

Additional sign gantries will be required to provide advance warning of the SH20 motorway ramp, as well as changes to the existing signage resulting from revised lane assignment.

4.4.6.10 Other Urban Design and Landscape Elements

Key urban and landscape design elements proposed in this Sector include:

F.16: Urban Design and Landscape Plans, Part F

- Continuation of the current 'green route' theme for SH16 from Te Atatu to the GNR Interchange. The focus is on intensive planting of native species from the Harbour Coastline Species list, where space permits;
- Significant trees will be retained where possible and a stormwater pond will be constructed north of the corridor, with associated wetland planting; and
- The noise barriers (see discussion above) are proposed to be formed in pre cast concrete mounted on semi-concealed steel posts and associated planting.

Further details on these elements are provided in F.16 *Urban Design and Landscape Plans*, Part F of this AEE.

4.4.7 Sector 7 – GNR Underpass

4.4.7.1 General Description

SH20 will pass beneath GNR

This Sector comprises the 'cut and cover' section of tunnel and runs from the northern portal at Waterview Park, crosses beneath GNR in a southerly direction, and connects with the excavated tunnel at Oakley Creek Reserve (Sector 8). The northbound and southbound alignments will be generally accommodated within one single cut and cover box, approximately 40m wide. Between Chainage 3930 and 3785 (see F.2 *Operation Scheme Plans*), the southbound alignment will be accommodated within a single cut and cover box approximately 17m wide, while the northbound alignment will continue as part of the driven tunnel. The tunnel has a maximum depth of 30m. Figure 4.13 provides an overview of the Project in this Sector. Drawings 113 and 114 in Part F.2 *Operation Scheme Plans*, provide further detail on this description.

Within the cut and cover section of the tunnel, the 3-lane northbound carriageway diverges to form two 2-lane ramps connecting the SH20 tunnel with SH16 in both the west (ramp 2) and east (ramp 4) directions. In the southbound tunnel, the 2-lane connection from the west (ramp 3) joins the single lane connection (ramp 1) from Auckland City to form the three southbound lanes.

The north bound tunnel ventilation station building is located in this Sector. This two level building is approximately 17m in height, but will be partly below ground level (5m-7m) to minimise the visual impact. In addition to the building, a ventilation stack is proposed in this location, which will have a height of 25m above ground level.

There are no dedicated passenger transport facilities through the tunnel. This is discussed further in Chapter 13 of this AEE.

See F.2 *Operation Scheme Plans*, Part F of this AEE, for further details on the general Project arrangement in this Sector. The extent of the boundaries for Sector 7 are shown below in Figure 4.13.

4.4.7.2 Land Requirements

Land is required for the Project

To provide for the proposed works in this Sector, land is required to provide for the cut and cover tunnel and to provide for the tunnels ventilation building. In summary the designation includes:

- Some 15 residential land titles along GNR between Alford Street and Herdman Street directly adjacent to Waterview Primary School;
- A very small strip of Special Purpose land from Waterview Primary School, designated for education purposes but not used as such, is required where the School fronts onto GNR; and
- The land occupied by the dairy (zoned Business) at 1481 GNR although it is anticipated that the business will remain operating during construction.

Detail on the extent and properties affected for Sector 7 are provided in the Schedule of Properties associated with NOR 4.

4.4.7.3 Interchanges and Local Connections

There are no interchanges within this Sector. Cowley Street is proposed to be closed. There are no other long-term changes proposed to the functioning of GNR or the adjoining streets, as the cut and cover tunnel runs under this Sector.

Figure 4.13: Sector 7

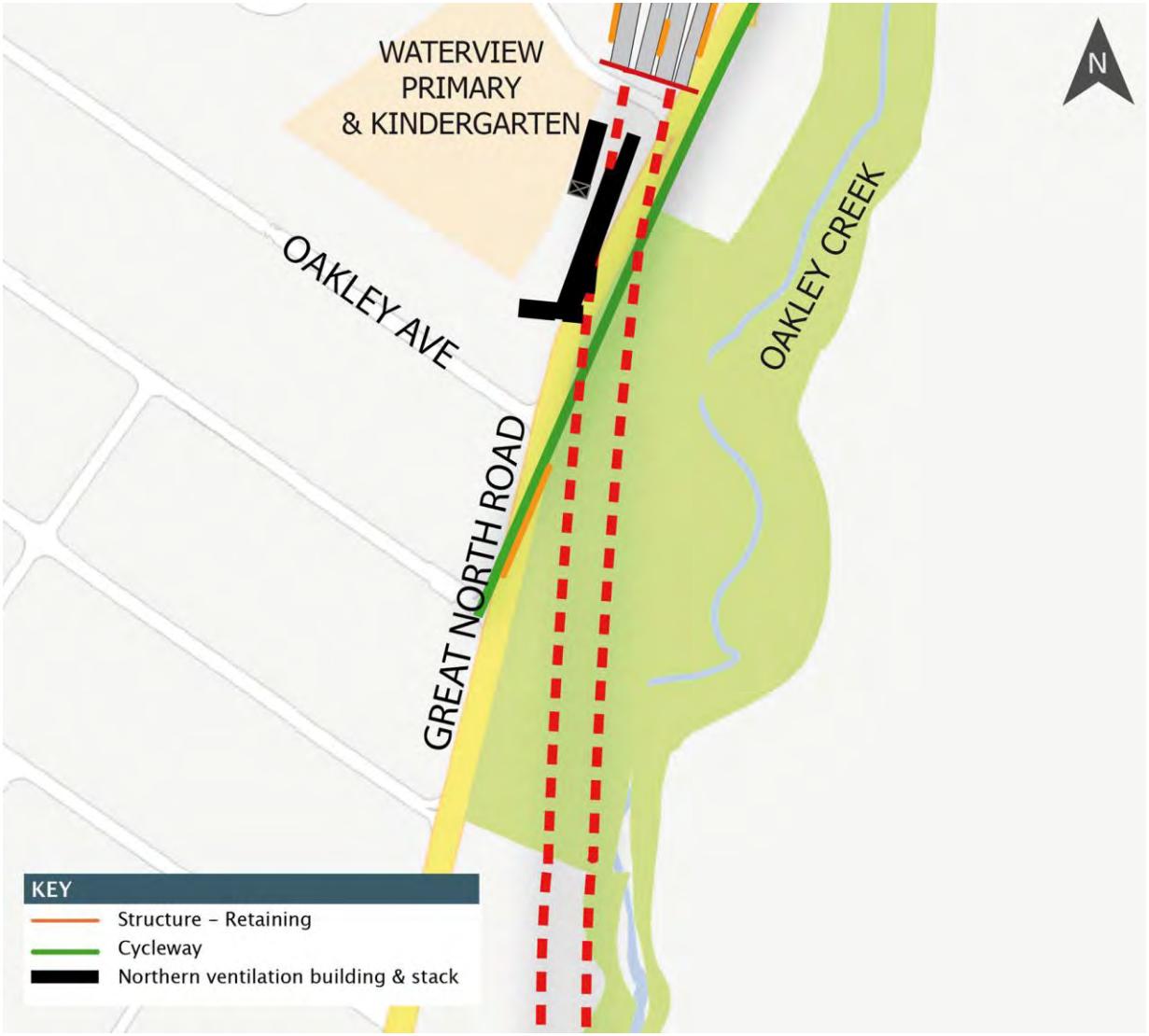


Figure 4.14: Visual of proposed vent building and stack from Oakley Avenue (looking north)

Source: BuildMedia Limited 2010 (See *Assessment of Visual and Landscape Effects* in G.20)

4.4.7.4 Traffic Volumes and Flows

The *Assessment of Transport Effects* Technical Report G.18 shows the expected traffic flows for SH20 (southbound and northbound) within Sector 7 from 2016 (expected year of opening), to 2026. In 2016 there is expected to be up to 69,900 vpd, which is expected to increase to up to 82,800 vpd in 2026.

The traffic assessment in Chapter 13 (Section 13.2) provides detail on how these traffic flows impact the wider transport network (e.g. reducing local road traffic volumes) and the levels or service and design capacity of SH20.

4.4.7.5 Key Structures

The key structures (for which a design is provided in Plan F.8 *Plans of Structures*) in Sector 7 include:

- The northern portals of the excavated tunnels;
- The cut and cover tunnel which will be approximately 350m long and approximately 40m wide in both directions. The southbound tunnel will extend for a further 150m, and be approximately 17m wide. The cut and cover tunnel will vary in depth from 30m at the southern end to 10m at the northern end;
- A 25 metre high ventilation stack and 17m high ventilation control building, partly below ground. The ventilation stack building will be located adjacent to the western side of GNR between Herdman Street and Oakley Avenue; and
- Retaining walls.

Further detail on the proposed structures in this Sector is provided in F.8 *Plans of Structures*, Part F of this AEE.

4.4.7.6 Drainage and Stormwater Treatment

Drainage flows from Sector 7 are limited to a small amount of groundwater that may enter through the tunnel lining, tunnel washdown flows, and flows from the deluge system during an emergency. Collection, conveyance, storage and pumping systems have been designed for these flows.

The low point in the tunnel occurs in Sector 8 and pump out will be to the northern portal in Sector 5. Depending on the level of water contamination, the flows can be discharged to either the northern portal wetland (normal levels of stormwater pollutants in water, or tanker trucks for offsite treatment and disposal (highly contaminated water).

During the construction phase stormwater runoff from the contractor's working area in this Sector will be treated by a wet pond. Stormwater treatment for temporary diversions of GNR will be provided by upflow filters.

Detail on the proposed stormwater design is provided in Technical Report G.27 *Stormwater Design Philosophy Statement.*

4.4.7.7 Pedestrian/Cycle Way and Other Integration Elements

Through this Sector it is proposed that the existing off road pedestrian/ cycle way will be re-established on GNR. The existing shared pedestrian/cycle way is off-road along the eastern side of GNR. The motorway will go under GNR using the cut and cover tunnel method. Walking and cycling facilities will be reinstated following construction.

4.4.7.8 Tunnel Operation

A description of the tunnel operational elements is described for Sector 8 below.

4.4.7.9 Street Furniture

During construction there will be a temporary deviation for a small section of GNR to circumvent the construction operations at the northern tunnel portal. The road will be reinstated as previously with the same lighting. The lighting arrangement will remain the same as the existing lighting along GNR.

4.4.7.10 Other Urban Design and Landscape Elements

The ventilation building and stack are key structures in this Sector. Plans of the form and design for this building and stack are provided in Plans F.8 *Plans of Structures* and F.16 *Urban Design and Landscape Plans*.

4.4.8 Sector 8 – Avondale Heights Tunnel

4.4.8.1 General Description

The motorway continues from the cut and cover tunnel section in Sector 7 into two excavated tunnels in a southerly direction through to Alan Wood Reserve, passing beneath Avondale Heights/Springleigh,

The Project is in excavated tunnel in this Sector

As described in Chapter 5 (Construction), in this Sector two 15m wide by 12m high tunnels will be excavated to a minimum depth of 11m to the crown of the tunnel, and a maximum depth of 65m to the tunnel invert, for approximately 2km. The two tunnels will be able to be excavated concurrently from both the northern and southern portals.

The North Auckland Rail Line and New North Road. The tunnels will emerge at grade approximately halfway along the length of Alan Wood Reserve. Figure 4.15 provides an overview of the Project in this Sector.

The two tunnels are approximately 2km long, with each tunnel carrying three lanes of traffic (3.5m wide each) with 1m shoulders on each side. The tunnels will be approximately 15m apart.

See F.2 *Operation Scheme Plans*, Part F of this AEE, for further details on the general Project arrangement in this Sector.

4.4.8.2 Land Requirements

The land required for the tunnels is identified to be subject to a sub-strata designation. The designation will "have effect" (i.e identify an interest by the NZTA in the land) 7m below natural ground level from affected properties above and 4m below roads and open space/reserve areas. Details of the properties affected by the substrata designation are provided in the Schedule of Properties for NOR 5.

The proposed works in this Sector include an emergency exhaust which land at36 Craddock Street (included in NOR 6).

Detail on the amount of land required and the properties affected by the Project designation in Sector 8 is provided in the Schedule of Properties for NOR 5 and 6.

4.4.8.3 Interchanges and Local Connections

All existing local road connections will be maintained, with no long-term change to the proposed functioning of GNR or the adjoining Streets.

The tunnels also pass beneath the North Auckland Rail Line and the designation for the Avondale-Southdown Rail. These are not affected by the Project in this Sector.

4.4.8.4 Traffic Volumes and Flows

The Assessment of Transport Effects Technical Report G.18 outlines the expected traffic volumes for SH20 (southbound and northbound) within Sector 8 from 2016 (expected year of opening), to 2026. In 2016 there is expected to be up to 69,900 vpd, which is expected to increase to up to 82,800 vpd in 2026.

The traffic assessment (Section 13.2) provides detail on how these traffic flows impact the wider transport network (e.g. reducing local traffic volumes) and the capacity of SH20.

The traffic assessment in Chapter 13 (Section 13.2) provides detail on how these traffic flows impact the wider transport network (e.g. reducing local road traffic volumes) and the levels or service and design capacity of SH20.

4.4.8.5 Key Structures

The key structures (for which a design is provided in Plan F.8 Plans of Structures) in Sector 8 include:

- Two excavated tunnels to provide sub-surface alignment through the Sector. The tunnels will be up to 65m deep at the deepest in the vicinity of Phyllis Street.
- An emergency exhaust and building at 36 Craddock Street, approximately mid way along the tunnel alignment. The emergency smoke exhaust will be approximately 12m high, and associated building approximately 10m by 10m in extent.

Further detail on the proposed structures in this Sector is provided in F.8 Plans of Structures, Part F of this AEE.

4.4.8.6 Drainage and Stormwater Treatment

Provision will be made for treatment of drainage flows from Sector 8, which are limited to a small amount of groundwater that may enter through the tunnel lining, tunnel washdown flows, and flows from the deluge system during an emergency. Collection, conveyance, storage and pumping systems have been designed for these flows.

The low point in the tunnel occurs in Sector 8 and pump out will be to the northern portal in Sector 5. Depending on the level on water contamination, the flows can be discharged to either the northern portal wetland (normal levels of stormwater pollutants in water, or tanker trucks for offsite treatment and disposal (highly contaminated water).

During construction tunnel water will be treated at both portals (refer to the Technical report G.22 Erosion and Sediment Control Plan and discharged through temporary stormwater systems.

Detail on the proposed stormwater design is provided in Technical Report G.27 Stormwater Design Philosophy Statement.

Figure 4.15: Sector 8

4.4.8.7 Tunnel Operation

Tunnel Power Supply

Additional substations are proposed

It has been calculated that the site will require between 6MW and 8MW of power to operate. A reliable power supply is required for the tunnels. Vector infrastructure for the tunnels' permanent supply will be from the Te Atatu substation in the north and Sandringham substation in the south. The dual configuration gives increased reliability to the permanent supply.

Vector has indicated that it requires two new zone substations to support the maximum demand required, one zone substation at each tunnel portal, with the zone substations being linked together via ducts run through the tunnels (northbound and southbound).

For the permanent power supply, two substations are therefore integrated into the ventilation station buildings at the northern (Sector 7) and southern (Sector 9) portals, and a further two above ground substations are located approximately one third and two thirds of the length from each tunnel portal (access via the road tunnels).

Tunnel Lighting

General lighting for the tunnel consists of continuous rows of fluorescent lighting for general and night-time illumination. Two rows of high pressure sodium (HPS) high intensity discharge lighting will be used to augment the fluorescent lighting for entrance and exit transition zones adaption lighting.

Illuminated directional exit signs will be provided at nominally 60m intervals throughout the tunnel adjacent to the equipment cabinets and at the cross passage indicating direction into the cross passage. Emergency strobes, activated by fire systems and power failure will be provided at the portals and the cross passage. The exit signs will be illuminated at all times.

Tunnel Operation and Control System

The Tunnel Operations Management and Control System (OMCS) will be controlled locally in a local tunnel control room. It will be linked to the "Offsite Monitoring System" control centre in the local area via a LAN based fibre network. All communications systems for the tunnels will be located within the local control buildings.

An incident control CCTV system will also operate within the tunnels. This system will consist of CCTV cameras mounted within the tunnels to provide continuous coverage of the tunnel interior and exit portals.

Variable messaging signage will be provided within and outside the tunnel. The external variable messaging system will be erected on an overhead steel gantry mounted at an appropriate distance prior to the tunnel on the approach to the portal at both tunnel entries.

Prior to the portals, over height warning systems will be in place. These may include illuminated flashing signage and/or warning chains.

Tunnel Ventilation System

Tunnel ventilation will maintain in tunnel air quality

The tunnel ventilation system has been designed to:

- Maintain in-tunnel air quality (including visibility) by providing sufficient fresh air intake for the control of vehicle pollutant concentration to acceptable levels;
- Provide portal emissions control and adequate atmospheric emissions dispersion; and
- Control the spread of fire smoke enabling safe occupant egress under fire conditions and to facilitate an effective emergency response.

The ventilation system comprises a longitudinal in-tunnel ventilation system and an exhaust ventilation system.

The longitudinal in-tunnel ventilation system comprises reversible jet fans located along the ceiling of the tunnels, and is designed to maintain sufficient airflow so as to provide air quality within the tunnels that is adequate for the safety of vehicle occupants. As the carbon monoxide levels in the tunnels increase, banks of jet fans will be sequentially operated to increase the in-tunnel air flow. Air will be extracted from the tunnels upstream of the respective traffic exit portal, pass through an exhaust tunnel and into the ventilation station where it is discharged from ventilation stacks for dispersion of emissions.

The tunnels themselves become self ventilating at vehicle speeds greater than approximately 20km/h as a result of the vehicle induced air flow (piston effect). Consequent portal emissions can be controlled by reversing the operation of the jet fans located immediately upstream of the traffic exit portal.

As the operation of tunnel ventilation systems consumes a large amount of energy, for sustainable operation (energy efficiency), it is proposed that operational flexibility is retained e.g to turn down or switch off fans during very low traffic flows (e.g. in the middle of the night). Under these conditions the tunnels are ventilated naturally via the portals.

The jet fans will be utilised for all fire emergency (fire smoke control) scenarios. An emergency exhaust will be located at 36 Craddock Street, approximately half way along the tunnel alignment. The emergency exhaust will only operate in the event of fire (or similar emergency). However, to ensure the fans/power supply for the emergency exhaust is fully operational, periodic maintenance/testing will be undertaken.

Fire Protection System

The tunnels will include fire protection. This will involve manual elements (eg fire control cabinets, call points for people in the tunnels, and alarms). In addition, automated heat and smoke detection and deluge systems will operate.

The fire suppression water system will be required to deliver a minimum 855,000 litres to satisfy the requirements of the sprinkler deluge and hydrant system. In order to meet these requirements, it is proposed to install two separate storage tanks at each tunnel portal. Each tank will be sized to deliver the full flow capacity from either end of the tunnel, and will be fed from independent mains supplies.

The water supply storage tank may be a cylindrical tank or rectangular in shape. This will depend on spacing requirements for the site. The dimensions are approximately 10m x 10m x 10m, with a pump structure of around 10m x 10m x 3m.

4.4.9 Sector 9 – Alan Wood Reserve

4.4.9.1 General Description

The excavated tunnels emerge into Alan Wood Reserve at the southern portals. The two carriageways will continue through Alan Wood Reserve, under the proposed Richardson Road bridge and continue to join up with the existing SH20 motorway section at the Maioro Street Interchange. The southern ventilation building and stack will be located within this Sector.

See F.2 *Operation Scheme Plans*, Part F of this AEE, for further details on the general Project arrangement in this Sector. Figure 4.16 outlines the extent of Sector 9.

4.4.9.2 Land Requirements

To provide for the Project through this Sector the following land is required:

Land take is required for the Project

- Residential Take: Approximately 40-45 residential property titles are affected through this Sector. One of these properties is undeveloped but has resource consent for 83 residential dwellings (25 Valonia Street). Detail on the extent of property affected for Sector 9 is provided in the Schedule of Properties for NOR 6 (Volume I).
- Business Take: Business Take: There are a number of business properties affected by the Project in the Stoddard Road area. The proposed land take involves partial acquisition of these lots.

Open space restoration is proposed

- Reserve Take:Reserve Take: Land is required from two reserve areas in this Sector: Alan Wood Reserve and Hendon Park. Overall, following construction approximately 3.2 ha is permanently required from these areas. Approximately 8.3ha of the existing reserve will be retained and approximately 3.7ha of new open space area is proposed to be added to the reserve (a surplus in reserve area of approximately 0.55ha). Two senior sportsfields are proposed to be provided at 25 Valonia Street to replace the existing sportsfields currently located in this area.

Detail on the extent of impact and the properties affected by the Project designation in Sector 9 is provided in the Schedule of Properties for NOR 6 and 7.

Figure 4.16: Sector 9

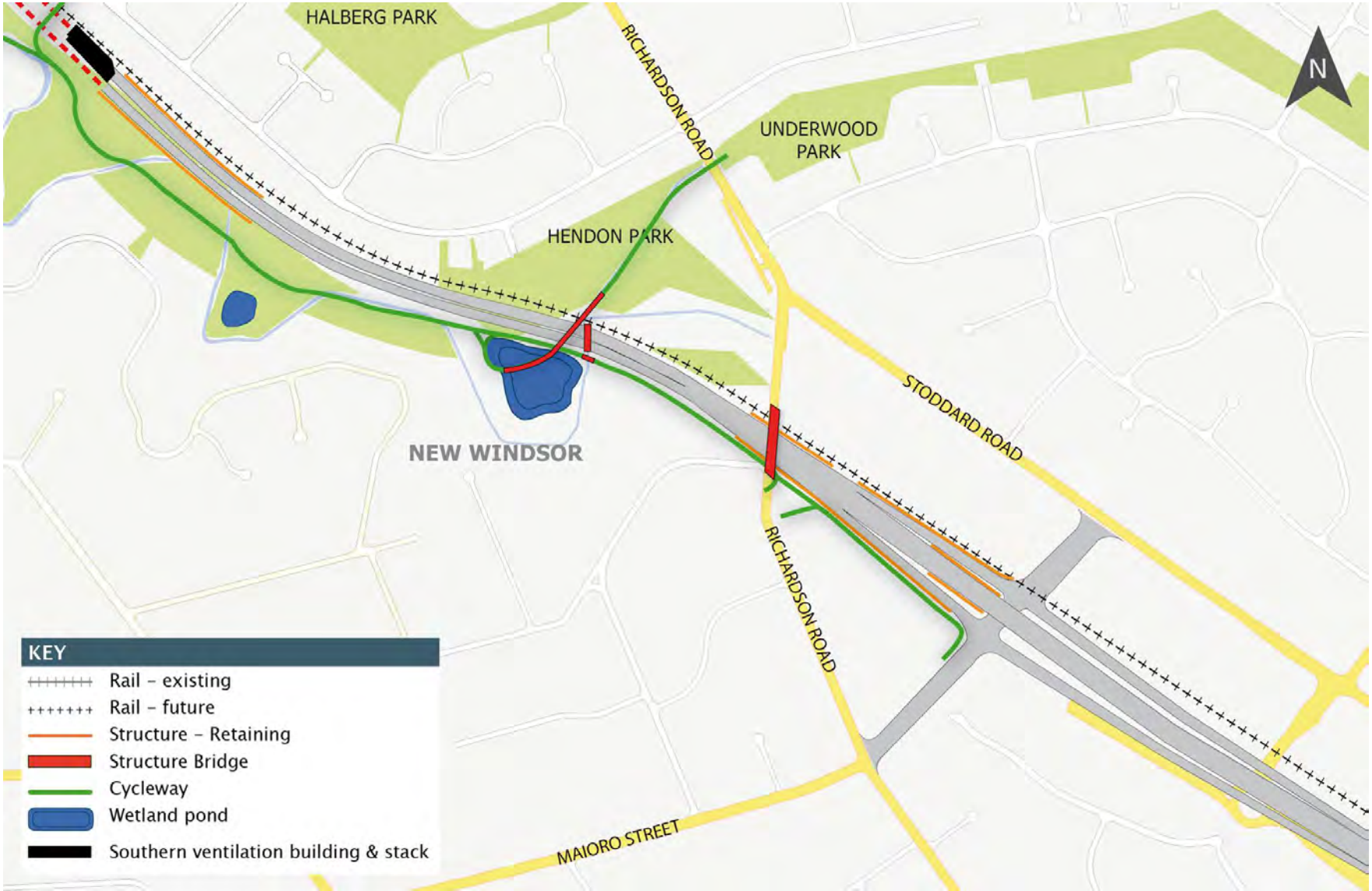


Figure 4.17: Visual of Hendon Park Bridge from Barrymore Road

Source: BuildMedia Limited 2010 (See *Assessment of Visual and Landscape Effects* in G.20)

Figure 4.18: Visual of Alan Wood Reserve from Methuen Road (approximately 108 Methuen Road)

Source: BuildMedia Limited 2010 (See *Assessment of Visual and Landscape Effects* in G.20)

Figure 4.19: Visual of southern ventilation building in Alan Wood Reserve from Avondale Motor Park

4.4.9.3 Interchanges and Local Connections

Interchanges

The Maioro Street Interchange marks the southern extent of the Project. The southern on/off ramps are subject to a separate project. The northern Maioro Street Interchange on and off ramps are part of this Project and will connect the surrounding local area to the northern SH20 network.

To the north of the Maioro Street Interchange, the Richardson Road alignment will be provided via a bridge across the new SH20 motorway.

Local Connections

Realignment of Valonia Street is required to provide for the SH20 connection under Richardson Road.

4.4.9.4 Traffic Volumes and Flows

The *Assessment of Transport Effects* Technical Report G.18 outlines the expected traffic volumes for SH20 (southbound and northbound) within Sector 9 from 2016 (expected year of opening), to 2026. In 2016 there is expected to be up to 69,900 vpd, which is expected to increase to up to 82,800 vpd in 2026.

The traffic assessment in Chapter 13 (Section 13.2) provides detail on how these traffic flows impact the wider transport network (e.g. reducing local road traffic volumes) and the levels or service and design capacity of SH20.

4.4.9.5 Key Structures

The key structures (for which a design is provided in Plan F.8 *Plans of Structures*) in Sector 9 include:

- Southern portals of the tunnels;
- Ventilation building and stack. The ventilation building will be 86m x 46m and approximately 10m high. The ventilation stack will be positioned in front of the southern portal and will be 25m above ground level;
- Embankments or retaining walls for alignment through Alan Wood Reserve;
- The Hendon Avenue pedestrian and cycle bridge;
- Bridging of Oakley Creek for the SH20 carraigeway (Oakley Creek Bridge (SH20));

- Bridging of Richardson Road allowing for two lanes of traffic, the potential for parking, a shared pedestrian and cycle path and on road cycle lanes. The three span bridge will be 24.6m wide, and constructed with Super-T precast beams supported on concrete wall piers on piles and piled abutment beams;
- Off and On Ramps linking the motorway section to Maioro Street; and
- Pedestrian/cycle bridges over Oakley Creek associated with the pedestrian/ cycle way.

Further detail on the proposed structures in this Sector is provided in F.8 *Plans of Structures*, Part F of this AEE.

4.4.9.6 Drainage and Stormwater Treatment

Stormwater quality treatment, extended detention and flood attenuation will be provided by two constructed wetlands. During construction, management of stormwater will be provided for the motorway and construction yards by temporary wetlands and wet ponds.

The motorway alignment will require realignment of sections of Oakley Creek, realignment of the Stoddard Road tributary, and the bridging of Oakley Creek. The motorway alignment through Hendon Park and Alan Wood reserve will be raised above the 100 year flood event. Stormwater overland flows will be redirected to mitigate any adverse effects. Detail of the proposed realignment works are provided in Technical Report G.14 *Streamworks and Stormwater Discharges*.

Detail on the proposed stormwater design is provided in Technical Report G.27 *Stormwater Design Philosophy Statement.*

4.4.9.7 Pedestrian/Cycle Way and Other Integration Elements

Improved pedestrian/ cycle connections

The SH20 pedestrian/cycle way is proposed to run northeast/southwest through Alan Wood Reserve/Hendon Park, improving both north/south and east/west connectivity. The pedestrian/cycle way connects to the Maioro Street pedestrian/cycle way under the proposed Richardson Road bridge.

In order to provide connectivity between the residential areas to the north and the south of the new motorway, a pedestrian/cycle way bridge will be provided, known as the Hendon Bridge. The bridge will connect to the Walmsley/Underwood pedestrian/cycle way and provide access for the Owairaka community to the open space proposed at 25 Valonia Street. The bridge will play an important role in both accessing and activating the open space, and in contributing to a better-used environment will also contribute to safety.

Pedestrian connections to the local street network are provided at regular intervals, and all major intersections have wide street frontages, being a minimum of 20m width. Connections are made to Richardson Rd, Valonia St, Methuen Rd, Bollard Ave, New North Road and Hendon Ave.

4.4.9.8 Noise Mitigation `

Noise walls proposed

Separate noise barriers will be located in three locations within Sector 9, including,

- A noise barrier located on the northern side of proposed SH20. The noise wall will be a maximum of 2.5m in height for a length of approximately 260m;
- A noise barrier located on the southern side of proposed SH20. The noise wall will range from 2-5m in height and will run for a length of approximately 550m; and
- Noise barriers surrounding the Christ the King School site. 3-4m noise barriers will run for a length of approximately 340m in this vicinity.

Detail on the extent and location of the proposed noise walls is provided in the plans F.17: *Noise Walls*, Part F of this AEE.

4.4.9.9 Street Furniture

Where the motorway exits the tunnels, the median is too wide for single pole median lighting and a single sided median lighting arrangement will be required with alternate staggered pole spacing. They will be 15m high poles. Further to the south, away from the tunnel portals where the two carriageways come together, the motorway will be lit with central median lighting from 20m single poles.

South of the new Maioro Street Bridge, it will revert to an existing opposite side pole arrangement, consistent with the Mt Roskill Extension project. There will be a pedestrian/cycle way on the south side of the motorway which will be provided with its own amenity lighting, as there will likely be planting between it and the motorway. These are proposed as 5m poles at 35m spacing.

On the approach to the tunnel portal a series of overhead gantries will be provided to accommodate signs. There will also be numerous VMS and other signs associated with the operation of the tunnels, for incidents in the tunnels and over-height vehicles.

4.4.9.10 Other Urban Design and Landscape Elements

Key urban and landscape design elements in this Sector include:

- Architecturally designed bridge at Hendon Park to connect to the Walmsley/Underwood pedestrian/cycle way. The Hendon Bridge provides access for the Owairaka community to access the sportsfields located at 25 Valonia Street (see F.8 *Plans of Structures*);

- The Hendon and Richardson Road bridges will also afford views to the side slopes and summit of Mt Albert. Good aerial views of the restored Oakley Creek habitat and Alan Wood Reserve will also be available from the overbridges in this Sector, in addition to views of the motorway corridor itself;
- Significant vegetation planting, including riparian vegetation, screen vegetation to the motorway and park amenity planting;
- The riparian margins of Oakley Creek in this area will be restored with improvements to the surrounding vegetation aimed at improving habitat and carrying capacity of the waterway;
- The form of the southern vent building and stack (see F.8 *Plans of Structures* for detail);
- Noise walls required (discussed above) and retaining wall structures (discussed above) will be designed to pick up on the volcanic landscape as design inspiration and visually integrate the materials and finishes with the landscape design and design of the bridge structures; and
- Detailed reserve reinstatement will be required.

Further details on these elements are provided in F.16 *Urban Design and Landscape Plans*, Part F of this AEE.

4.5 Integration with Other Projects

There are a number of other relevant projects that either complement or are supported by the Project. These projects are not part of this Project and **are not assessed in this AEE.** However, they are described below to show how better land use and transport integration is being progressed in the area.

4.5.1 Avondale to Southdown Rail Line

As noted earlier, there is currently provision for a land corridor for the future Avondale to Southdown Rail Line in the Project area. In order to accommodate both the future Avondale to Southdown Line and the SH20 extension, a nominal 20m wide corridor has been maintained for the future rail development (double track with electrification). This corridor is indicated on F.7: Rail Alignment.

Where practicable, the Project has been designed to facilitate rail development in the future. For example, the Richardson Road Bridge has been designed to accommodate a future rail alignment.

However, the designation of this replacement corridor and the development of the rail infrastructure and stations associated with the Avondale to Southdown Rail Line are not included in this Project. It is assumed that such works would be subject to their own RMA statutory process prior to that project progressing. That process would be the responsibility of KiwiRail.

4.5.2 Local Road Link at Alan Wood Reserve

The opportunity for a local road link through Alan Wood Reserve (i.e a connection between Owairaka and New Windsor) has been identified for the future local transport network. While there are opportunities for construction of such a project to be undertaken in tandem with this Project, this would be the responsibility of the future Auckland Council.

4.5.3 Pedestrian Link to Unitec from GNR

There are a number of opportunities identified to improve pedestrian and cycle connections. In particular these include:

- Extension of the pedestrian/cycle way from Alan Wood Reserve to the Northwestern Cycleway. This is considered a local transport Project.
- A possible connection (road or pedestrian) from GNR to Unitec in the vicinity of Alford Street. There is opportunity for this connection to be undertaken in tandem with construction of the Project but would be the responsibility of the [Auckland Council] and Unitec.

5. Project Description (Construction)

The purpose of this Chapter is to describe the nature of the construction activities (by Sector) for the Project as the basis for the effects assessment. It provides a description of the likely scale, duration and type of construction activities which may take place, to enable potential effects to be identified and any necessary mitigation measures developed.

5.1 Introduction

This section describes the construction methodology

This Chapter provides a description of the anticipated construction methodology for the Waterview Connection Project. It provides a broad overview of construction across the Project, and then provides further detail of activities that will be undertaken within each of the nine Sectors (see Figure 2.1).

The construction methodology described in this Chapter is intended as a realistic and feasible methodology from which the anticipated effects on the environment of these activities can be identified. The purpose of this description is to provide sufficient detail on the proposed construction activities to assess their potential environmental effects and subsequently to identify any necessary measures to avoid, remedy or mitigate these effects where appropriate (e.g. to assist the specialists and ultimately the consenting agency to identify a suitable suite of conditions for the consents and designations to effectively manage the effects of the construction activity).

It is recognised that once the Project has been awarded and a contractor (or contractors) are in place, the methodology will be further refined and developed. This will be done within the scope of the conditions which will be in place to manage the environmental effects of the construction activities.

Further construction details are provided in the Technical Reports – Part G

It is also noted that for some construction activities a greater level of specificity is required, dependent on the sensitivity of the receiving environment. In particular, further detail on construction works within the Coastal Marine Area (CMA) (supporting specific consent applications relating to reclamation, temporary and permanent occupation and discharges to the CMA) are provided in relevant Technical Reports (Part G of this AEE). References to these reports are highlighted throughout this Chapter.

Throughout this Chapter there will be cross references to Technical Reports and Plans where further information describing the Project is available. In particular, the following additional information references are highlighted:

- Part F of the AEE contains Plans and Drawings:
    - F.5: Construction Scheme Plans show the construction footprint of the Project; and

- F.6: Construction Yard Plans, show in more detail the main features of the construction yards, including access arrangements, erosion and sediment controls, temporary stormwater controls and particularly sensitive areas within the yards.

5.2 Construction Duration

Construction will take between 5 and 7 years

For assessment, the construction of the Project is anticipated to take between 5 and 7 years to complete[1]. It will be able to be undertaken on a number of fronts or work faces, such that many elements of the Project will be undertaken concurrently.

The main construction elements[2] are:

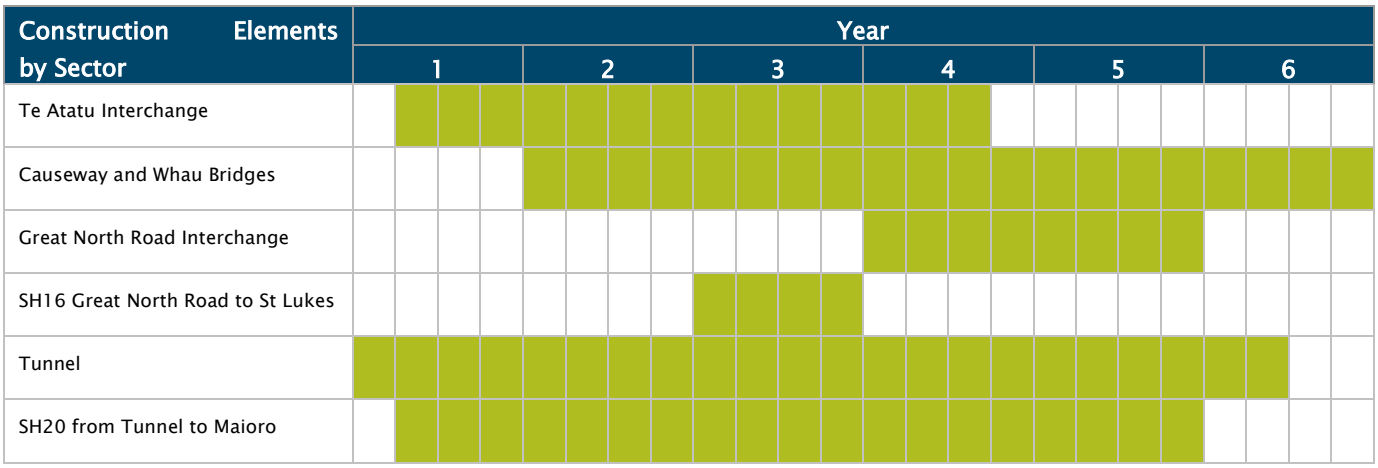
1. Te Atatu Interchange, (Sector 1)
2. Causeway and Whau River Bridges (Sector 2, 3 and 4)
3. Great North Road Interchange (Sector 5)
4. SH16 Great North Road to St Lukes (Sector 6)
5. Tunnel (Sector 7 and 8)
6. SH20 to Maioro Interchange (Sector 9)

Figure 5.1 shows the approximate timing of the proposed works and how the different work fronts may progress over and within the 5-7 year timeframe. It is reiterated that while there are some dependencies between these work fronts, the specific staging and phasing of the work will be dependent on the methods of procurement, the availability of contractors and availability of other resources (such as land, materials and construction equipment).

1 NZTA are seeking consents and designations for a 10 year construction duration to accommodate the 5-7 year construction period

2 Note: The proposed construction procurement strategy envisages the following construction sequence:
SH20 and Great North Road Interchange (Sector 5, 8, 9)
SH16 Causeway (Sectors 2, 3 and 4)
Sh16 Great North Road to St Lukes (Sector 6)
Te Atatu Interchange (Sector 1)

Figure 5.1: Timing of Construction Elements



5.3 Night Time Works

Works will be required at night for areas on the existing motorway and for tunnel construction

Underground construction of the tunnels (Sector 8) will be carried out 24 hours a day, 7 days a week, for efficiency and safety reasons (e.g. so that works are not halted in mid-process). Access to the excavated tunnel will be via the construction yards within Sectors 7 and 9 (refer Section 5.7).

In order to minimise disruption to traffic, some works will also be undertaken on the existing Motorway at night. For example, this includes (but not limited to) the following major construction activities:

- Te Atatu Interchange Bridge Deck replacement (Sector 1);
- Te Atatu Interchange on/off ramps (localised sections only, where offline works need to tie in with the existing Te Atatu Road) (Sector 1);
- Underpass at Te Atatu eastbound on and off ramp (Sector 1);
- Patiki Cycle Bridge – removal of existing cycle bridge & positioning of replacement bridge (Sector 3);
- Erection of structures at the Great North Road Interchange over the live motorway (Sector 5);
- Some aspects of the widening works on SH16 between Great North Road Interchange and St Lukes adjacent to the live motorway (Sector 6);
- Works associated with the Great North Road underpass where traffic connections are required to the existing Great North Road arterial (Sector 7);
- Richardson Road bridge tie in (Sector 9); and
- General Traffic Management set up and changes and removal throughout the life of the contract (all Sectors).

5.4 Erosion and Sediment Control

Temporary erosion and sediment control will be installed (Technical Report G.22)

During construction, erosion and sediment control measures will be put in place to minimise potential adverse effects by utilising measures which meet industry best practice guidelines (such as reflected by ARC's TP 90).

Specific details of the erosion and sediment control plans that have been developed for the Project works are provided in Technical Report G.22: *Erosion and Sediment Control Plan*. The plans are based on the construction activities as detailed in this section. However, it is expected that site specific and activity specific Erosion and Sediment Control Plans will also be developed which will follow the general principles of the Erosion and Sediment Control Plan developed for the Project to date and comply with any relevant consent conditions. This will enable the contractor(s) and consent authority to have further input into the methodologies implemented for specific sites and activities.

Once the erosion and sediment controls are in place, ongoing site monitoring by the contractor and NZTA representative will occur to check that the proposed erosion and sediment control measures have been installed correctly and are functioning effectively throughout the duration of the works. An important aspect of the monitoring is the automated pH and turbidity meter for all discharges of pumped water from the tunnel dewatering. In addition, water quality and visual assessments of the receiving environment will continue to be undertaken during the works period by the contractor with particular attention during and after periods of rainfall. Any noticeable change in water clarity from that previous to the rainfall event as a result of the earthworks activity will result in a review of the erosion and sediment control measures implemented and changes made as necessary.

5.5 Temporary Stormwater Management

Temporary stormwater management will be installed for the Project and each construction yard (Refer Technical Report G.15)

Stormwater management during the construction phase is a separate and unique stage in the water management of the Project. It occurs after bulk earthwork activities have ceased in an area and erosion and sediment controls are no longer appropriate, but before operational stormwater controls are in place.

Stormwater management measures are proposed for impervious construction areas and the pavement of the constructed motorway. Temporary devices are proposed to treat stormwater (removal of pollutants) and discharges to Oakley Creek will be treated through extended detention measures and flood attenuation to improve quality. The proposed treatment devices have been selected using a Best Practicable Option (BPO) approach and include wetlands, ponds, filter strips and filter trenches. Where possible, temporary devices are designed in accordance with the ARCs TP10 Stormwater Management Devices: Design Guidelines Manual. In areas such as the SH16 lane widening construction, it is proposed to leave the erosion and sediment control devices in place as the primary treatment devices. Decanting earth bunds, designed in accordance with ARCs TP90, are proposed as temporary stormwater treatment devices during the construction of the causeway.

5.6 Services

5.6.1 Relocation of Services

Wherever practicable, service relocations will occur before mainline construction works

The Project traverses a highly modified urban environment and as a result there are numerous services crossing the alignment. These services range from major arterial networks servicing main areas (such as gas mains, power cables and trunk sewers) and minor services supplying local dwellings.

Discussions have been undertaken with affected service providers and agreements are being developed with each provider regarding their assets. Where possible before construction of the main works for the Project begins, it is intended to relocate services only once due to the high cost and time associated with movement and disruption effects. Services will be relocated to the relevant provider's standards and where possible located within dedicated service corridors. Services will be constructed and tested in the realigned position to enable a short switch-over timeframe with minimal disruption to users.

The major services within the Project area include:

- High pressure gas mains;
- Trunk sewer and stormwater lines;
- High voltage pylons and power cables;
- Fibre optic communication cables;
- Mobile phone mast and telephone lines; and
- Water supply.

High Pressure Gas Mains

Vector's gas network reticulation runs the length of the Project from Te Atatu Interchange within Sector 1 to Richardson Road in Sector 9. The current alignment of the gas mains conflicts with the proposed alignment of the Project. It is proposed to keep the gas infrastructure operational during construction.

Trunk Sewer and Stormwater Lines

Watercare Services Ltd (WSL) waste water pipes are reticulated through the Project Area including the 600mm sewer that runs between Richardson Road and the south tunnel portal. Waitakere City Council wastewater sewer pipes are also located through the Te Atatu Interchange. Stormwater pipes are located throughout the Project area.

Those sewer and stormwater lines that conflict with the works will be relocated or protected depending on the alignment through each Sector. They will be kept operational during construction or an alternative implemented with the agreement of the provider.

High Voltage Pylons and Power Cables

High voltage transmission lines that are part of Transpower's national grid cross the Project alignment in various locations. Six pylons are located within close proximity to the alignment. The Project has, for the most part, complied with the 12m specified safe distance requirement for excavation and construction. Where this setback cannot be met, Transpower has been advised of the work and has indicated that the work is acceptable. The written consent from Transpower will be obtained prior to works (once detailed design plans are available) in accordance with the "New Zealand Electrical Code of Practice for Electrical Distances" (NZECD 34:2001).

Some of Vector's electricity power cables are also located within the Project area. Relocation of existing power poles may be required to avoid or manage conflict. In addition overhead electricity cables that run along or in close proximity to the motorway carriageway will require protection and/or relocation to prevent any disruption to supply from crane movements. Such works can be managed for continuity of supply over construction.

Fibre-Optic Communications Cables

Both TelstraClear and Telecom have telecommunications infrastructure within the Project area. This is generally located in close proximity to the shoulders of the existing carriageway. The current alignment of some of these cables conflicts with the Project, therefore relocations will be required. Ducting will be undertaken to relocate these services which will be kept operational during works (or alternative measures implemented as agreed by the service providers).

Mobile Phone Mast and telephone lines

Telecom infrastructure for Telecom's Auckland network is reticulated throughout Auckland. The majority of Telecom's ducting will require protection and/or relocation. Ducting will be undertaken to relocate these services which will be kept operational during works (or alternative measures implemented as agreed by the service providers).

An existing Vodafone mast at Rosebank Peninsula will be protected during construction.

Water Infrastructure

Water infrastructure is reticulated along and within sections of the existing and proposed motorway corridor, including Ecowater water mains that run along Te Atatu Road, Metrowater water mains along Great North Road, and two Watercare water mains. The water infrastructure will require relocation and/or some form of protection during the construction phase. However, it is expected that the water infrastructure will need to be kept operational during the project construction phase.

5.7 Construction Yards

The works will be staged from 12 Construction Yards as shown on Plan Set F.6

There are 12 construction yards proposed for the Project (as shown on Plan Set F.6). A description of each construction yard and the activities that will be undertaken are described below under the relevant Sector where the construction yard is located.

All yards will be fully fenced and made secure. Site establishment activities will include site clearance, ground preparation, and establishing erosion and sediment control measures prior to any construction activities occurring. Upon completion of the works, the construction yards will be disestablished and the areas reinstated.

All yards will be provided with water, telecommunications and power connections, and where required sewer. In most cases, these services are able to be connected directly to the existing adjacent networks. Where there is no existing network adjacent to the yard, a temporary connection will be made. These connections will be removed after the completion of the Project. Construction Yards 6 and 9, located at the northern and southern tunnel portals, will have greater power supply requirements than other yards to run tunnelling machinery and other related tunnel operations. The yard will be fed with two high voltage feeds from separate supplies - Point Chevalier and Mount Roskill substations.

In general, the construction yards will operate during daytime from 6am to 7pm Monday to Saturday, and 8am - 3pm on Sunday (to allow receipt of materials and plant for the upcoming week work, and to undertake maintenance work on equipment).

As night time works are required on occasions across all of the Sectors, access will be required to yards at night.3 As such perimeter lighting will be required; this will be designed to meet relevant council bylaws and standards. While the construction yards for the deep tunnel (Yards 6, 7, 9 and 10) will be active 24 hours a day, 7 days a week, the night time works within these yards will be limited, as the majority of work will be undertaken underground.

5.8 Construction Environmental Management

A CEMP has been prepared to manage the environmental effects

During construction a variety of measures will be used to manage activities and enable construction to be undertaken in a way that avoids, minimises or reduces effects on the environment. This will include specific mitigation measures, environmental monitoring and environmental auditing.

[3] Night access will be for those activities specified in Section 5.3

To assist this process a draft Construction Environmental Management Plan (CEMP) has been prepared for the Project. The CEMP sets out the specific measures required to be put in place by the contractor(s) to manage actual and potential environmental effects during construction. The CEMP is consistent with, and complements the AEE, the anticipated designation/consent requirements, and the NZTA's minimum environmental standards. Once the conditions have been confirmed through the consenting process, the CEMP will be reviewed and updated (if required) and provided to each contractor prior to works commencing.

The contractor will be required to undertake construction activities in accordance with the CEMP. This process is discussed further in Chapter 23 and *Technical Report G.21 Construction Environmental Management Plan (CEMP).*

5.9 Construction Works by Sector

5.9.1 Sector 1 – Te Atatu Interchange

Figure 5.2 provides a schematic of the construction area within Sector 1.

5.9.1.1 Construction Activities

The main construction activities undertaken within Sector 1 include:

- Major changes to the vertical and horizontal realignment of SH16;
- Major changes to the Te Atatu Interchange; and
- Small area of reclamation and a stormwater wetland pond at Jack Colvin Park.

<u>SH16 Vertical and Horizontal Alignment</u>

Widening and the horizontal alignment works proposed on SH16

The motorway widening between Te Atatu Interchange and Henderson Creek Bridge will typically be common parallel road widening; with the pavement widened on both the north and south sides. Construction will be predominantly via fill with retaining walls.

A large retaining wall on the northern side of SH16 will minimise the amount of land required at Jack Colvin Park, where there are active sports grounds. A retaining structure can be constructed mostly offline, with traffic management measures in place on SH16 to provide a small working zone to accommodate construction plant.

There are currently two substandard vertical crest curves on SH16 approaches as it Te Atatu interchange from the city. The motorway will be lowered by approximately 370mm up to and under the Te Atatu Interchange Bridge to improve these vertical curves, which will also improve the vertical clearance under Te Atatu Interchange Bridge. To achieve this depth the existing motorway under SH16 will be milled for an approximate length of 350m, allowing the new alignment to tie in with the existing motorway.

A new pavement will be constructed over this length to achieve the new SH16 design level, and incorporate the proposed three lanes in each direction under Te Atatu Bridge. The pavement composition will match existing, (OGPA surfacing will be used).

Te Atatu Interchange Improvements

The Te Atatu Interchange comprises three bridges over SH16: the Te Atatu Road northbound bridge, the Te Atatu southbound bridge and the Te Atatu Pedestrian Bridge.

Improved capacity at Te Atatu Interchange

It is proposed that Te Atatu northbound bridge be replaced with a new steel girder and cast in-situ deck arrangement to accommodate three 3.5 lanes and 0.6m shoulders. This will allow the girders to utilise the full width of the existing pier headstock with a 1m extension on either side. The northbound bridge deck will be constructed upon the existing abutments and central pier.

All removal/replacement of the bridge deck will take place at night. A crane will be located on the SH16 motorway and within a "central working zone". The working zone is expected to be approximately 10m wide and 100m long, Enabling works will allow for traffic to be diverted around this central working area.

The new deck will be positioned on the existing centre line albeit with a wider deck width. As a result, the western edge of the new deck will overlap with the pedestrian footbridge. This will require minor modification to the eastern edge of the footbridge which will result in a reduction in the width of the overall footbridge between handrails, from 4m to 3.3m. All beams will be lifted into place via a crane positioned in the central working zone at night time.

Existing lane capacity cannot be maintained during construction of the northbound bridge. It is therefore proposed to widen the southbound bridge, which will then be able to accommodate one of the northbound lanes as a contra-flow in addition to the two existing southbound lanes. The remaining northbound lane would be accommodated by staging of demolition and construction of the Te Atatu southbound bridge.

The Te Atatu southbound bridge will comprise three 3.25m lanes and 0.5m shoulders. The additional lane capacity can be achieved by relocating the existing footpath together with some modifications to the deck at the eastern edge to accommodate the three lanes.

The design proposes to extend the existing pier of the Te Atatu southbound bridge to support a new footbridge at this location. The extended wall will be constructed on four new piles, supporting the loads from the pedestrian bridge and the widened section of the southbound bridge. Four bore pile foundations will be required to provide sufficient strength to the extended bridge pier. A bore hole is typically excavated, then a reinforcement cage placed within the bore hole and in-situ concrete poured. Once the piles have been poured and the concrete cured, the bladed pier can be constructed on the pile foundation. All piling and pier construction work can take place within the "central working zone" during normal working hours.

Figure 5.2 Extent of Construction Area in Sector 1

The existing footway bridge on the western edge will be reduced in size to allow for the widening of the northbound bridge. The pedestrian barrier will be replaced with a new 1.4m high barrier complying with requirements for cyclists. A new kerb will be provided by drilling and fixing into the existing deck. The new footbridge will be formed using two 27.5m spans using two 1200 Super Tee beams to form a footway with a width of 3m.

Pedestrian/Cycle Facilities

Upgraded underpass construction

The existing pedestrian underpass that runs underneath the existing eastbound on and off-ramps take pedestrians/cyclists between Te Atatu Bridge and Te Atatu Road near Titoki Street. The existing underpass will be removed, and an enhanced underpass constructed to retain the existing facility. At-grade crossings will be installed as an addition to the underpass, and located across the eastbound on and off-ramp.

The underpass will be constructed using precast concrete sections, which will make up the 45m long underpass. The precast concrete sections will be 5m wide and 2.5m high. The majority of the underpass can be constructed offline as cut and cover, with lane diversions or night time work being required to install sections of the underpass within the active on/off-ramp areas. Excavated material will be disposed of offsite, if necessary to a licensed clean fill site.

The at-grade pedestrian crossings will require little physical work aside from the installation of signal equipment on the eastbound on and off-ramps.

Construction of the Stormwater Wetland

Wetland constructed in Jack Colvin Park

A permanent stormwater wetland is required within Jack Colvin Park, to treat stormwater runoff from SH16. Construction of the wetland will be undertaken offline, with little impact on the existing SH16 traffic. Minor reclamation (0.10ha) will be required to accommodate the new wetland.

Excavators will be used to remove existing mangrove and mud in the area where reclamation is required. Imported clay will be used to form the new embankment, with a temporary rock toe silt fence constructed in the mudflat, approximately 5m from the bottom of the embankment. Excavators will be used to form the wetland embankment out of either imported clay, or existing material on site (provided this material is to specification).

A shallow 150mm waste water pipe currently runs under the proposed wetland location. Before the excavator can begin forming the wetland, this pipe will be diverted to avoid any direct conflict. The pipe invert on site is shallow, suggesting a relatively straightforward diversion of services.

Work Over the Motorway

Demolition and placement of the new Te Atatu Bridge beams over the motorway will require temporary night time closure of SH16 to maintain public safety. This will consist of a localised closure, with vehicles being diverted via the interchange ramps. The main spans will consist of either precast concrete or steel girders that can be lifted into place by crane over a short time period to minimise disruption to the public.

Minor work can be undertaken over live traffic lanes with appropriate controls and work practices

5.9.1.2 Construction Duration

Table 5.1 summaries the key activities within Sector 1 and the approximate durations. As noted previously the activities will be able to be undertaken concurrently.

Table 5.1 Construction Duration of Major Activities in Sector 1

Activity	Duration (Month)
Changes to the vertical and horizontal realignment of SH16	36
Changes to Te Atatu Interchange	42
Reclamation and construction of stormwater pond at Jack Colvin Park	6

5.9.1.3 Construction Yards

Construction Yard 1 is located in Sector 1 and will be the main construction lay-down area for construction activities occurring within Sectors 1-4. Table 5.2 summarises the key activities occurring within Construction Yard 1. Figure 5-2 shows the location of Construction Yard 1.

Access to the construction yard will be off Te Atatu Road north, approximately 50m north of Titoki Street. Access will be provided by way of a dedicated right turn area, where construction traffic will be required to give-way to oncoming vehicles.

Table 5.2 Summary of Construction Yards in Sector 1

Yard No.	Main Purpose	Location	Size	Key Activities
1	Causeway, Road, Bridge Builders Yard	Harbourview-Orangihina Park	4.2ha	Offices/Ablutions Storage and laydown areas Construction plant and equipment Workshop Refuelling facility Contractor carparking

5.9.1.4 Temporary Stormwater Management

Stormwater management for the widening of SH16 will include sediment retention ponds and swales until the permanent stormwater treatment devices are ready for use.

Further details of are outlined in Technical Report G.15

The eastbound on-ramp is currently treated by grass swale, which is a requirement of the existing resource consent (Permit No. 35626). The ramp will be realigned as part of the works, and the proposed treatment device is a swale in a realigned location. The erosion and sediment control measures will be in place during construction. Once the earthworks are stabilised and the grass has become established in the new swale it will act as the permanent treatment device.

In addition a temporary stormwater pond, modified from the erosion and sediment control pond, will treat runoff from the Construction Yard 1. This will have an outfall via the swales described above, to the Whau Creek.

5.9.1.5 Temporary Traffic Management

During the widening of SH16, traffic management will be put in place to maintain the existing number of lanes on the mainline and on the ramps. The works will be undertaken over four phases of mainline and ramp realignments with associated lane and shoulder narrowing. Initially, works on the outer shoulders of the SH16 carriageway will be completed, which will allow works to be completed in the median.

Further details of are outlined in Technical Report G.16

The majority of work on the eastbound and westbound off-ramp will be undertaken off-line and as a result will have little impact on motorway traffic, while work on the remaining ramps (eastbound on-ramps and westbound on-ramp) will require a staged approach with lane narrowing and minor realignments.

Works on the Te Atatu Interchange will also be undertaken over three phases so that the existing functionality and lanes in the interchange will be maintained throughout the works. Works on the bridges over SH16 or in the live lanes will be conducted during night closures under an approved Site Specific Traffic management plan (SSTMP).

Temporary TL-3 barriers will be installed to isolate the work site from passing traffic with gaps provided where necessary for site access from the motorway.

As noted above, the works within Sector 1 will be staged from Construction Yard 1 which will be accessed from Te Atatu Road, north of SH16. Site accesses to the compound will be designed and managed to minimise the effect on the road network, which will be agreed with the relevant road controlling authority in a SSTMP prior to start of works.

Technical Report G.16: *Assessment of Temporary Traffic Effects* provides more detail of the management proposed for temporary/construction traffic.

5.9.2 Sector 2 – Whau River

Figure 5.3 shows the extent of the construction footprint within Sector 2.

5.9.2.1 Construction Activities

The main construction activities to be undertaken within Sector 2 include:

- Widening both the eastbound and westbound Whau River bridge decks;
- Construction of a new separate 3m wide pedestrian/cycle way bridge to the south; and
- Reclamation around bridge abutments.

Whau River Bridge

Bridge widening via temporary construction platform

The existing bridge decks will be widened by 7.5m for the eastbound bridge and 8m for the westbound bridge. Widening of the superstructure is proposed to adopt a similar girder and deck system to the existing bridge decks to achieve similar characteristics. Bridge widening will require 54 new piles (27 eastbound and 27 westbound) to be constructed within the Whau River. The bridge piles are proposed to be 1.5m in diameter, extending into the seabed to rest on firm material below, and arranged to match the existing Whau Bridge pier locations.

The construction of all bridges will be undertaken from temporary staging platforms. The westbound staging platform will be located between the motorway and the new pedestrian/cycle way bridge (located 8m to the south) to enable construction of both bridges (westbound and cycleway) from the same platform.

Figure 5.3 Extent of Construction Area in Sector 2

Allowance for a 7m (wide) temporary platform has been provided with 0.5m clearance to the permanent bridge for formwork to be located. The temporary platform will be supported by driven piles, driven into the underlying mud until a sufficient bearing capacity is achieved (support provided via skin friction, so length will vary). The piles are typically arranged in pairs at 9m centres longitudinally and 5-6m centres laterally. The piles will support a steel superstructure with a timber decking to form the surface of the temporary platform.

The deck and supporting beams will be set at a level high enough so as not to reduce the vertical clearance (freeboard) to the water (to maintain navigation channels). The westbound staging platform will be located between the motorway extension and the proposed Cycleway Bridge to enable construction of both bridges from the same platform. The temporary platform has been designed to provide access from each bank of the Whau River, whilst maintaining the existing navigation channel.

Following completion of the bridge structures, the platform will be removed. The piles will be removed through the use of vibration equipment.

Pedestrian/Cycle Way Bridge

The existing 1m cycle way located on the existing bridge is proposed to be relocated to a new 3m wide cycle way bridge located approximately 8m south of the extension to the westbound bridge. This cycle way bridge will be constructed using spans of 25.4m to match existing pier locations. As noted above, the works will be undertaken from the temporary staging platform. The separated cycle bridge will be supported by nine 1.5m piles reaching approximately 15-20m.

The piles will be cased with temporary or permanent steel casings through the Holocene alluvium and above normal tide level.

During construction pedestrians/cyclists will continue to cross the Whau River via the existing cycle path. Once the separated pedestrian/cycle bridge is complete, users will be transferred to the new facility before the westbound carriageway is widened.

Reclamation

A small area of reclamation (0.41ha) is required around the bridge abutments on both sides of the Whau River. This reclamation will accommodate the widened sections of the SH16 bridge sections. The methodology for the reclamation will be as described for Sector 4 below.

5.9.2.2 Construction Duration

Table 5.3 summaries the key activities within Sector 2 and the approximate durations. It is noted that some works will occur concurrently so these durations are not sequential.

Table 5.3 Construction Duration of Major Activities in Sector 2

Activity	Duration (months)
Temporary construction bridge	2
Widening bridge decks	28
Pedestrian/ Cycle Way Bridge	10
Reclamation around bridge abutments	4

5.9.2.3 Erosion and Sediment Control

Erosion and sediment control methods such as temporary silt fences, clean water diversion bunds and dirty water diversion bunds will be used in Sector 2. In the coastal environment, consideration has been given to reducing the potential sediment generation and managing any suspended material generated from the earthworks. Further detail is provided in Technical Report G.22: *Erosion and Sediment Control Plan*.

Erosion and Sediment Control measures are detailed in Technical Report G.22

Erosion and sediment control in the marine environment is described in more detail in Section 5.9.4 below.

5.9.2.4 Temporary Stormwater Management

Stormwater management for the widening of SH16 in Sector 2 will be by temporary retention of the erosion and sediment control measures until the permanent stormwater reticulation and treatment devices are ready.

Further details of are outlined in Technical Report G.15

Temporary treatment devices are located on the Plans F.5: Construction Scheme Plans and further detail is provided in Technical Report G.15: Assessment of Stormwater and Streamworks Effects.

5.9.2.5 Temporary Traffic Management

Widening of the Whau River Bridge on SH16 (Sector 2) will be undertaken over five phases of mainline realignments with associated lane and shoulder narrowing. This will allow the existing number of lanes to remain operational throughout the works, and the carriageway narrowed to a minimum of 3.35m lanes (from 3.5m) and 0.3m shoulders (from 0.5m) during the works. Temporary TL-3 barriers will be installed to isolate the work site from passing traffic with gaps provided where necessary for site access from the motorway.

Further details of are outlined in Technical Report G.16

In the first and second stages, the eastbound bridge deck will be extended and then joined to the existing bridge. The westbound bridge deck widening will be undertaken in stage three with central median works and surfacing undertaken in stage four. Bus shoulders on SH16 will be provided from the fourth stage as construction works allow.

As noted above, the works on the Whau River Bridge will be staged from Construction Yard 1 accessed from Te Atatu Road, south of SH16.

Technical Report G.16: Assessment of Temporary Traffic Effects provides more detail of the management proposed for temporary/construction traffic.

5.9.3 Sector 3 – Rosebank (Terrestrial)

Figure 5.4 provides a schematic of the construction area within Sector 3.

5.9.3.1 Construction Activities

Construction works in Sector 3 include:

- Widening of SH16;
- Retaining walls;
- Replace existing Pedestrian/Cycle Way Bridge; and
- Construction of a new access road to Rosebank Park Domain.

SH16 Widening

The proposed widening of SH16 within this Sector will be undertaken under the Rosebank and Patiki Road bridges without any need for structural work to the overhead bridges. The existing bridge structures will require barrier protection where they are within the clearance zone.

Figure 5.4 Extent of Construction Area in Sector 3

Pedestrian/ Cycle Way Bridge

A new Patiki Pedestrian/ Cycle Way Bridge will be constructed over the Patiki westbound on-ramp (9m span for the approaches and a 25.5m span for the main carriageway). Before the new Patiki Pedestrian/ Cycle bridge can be installed, the existing cycle bridge must be demolished. This work will require cyclists to use Patiki Road as a diversion during these works. Night closures will be required to accommodate the crane and excavators needed to complete the task.

When constructing the new footbridge, construction time over the live motorway will be relatively short duration, as the new bridge is currently proposed as a Truss design. This will be constructed off site, and lowered into place by crane when ready. This will require night time works and night closures with traffic diversions.

For assessment purposes the following construction methodology has been developed. The first 21m length of the eastern approach to the bridge is proposed to be formed with earthworks and retaining walls to eliminate the need for piling works below the existing Patiki off-ramp. The approach spans are proposed to be formed with precast concrete beams supported on piers at 10.2m centres. Sixteen piers are required to support the bridge.

The new bridge can only be completed once the westbound on-ramp has been modified/ realigned as two of its piers will be positioned in the existing Patiki westbound on-ramp.

The main span over the on-ramp will require a temporary closure of the ramp to maintain public safety during the main beam lift (this will be undertaken as night works). The main span will consist of a truss constructed of universal beams for the top and bottom cords. The ends of the truss are proposed to be supported by a blade pier.

Rosebank Park Domain Access Road

Part of the SH16 widening works in this area will occupy land currently in use as the access road to the Rosebank Park Domain. To maintain access to the Domain the works will include construction of a new two lane access road, running adjacent to the widened motorway alignment. The local road has been designed to Auckland City Council standards. The new local road is approximately 420m in length and consists of two 3m lanes.

This work will be completed before the SH16 motorway is widened, allowing for access to Rosebank Park Domain to be maintained through the construction period.

5.9.3.2 Construction Duration

Table 5.4 summarises the key activities within Sector 3 and the approximate durations. As noted previously where possible, activities will be undertaken concurrently.

Table 5.4 Construction Duration of Major Activities in Sector 3

Activity	Duration (months)
SH16 widening	24
Retaining walls	11
Cycle Bridge	7
New access road to Rosebank Park Domain	6

5.9.3.3 Construction Yard

Construction Yard 2 will be located in Sector 3. This is a small construction yard, which will mainly be used as a laydown area, although later in the construction programme the area will be used for temporary sediment and erosion control devices for Rosebank Road and Patiki Road ramps that will be removed for the road widening (refer to 5.9.3.5). These will be replaced.

A summary of key activities is provided in Table 5.5. Figure 5.5 shows the location of the construction yard.

Table 5.5 Summary of Construction Yards in Sector 3

Yard No.	Main Purpose	Location	Size	Key Activities
2	Road and Bridge Builders Yard	Patiki Road	0.37ha	Storage and laydown areas Sediment detention and treatment devices during SH16 widening

Access to this Construction Yard will be from the existing Rosebank Domain local access road. A give-way entry/exit will be provided into the laydown area.

5.9.3.4 Erosion and Sediment Control

Erosion and sediment control for this Sector relies on sediment retention ponds, decanting earth bunds and associated diversion channels. As with the other Sectors, emphasis will be placed on diversion of clean water away from earthwork areas such that only dirty water generated from the earthworks activity will require treatment. Further to these measures it is noted that silt fences and super silt fences will provide further management and all detention devices will be fitted with chemical treatment to assist with increasing efficiency of sediment removal.

Erosion and Sediment Control measures are detailed in Technical Report G.22

5.9.3.5 Temporary Stormwater Management

Stormwater management for the widening of SH16 in Sector 3 will be by sediment retention ponds / devices until the permanent stormwater reticulation and treatment devices are ready for use.

Further details of are outlined in Technical Report G.15

There are currently 4 settlement tanks treating runoff from the Rosebank Road and Patiki Road on and off ramps as required by Stormwater Discharge and Diversion Permit BH/8735. These settlement tanks will be removed during construction to allow for the road widening. To compensate for the loss of these treatment devices, the runoff from the bridge structures of the Rosebank Road on and off ramps and Patiki Road eastbound off ramp will be intercepted, collected and discharged through temporary cartridge vaults located under the first downhill span of each bridge until the permanent stormwater reticulation is in place (see Chapter 4 of this AEE for a description and Technical Report G.15 for further details).

5.9.3.6 Temporary Traffic Management

The general traffic management methodology that will be adopted for Sector 3 is described in Sector 4 below. The work site in Sector 3 will typically be accessed from Patiki Road or SH16.

Further details of are outlined in Technical Report G.16

Technical Report G.16: Assessment of Temporary Traffic Effects provides more detail of the management proposed for temporary/construction traffic.

5.9.4 Sector 4 – Reclamation

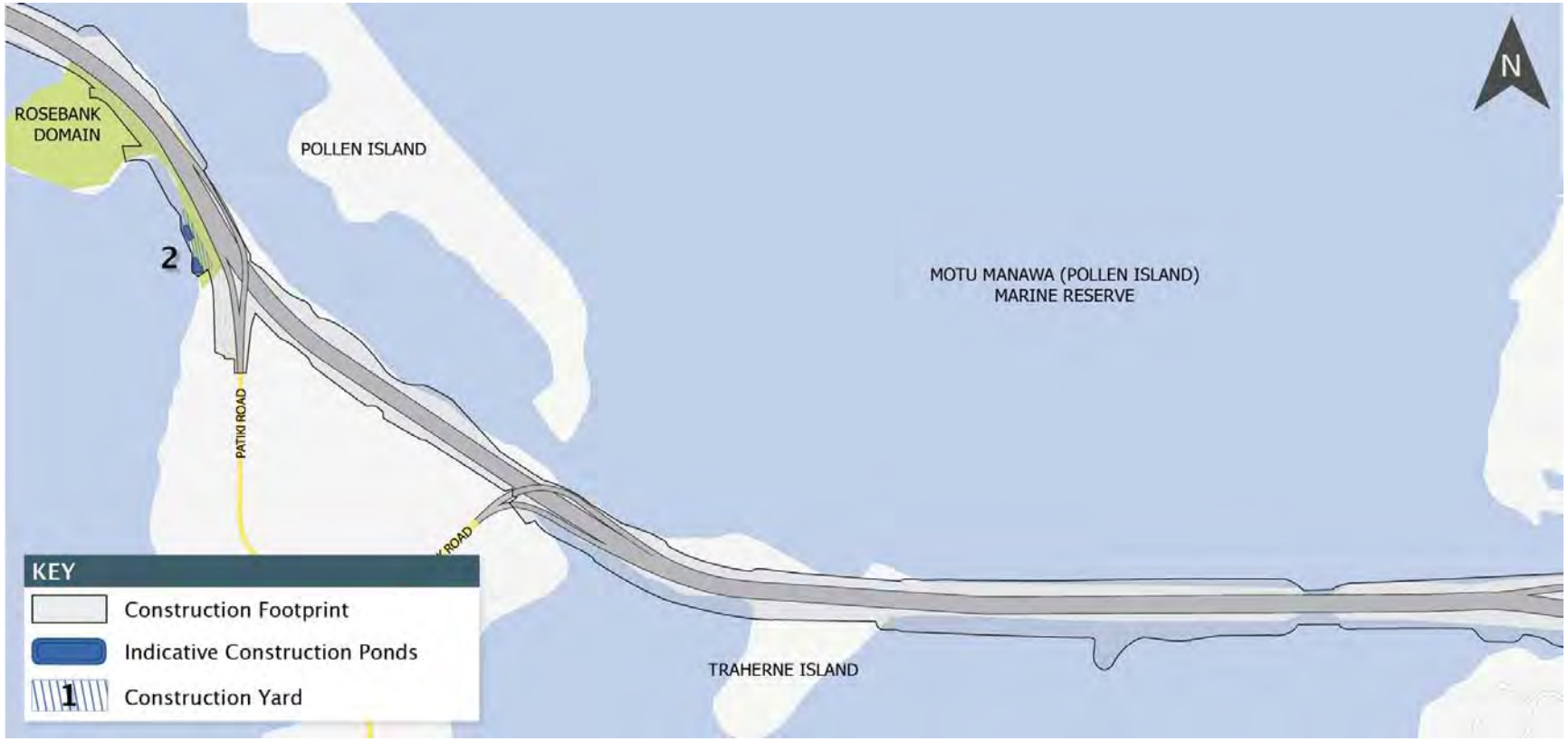
Figure 5.5 provides a schematic of the construction area within Sector 4.

5.9.4.1 Construction Activities

The main construction activities within Sector 4 include:

- Realignment of three channels to accommodate widening of SH16 (Waterview Estuary and Oakley Inlet);
- Reclamation of the SH16 causeway (raising and widening the causeway); and
- Widening the causeway bridges and construction of new cycle way bridge.

Figure 5.5 Extent of Construction Area in Sector 4



Channel Realignment (Waterview and Oakley Inlets)

Realignment of three channels (two sections of Oakley Creek and one section of Waterview Estuary) is proposed prior to widening of the Causeway (landward side). A similar methodology will be adopted to realign these channels, as follows:

- Initially, a barge mounted excavator will excavate the new channel, leaving bunds at either end;
- The material removed will be stored within a temporary storage lagoon;
- Scour protection will be placed within the excavated channel to prevent erosion;
- The flows from the existing channel will be diverted into the new channel by removing the bunds at either end and placing rock bunds in the existing channel to divert the flow; and
- The stored material excavated from the new channel will be used to fill the original channel.

Causeway Reclamation

Widening the Causeway will require extensive reclamation on both its northern and southern sides. The total area of reclamation is approximately 42,000m^2 (4.2ha).

The proposed reclamation will require a large quantity of fill material for Sector 4 and smaller amounts for Sector 2. Approximately 350,000m^3 of fill will be required ($\pm$ up to 70,000m^3 for compensatory fill[4]). The volume of fill required will either be sourced from a nearby quarry and/or provided from material removed from the SH20 tunnel (refer Section 5.9.8) if this is suitable. The fill requirements need to take into account additional considerations such as coastal erosion, stability of underlying sediments and settlement. As such, the properties of fill materials from the tunnel will require testing to determine its suitability once tunnelling commences. For 'conservative' assessment purposes, it is assumed that all fill will be imported to the site for reclamation and all tunnel spoil will be removed from the site[5].

There will be four main fill types used for the reclamation works:

- Bulk and Shoulder fill – material used to raise the causeway to the proposed design level and widen the causeway;
- Rock Armour – used on the Causeway embankment to combat wave attack/erosion;
- Pavement material – for the pavement layers; and

[4] Compensatory Fill will be used to account for short term settlement within the causeway during construction. This will be applied regularly to maintain the Causeway's engineered design level throughout the construction period. Preliminary projections for Compensatory Fill suggest approximately 68,000m^3 will be required.

[5] If tunnel spoil can be used this would be stockpiled in Construction Yards 3 and 4 (this stockpiling has been considered in the AEE).

- Filter materials – to allow the flow of water/provide protection to internal fill layers.

Temporary traffic management will accommodate the formation of a temporary haul road and construction area for reclamation, with initial work involving installation of a temporary batter and removal of the existing rock armour (rip-rap) material.

A working platform will be created from durable hard rock being placed on the mudflat. Geogrid or similar material will then be placed on top of the rock fill. Subsequently, a geogrid or similar reinforced raft will complete the working platform. The geogrid reinforced raft has a twin role of providing a safe working platform and also contributing towards the reinforcement and strength of the hard rock and/or global shear restraint of the permanent slope.

Once the working platform is in place, construction plant can operate and carry out the specified ground improvement work (possibly Mudcrete) and subsequent formation of the new geogrid reinforced fill embankment.

Construction of embankments may require some form of foundation undercut. This means the formation will be stripped of topsoil or unsuitable marine sediments. The foundation will be inspected by a qualified geotechnical engineer and proof-rolled under their observation before backfilling with suitable material. For assessment purposes, this methodology has been considered.

Causeway Bridge and Cycleway Bridge

The Causeway Bridge will be widened by 6.0m and 8.5m on the eastbound and westbound carriageways respectively.

The piles are proposed to consist of driven piles about 500mm diameter at approximately 1.8m centres. The piles are proposed to be driven 25m into the underlying mud until they pull up on the firmer clay or rock beneath.

The existing 2.5m wide cycle way will be removed and a new 3m wide pedestrian/cycle bridge will be located approximately 8m south of the extension to the westbound motorway bridges (similar to the pedestrian/cycle bridge in Sector 2 – Whau Bridge). This bridge is proposed to be constructed using 5 spans of 30m matching every second existing motorway pier location approximately.

These spans are proposed to be constructed using a single super tee beam with extended flanges to allow greater width. The deck level of the new bridge is proposed to be set 2-3m above the existing road carriageway level.

The foundations of the new cycle bridge will be nominally 1m diameter bored piles or a pair of driven piles founding on or within the bedrock some 25m below ground.

As with the Whau Bridge in Sector 2, construction of both the Causeway and cycleway bridges will be completed from temporary platforms. The westbound staging platform will be located between the motorway and the new cycleway bridge (located 8m to the south) to enable construction of both bridges from the same platform.

Allowance for a 7m wide temporary platform has been provided with 0.5m clearance to the permanent bridges for formwork to be located. The temporary platform will be supported by driven piles, driven into the underlying mud until a sufficient bearing capacity is achieved (support provided via skin friction, so approximate length will vary). The piles are typically arranged in pairs at 9m centres longitudinally and 5-6m centres laterally. The piles will support a steel super structure with a timber decking to form the surface of the temporary platform.

The deck and supporting beams will be set at a level high enough so as to maintain the vertical clearance (freeboard) to the water. The westbound staging platform will be located between the motorway extension and the proposed Cycleway Bridge to enable construction of both bridges from the same platform.

This work will be performed during normal working hours, as the platform can be set up offline.

Following completion of the bridge structures, the platform will be removed. The piles will be removed through the use of vibration equipment.

5.9.4.2 Construction Duration

Table 5.6 summarises the key activities within Sector 4 and the approximate durations. As noted previously, where possible the activities will be undertaken concurrently and therefore these durations are not the total construction duration in this Sector.

Table 5.6 Construction Duration for Major Activities in Sector 4

Activity	Duration (months)
Realigning Waterview Estuary and Oakley Inlet to accommodate widened Causeway	8
Raising and widening the Causeway by reclamation	54
Widening the Causeway Bridge	22

5.9.4.3 Erosion and Sediment Control

Erosion and Sediment Control measures are detailed in Technical Report G.22

Reclamation activities will be undertaken in a "dry" environment. Portable coffer dams will form the primary tool in this regard. They will be placed within the CMA, will allow for a 24 hour per day dry working area and will capture all contaminants from the reclamation construction activities. These coffer dams will remain in place throughout the construction period until such a time as a stabilised surface is established. In addition to the portable coffer dams, the erosion and sediment control methodology includes the use of more traditional control measures such as super silt fences (on land) and rock toe silt fences (within the CMA).

With respect to realignment activities within the Oakley Creek channel, these will be undertaken at times of low tide with the diversion constructed and stabilised prior to any flows entering the new channel. Erosion and sediment controls will be utilised for the spoil material removed from the diversion which will be stockpiled prior to placement back into the 'old' channel.

5.9.4.4 Temporary Stormwater Management

Further details of are outlined in Technical Report G.15

There is currently stormwater treatment provided by a hybrid treatment device, which comprises part filter strip, part grass swale, part sand filter and part infiltration device that is approximately 800 m in length. The current stormwater treatment device is required as part of the Stormwater Discharge and Diversion Permit no. 30235. The existing level of treatment for the causeway will be maintained, plus treatment of any additional impervious areas once they are paved. Stormwater treatment during construction is proposed by a combination of sand filter trenches and bio filter strips. A staged approach is proposed where the treatment devices move several times to accommodate the construction process and traffic diversions.

Elsewhere, stormwater management for the widening of SH16 in Sector 4 will be by retention of erosion and sediment controls until the permanent stormwater reticulation and treatment devices are ready for use.

5.9.4.5 Temporary Traffic Management

Further details of are outlined in Technical Report G.16

Widening of SH16 will be undertaken over four phases. During the works it is expected that the existing number of lanes on the motorway will be operational throughout the works (though some night closures of lanes may be required, under managed conditions).

To accommodate the works, the carriageway will need to be narrowed to a minimum of 3.35m lanes and 0.3m and the motorway speed will be lowered to 80 kph during works. SH16 will be realigned by re-marking lanes and installing safety barriers to open up work zones and allow off-line site construction.

The construction methodology employed in Sector 4 commences on the northern side of SH16 to widen the existing shoulder and complete works on the causeway reclamation. This is followed by similar works to the south of SH16, which allows completion of works in the median through utilisation of the newly constructed shoulders.

The existing bus shoulders on SH16 eastbound will be removed during the first two stages. During phase three the eastbound bus shoulder will be open from the Whau River Bridge to the Rosebank Bridge (not past the Rosebank On-Ramp) and westbound open from the Great North Road Interchange to the Rosebank Off- Ramp.

During phase four the eastbound bus shoulder will remain open from Whau River Bridge to Great North Road Interchange (but not past the Rosebank On-Ramp as existing) and westbound bus shoulder from Great North Road Interchange to the Rosebank Off-Ramp.

The Rosebank Bridge widening will take place in line with the causeway widening and following the same staging. The SH16 Eastbound traffic over the bridge will operate under a contra-flow arrangement during stage three. The Rosebank Road on and off ramps and the Patiki Road on and off ramps will closed over night to rearrange the markings and install barriers for each phase.

The works will be staged from the construction yard no. 1 accessed from either Te Atatu Road (north of SH16) or SH16 Eastbound. Site accesses to the compound will be designed and managed to minimise the effect on the road network, which will be agreed in a SSTMP prior to start of works.

Technical Report G.16: Assessment of Temporary Traffic Effects provides more detail of the management proposed for temporary/construction traffic.

5.9.5 Sector 5 – Great North Road Interchange

Figure 5.6 shows the extent of the construction footprint required for this Sector.

5.9.5.1 Construction Activities

The main construction activities that will be undertaken within Sector 5 are:

- Construction of four new ramps within the Great North Road Interchange to provide connection between SH20 and SH16 west and east bound; and
- Construction of the retaining wall approaches to the tunnel portal.

Great North Road Interchange

The four new ramps range in length from 240m to 550m long, with a maximum height of 22m above Oakley Creek. All spans for the new ramps will be no shorter than 35m and will be supported by piers. As some of the ramps are within the CMA, 4 piers will be located within the CMA. The piers are likely to be constructed of reinforced concrete and supported on piled foundations in the East Coast Bays Formation (ECBF) sandstone. Some foundations may be spread footings supported on basalt where this is present at shallow depth. For the purpose of assessment, it is proposed that the piles will be large diameter bored concrete piles[6].

The typical construction activities required to build the four new ramps are construction of the foundations, construction of the piers and then construction of the superstructure.

Pile construction will comprise driving a steel casing through the overlying material and imbedding into the sandstone. The piles will then be excavated using an auger to remove the soil. The reinforcement cages will then be inserted and concrete will be placed using a concrete skip or by pumping through a pipeline.

Working platforms, with access roads to the platforms, will be required adjacent to the foundations and will be a suitable size and width to provide for pilling rigs, cranes, excavators and trucks.

Where piles are constructed in the CMA, temporary staging platforms will be required. These have been assumed to be in the form of a bridge structure similar to that proposed for Sector 2, constructed of steel piles driven into the seabed with a steel decking and concrete deck slab.

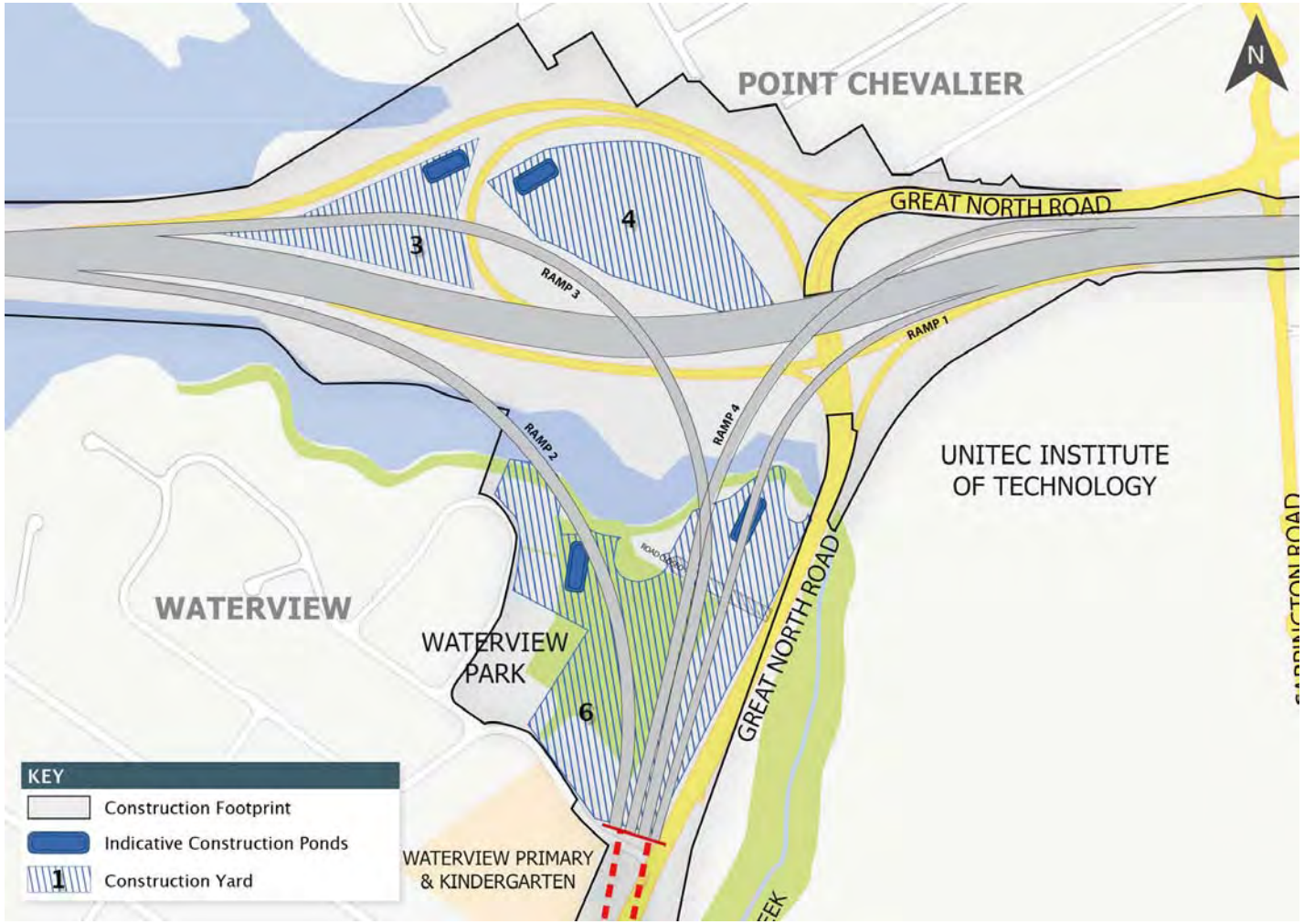
Where foundations are spread footings, excavation will be made into the overlying soils down to the basalt. Temporary sheet piling may be required to support the sides of the excavations, and excavations then made using an excavator. Blinding concrete will then be placed on the exposed surface of the basalt and the footing constructed by fixing reinforcement, placing formwork and concrete using a concrete remixer. The formwork will then be removed and the foundation backfilled with soil using an excavator and compacted to achieve design density of material.

The piers are expected to be cast-insitu reinforced concrete. Construction would typically comprise fixing the steel reinforcement for the piers, placing the formwork and pouring the concrete using either a concrete skip or by pumping through a pipeline. The pier could be constructed in several vertical lifts and the formwork moved up the pier shaft[7].

[6] To take a precautionary or "worst case" assessment.

[7] This method has been assumed as "worst case" for potential impacts on the CMA. The alternative would be precast concrete piers, with precast sections brought to the site and lifted into position using a crane located adjacent to the pier. The joints between the precast sections would then either be grouted or formed using insitu concrete.

Figure 5.6 Extent of Construction Area in Sector 5



Once the foundations and piers are in place the superstructures will be constructed. Precast concrete Super-T girders or similar will be used for the superstructure, which will be supported on bridge bearings that are first placed on top of the pier tops. A crane will be used to lift the girders into place on the pier crossheads. Once in place, reinforcement will be fixed and the slab cast with concrete placed either by concrete skip or pumped via pipeline. An alternative method of construction to erect the girders might be to use a launching gantry, located above the span being erected, which will lift the girders into place. The effects of these are considered comparable but cranes have been assumed as "worse case" for construction. Overall the edge effects are the same.

Retaining wall approaches to underpass

The underpass portal will be constructed using diaphragm wall construction, similar to that of the cut and cover tunnel described under Sector 7 below. The walls will be supported by soil/rock anchors, (possibly with multiple rows at different elevations). For the purpose of assessment, the anchors are assumed to extend either side of the trench sections by up to 20m.

5.9.5.2 Construction Duration

Table 5.7 summarises the key activities within Sector 5 and the approximate durations. As noted previously, where possible the works will be undertaken concurrently and cannot therefore be considered to provide the complete duration period for this Sector.

Table 5.7 Construction Duration for Major Activities in Sector 5

Activity	Duration (months)
Great North Road Interchange Ramps	24
Approaches to the underpass portal	12

5.9.5.3 Construction Yards

Table 5.8 summarises the construction yards that will be located within Sector 5 and the key activities that will be undertaken within each yard. Figure 5-6 shows the location of each construction yard.

Table 5.8 Summary of Construction Yards in Sector 5

Yard No.	Main Purpose	Location	Size	Key Activities
3	Causeway Contractors Area	Great North Road Interchange	1.46ha	Offices/ablutions Construction plant and equipment Storage and Laydown areas Field laboratory (QA on granular fill/mudcrete) Workshop Contractor carparking

Yard No.	Main Purpose	Location	Size	Key Activities
4	Stockpiling	Great North Road Interchange	2.61ha	Construction plant and equipment Storage and lay down areas Pugmill Conveyor and/or trucked tunnel spoil storage Cement and/or Lime mixing / spoil drying Contractor carparking
6	Tunnel Contractor's Area / Interchange Contractor (staged use)	Waterview Park	5.02ha	Offices/Ablutions Construction plant and equipment Storage and lay down areas Workshops Refuelling facility Conveyor and/or trucked spoil storage (covered building) Steel fixing Bentonite plant (possible location or Construction Yard 7) Concrete batching plant Contractor carparking

Construction Yard 3 will be used for staging the works for the causeway construction. Construction Yard 4 will be used for stockpiling soil material from the tunnel and the Great North Road underpass construction. Excavated material will be brought here by an overhead conveyor and/or trucks. Some spoil will be used in the causeway construction and the excess will be disposed of at an approved facility off site. As the spoil for the causeway may be stockpiled for extended periods, appropriate sediment mitigation measures (such as covering or grassing the stockpiles, or isolating the area around the stockpiles through the construction of bunds or trenches), will be employed.

Construction Yard 6 is one of the main construction yards for the tunnel. It will be operated 24 hours a day, 7 days a week (with reduced level of operations at night at the surface, as mainly below ground construction works will be occurring). The yard will be fully fenced for security and access will be controlled. It is expected that this yard will have a staged use and will also be used by the contractor constructing the Great North Road Interchange, on completion of the tunnel excavation works (see below).

Excavated material from the tunnel may be brought here by an overhead conveyor and/or trucks and stockpiled temporarily on site before being loaded into street trucks and removed to disposal at an approved disposal site or to the causeway site. Where spoil is stockpiled, provision will be made to store up to 3 days tunnel excavation on site to allow for potential constraints removing the material from site. The spoil will be stockpiled in a covered building to minimise sediment laden runoff during rain. The conveyor will be enclosed where necessary to contain noise levels within acceptable limits.

A concrete batching plant will be required at the northern end of the tunnel, within Construction Yard 6. This will be used to produce shotcrete for the ground support within the tunnel as the tunnel is excavated. Since the tunnel construction is a 24 hour operation, shotcrete also needs to be available 24 hours for safety of the workforce and stability of the tunnel. The batching plant is envisaged to have a capacity of 30 m^3 /hr and a maximum capacity produce up to 320m^3/day. Most of the water from the concrete batching plant will be

recycled through the plant, with any excess water, such as that produced during rainfall events or by washdown activities, treated and discharged either to sewer or by trucked off site for disposal.

Bentonite is required for the construction of diaphragm walls for the Cut and Cover Tunnel/Great North Road Underpass. A bentonite plant will therefore be located in either Construction Yard 6 or Construction Yard 7. The bentonite plant is likely to consist of a series of bentonite slurry storage tanks with an open settling tank adjacent, a series of pumps and generators and a network of pipes capable of pumping the bentonite slurry to any point along the cut and cover tunnel alignment as it is required. The bentonite is recycled after use with sand and other unsuitable material filtered from the slurry before being re-used again. The unsuitable materials (e.g. sand and gravels) are stored in a container which will periodically be cleaned out via sucker truck for disposal offsite. An area of between 50 and 100 m^2 will also be required for storage of dry bentonite, normally stored in bags. The bentonite plant will be fully contained to allow all runoff to be collected and treated through the temporary stormwater pond prior to discharge to the stormwater system.

Construction Yard 6 is also the main construction yard for the Great North Road Interchange. This work will likely be undertaken after the tunnel construction is completed. It is anticipated that most of the structures for the Interchange will be precast offsite. Therefore, this yard will be used for site operations and as a storage and lay down area.

5.9.5.4 Erosion and Sediment Control

Erosion and sediment control in this area is based upon the implementation of sediment retention ponds with associated diversion channels. These sediment retention ponds will be chemically treated and will allow for full treatment of the construction associated earthworks. In addition to the sediment retention ponds, super silt fences will be established along the margin of the Oakley Creek. This will provide a further back up to the control measures in recognition of the values of the receiving environment.

Erosion and Sediment Control measures are detailed in Technical Report G.22

All contractor yard areas are to be progressively stabilised as they are developed and, in particular, the use of hard fill for this purpose will be undertaken which provides an immediate protection of the surface from erosion.

5.9.5.5 Stormwater Management

Stormwater management for the works in Sector 5 will be provided to maintain treatment to areas currently receiving treatment, treatment for temporarily impervious construction working areas and elsewhere rely on erosion and sediment controls until the permanent stormwater reticulation and treatment devices are ready for use.

Further details of are outlined in Technical Report G.15

The stormwater management pond located adjacent to the SH16 eastbound onramp will be kept in place. However, it will be enlarged during construction as the permanent wetland in this location and will provide a higher level of treatment than currently occurs.

The construction yards will have treatment by stormwater wet ponds. The stormwater wet pond for Construction Yard 6 in Waterview Park will have an outfall to the Oakley Inlet. The stormwater wet ponds for Construction Yards 3 and 4 in the SH16/Great North Road interchange loop will discharge into an existing stormwater network that discharges to the CMA to the north of SH16.

5.9.5.6 Temporary Traffic Management

Construction of the Waterview Interchange ramps in Sector 5 will largely be undertaken off-line, and therefore this will not affect motorway or arterial alignments.

Further details of are outlined in Technical Report G.16

Work on the motorway to motorway ramps that intersect existing interchange carriageways will be undertaken under two phases of minor mainline and ramp realignments with associated lane and shoulder narrowing.

Work in the median, and on structures over live carriageways, will be undertaken during night time lane and full closures. The site will be made safe and maintained in accordance with a Site Specific Traffic Management Plan (SSTMP).

The realignment of the westbound off-ramp will be undertaken in two phases with work completed on the southern (left hand shoulder) of the ramp, followed by work in the off-ramp gore area between the off-ramp and SH16 westbound carriageway.

Construction of the new SH16 eastbound motorway to motorway on-ramp will be completed through implementation of lane and shoulder narrowing on SH16 Westbound.

The existing number of lanes on the mainline and on the ramps will remain operational throughout the works, and the carriageway narrowed to a minimum of 3.25m lanes and 0.3m shoulders during works. Temporary TL-3 barriers will be installed to isolate the work site from passing traffic, with gaps provided where necessary for site access from the motorway.

Construction site access will typically be undertaken from Great North Road, where possible, with limited movements from the existing interchange ramps or SH16.

Truck movements to / from SH16 or the interchange ramps will be managed in accordance with a Site Specific Traffic Management Plan (SSTMP), particularly for any peak period movements. It is proposed that the requirements of such management will be agreed with the relevant road controlling authority in advance of works commencing on site.

The works will be staged from Construction Yard 4 which will be accessed from Great North Road (south of SH16). Site accesses to the compound will be designed and managed to minimise the effect on the road network.

Technical Report G.16: Assessment of Temporary Traffic Effects provides more detail of the management proposed for temporary/construction traffic.

5.9.6 Sector 6 – SH16 to St Lukes Interchange

Figure 5.7 shows the extent of the construction footprint required for this Sector.

5.9.6.1 Construction Activities

The main construction activities in Sector 6 relate to the widening of SH16 on the northern and southern sides and associated retaining walls and fill embankment widening.

SH16 Eastbound Carriageway Widening Under Carrington Road Overbridge

The section of SH16 towards St Lukes includes a one lane widening on the north side (eastbound carriageway). In order to facilitate this, a section of cut is proposed on the northern side of SH16 including the section that passes under the Carrington Road overbridge. This section currently has a cut profile supported by a post and panel concrete retaining wall. The proposed widening will result in an approximately 5m high cut behind the existing retaining wall. It is proposed that this cut be retained by a soil nail wall, faced with shotcrete and precast concrete panels. Concrete crash barriers will be incorporated in front of the design on the road shoulder. A top down construction will be adopted, installing the top row of soil nails and facing reinforcing first, before excavating down to the next level. Up to 4 rows of soils nails (at approximately 1m vertical spacing) will be used, which will result in either 3 or 4 excavation stages. An alternative option at this location is to retain the cut by means of bored pile retaining walls similar to those proposed for the Maioro Street Interchange and beneath Richardson Road cut. Where cut heights are greater than 3m, ground anchors may be required to extend behind the retaining wall face. The effects of these methods are considered similar.

Figure 5.7 Extent of Construction Area in Sector 6

SH16 Eastbound Carriageway Fill Embankment Widening

The existing eastbound motorway carriageway embankment is required to be widened by 3.5m over a length of around 180m between the Great North Road Interchange and St Luke Interchange. This will require unsuitable material to be undercut from beneath the embankment footprint, underdrainage installed and a fill embankment constructed. Some of the fill is likely to be sourced from the proposed Meola wetland and the balance from excess material from other portions of the wider SH16 to SH 20 project or from other locations e.g. quarries. Some of this fill is likely to require lime and or cement addition to allow placement to engineering fill standards.

SH16 Westbound Carriageway Widening

The westbound carriageway (southern side) is required to be widened between the two interchanges. As part of this widening, an existing 3m high concrete post and panel retaining wall will be demolished (in the vicinity of the SH16 off ramp to SH20 (Ramp 1)) and rebuilt to allow for the additional lane widening.

It is proposed that this cut be retained by a bored pile retaining wall similar to those proposed for the Maioro Street Interchange and beneath Richardson Road cut. Alternatively a soil nail wall similar to the soil nail wall proposed beneath the Carrington Road overbridge as described above will be required. The soil nail wall option will likely result in soil nails extending beneath the existing buildings at this location. The effects of these alternatives are considered similar.

An additional retaining wall is also required for the 2m high cut between Ch 560 and Ch 610 on the Ramp 1 alignment. At present it is proposed that this cut will be retained by a retaining wall (Massbloc). Alternatively bored pile or soil nail retaining walls may also be used.

Meola Wetland

A new stormwater wetland will be constructed on the northern side of the motorway to treat runoff from the motorway.

5.9.6.2 Construction Duration

Table 5.9 summarises the key construction activities in Sector 6, and the approximate duration. As noted previously, where possible construction activities will occur concurrently (e.g. the duration of works in this Sector are less than 24 months).

Table 5.9 Construction Duration of Major Activities in Sector 6

Activity	Duration (months)
Widening SH16	12
Widening either side of Carrington Overbridge	12

5.9.6.3 Construction yards

Construction Yard 5 is located within this Sector. A summary of the key activities being undertaken within this construction yard is set out in Table 5.10, and the proposed location of the construction yard is shown in Figure 5.7.

Table 5.10 Summary of Construction Yards located in Sector 6

Yard No.	Main Purpose	Location	Size	Key Activities
5	Road Builders Yard	Meola Creek	1.22ha	Offices/Ablutions Construction plant and equipment storage Materials storage and lay down areas; Lime and/or cement drying (rotary hoe) Contractor parking

Construction Yard 5 will be the main construction yard for the widening works along SH16 within the Sector 6. Access to the construction yard will be from Great North Road. The construction yard will operate at night to support the widening works.

5.9.6.4 Erosion and Sediment Control

Erosion and sediment control will be largely based on silt fences with super silt fences utilised around the margins of the Meola Creek. In addition, decanting earth bunds will be established at the western extent of this Sector to provide a more robust control measure including chemical treatment. The construction of the Meola wetland includes the establishment of decanting earth bunds during the earthworks activity.

Erosion and Sediment Control measures are detailed in Technical Report G.22

5.9.6.5 Stormwater Management

Stormwater management will be by temporary sediment retention ponds and devices until the permanent stormwater reticulation and treatment devices are ready for use.

Further details of are outlined in Technical Report G.15

5.9.6.6 Temporary Traffic Management

Construction will be undertaken under shoulder closures with minor mainline and ramp realignments and associated lane and shoulder narrowing. Temporary TL-3 barriers will be installed to isolate the work site from passing traffic, with gaps provided where necessary for site access from the motorway.

Further details of are outlined in Technical Report G.16

Truck movements to/ from SH16 or the interchange ramps will require escorted entry/ exit during peak periods (6am – 9am on SH16 Eastbound and 3pm – 6pm on SH16 Westbound), the requirements of which will be agreed with the relevant road controlling authority in

advance of works commencing on site.

Technical Report G.16: Assessment of Temporary Traffic Effects provides more detail of the management proposed for temporary/construction traffic.

5.9.7 Sector 7 – Great North Road Underpass

Figure 5.8 shows the extent of the construction footprint required for this Sector.

5.9.7.1 Construction Activities

The main construction activities in this Sector are:

- Great North Road underpass; and
- Construction of the northern ventilation building.

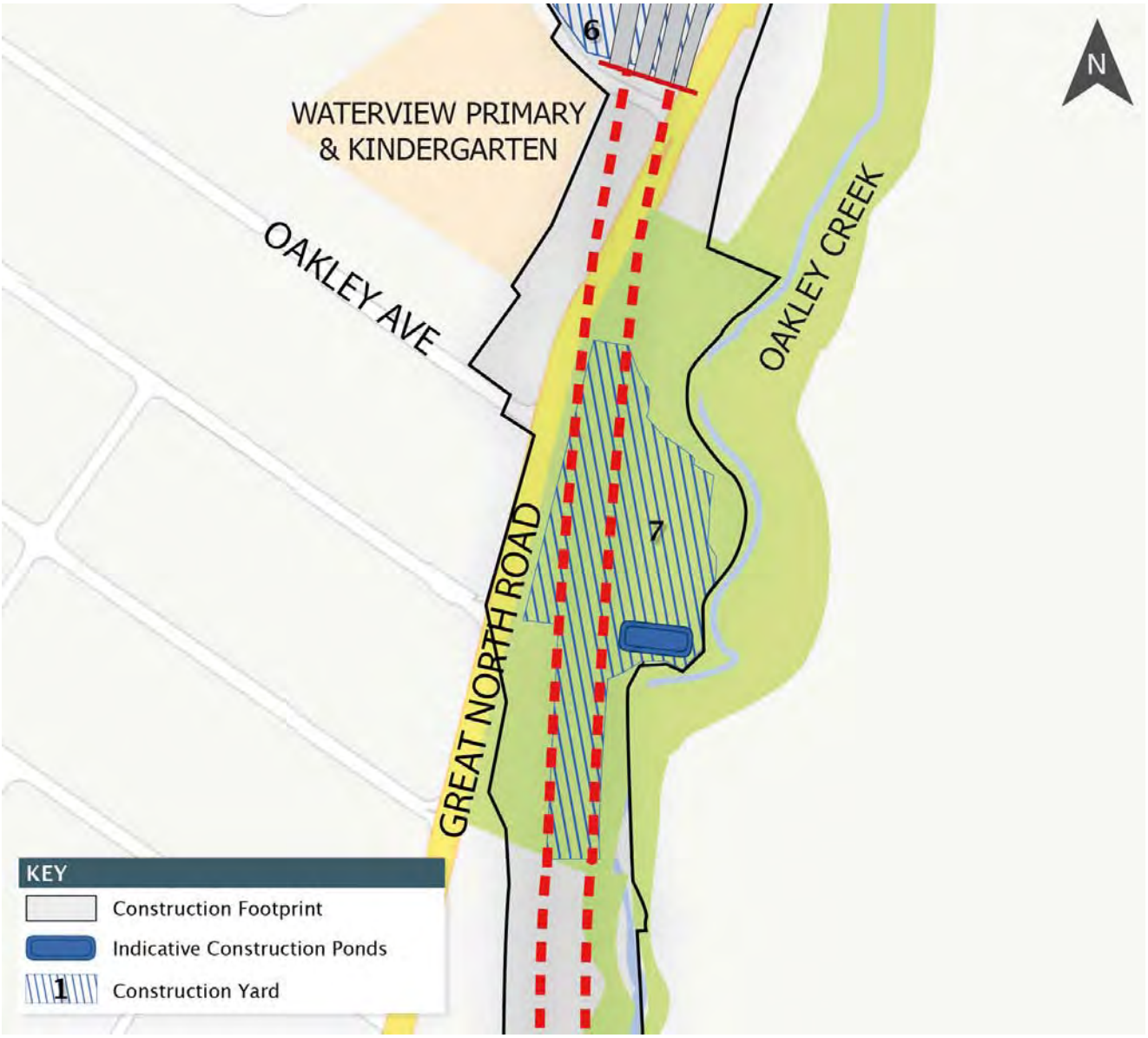
Great North Road Underpass

Construction of the Great North Road underpass will be separated into three main stages to enable at least four lanes are maintained for Great North Road traffic at all times:

- Stage 1(a) – North of Great North Road underpass;
- Stage 1(b) – South of Great North Road underpass; and
- Stage 2 – Great North Road underpass.

It is envisaged that Stage 1(a) will commence first to provide construction access to the northern tunnel portal, concurrently with Stage 1(b). Stage 2 will be completed once temporary traffic diversions are established for Great North Road traffic.

Figure 5.8 Extent of Construction Area in Sector 7



For the purpose of this assessment, the following construction methods have been proposed. It is noted that the final methodology may vary and will be confirmed once the contractor demonstrates that works can be undertaken in accordance with the relevant consent/designation conditions and the Construction Environmental Management Plans).

The underpass will be constructed using diaphragm walls to support the excavation. The diaphragm walls will be excavated in 5-8 m long trenches and backfilled with reinforced concrete. Two rows of diaphragm walls will extend over the full length of the cut and cover tunnel (495 m) with a central row of piles in the 'combined' tunnel box between CH3930 and CH4280 to support the tunnel roof. This central row of piles will also provide separation between the two traffic flow directions. Transverse diaphragm walls will be constructed at the two excavated tunnel portals - CH3930 and CH3785 m.

Once in place, excavation of the tunnel will be undertaken between the diaphragm walls to a depth of 3-5m below ground level. A crane will then be used to place the precast concrete roof sections, leaving sufficient distance to provide continual access for removal of excavation spoil. The excavation will extend to carriageway subgrade elevation with temporary props installed to support the diaphragm walls where required. Drainage will be installed to relieve long term groundwater beneath the floor slab. To complete the tunnel box the remaining sections of the roof will be constructed and fill placed over the roof to provide nominal ground cover to the structure.

Northern Ventilation Building

Construction of the northern ventilation building starts with the construction of a 600mm diameter pile wall (soldier pile wall) around the perimeter of the building. This will be installed from existing ground level.

Once the soldier pile wall is constructed, all material within the building footprint will be excavated down to the level of the plant room floor slab. Temporary propping will be required to support the pile wall as the excavation depth increases.

Following the excavation works, internal foundation piles will be constructed at the base of the excavation, to support the building column loads. Drainage will be placed at the base of the excavation to provide relief to groundwater uplift pressures beneath the slab. The plant room floor slab will then be constructed.

Internal columns and support beams will then be formed. These support the precast concrete roof units that will be lifted in by crane and connected to the structure by an insitu concrete topping.

Finally, the above ground plant rooms will be constructed, possibly using a steel frame structure. These are supported directly by the precast plant room roof units.

The vent stack will also be supported by the pile wall and a series of precast concrete sections that will be craned and fastened into position.

5.9.7.2 Construction Duration

Table 5.11 summarises the main activities within this Sector and their approximate duration. As noted earlier, some elements of these activities will occur concurrently so they do not collectively represent construction duration in this Sector.

Table 5.11Construction Duration of Major Activities in Sector 7

Activity	Duration (months)
Great North Road Underpass	30
Northern Ventilation Building	18

5.9.7.3 Construction Yard

Construction Yard 7 will be established in Sector 7, to allow commencement of the excavated tunnel from this end (until construction access is available through the Great North Rd Underpass). Figure 5.8 shows the location of the construction yard, and Table 5.12 summarises the key activities that will be undertaken.

Table 5.12 Summary of Construction Yards in Sector 7

Yard No.	Main Purpose	Location	Size	Key Activities
7	Excavated Tunnel Operation	Oakley Creek Esplanade Reserve	2.14ha	Offices/Ablutions Construction plant and equipment Storage and lay down areas Trucked Tunnel spoil Workshops Bentonite plant (possible location or Construction Yard 6) Refuelling facility Flocculation plant Ventilation compressors Transformers Contractor parking

This yard will be operated 24 hours a day, 7 days a week (reduced level of operations at night as only below ground construction works will occur at night). The yard will be fully fenced for security and access will be controlled.

Excavated material from the tunnel face may be brought here by trucks or overhead conveyor and stockpiled temporarily on site before being loaded into street trucks and removed to disposal or the causeway site. The size of the site puts constraints on the amount of spoil that can be stockpiled and this may limit tunnel production rates on occasions.

As noted previously, a bentonite plant is also required. This will be located in either Construction Yard 6 and then moved to Yard 7. As described under Sector 5, Bentonite is required for the construction of diaphragm walls for the cut and cover tunnel/Great North Road Underpass. The bentonite is recycled after use with sand and other unsuitable material filtered from the slurry before being re-used again. The unsuitable materials (e.g. sand and gravels) are stored in a container which will periodically be cleaned out via sucker truck for disposal offsite. An area of between 50 and 100 m^2 will also be required for storage of dry bentonite, normally stored in bags. The bentonite plant will be fully contained to allow all runoff to be collected and treated through the temporary stormwater pond prior to discharge to the stormwater system.

5.9.7.4 Erosion and Sediment Control

A surface water runoff will be treated through a chemically treated sediment retention pond located in Waterview Park prior to discharge into the Oakley Creek. A number of other control measures such as super silt fences and diversion channel will also be established.

Erosion and Sediment Control detailed in Technical Report G.22

5.9.7.5 Stormwater Management

During the construction phase, stormwater runoff from the contractor's working area will be treated by a temporary pond shown on Figure 5-10. Tunnel and concrete batching plant water will be discharged through the wetland for water quality polishing after treatment in the tunnel treatment containers. The concrete batching plant stormwater will be managed with a closed stormwater system whereby stormwater and wash-down water is drained into an onsite tank for reuse for concrete manufacturing. Water in excess of the reuse demands of the concrete batching plant will be treated by the tunnel treatment container.

Further details of are outlined in Technical Report G.15

Stormwater treatment measures for the stage 2 traffic diversion of Great North Road will be provided by Hynds upflow filters or similar.

5.9.7.6 Temporary Traffic Management

Construction of the Great North Road Underpass will be conducted over two phases with a requirement for a realignment of Great North Road and associated temporary lane and shoulder narrowing. A 30km/hr speed limit will be implemented throughout the works.

Further details of are outlined in Technical Report G.16

Initially, Great North Road will be realigned to the south to begin construction of the underpass, followed by a shift to the north to facilitate work on the southern extent of the underpass and the portals for the Avondale Heights Tunnel.

The existing number of lanes on Great North Road will remain operational in the temporary alignment during works; however they will be narrowed to a minimum width of 3.0m and 0.3m shoulders. Work in the live lanes of Great North Road will be conducted during night closures under an approved Site Specific Traffic Management Plan.

Pedestrian and cycle access will be maintained on Great North Road, with appropriate diversions for pedestrians and cyclists in accordance with the specific management agreed in the Site Specific Traffic Management Plan.

Temporary TL-3 barriers will be installed to isolate the work site from passing traffic. Site accesses will be provided just to the south of the BP station on the southbound side of Great North Road. This site access may be signalised depending on the impact of access movements on Great North Road (this will be confirmed in the Site Specific Traffic Management Plan).

Technical Report G.16: Assessment of Temporary Traffic Effects provides more detail of the management proposed for temporary/construction traffic.

5.9.8 Sector 8 – Avondale Heights Tunnel

Figure 5-9 shows the extent of the construction footprint required for this Sector.

5.9.8.1 Construction activities

The main construction activities in this Sector are:

- Tunnelling;
- Installation of the ventilation systems and operation buildings for the tunnel (i.e. including power supply and communication systems); and
- Construction of the emergency smoke exhaust

Figure 5-9 Extent of Construction Area in Sector 8

Tunnelling

As described in Chapter 4 (operation), in this Sector two 15m wide by 12m high tunnels will be excavated to a minimum depth of 11m to the crown of the tunnel, and a maximum depth of 65m to the tunnel invert, for approximately 2km. The two tunnels will be able to be excavated concurrently from both the northern and southern portals.

For the purpose of the assessment, the construction methodology for tunnelling has been developed using road headers and/or excavators, with muck removed via conveyors to stockpile buildings. During excavation, temporary support will be installed directly behind the open face and will comprise combinations of bolts, lattice arches, grouted piles and sprayed steel fibre reinforced shotcrete as determined by the specific geological conditions encountered during construction. The permanent support will comprise a waterproof membrane and either cast in-situ concrete or sprayed shotcrete lining.

Ventilation at the tunnel face will be driven by fans at each portal. Roadheaders would be powered from substations in Construction Yard 7 (at the northern portal) and Construction Yards 9 or 10 (at the southern portal), so power and communication cables will extend into the tunnel. Other machinery will be predominantly diesel, with catalytic converters and / or scrubbers for underground use. Refuelling will be carried out in place.

Drainage channels and service ducts will be laid in the invert of the lined tunnel and backfill placed to form the carriageway. The tunnel mechanical and electrical fit out will then be completed.

Tunnel Spoil Management

Approximately 1,400,000 m^3 of material is expected to be excavated from the tunnels. This material will either by reused within the Project, such as on the Causeway, or disposed of offsite to an appropriate clean fill facility. A review of clean fill sites indicates that there is sufficient capacity in the Three Kings and/or Wiri clean fill facilities to take all of the material generated from the tunnel excavation.

Material from the southern tunnel portal will either be loaded directly onto trucks for disposal offsite, or temporarily stockpiled in Construction Yards 9 or 10 before being reused in the causeway or disposed of offsite. Trucks from this end of the tunnel will be able to access SH20 directly.

Material from the northern tunnel portal will be stockpiled temporarily within Construction Yards 4, 6 and/or 7 before being either reused in the causeway or disposed of off-site. It is noted that for the purpose of assessment a conservative presumption is made that all materials will be imported for the causeway and tunnel materials exported off-site for disposal. However, where material is suitable for use on the causeway, it is planned that it will be stockpiled within the Construction Yard 6 (which will reduce traffic impacts of the Project).

Further, to minimise traffic disruption at and around the construction yard, a temporary conveyance system is proposed from the northern portal to the temporary stockpiles within Construction Yard 4. The temporary conveyance system would be approximately 800m long and is likely to be approximately 6-8m above the existing ground to safely cross the CMA and the motorway. It would run along the new road alignment within the proposed designation.

The conveyer would be an enclosed system, to minimise the potential for spoil to spill over the edges and would be insulated to meet District Plan noise requirements. It is envisaged that the conveyor would run 24 hours a day in conjunction with the tunnelling operation. Noise monitoring would be undertaken to monitor noise requirements.

The conveyance system may also be used to transfer material from the stockpiles to the causeway for the reclamation, rather than trucks. Should this be the case, the conveyance system would run from Construction Yard 5 along the northern edge of the causeway to a receiving point. Then, as the causeway reclamation advances west, the conveyor will be advanced with additional cassettes being placed. For reclamation work on the southern side, the conveyor would be extended across the motorway, and advance on the southern side in a similar fashion. This alternative would reduce truck movements. To take a "worse case" assessment, truck movements have been assumed.

Emergency Smoke Exhaust

An emergency smoke exhaust and building will be located at 36 Craddock Street. As an existing building is located on the site, this building will require demolition prior to works commencing. The site will then be levelled by a small digger, the top of the 5m radius shaft will be excavated using a small excavator and the ring of the shaft cast. Once the concrete ring has been cured, excavation will then continue using the small excavator, with excavated from the shaft placed into 20 trucks and is disposed of off site. The excavation will be under taken in depth section not exceeding 1.5m before a shotcrete lining is put in place. After every 4.5m of excavation it is expected that the permanent waterproof concrete lining will be cast using a ring shutter which progressively moves down the shaft. This cycle is repeated until the full depth of the shaft has been reached.

Due to the size of the tunnels and central placement of the smoke extraction shaft to the twin tunnels it is expected that the digger will be removed through the tunnels. It is also possible to rig a crane beam across the shaft and then to winch the digger to the surface.

Once the shaft has been constructed the surface building works will commence with the construction of the smoke exhaust. The exhaust stack will be cast in incremental lifts of no more than 2m until the final design height is achieved. Concrete delivery will be by remixer trucks and every lift is expected to have cycle time of 7 days. This will be followed by the construction of the building including the mechanical, electrical and instrumentation fit out. The building has been designed to emulate a residential property and the construction will be similar in nature to that for the construction of the residential home.

5.9.8.2 Construction Duration

Table 5.13 summarises the key activity within Sector 8 and its approximate durations.

Table 5.13 Construction Duration for Major Activities in Sector 8

Activity	Duration (months)
Tunnelling and associated mechanical, electrical fit out (including ventilation systems)	60

5.9.8.3 Erosion and Sediment Control

Groundwater from the tunnel excavation will become contaminated with both sediment and concrete activity and will need to be treated accordingly. This water will be pumped from each tunnel to the adjacent construction yard where a series of containers (tunnel treatment containers) will be located for treatment. These containers will contain a series of baffles and also contain a bark/mulch media within the baffles to assist with achieving an acceptable turbidity and pH level. Acid dosing may also be required to correct the groundwater pH if concreting activities within the tunnels result in pH levels that cannot be corrected through flocculation.

Erosion and Sediment Control measures are detailed in Technical Report G.22

All discharges from these containers will be to an interim stormwater wetland feature which will provide further polishing and ensure that discharge standards are achieved. In addition, a pH and turbidity meter will be established at both the portal and interim wetland location to ensure that all discharges achieve an agreed standard of 50 NTU and pH of 7.5.

5.9.8.4 Stormwater Management

During construction, water from the tunnels will be treated at the tunnel treatment containers located at the northern and southern portals. The treated water will then be discharged through the wetlands for water quality polishing.

Further details of are outlined in Technical Report G.15

5.9.8.5 Temporary Traffic Management

Works on the tunnels will be undertaken off line from the road network. Impacts arising from the tunnel construction are expected to be limited to site access movements at the northern and southern end of the site, at Great North Road, Richardson Road and SH20 (via the Maioro St Interchange).

Further details of are outlined in Technical Report G.16

The location and management of the site access movements at Great North Road are detailed in Sector 7 (Section 5.9.7.6).

Access movements to the south will occur via Richardson Road and SH20. During the first stage of works on Richardson Road bridge (see Sector 9), access to the Avondale Heights Tunnel site will mainly be via site accesses on Richardson Road (local road access to the sites will also be provided for site set up, from Hendon Avenue). Following completion of the Richardson Road bridge, the site will be accessed via SH20 (as discussed in Section 5.9.9 below).

The Richardson Road access will be designed and managed to minimise the effect on the road network, which will be agreed with relevant local road controlling authority in a SSTMP prior to start of works.

Technical Report G.16: Assessment of Temporary Traffic Effects provides more detail of the management proposed for temporary/construction traffic.

5.9.9 Sector 9 – Alan Wood Reserve

Figure 5.9 shows the extent of the construction footprint required for this Sector.

5.9.9.1 Construction Activities

The main construction activities being undertaken in this Sector include:

- Construction of the Southern Portal and Southern Ventilation Building;
- Construction of the road between the southern portal and Maioro Street Interchange, including construction of permanent stormwater wetlands;
- Construction of the Richardson Road Bridge and associated retaining walls;
- Construction of Hendon Pedestrian Bridge; and
- Construction of the northern half of the Maioro Street Interchange with associated retaining walls.

Southern Portal and Ventilation Building

Due to the high groundwater table within the basalt layer, a grout curtain cut-off will be installed to limit groundwater flows into the portal area both during construction and in the long term. The grout curtain will be installed by percussion drilling holes within the basalt at close spacing around the perimeter of the portal and then pressure grouting the holes. The effectiveness of the grout curtain will be monitored by piezometers on either side of the curtain.

Figure 5.9 Extent of Construction Area in Sector 9

Once the grout curtain is in place, excavation of the upper layer of basalt within the portal area will be undertaken. It is anticipated that controlled blasting and rock breakers will be required to remove the basalt. The basalt will be excavated out in a series of narrow benches to limit the height of the face and permit progressive removal of loose rocks and securing of the face using rock bolts, steel mesh and shotcrete (where required) to prevent drop outs and toppling failures. In order to break the basalt down to a manageable size for removal by trucks it is anticipated that a mobile primary crusher will be required on site.

Secant pile walls (of around 900mm diameter) will then be constructed along each side of the portal. These will be tied back with multiple rows of ground anchors and excavation extended down in stages to road formation level.

Once excavation is complete, the ventilation building will be constructed in a conventional bottom up construction sequence with the building of pads and support columns. Precast concrete beams and flooring will form the plant room floor of the building and the roof for the tunnel. Similarly precast concrete beams and flooring will form the roof and support the finished ground treatment over the top of the building.

The vent stack is supported on a pad foundation and consists of a series of precast concrete sections fastened together.

Road construction and Stormwater Wetlands

This section involves general site clearance works and earthworks to develop the final road formation. Earthworks equipment, such as excavators, will be used to carry out the excavation and earthmoving operation, with excess material trucked from site via the SH20 motorway at Maioro Street.

Two permanent wetlands will also be constructed in this area.

Richardson Road Bridge Construction

SH20 will pass below Richardson Road and a new road bridge is required. This has been designed to clear both SH20 and the rail corridor, and will generally follow the existing alignment of Richardson Road. This has been designed to be constructed with Super-T precast beams supported on concrete wall piers on piles and pile abutment beams. The foundations and piers for the bridge will be constructed in a similar manner to that described in Sector 5 for the ramps, with the superstructure supported on bridge bearings that are first placed on the pier tops.

The precast concrete Super-T girders (or equivalent) will be erected using cranes located adjacent to the spans. The concrete girders will be delivered to site by truck and lifted directly into place on falsework adjacent to the pier crossheads. Once in place, reinforcement for the insitu concrete cross girders and deck slab will be fixed and the cross girders and deck slab cast with concrete placed by concrete mixer or pumped via a pipeline. The superstructure will be completed with construction of the edge barriers.

Maioro Street Interchange and Richardson Road Cut Retaining Walls

Several retaining walls are required to allow the north facing ramps of the Maioro Street Interchange and the cut under Richardson Road to be constructed.

As the retaining walls will be built in cut, top down constructed bored pile type retaining walls with shotcrete infill between piles and a concrete facing panel are proposed. The retaining wall height will vary and be up to 11m. Retaining walls greater than approximately 4m in height will require ground anchors to limit wall deflections and reduce structural actions in retaining wall piles. Soil nail walls may be used as an alternative to bored pile retaining walls where the depth to rock is well below road formation level. The effects of these methods are considered comparable.

Hendon Pedestrian Bridge

The foundations and piers for the pedestrian bridge will be constructed in a similar way to that described previously for Sector 5 for the ramps, with the superstructure supported on bearings that are first placed on the pier tops.

Hendon Avenue Pedestrian Bridge comprises a five span pedestrian and cyclist bridge crossing SH20, the Mt Roskill rail corridor, Oakley Stream diversion and a footpath. The bridge is constructed of steelwork and comprises a 4-leg arch structure with a suspended steel deck. The bridge is supported on a combination of spread footings onto basalt and bored concrete piles into the ECBF. The piles will be constructed by driving a casing through the overlying materials and the soil will be extracted by auger. The spread footings will be constructed by excavating to the top of the basalt and casting the footings insitu. The steel superstructure will be erected by crane located adjacent to the spans. The approach spans will comprise precast concrete deck spans which will be erected by crane.

5.9.9.2 Construction Duration

Table 5.14 summarises the key activities in Sector 9 and their approximate durations. As noted these activities are in many instances concurrent and therefore cannot be interpreted collectively for the duration of works in this Sector.

Table 5.14 Construction Duration for Major Activities in Sector 9

Activity	Duration (months)
Southern portal	18
Road construction	12
Richardson Road Bridge	12
Pedestrian Bridge	12
Vent Building	12

5.9.9.3 Construction yard

Four construction yards are located in this Sector, as summarised in Table 5.15 and shown on Figure 5-10. As some of these yards will be used during the construction of the tunnel, they will be in place throughout the duration of the tunnelling works (approximately 5 years).

Table 5.15 Summary of Construction Yards in Sector 9

Yard No.	Main Purpose	Location	Size	Key Activities
8	Mechanical Laydown Area	Alan Wood Reserve	1.01ha	Offices/Ablutions Materials storage and lay down areas Contractor parking
9	Excavated Tunnel Operations	Alan Wood Reserve	1.37ha	Offices/ Ablutions Construction plant and equipment storage Materials storage and lay down areas Vent building construction Tunnel spoil stockpile (covered building) Field Laboratory Workshop Ventilation compressors Transformers Refuelling facility Contractor parking
10	Excavated Tunnel Operation	Alan Wood Reserve	0.81ha	Offices/ Ablutions Construction plant and equipment storage Storage and laydown areas Concrete Batching plant Field Laboratory (Concrete QA) Contractor parking
11	Piling Operations Yard	Hendon Park	1.62ha	Offices/Ablutions Construction plant and equipment storage Storage and lay down areas Field Laboratory Workshop Contractor parking
12	Road and Bridge Contractors yard		0.29ha	Offices/Ablutions Construction plant and equipment storage Storage and lay down areas Contractor parking

Construction Yard 8 is a lay-down area for the tunnel contractor. It may also be used for contractor parking and offices/ablutions.

Construction Yards 9 and 10 are the primary construction yards for the tunnels and will also accommodate the main tunnel design and site office. They will be operated 24 hours a day, 7 days a week (reduced level of operations at night as only below ground construction works will occur at night). The yards will be fully fenced for security and access will be controlled.

Excavated material will be brought to the yards by an overhead conveyor and/or trucks and generally taken off-site or if necessary (e.g. for night works) stockpiled on site in the road area, before being loaded into street trucks and removed to disposal. Provision will be made to store up to 3 days tunnel excavation on site to allow for potential constraints removing the material from site. The spoil will be stockpiled in a covered building to minimise sediment laden runoff during rain. The conveyor will be enclosed where necessary to contain noise levels within acceptable limits.

A concrete batching plant will be located within Construction Yard 10. This will be used to produce shotcrete for the ground support within the tunnel as the tunnel is advanced. Since the tunnel construction is a 24 hour operation, shotcrete also needs to be available 24 hours for safety of the workforce and stability of the tunnel. The batching plant is envisaged to be of the order of 30 m^3 capacity per hour and is likely to be required to produce up to 320 m^3 per day. Most of the water from the concrete batching plant will be recycled through the plant, with any excess water, such as that produced during rainfall events or by washdown activities, treated and discharged to sewer or trucked off site for disposal.

There will also be a crusher located at this end of the works to breakdown the basalt excavated from the tunnel portal area. The crusher will be located in Hendon Reserve. The crusher will only operate during standard working hours, and will be enclosed as necessary to contain noise levels.

5.9.9.4 Erosion and Sediment Control

Erosion and sediment control in this Sector is based on the same principles as utilised at the northern portal location with surface water treated through Sediment Retention Ponds and tunnel dewatering through containers and an interim stormwater wetland with associated pH and turbidity meters. Chemical treatment will be utilised and will ensure appropriate sediment removal efficiency from the control measures. A number of other controls including super silt fences will be utilised as necessary with a key measure being the use of progressive stabilisation, both hard fill and mulch, to avoid erosion of exposed surfaces.

Erosion and Sediment Control measures are detailed in Technical Report G.22

The diversion of the Oakley Creek and Stoddard Road tributary will be undertaken with a methodology based on construction of the diversion in a 'dry environment' (outside the flowing channel of the creek); fully stabilising the alignment for the diversion before diverting flows through the new channel, which will also be protected with super silt fences at that time. Methodologies include risk management techniques such as weather forecasting such that during rain events works are restricted accordingly.

5.9.9.5 Construction Stormwater Management

During the construction phase stormwater runoff from the under construction motorway and contractor's working area will be treated for water quality and quantity (extended detention and flood attenuation). The treatment will be provided by a series of stormwater wet ponds. Where possible the permanent stormwater treatment wetlands will be constructed early in the programme for use for treatment of construction stormwater.

Further details of are outlined in Technical Report G.15

The stormwater wetlands will also receive the tunnel and concrete batching plant water after the water is first treated in tunnel treatment containers. The concrete batching plant stormwater will be managed with a closed stormwater system whereby stormwater and wash-down water is drained and in an onsite tank for reuse for concrete manufacturing. Water in excess of the reuse demands of the concrete batching plant will be treated by the tunnel treatment containers.

5.9.9.6 Temporary Traffic Management

With the exception of the Richardson Road bridge construction, a majority of works on the SH20 extension through Sector 9 will be conducted off-line and will not impact on the existing road network. Impacts arising from the extension are expected to be limited to site access movements at the southern end of the site.

Further details of are outlined in Technical Report G.16

Work on the Richardson Road bridge will be undertaken over two stages of realignments with lane and shoulder narrowing. In the first stage Richardson Road will be realigned to the west to allow completion of the new bridge, and Richardson Road transferred to the new bridge under stage two. The existing number of lanes on Richardson Road will remain operational throughout works; however they will be narrowed to a minimum width of 3.0m and 0.3m shoulders.

Pedestrian and cycle access will be maintained, with appropriate measures to divert pedestrians and cyclists where necessary. This will be undertaken in accordance with the Site Specific Traffic Management Plan proposed.

Existing bus stops on Richardson Road will likely be relocated away from the extent of the works to minimise the risk to pedestrians and to minimise interaction between buses and construction traffic. It is anticipated that bus stops on the northbound direction will be relocated to the south, and bus stops on the southbound direction will be relocated to the north.

Temporary TL-3 barriers will be installed to isolate the work site from passing traffic, with gaps provided where necessary.

The works on the SH20 extension to the north of Richardson Road will be accessed from Richardson Road until works are completed on the Richardson Road bridge, at which time access will be gained via SH20 at the Maioro St Interchange. Site access via Maioro St Interchange will be achieved through a temporary "site entry only" off-ramp from SH20 northbound and a temporary "site exit only" on-ramp to SH20 southbound.

Site accesses to the compound will be designed and managed to minimise the effect on the road network, which will be agreed with the relevant road controlling authority in an SSTMP prior to start of works.

Technical Report G.16: Assessment of Temporary Traffic Effects provides more detail of the management proposed for temporary/construction traffic.

5.10 Conclusion

This section has outlined the construction activities that will be undertaken to deliver the Waterview Connection Project, and provides the basis from which the assessment of effects on the environment has been undertaken.

Given the location of the works, within an urban environment, construction activities have been designed to minimise disruption as much as practicable. Where possible, works will be undertaken offline to minimise disruption to existing traffic, with tie-ins undertaken at night. Construction activities have also been designed to take into account the location of the works within a sensitive ecological area, including Oakley Creek and the Waitemata Harbour.

All environmental mitigation and monitoring required will be managed through the implementation of a Construction Environmental Management Plan. A draft CEMP (Technical Report G.21) has been developed to provide specific guidance on the requirements for the Contractor(s) in this respect, which will be developed and refined once the work packages for the Project have been assigned to Contractors.

6. Statutory and Strategic Matters

Overview:

The purpose of the RMA is to promote the sustainable management of natural and physical resources. Unless an activity is authorised in the RMA, or a National Environmental Standard, Regional Plan or District Plan, it will require authorisation by way of resource consent and/or designation Under section 104 of the RMA (consideration of resource consent applications) and under section 171 of the RMA (consideration of NORs for new designations and alterations to existing designations), regard must be had by the relevant territorial authority to the relevant provisions of a national policy statement, national environmental standard, regional and district planning documents when considering the application.

This chapter outlines the statutory and strategic documents which are relevant to the Project. Some of these documents are relevant as they set out the regional and economic context and the need for the Project. Other documents are relevant as they guide the design and development of the Project and outline specific assessment matters which are relevant to the Project.

In summary and in addition to the RMA, the following documents are considered relevant to the assessment of the Project:

- National Environmental Standard – Air Quality;
- New Zealand Coastal Policy Statement;
- Auckland Regional Policy Statement;
- Auckland Regional Plan: Coastal;
- Auckland Regional Plan: Sediment Control;
- Proposed Auckland Regional Plan: Air, Land and Water;
- Transitional Regional Plan;
- Auckland City District Plan: Isthmus Section; and
- Waitakere City District Plan

This Chapter provides for the statutory and strategic context outlined within these documents. Chapter 23 of the AEE provides an assessment of the Project against matters from the above documents.

6.1 Statutory Context

The RMA and other legislation is relevant to consenting and approval of the Project

This chapter considers the relevant provisions of the Resource Management Act 1991 (RMA) in relation to the Project. The RMA is the legislation governing resource consents and designations. The purpose of the RMA is to promote the sustainable management of natural and physical resources. Unless an activity is authorised in the RMA, or a National Environmental Standard, Regional Plan or District Plan, it will require authorisation by way of resource consent and/or designation. The following legislation is also relevant:

- Hauraki Gulf Marine Park Act 2000 (HGMPA);
- Land Transport Management Act 2003 (LTMA);
- Reserves Act 1977;
- Marine Reserves Act 1971;
- Historic Places Act 1993 (HPA);
- Public Works Act 1981; and
- Wildlife Act 1953.

Full excerpts of sections of the above Acts have not been reproduced entirely within this document, those relevant sections of the above Acts are set out in Appendix E.3 of this AEE.

6.2 Resource Management Act 1991

RMA governs the use and development of New Zealand's natural and physical resources

The RMA governs the use and development of New Zealand's natural and physical resources through:

- Part 2 which establishes the purpose and principles of the Act;
- Section 104, which sets out the principal matters, subject to Part 2, which a consent authority shall have regard to (and other matters it must disregard) when considering an application for resource consent and any submissions received;
- Section 105 which relates to matters relevant to applications for discharge and reclamation permits;
- Sections 117 and 119A which set out the special procedures under which an application for a Restricted Coastal Activity made to a regional council must be notified, considered and decided;

- Part 6AA (Sections 140-149) which sets outs the procedures for matters in relation to Proposals of National Significance including how they are lodged, considered and decided; and
- Sections 166 to 186 which set out the process and procedure for a requirement for a designation or alteration to a designation

6.2.1 Purposes and Principles of the RMA

A territorial authority must, when considering the matters set out in Section 171, do so subject to Part II of the RMA. In addition a consent authority's consideration of applications for resource consent applications under Section 104 of the RMA must also be subject to Part II of the RMA.

6.2.1.1 Section 5 – Purpose

Section 5 states the purpose of the Act:

The purpose of the RMA is to promote the sustainable management of natural and physical resources

(1) The purpose of this Act is to promote the sustainable management of natural and physical resources.

(2) In this Act, ***sustainable management*** *means managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well-being and for their health and safety while—*

(a) sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and

(b) safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and

(c) avoiding, remedying, or mitigating any adverse effects of activities on the environment.

6.2.1.2 Section 6 – Matters of National Importance

Matters of national importance are set out in Section 6 of the RMA:

Relevant matters of national importance under the RMA

In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall recognise and provide for the following matters of national importance:

a) the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development:

(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:

(f) the protection of historic heritage from inappropriate subdivision, use, and development:

(g) the protection of recognised customary activities.

6.2.1.3 Section 7- Other Matters

Matters to have regard to

Section 7 sets out the following:-

In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall have particular regard to—

(a) kaitiakitanga:

(aa) the ethic of stewardship:

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

(ba) the efficiency of the end use of energy:

(c) the maintenance and enhancement of amenity values:

(d) intrinsic values of ecosystems:…

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

(g) any finite characteristics of natural and physical resources: …

(i) the effects of climate change.

6.2.1.4 Section 8 – Treaty of Waitangi

Take into account the principles of the 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 follows:

In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall take into account the principles of the Treaty of Waitangi (Te Tiriti o Waitangi)

6.2.2 Notices of Requirement

Sections 168 and 181 – Notice of Requirement for Designation and Alteration to an Existing Designation(s).

6.2.2.1 Section 168

The NZTA is a network utility operator approved as a requiring authority under Section 167 of the RMA. Section 168 provides for requiring authorities to give notice to a territorial authority of its requirement to designate for a project or work.

the NZTA is a network utility operator

> *(2) A requiring authority for the purposes approved under section 167 may at any time give notice in the prescribed form to a territorial authority of its requirement for a designation—*
>
> *(a) for a project or work; or*
>
> *(b) in respect of any land, water, subsoil, or airspace where a restriction is reasonably necessary for the safe or efficient functioning or operation of such a project or work.*

6.2.2.2 Section 181 – Alteration of Designation

Under Section 181, a requiring authority may give notice to a territorial authority of its requirement to alter a designation.

> *(1) A requiring authority that is responsible for a designation may at any time give notice to the territorial authority of its requirement to alter the designation.*
>
> *(2) Subject to subsection (3), sections 168 to 179 shall, with all necessary modifications, apply to a requirement referred to in subsection (1) as if it were a requirement for a new designation.*

6.2.2.3 *Section 177 Land subject to existing designation or heritage order*

Section 177 applies to circumstances where a designation is included in a District Plan and the land that is the subject of the designation is already the subject of an earlier designation.

To construct the Project, the NZTA will require the approval of a number of existing Requiring Authorities with designations in the Project area. These are discussed and detailed in Chapter 7 of this AEE. In particular, KiwiRail (New Zealand Railways Corporation) and the Auckland City Council[1] are noted as earlier requiring authorities pursuant to Section 177 (1)(a) of the RMA, and where significant works are proposed by the Project, within their designations.

6.2.2.4 Section 171 Recommendation by territorial authority

Section 171 sets out the matters a territorial authority must have regard to when considering a notice of requirement and any submissions received.

Matters of regard when considering a notice of requirement

(1A) When considering a requirement and any submissions received, a territorial authority must not have regard to trade competition or the effects of trade competition.

(1) When considering a requirement and any submissions received, a territorial authority must, subject to Part 2 consider the effects on the environment of allowing the requirement, having particular regard to—

(a) any relevant provisions of—

(i) a national policy statement:

(ii) a New Zealand coastal policy statement:

(iii) a regional policy statement or proposed regional policy statement:

(iv) a plan or proposed plan; and

(b) whether adequate consideration has been given to alternative sites, routes, or methods of undertaking the work if—

(i) the requiring authority does not have an interest in the land sufficient for undertaking the work; or

(ii) it is likely that the work will have a significant adverse effect on the environment; and

(c) whether the work and designation are reasonably necessary for achieving the objectives of the requiring authority for which the designation is sought; and

(d) any other matter the territorial authority considers reasonably necessary in order to make a recommendation on the requirement.

[1] Particularly for their designation of public roads.

(2) The territorial authority may recommend to the requiring authority that it—

(a) confirm the requirement:

(b) modify the requirement:

(c) impose conditions:

(d) withdraw the requirement.

(3) The territorial authority must give reasons for its recommendation under subsection (2).

6.2.3 Resource Consent Requirements

6.2.3.1 Section 104 – Consideration of Applications (Resource Consents)

Matters of regard when considering resource consents

Section 104(1) of the Act requires a consent authority, when considering an application for resource consent, and any submissions received, to have regard to:

(a) any actual and potential effects on the environment of allowing the activity; and

(b) any relevant provisions of—

(i) a national environmental standard:

(ii) other regulations:

(iii) a national policy statement:

(iv) a New Zealand coastal policy statement:

(v) a regional policy statement or proposed regional policy statement:

(vi) a plan or proposed plan; and

(c) any other matter the consent authority considers relevant and reasonably necessary to determine the application.

Section 104C relates to particular restrictions to restricted discretionary activities and reads as follows:

(1) When considering an application for a resource consent for a restricted discretionary activity, a consent authority must consider only those matters over which—

(a) a discretion is restricted in national environmental standards or other regulations;

(b) it has restricted the exercise of its discretion in its plan or proposed plan.

Section 104D relates to particular restrictions for non-complying activities and reads as follows:

> *(1) Despite any decision made for the purpose of section 95A(2)(a) in relation to adverse effects, a consent authority may grant a resource consent for a non-complying activity only if it is satisfied that either—*
>
> *(a) the adverse effects of the activity on the environment (other than any effect to which [[section 104(3)(a)(ii)]] applies) will be minor; or*
>
> *(b) the application is for an activity that will not be contrary to the objectives and policies of—*
>
> *(i) the relevant plan, if there is a plan but no proposed plan in respect of the activity; or*
>
> *(ii) the relevant proposed plan, if there is a proposed plan but no relevant plan in respect of the activity; or*
>
> *(iii) both the relevant plan and the relevant proposed plan, if there is both a plan and a proposed plan in respect of the activity.*
>
> *(2) To avoid doubt, section 104(2) applies to the determination of an application for a non-complying activity.*

The gateway tests set by this section of the RMA are of particular relevance to the proposed Project for reasons set out in Section 23 of this AEE.

6.2.3.2 Section 105 Additional Matters in Relation to Discharge Permits

Section 105 relates to matters relevant to certain applications and reads as follows:

> *(1) If an application is for a discharge permit or coastal permit to do something that would contravene section 15 or section 15B, the consent authority must, in addition to the matters in section 104(1), have regard to—*
>
> *(a) the nature of the discharge and the sensitivity of the receiving environment to adverse effects; and*
>
> *(b) the applicant's reasons for the proposed choice; and*
>
> *(c) any possible alternative methods of discharge, including discharge into any other receiving environment.*
>
> *(2) If an application is for a resource consent for a reclamation, the consent authority must, in addition to the matters in section (104)(1), consider whether an esplanade reserve or esplanade strip is appropriate and, if so, impose a condition under section 108(2)(g)*

6.2.3.3 Section 88 Information Requirements

Section 88 of the RMA sets out the information requirements for an AEE. Table 6.1 provides cross reference between the requirements of Schedule 4 and the relevant sections of this AEE. Under Section 88(2),

> *(2) An application must—*
>
> *(a) be made in the prescribed form and manner; and*
>
> *(b) include, in accordance with Schedule 4, an assessment of environmental effects in such detail as corresponds with the scale and significance of the effects that the activity may have on the environment.*

Table 6.1: Schedule 4

Schedule 4 Item – Matters to be Included in an AEE	Comment
A description of the proposal	The Project description is outlined in Chapters 4 and 5 of this document.
Where it is likely that an activity will result in any significant adverse effect on the environment, a description of any possible alternative locations or methods for undertaking the activity	An assessment of Project alternatives has been undertaken and included in Chapter 11 of this document.
An assessment of the actual or potential effect on the environment of the proposed activity.	A detailed assessment of effects on the environment is set out in Chapters 12-24 where relevant.
Where the activity includes the discharge of any contaminant, a description of – The nature of the discharge and the sensitivity of the proposed receiving environment to adverse effects; and Any possible alternative methods of discharge into any other receiving environment:	An assessment of the discharge of contaminants is included in Chapters 12-24 where relevant.
A description of the mitigation measures (safeguards and contingency plans where relevant) to be undertaken to help prevent or reduce the actual or potential effect:	Proposed mitigation measures are set out in Chapters 12-24 where relevant.
Identification of the persons affected by the proposal, the consultation undertaken, if any, and any response to the views of any person consulted:	Details of consultation undertaken in relation to this Project are outlined in Chapter 10.
Where the scale or significance of the activity's effect are such that monitoring is required, a description of how, once the proposal is approved, effects will be monitored and by whom.	Proposed monitoring mechanisms and methods are set out in Chapters12-24 where relevant.

6.2.3.4 Section 117

Section 117 sets out the procedures for applications for restricted coastal activities, including:

> *(3) Any provisions of this Act that apply in relation to an application for a resource consent apply in relation to the application for the coastal permit, except as provided in this section.*

6.2.3.5 Section 89

Section 89 sets out the procedures for resource consent applications where land is in the CMA. Section 89(2) states that Where an application is made to a territorial authority for a resource consent for an activity which an applicant intends to undertake within the district which is in the CMA then the territorial authority may hear and decide the application as if the application related to an activity within its district.

6.2.4 Part 6AA – Proposals of National Significance

Part 6AA provides the Minister for the Environment with specific powers in relation to applications for resource consents and notices of requirement that are part of a proposal of national significance.

6.2.4.1 Section 142

Section 142 sets out the procedures for when and how the Minister(s) may call in a matter that is or is part of a proposal of national significance including what factors influence whether a proposal can be considered of national significance.

> *(2) If the Minister considers that a matter is or is part of a proposal of national significance, the Minister may call in the matter by making a direction to—*
>
> *(a) refer the matter to a board of inquiry for decision; or*
>
> *(b) refer the matter to the Environment Court for decision.*
>
> *(3) In deciding whether a matter is or is part of a proposal of national significance, the Minister may have regard to any relevant factor, including whether the matter—*
>
> *(a) has aroused widespread public concern or interest regarding its actual or likely effect on the environment (including the global environment); or*

(b) involves or is likely to involve significant use of natural and physical resources; or

(c) affects or is likely to affect a structure, feature, place, or area of national significance; or

(d) affects or is likely to affect or is relevant to New Zealand's international obligations to the global environment; or

(e) results or is likely to result in or contribute to significant or irreversible changes to the environment (including the global environment); or

(f) involves or is likely to involve technology, processes, or methods that are new to New Zealand and that may affect its environment; or

(g) is or is likely to be significant in terms of Section 8; or

(h) will assist the Crown in fulfilling its public health, welfare, security, or safety obligations or functions; or

(i) affects or is likely to affect more than 1 region or district; or

(j) relates to a network utility operation that extends or is proposed to extend to more than 1 district or region.

6.2.4.2 Section 145 Matter Lodged with the EPA

Section 145 sets out how an application for resource consent and notice of requirement for a designation or to alter a designation can be lodged with the Environmental Protection Authority (EPA).

6.2.4.3 Minister Makes Direction After the EPAs Recommendation

Section 146 sets out the recommendations the EPA must make to the Minister on whether to refer the matter to the Board of Inquiry for a decision, the Environment Court for a decision or a local authority. Section 147 sets out the process for the Minister to make a direction following the EPA recommendation, it is noted that the RMA states:

(4) In deciding on making a direction under subsection (1), the Minister must have regard to—

(a) the views of the applicant and the local authority; and

(b) the capacity of the local authority to process the matter; and

(c) the recommendations of the EPA.

6.2.4.4 Section 148 Proposals Relating to Coastal Marine Area

When a proposal of national significance relates in whole or part to the CMA, Section 148 requires that all references in Part 6AA to "the Minister" shall be read as references to both the Minister of Conservation and the Minister for the Environment.

6.2.4.5 Section 149 EPA May Request Further Information or Commission Report

Section 149 provides that the EPA may request further information on a matter lodged with the EPA, or require a report to be prepared on an issue relating to such a matter by an EPA employee or other person so commissioned.

6.3 Strategic Matters

6.3.1 Hauraki Gulf Marine Park Act 2000 (HGMPA)

The HGMPA is a NZCPS under the RMA

The HGMPA outlines broad policy matters, which recognise the features that contribute to the national significance of the Hauraki Gulf and appropriate objectives for the Gulf's management. The purpose of the HGMPA is set out in section 3 as follows:

> *(a) integrate the management of the natural, historic, and physical resources of the Hauraki Gulf, its islands, and catchments:*
>
> *(b) establish the Hauraki Gulf Marine Park:*
>
> *(c) establish objectives for the management of the Hauraki Gulf, its islands, and catchments:*
>
> *(d) recognise the historic, traditional, cultural, and spiritual relationship of the tangata whenua with the Hauraki Gulf and its islands:*
>
> *(e) establish the Hauraki Gulf Forum*

Of specific relevance to this AEE, Section 10 of the HGMPA states that *For the coastal environment of the Hauraki Gulf, sections 7 and 8 must be treated as a New Zealand coastal policy statement issued under the Resource Management Act 1991* (Section 10(1))[2].

[2] It is noted that Section 10(2) provides qualification that for any conflict between the HGMPA and a NZCPS prepared under the RMA, then that NZCPS will take precedence.

Section 7 of the HGMPA recognises the Hauraki Gulf as an area of national significance, providing direction on this specific area of the CMA pursuant to the matters of section 6 of the RMA.

> *1) The interrelationship between the Hauraki Gulf, its islands, and catchments and the ability of that interrelationship to sustain the life-supporting capacity of the environment of the Hauraki Gulf and its islands are matters of national significance.*
>
> *(2) The life-supporting capacity of the environment of the Gulf and its islands includes the capacity—*
>
> *(a) to provide for—*
>
> *(i) the historic, traditional, cultural, and spiritual relationship of the tangata whenua of the Gulf with the Gulf and its islands; and*
>
> *(ii) the social, economic, recreational, and cultural well-being of people and communities:*
>
> *(b) to use the resources of the Gulf by the people and communities of the Gulf and New Zealand for economic activities and recreation:*
>
> *(c) to maintain the soil, air, water, and ecosystems of the Gulf*.

Section 8 provides further specific direction on those resource management matters within the HGMPA that contribute to its significance. In particular:

> *To recognise the national significance of the Hauraki Gulf, its islands, and catchments, the objectives of the management of the Hauraki Gulf, its islands, and catchments are—*
>
> *(a) the protection and, where appropriate, the enhancement of the life-supporting capacity of the environment of the Hauraki Gulf, its islands, and catchments:*
>
> *(b) the protection and, where appropriate, the enhancement of the natural, historic, and physical resources of the Hauraki Gulf, its islands, and catchments:*
>
> *(c) the protection and, where appropriate, the enhancement of those natural, historic, and physical resources (including kaimoana) of the Hauraki Gulf, its islands, and catchments with which tangata whenua have an historic, traditional, cultural, and spiritual relationship:*
>
> *(d) the protection of the cultural and historic associations of people and communities in and around the Hauraki Gulf with its natural, historic, and physical resources:*
>
> *(e) the maintenance and, where appropriate, the enhancement of the contribution of the natural, historic, and physical resources of the Hauraki Gulf, its islands, and catchments to the social and economic well-being of the people and communities of the Hauraki Gulf and New Zealand:*

(f) the maintenance and, where appropriate, the enhancement of the natural, historic, and physical resources of the Hauraki Gulf, its islands, and catchments, which contribute to the recreation and enjoyment of the Hauraki Gulf for the people and communities of the Hauraki Gulf and New Zealand

6.3.2 Land Transport Management Act 2003 (LTMA)

Statutory framework for Land Transport Management

The LTMA establishes the statutory framework for Land Transport Management in New Zealand.

The purpose of the LTMA is set out in section 3, as follows:

(1) The purpose of this Act is to contribute to the aim of achieving an affordable, integrated, safe, responsive, and sustainable land transport system.

(2) To contribute to that purpose, this Act—

(a) provides an integrated approach to land transport funding and management; and

(b) improves social and environmental responsibility in land transport funding, planning, and management; and

(c) provides the Agency with a broad land transport focus; and

(d) improves long-term planning and investment in land transport, including planning and investment in coastal shipping and rail; and

(e) ensures that land transport funding is allocated in an efficient and effective manner; and

(f) improves the flexibility of land transport funding by providing for alternative funding mechanisms.

6.3.3 Local Government (Auckland) Amendment Act 2004 (LGAAA)

The purpose of the LGAAA is set out in Section 3 as follows:

(a) to improve the integration of—

(i) the Auckland regional land transport system; and

(ii) the management of land transport funding and assets for the Auckland Region; and

(iii) decisions on stormwater funding for the Auckland Region; and

(b) to require Auckland local authorities to change the policy statement and plans prepared under the Resource Management Act 1991 to integrate the land transport and land use provisions and make those provisions consistent with the Auckland Regional Growth Strategy.

6.3.4 Other Legislative Matters

6.3.4.1 Reserves Act 1977

The Reserves Act 1977 was established to acquire, preserve and manage areas for their conservation values or public recreational and educational values. Section 3 sets out the purpose of the Act as follows:

General purpose of this Act

(1) It is hereby declared that, subject to the control of the Minister, this Act shall be administered in the Department of Conservation for the purpose of—

(a) Providing, for the preservation and management for the benefit and enjoyment of the public, areas of New Zealand possessing—

(i) Recreational use or potential, whether active or passive; or

(ii) Wildlife; or

(iii) Indigenous flora or fauna; or

(iv) Environmental and landscape amenity or interest; or

(v) Natural, scenic, historic, cultural, archaeological, biological, geological, scientific, educational, community, or other special features or value:

(b) Ensuring, as far as possible, the survival of all indigenous species of flora and fauna, both rare and commonplace, in their natural communities and habitats, and the preservation of representative samples of all classes of natural ecosystems and landscape which in the aggregate originally gave New Zealand its own recognisable character:

(c) Ensuring, as far as possible, the preservation of access for the public to and along the sea coast, its bays and inlets and offshore islands, lakeshores, and riverbanks, and fostering and promoting the preservation of the natural character of the coastal environment and of the margins of lakes and rivers and the protection of them from unnecessary subdivision and development.

(2) In the exercise of its administration of this Act, the Department may take any action approved or directed from time to time by the Minister so far as it is consistent with this Act or is provided for in any other Act and is not inconsistent with this Act.

6.3.4.2 Marine Reserves Act 1971

The purpose of the Marine Reserves Act is to preserve areas of New Zealand, that contain underwater scenery, natural features or marine life of distinctive quality or beauty or unique nature. These areas are set aside as 'marine reserves' for scientific study.

Section 4(3) provides for public works in a Marine Reserve with the consent of the Minister of Conservation and the Minister of Transport and subject to conditions.

> *(3) Notwithstanding anything in the Public Works Act 1981 or any other Act, no public work, other than a work authorised by this Act, may be undertaken or constructed on any area included in a marine reserve except with the consent of the Minister, and the Minister in charge of the department in control of the work, and subject to such conditions as those Ministers may jointly impose*

6.3.4.3 Historic Places Act 1993 (HPA)

The HPA establishes the New Zealand Historic Places Trust and its role in preserving, marking and recording places of historic interest in New Zealand. Its purpose is set out in section 4 as follows:

> *(1) The purpose of this Act is to promote the identification, protection, preservation, and conservation of the historical and cultural heritage of New Zealand.*
>
> *(2) In achieving the purpose of this Act, all persons exercising functions and powers under it shall recognise—*
>
> *(a) The principle that historic places have lasting value in their own right and provide evidence of the origins of New Zealand's distinct society; and*
>
> *(b) The principle that the identification, protection, preservation, and conservation of New Zealand's historical and cultural heritage should—*
>
> *(i) Take account of all relevant cultural values, knowledge, and disciplines; and*
>
> *(ii) Take account of material of cultural heritage value and involve the least possible alteration or loss of it; and*
>
> *(iii) Safeguard the options of present and future generations; and*
>
> *(iv) Be fully researched, documented, and recorded, where culturally appropriate; and*
>
> *(c) The relationship of Maori and their culture and traditions with their ancestral lands, water, sites, wahi tapu, and other taonga.*

6.3.4.4 Public Works Act 1981

The Public Works Act 1981 enables land to be acquired, either by agreement or by compulsion, for the construction of roads, railways and airports, the provision of services such as electricity and water supply and to build other public facilities. The Act also contains provisions for disposal of land no longer required for a public work.

6.3.4.5 Wildlife Act 1953

The Wildlife Act deals with the protection and control of wild animals and birds and the management of game.

6.4 Planning Context

It is considered that the following national environmental standards, policy statements and plans are particularly relevant to the Project. The relevant objectives/policies contained in the relevant statutory documents below are outlined in Appendix E.3 Statutory References:

Relevant Planning Document

- National Environmental Standard – Air Quality 2004[3];
- New Zealand Coastal Policy Statement 1994;
- Auckland Regional Policy Statement 1999;
- Auckland Regional Plan: Coastal 2004;
- Auckland Regional Plan: Sediment Control 1993;
- Proposed Auckland Regional Plan: Air, Land and Water 2001;
- Auckland Transitional Regional Plan 1991;
- Auckland City District Plan – Isthmus Section 1999; and
- Waitakere City District Plan 1995.

The following sections of this Chapter provide an outline of the relevant Planning Documents only. An assessment of the Project in relation to all of the planning and non-statutory documents and the relevant objectives and policies is included in Part D – Section 23 of this AEE.

[3] Resource Management (National Environmental Standards Relating to Certain Air Pollutants, Dioxins, and Other Toxics) Regulations 2004

6.5 Planning Documents

6.5.1 National Environmental Standard – Air Quality 2004[4]

The AQNES sets concentration limits for certain air pollutants

National Environmental Standards are regulations issued under Sections 43 and 44 of the RMA and apply nationally. The Resource Management (National Environmental Standards Relating to Certain Air Pollutants, Dioxins and Other Toxics) Regulations 2004 (as amended) (AQNES) were prepared under Sections 43 and 44 of the RMA and are designed to protect public health and the environment of New Zealand by, among other things, setting concentration limits for certain air pollutants.

The standards are mandatory and have the force of regulations. Within the Auckland region they are implemented by the regional council through its RMA responsibilities. The NES sits above regional plans in the hierarchy of statutory documents.

There are five ambient air quality standards in AQNES relevant to the Project due to the air emissions from vehicles. Schedule 1 of the Regulations sets out ambient air quality concentration limits for the following:

- Carbon monoxide (CO);
- Nitrogen dioxide (NO2);
- Sulphur dioxide (S02);
- Ozone; and
- Fine particulate matter that is less than 10 micron in diameter (PM10).

While the NES replace Ambient Air Quality Guidelines (AAQG) for a particular pollutant and averaging period, AAQG levels for pollutants (and averaging periods) not covered by the former still apply.

[4] Resource Management (National Environmental Standards Relating to Certain Air Pollutants, Dioxins, and Other Toxics) Regulations 2004

6.5.2 New Zealand Coastal Policy Statement 1994

6.5.2.1 Introduction

The NZCPS provides guidance on the management of the coastal environment

The New Zealand Coastal Policy Statement (NZCPS) provides guidance on the management of the coastal environment.

Policy statements and plans produced by regional and territorial authorities are required to give effect to the NZCPS. Matters addressed in the NZCPS include:

- Preservation of the natural environment;
- Protection of those characteristics of the coastal environment of special value to tangata whenua;
- Provision for appropriate subdivision, use and development of the coastal environment; and
- The Crown's interest in the land of the Crown in the CMA.

These matters are addressed within the objectives, policies, rules and other provisions of the Auckland Regional Policy Statement (RPS) and the Auckland Regional Plan: Coastal (ARP: C). The relevant provisions in these statutory documents are discussed within this chapter.

It is noted that the extent of the reclamation along the Causeway in Sector 4 of the Project determines the activity to be undertaken as a restricted coastal activity under Schedule 1 of the NZCPS.

6.5.2.2 National Priorities for the Preservation of Natural Character

Chapter 1 of the NZCPS provides policies relating to the preservation and/or protection of the coastal environment including protection from inappropriate subdivision, use and development. Generally, preservation and protection of indigenous vegetation, significant habitats of indigenous flora and fauna and protection of dynamic ecosystems are noted as national priorities.

6.5.2.3 Protection of Characteristics of Special Value to Tangata Whenua

Chapter 2 of the NZCPS provides policies relating to the protection of characteristics of the coastal environment of special value to Tangata Whenua e.g. waahi tapu, in accordance with tikanga Maori.

6.5.2.4 Activities Involving the Subdivision, Use or Development of areas of the Coastal Environment

Chapter 3 of the NZCPS provides policies relating to activities involving use and development of the coastal environment. The following are considered national priorities in the coastal environment:

- The maintenance and enhancement of amenity values;
- Providing for appropriate subdivision, use and development;
- Adoption of a precautionary approach;
- Recognition of natural hazards and provision for avoiding/mitigation their effects; and
- Maintenance and enhancement of public access to and along the CMA;

6.5.2.5 The Crown's Interest in Land of the Crown in the Coastal Marine Area

Chapter 4 of the NZCPS provides policies relating to Crown owned land in the coastal marine area. This includes taking into account the principles of the Treaty of Waitangi.

6.5.3 Auckland Regional Policy Statement 1999

The RPS sets out the strategic vision for the Auckland region

The Auckland Regional Policy Statement (RPS) sets out the strategic vision for the Auckland region and outlines objectives, policies, rules and methods for managing the use, development and protection of the region's natural and physical resources.

The aim of the RPS is to achieve the integrated, consistent and co-ordinated management of the Region's resources and to provide greater certainty over the ways that natural and physical resources are to be managed.

The RPS addresses a number of regional resource issues, including matters of significance to iwi, transport, energy and environmental protection (such as air, water quality and soil conservation).

The RPS has been amended a number of times[5] the most relevant two of which are:

- Proposed Change 6 – Giving effect to the Regional Growth Concept and Integrating Land Use and Transport (publicly notified on March 2005); and
- Proposed Change 8 – Volcanic Cones (publicly notified on September 2005).

There are four other amendments to the RPS (which are not yet operative), however these are not relevant to the Project.

The relevant chapters of the RPS and the proposed plan changes are described in more detail below.

6.5.3.1 Regional Overview and Strategic Direction

Chapter 2 of the RPS provides objectives and policies relating to the strategic framework for managing the significant environmental issues of the Region. The objectives and policies ensure that provision is made:

- to accommodate the Region's growth consistent with provisions of the RPS;
- to maintain and enhance the overall quality of the environment of metropolitan Auckland, including its unique maritime setting, volcanic features, cultural heritage values, and public open space;
- to preserve the natural character of the coastal environment and protect the intrinsic values of the Region's natural resources;
- to promote transport efficiency, and to encourage the efficient use of natural and physical resources, including urban land, infrastructure, and energy resources;
- to preserve and protect a representative range of the Region's heritage resources;
- to manage the Region's natural and physical resources in an integrated manner; and
- to involve the Tangata Whenua as kaitiaki of the Region's natural resources.

6.5.3.2 Matters of Significance to Iwi

Chapter 3 of the RPS contains objectives and policies relating to matters of significance to iwi. This includes providing for the social, economic and cultural wellbeing of Maori by sustaining the mauri of natural and physical resources.

[5] In total, there have been 11 Changes to the RPS, of which only two relevant remain proposed. It is noted that the RPS is currently under a full review. Throughout 2009 the ARC began drafting a revision of the RPS. A decision regarding further consultation and subsequent notification of the proposed RPS has confirmed that the release of the Proposed RPS has been deferred until the new Auckland Council is established, which will be in November 2010.

6.5.3.3 Transport

Chapter 4 of the RPS contains objectives and policies relating to transport matters. This includes avoiding, remedying and mitigating adverse effects of transport on the environment (e.g. adverse effects of transport on air quality, water quality, local amenities and infrastructure), and the development of a safe and accessible transport network.

6.5.3.4 Heritage

Chapter 6 of the RPS contains objectives and policies that are related to the protection of Auckland's natural and physical heritage resources including maintaining and enhancing public access to the Region's heritage resources including cultural heritage, natural heritage, matters of significant to tangata whenua, geological heritage and landscape (i.e volcanic cones).

6.5.3.5 Coastal Environment

Chapter 7 of the RPS includes objectives and policies related to the coastal environment, including preserving natural character, protecting outstanding natural features and landscapes, and enabling appropriate subdivision and development within the coastal environment.

6.5.3.6 Water Quality

Chapter 8 of the RPS contains objectives and policies relating to the maintenance and enhancement of water quality in the Auckland Region through comprehensive and integrated management approaches.

6.5.3.7 Water Conservation and Allocation

Chapter 9 of the RPS contains objectives and policies relating to managing water conservation and the allocation of water within streams such as the Oakley and Meola Creeks.

6.5.3.8 Air Quality

Chapter 10 of the RPS contains objectives and policies relating to air quality. This includes avoiding, remedying or mitigating the deterioration of air quality in the Region, and includes avoiding adverse effects that arise from the discharge of contaminants from motor vehicles.

6.5.3.9 Natural Hazards

Chapter 11 of the RPS contains objectives and policies relating to avoiding, remedying or mitigating the effects of natural hazards on human life, property and the environment, for example flood and erosion hazards.

6.5.3.10 Soil Conservation

Chapter 12 of the RPS contains objectives and policies relating to avoiding, remedying and mitigating adverse effects of activities that result in soil degradation and to minimise the effects of soil degradation on the water quality of receiving environments.

6.5.3.11 Esplanade Reserves/Strip

Chapter 18 of the RPS contains objectives, policies and mechanisms for identifying present and future needs for the setting aside of esplanade reserves or esplanade strips and related access strips.

6.5.3.12 RPS Proposed Change 6 (PC6) – Giving Effect to the Regional Growth Concept and Integrating Land use and Transport

PC6 gives effect to the Regional Growth Strategy and provides for the integration of land use and transport as a requirement of the LGAAA.

The LGAAA directs all Councils in the Auckland Region to integrate their land transport and land use provisions and ensure these are consistent with the Auckland Regional Growth Strategy, give effect to its Growth Concept and contribute to the land transport and land use matters specified in Sections 39 and 40 of the LGAAA.

PC6 predominately does this by changing the wording in Chapters 2 – Regional Overview and Strategic Direction and 4 – Transport of the RPS.

The ARC's decisions on the Proposed Change were notified in June 2007. The Proposed Change remains the subject of a number of outstanding Environment Court appeals that relate to provisions which are relevant to the Project.

In particular, appeals on provisions in the Proposed Change regarding the integration of land use and transport networks, and other transport related issues, have been largely resolved by a draft consent order that was lodged with the Court in March 2010[6].

All appeals on the infrastructure provisions in the Proposed Change remain unresolved and are the subject of ongoing appeal discussions between relevant parties.

6.5.3.13 RPS Proposed Change 8 – Landscape and Volcanic Cones

Proposed Change 8 amends the existing volcanic cone view shaft provisions of Chapter 6 (Heritage) of the RPS and introduces new issues, objectives, policies and methods relating to the protection, maintenance and enhancement of volcanic features.

The boundaries of Regionally Significant Volcanic Features (RSVFs) (including Mt Albert) will be clearly shown in a new Map Series 2a.

Proposed Change 8 also revised volcanic cone viewshafts (including viewshaft A13, which crosses Great North Road in the location of the proposed tunnel alignment). As a result of Auckland City Council's appeal regarding the viewshafts, the ARC has agreed to resurvey a number of view-shafts, including A13, and the ARC have advised that they consider that any consequential changes will need to be addressed via a subsequent change to the RPS.

6.5.4 Auckland Regional Plan: Coastal 2004

The purpose of the Auckland Regional Plan: Coastal (ARP: C) is to provide a framework to promote the integrated and sustainable management of Auckland's coastal environment. The ARP:C is a "coastal environment plan" that includes the Coastal Marine Area (CMA), the active coastal zone and a landward component.

The ARP: C promotes the integrated and sustainable management of Auckland's coastal environment

The ARP:C contains objectives and policies that apply to the broader coastal environment and rules that have effect over the CMA.

The CMA extends from mean high water spring tide mark to the 12 mile territorial limit. Within the Auckland region it is divided into a number of management areas based on their use and values. Areas of significant ecological, landform or geological value are identified as Coastal Protection Areas (CPA). The Project has the potential to directly affect a Coastal Protection Area 1 (seaward side of the Causeway at the mouth of Oakley Creek) and Coastal Protection Area 2 (landward side of the Causeway).

[6] However, that draft consent order has been placed 'on hold' by the Court to enable relevant parties to resolve (through appeal discussions) related issues that were raised in other appeals on the proposed change.

The ARP:C is operative with the exception of provisions subject to Variations and proposed Plan Changes. Relevant to the Project is Variation 1: Stormwater and wastewater network discharges (which seeks to achieve consistency with provisions of the Auckland Regional Plan: Air, Land and Water) and Proposed Change 4: Mangrove Removal. The ARP:C relates to the CMA within Sectors 2, 3, 4 and 5 of the Project. The relevant chapters of the ARP: C, Variation 1 and Proposed Change 4 are described in more detail below.

6.5.4.1 Chapter 3 – Natural Character

The objectives and policies in Chapter 3 relate to preserving the natural character of the coastal environment by protecting the CMA and encouraging appropriate development within the CMA.

6.5.4.2 Chapter 4 – Landscape

The objectives and policies in Chapter 4 relate to protecting outstanding landscapes and enhancing the diversity, integrity and quality of the CMA.

6.5.4.3 Chapter 5 – Natural features and eco-systems

The objectives and policies in Chapter 5 relate to natural features and ecosystems. They relate to the protection of natural processes and recognising their intrinsic value, the rehabilitation of the CMA, the avoidance of inappropriate development and avoiding remedying or mitigating the adverse effects of development on the natural features of the CMA.

6.5.4.4 Chapter 6 – Coastal Matters of Significance to Tangata Whenua

The objectives and policies in Chapter 6 relate to coastal matters of significance to Tangata Whenua. This includes characteristics of special spiritual, historical and cultural significance. Provisions sustain the mauri of natural and physical resources of the coastal environment, and enable the provision for the social, economic and cultural wellbeing of Maori.

6.5.4.5 Chapter 7 – Public Access

The objectives and policies in Chapter 7 relate to maintaining and enhancing public access to the coast.

6.5.4.6 Chapter 8 – Cultural Heritage

The objectives and policies in Chapter 8 relate to cultural heritage in the coastal environment. This includes the preservation and protection of significant cultural heritage sites, buildings, places or other areas within the coastal environment.

6.5.4.7 Chapter 9 – Subdivision, Use and Development

The objectives and policies in Chapter 9 seek to provide for the appropriate development of the coastal environment while recognising the importance of the coast at a regional and national level.

6.5.4.8 Chapter 10 – General (including Occupation)

The objectives, policies and rules in Chapter 10 relate to occupation of the CMA under section 12(2) of the RMA.

6.5.4.9 Chapter 11 – Activities

The objectives, policies and rules in Chapter 11 relate to activities, under Section 12(3) of the RMA which are located in, or utilise the CMA. These provisions provide for a wide range of appropriate activities to use the CMA efficiently.

6.5.4.10 Chapter 12 – Structures

The objectives, policies and rules in Chapter 12 relates to the location of structures within the CMA, under Section 12(1) of the RMA. These provisions provide for appropriate structures in the CMA, while avoiding, remedying or mitigating adverse effects on the environment. Alternative locations, reclamation effects and effects on natural character, tangata whenua, coastal processes and vegetation are addressed.

6.5.4.11 Chapter 13 – Reclamation and Drainage

The objectives, policies and rules in Chapter 13 relate to the reclamation and drainage effects of the foreshore and seabed, under Section 12(1) of the RMA. The provisions avoid inappropriate reclamation and drainage of the coastal environment by ensuring the adverse environmental effects are avoided, remedied or mitigated.

6.5.4.12 Chapter 16 – Disturbance of Foreshore and Seabed III: Other than dredging or extraction

The objectives, policies and rules in Chapter 16 relate to providing appropriate activities which disturb the foreshore and seabed while avoiding, remedying or mitigating adverse effects on the coastal environment, under Sections12(1) and 15(1) of the RMA. The provisions of this chapter apply to all disturbance activities, except those covered by, or consequential to, an activity addressed by another chapter of the ARP:C, unless otherwise stated.

6.5.4.13 Chapter 19 – Taking, Use, Damming or Diverting Water

The objectives, policies and rules in Chapter 19 relate to the taking, using, damming or diverting of coastal water under Sections 14(1) and (2) of the RMA. The provisions provide for the appropriate take, use or diversion of water within the CMA while avoiding, remedying or mitigating adverse environment effects. The provisions of this chapter apply to all management areas in the ARP:C.

6.5.4.14 Chapter 20 – Discharge of Contaminants

The objectives, policies and rules in Chapter 20 relate to the discharge of contaminants under Section 15 of the RMA. The provisions aim to maintain appropriate water and sediment quality in the CMA and to enhance water and sediment quality where practicable in the parts of the CMA where water and sediment quality is degraded. The provisions also provide for the adoption of the best practicable option for avoiding, remedying or mitigating the adverse effects from stormwater discharges on the coastal environment.

6.5.4.15 Chapter 21 – Natural Coastal Hazards

The objectives and policies in Chapter 21 provide for the control the use of land in the coastal environment to ensure the adverse effects of natural coastal hazards are avoided or mitigated.

6.5.4.16 Variation 1: Stormwater and Wastewater Network Discharges

The ARC notified its decisions on Variation 1: Stormwater and Wastewater Network Discharges in October 2004. Variation 1 remains the subject of a number of outstanding Environment Court appeals, which are being case managed with related appeals on the ARP: ALW and are the subject of ongoing appeal discussions between relevant parties. Variation 1 proposes amendments to Chapters 10 and 20 of the ARP: C to provide consistency with related stormwater and wastewater network discharge provisions contained in the ARP: ALW.

6.5.4.17 Proposed Plan Change 4: Mangrove Removal

The ARC released decisions for Proposed Plan Change 4: Mangrove Removal (PPC4) in February 2009 and this is currently under appeal. The ARC advises that it has reached agreement for settlement with the remaining appellant (Federated Farmers) and that consent orders will be sought from the Environment Court. The Plan Change amends the objectives, policies and rules within Chapter 16 of the ARP:C.

Under PPC4 the use of motor vehicles in the CMA is permitted on existing lawful structures under Rule 16.5.11A (this will include motorway bridges as the Causeway is not part of the CMA, vehicle use on it is not affected by the Coastal Plan). Otherwise under PPC4, the use of motor vehicles is a non-complying activity (under Rule 16.5.22) in other parts of the CPA1 and a restricted discretionary activity in all other CMA areas (under Rule 16.5.14). None of the rules relating to motor vehicles use are subject to appeal.

Vegetation removal (including mangrove removal) for the purposes of construction of infrastructure is a discretionary activity under PPC4 in the CMA (Rule 16.5.15), CPA 2 (Rule 16.5.16) and CPA 1 (Rule 16.5.17) areas. In CPA 1 areas, vegetation removal is discretionary where required for the purpose of "providing public infrastructure where there is no practicable alternative location outside of the coastal protection area that would achieve a better environmental outcome". Rule 16.5.17 is under appeal, but the relevant appeal sought less stringent controls on vegetation removal in the CPA1 and the ARC have advised that the proposed settlement involves no amendment to the decision version of Rule 16.5.17[7].

[7] Vegetation removal in the CPA1 for the purposes of the Project should therefore has been assessed as a discretionary activity

6.5.5 Auckland Regional Plan: Sediment Control 1993

The ARP: SC promotes a sediment control programme

The Auckland Regional Plan: Sediment Control (ARP: SC) was made operative in November 2001 and addresses the issues of elevated sediment generation and discharge from areas subject to land disturbance. The ARP:SC seeks to promote a sediment control programme, through the introduction of objectives and policies, rules and methods to avoid, remedy or mitigate adverse effects resulting from sediment laden discharges entering the receiving environment.

The ARP:SC relates to of the Project. The relevant chapters of the ARP:SC are described in more detail below:

6.5.5.1 Chapter 5 – Regulation

The objectives and policies in Chapter 5 relate to regulation. The provisions provide for the maintenance or enhancement the quality of water in waterbodies and coastal water. The provisions also attempt to sustain the mauri of water in waterbodies and coastal waters, ancestral lands, sites, waahi tapu and other taonga. The plan requires that projects employ methods which avoid, remedy or mitigate adverse effects on the quality of water in waterbodies and coastal waters.

6.5.5.2 Chapter 7 – Minimum Earthwork Strategies

The objectives and policies in Chapter 7 relate to earthworks strategies. This includes reducing the exposure of land to the risk of surface erosion leading to sediment generation and minimising sediment discharge to the receiving environment.

6.5.6 Proposed Auckland Regional Plan: Air, Land and Water

The Proposed Auckland Regional Plan: Air, Land and Water (ARP: ALW) is the key mechanism for implementing the ARC's functions under the RMA, in relation to the management of air, land and water resources (excluding the management of resources within the CMA which is covered by the ARP:C and the management of land disturbance which is covered by the ARP:SC).

The ARP: ALW applies to the management of air, land and water resources in the region including: air, soil, rivers and streams, lakes, groundwater, wetlands and geothermal water.

The ARC notified its decisions on the ARP: ALW in October 2004. Appeals on the ARP: ALW have now been largely resolved by way of consent order or determination by the Environment Court. However, a number of appeals remain outstanding. In particular, appeals on the stormwater and wastewater network and non-network provisions (Chapter 5) and the financial contribution provisions (Chapter 8) of the ARP: ALW remain unresolved and are the subject of ongoing appeal discussions between relevant parties.

The ARP: ALW relates to the stormwater, discharge of contaminants to land/groundwater, taking/use/diversion of groundwater, disturbance of stream beds and the reclamation of stream beds elements of the Project. The relevant chapters of the ARP: ALW are described in more detail below:

6.5.6.1 Chapter 2.1 - Natural Values

The objectives and policies within Chapter 2.1 relate to the management of effects on several of the matters of national importance identified in Sections 6 (a) and (c) of the RMA. These matters are:

> *(a) The preservation of the natural character of wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use and development; and*
>
> *(c) The protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna.*

6.5.6.2 Chapter 2.2 - Use and Development

The objectives and policies in Chapter 2.2 provide for managing the use and development of natural and physical resources in an appropriate manner.

6.5.6.3 Chapter 2.3 - Tangata Whenua Values

The objectives and policies in Chapter 2.3 provide for matters of significance to Tangata Whenua. This includes sustaining the mauri of natural and physical resources in ways which enable provision for the social, economic and cultural wellbeing of Mäori.

6.5.6.4 Chapter 4 – Air Quality

Chapter 4 of the ARP: ALW sets out objectives, policies and rules for managing discharges to air. While transport and mobile sources are recognised as sources of contaminant to air, there are no Rules in the ARP: ALW that relate to these. The objectives and policies provide for the appropriate management of adverse effects of discharges to air and the management of land use activities for the purpose of air quality.

6.5.6.5 Chapter 5 – Discharges

The objectives, policies and rules in Chapter 5 address discharges to land or water, and acknowledge that vehicle use is a major cause of stormwater contamination. The objectives and policies provide for the appropriate management of adverse effects of stormwater discharges and the management of land containing elevated levels of contaminants including contaminated land.

6.5.6.6 Chapter 6 – Water Allocation

The objectives, policies and rules in Chapter 6 relate to freshwater, including taking and diverting groundwater. This includes maintaining the flows of surface water and maintaining water quality. The provisions also provide for the avoidance, remedy or mitigation of adverse effects of stormwater discharges to streams and the diversion of groundwater on surface water bodies and neighbouring structures.

6.5.6.7 Chapter 7 – Beds of Lakes and Rivers and Diversion of Surface Water

The objectives, policies and rules of Chapter 7 relate to activities within the beds of lakes and rivers and diversion of surface water. This includes maintaining and enhancing where practicable, the natural character of streams and avoiding, remedying or mitigating adverse effects of activities and structures in, on, under or over the beds of streams within the Auckland Region.

6.5.7 Transitional Regional Plan (TRP) 1991

The Transitional Regional Plan (TRP) was established in October 1991. It comprises a number of instruments that were put in place prior to the RMA being enacted. Until the ARP: ALW is finalised, the TRP is the operative plan for the Auckland Region. The TRP consists of general authorisations (or permitted activities), it has no policies or objectives and the rules are more stringent than those in the ARP: ALW. Further details of specific activities requiring resource consent as innominate applications addressed in the TRP are included in the resource consent assessment in Chapter 23 of this document.

6.5.8 Auckland City District Plan (Isthmus Section) 1999

The Auckland City District Plan: Isthmus Section 1999 (Auckland District Plan) contains the planning policies and rules for activities and development on the Isthmus.

The Project works are in land of the Auckland District Plan

6.5.8.1 Roading Provisions in the Auckland District Plan

The Auckland District Plan has applied a special purpose zone (Special Purpose 3) to all significant transport infrastructures whereby most transportation and utility services are permitted. Application of the Special Purpose 3 zone is expected to result in the protection of the Isthmus' significant transport corridors for continued use as transport modes and for alternative use as a conveyor of utility services. The zone restricts other activities and development to ensure that the land to which the zone is applied is not used for inappropriate activities.

The Special Purpose 3 zone provides for "any facility designed primarily for the movement of people and/or goods" as a permitted activity in Rule 10.7.3.1.

A road or motorway is considered to be a resource designed primarily for the movement of people and/or goods.

The Auckland District Plan also has a separate provision for Network Utility Services, which are defined in Part 13 of the Auckland District Plan as,

> *any activity relating to:*
>
> *(f) Construction, operation and maintenance of railway lines, tramways and roads;...*

The construction (including earthworks), operation and maintenance of roads is a permitted activity pursuant to Rule 4A.4.6 of the Auckland District Plan throughout the Isthmus and includes,

- Footways and footbridges over roads, motorways and railways; and

- Bridges for roads, tramways, railways and underpasses and retaining walls.

As Rule 4A.4.6 specifically excludes motorways from the definition of a road, the construction, operation and maintenance of the motorway cannot be considered as a permitted activity.

6.5.8.2 Adjoining Zones and Designations

The existing motorway corridor for SH16 is designated in the Auckland District Plan as "Motorway" (Designation Reference A07-01), located within Sectors 2 to 6 and traverses through a number of zones including:

- Special Purpose 2 and 3 zones;
- Open Space 1, 3 and 4 zones; and
- Business 6.

The zones adjoining the proposed SH20 alignment located within Sectors 5 to 9 include:

- Residential 5, 6a, 6b and 7a;
- Open Space 1, 2 and 3;
- Special Purpose 2 and 3; and
- Business 1, 2, 8 and mixed use.

Traherne Island and Pollen Island are identified as Significant Ecological Areas in Plan Change 88 and zoned Open Space 1 (Conservation) in the Auckland District Plan. They are categorised as Ecological Area A's which are older, rarer natural areas which retain a high degree of natural value.

There are a number of designations in the District affected by the Project. These are discussed further in Chapter 7 of the AEE and in the assessments relevant to each Sector (Part D).

A Coastal Management Area (Reference B04-01) is also located within Sector 5 in the Auckland District Plan however Rule 5B.7 specifically provides for "the maintenance and construction of roads within the meaning of Section 43 of the Transit NZ Act 1989" as a permitted activity within the Coastal Management Area.

6.5.8.3 Part 12 – Transportation

The objectives and policies in Part 12 of the Auckland District Plan recognise that the City's transportation system must cater for movements into and across the City and that due to traffic growth the ability for critical sections of the motorway to cater for higher levels of traffic is limited. Therefore an upgrade of these congested corridors is required to improve accessibility.

6.5.8.4 Part 5(b) – Coastal

The objectives and policies in Part 5b recognise the importance of the coastal environment to the economy and lifestyle of people living in the Auckland Isthmus area. The District Plan identifies objectives and policies for the management of the natural environment in terms of Auckland's identity and urban amenity.

6.5.8.5 Part 5(c) – Heritage

The objectives and policies in Part 5c recognise that Heritage resources are an essential part of the City's cultural values and that conservation of these resources enhance the identity and amenity of the City.

6.5.8.6 Part 7 – Residential

The objectives and policies in Part 7 encourage suitable levels of residential intensification in appropriate locations. The Project generally extends over residential land uses zoned 6a and 6b (medium density). The Residential 6 zone covers the largest area of residential land in the Isthmus, and is characterised by a diverse form of residential living, and is principally located on roads off the primary network.

6.5.8.7 Part 8 – Business

The objectives and policies in Part 8 provide for business activity while ensuring the sustainable management of the natural and physical resources of the City. The Auckland District Plan aims to ensure that the adverse effects of business activity are avoided or reduced to acceptable levels.

The Project extends over a small number of parcels zoned Business 4, 8 and Mixed Use within Sector 9. These zones are located in areas that are experiencing an increase in residential activity and are identified as future growth areas which can support alternative modes of transport.

The Project also extends over a small number of parcels zoned Business 6 within Sector 3. This zone is located in areas of heavy, noxious or otherwise unpleasant industrial and commercial activity.

6.5.8.8 Part 9 – Open Space

The objectives and policies in Part 9 for the recognition, maintenance and where possible, enhancement of reserves and open space areas within the City. The Project extends over a variety of Open Space zoned land. This includes Open Space 3 zoned land for recreation/organised sports (e.g. Rosebank Park Domain, Waterview Reserve and portions of Alan Wood Reserve), Open Space 2 zoned land for informal recreation (e.g. Oakley Creek Esplanade Reserve, Hendon Park and portions of Alan Wood Reserve), and Open Space 1 zoned land for conservation (e.g. Pollen Island, Traherne Island, Cowley Reserve and Waterview Esplanade Reserve). The tunnel alignment partially underlies other areas zoned Open Space 3 (Phyllis Reserve and Harbutt Reserve).

6.5.8.9 Part 10 – Special Purpose Zone (Transport Corridor)

The objectives and policies in Part 10 provide for transportation links which allow for the sustainable management of privately owned and strategically important land. The Special Purpose 3 Zone is applied to strategic roads, which are a valuable transport resource for protection of the corridors for transport use. The expected outcome is "the protection of the Isthmus' significant transportation corridors for the continued use as transport modes and for alternative use as a conveyor of utility services".

6.5.9 Waitakere City District Plan 1995

The Waitakere City District Plan ("Waitakere District Plan") was made operative in 2003. All roads in Waitakere City are zoned Transport Environment. The Transport Environment Rules contained within the Waitakere District Plan provide for infrastructure as a permitted activity subject to Rule 5 of the Transport Environment Section.

The Project works are in land of the Waitakere District Plan

The existing SH 16 motorway corridor affected by the Project is designated in the Waitakere District Plan as "Auckland-Kumeu Motorway (SH1)" (District Plan reference the NZTA1) with the NZTA as the requiring authority. The existing corridor traverses through the following Human Environment Zones:

- Transport Environment;
- Open Space; and
- Living 1.

The corridor also traverses through the following Natural Areas:

- 20m Coastal Edge;
- Coastal Natural Area;
- Ecological Linkage Opportunity;
- Riparian Margin (10m); and
- Non Riparian Stream.

The following discussion of objectives and policies focuses initially on those parts of the Waitakere District Plan relating to transportation.

6.5.9.1 Section 5.0 – Managing City Growth

The objectives and policies in Section 5.0 recognise the need to manage growth in such a way that will ensure the City develops and redevelops to achieve a sustainable compact urban form in a manner that appropriately manages adverse cumulative effects and reverse sensitivity issues.

6.5.9.2 Section 5.1 – Effects on Water: Quality and Quantity

The objectives and policies in Section 5.1 recognise the need to maintain the quality and quantity of existing waterways in Waitakere City.

6.5.9.3 Section 5.2 – Effects on Native Vegetation and Fauna Habitat

The objectives and policies in Section 5.2 focus on protecting, maintaining and enhancing the native vegetation and fauna habitat within Waitakere City.

6.5.9.4 Section 5.3 – Effects on Land (Including Soils)

The objectives and policies in Section 5.3 focus on the need to maintain the life supporting capacity of the City's land resource.

6.5.9.5 Section 5.5 – Effects on Ecosystem Stability

The objectives and policies in Section 5.5 seek to protect processes of natural regeneration within the City, and promote and maintain links between areas of significant and outstanding native vegetation and fauna habitat, so that their resilience is protected and enhanced.

6.5.9.6 Section 5.7 – Effects on Natural Character of the Coast and Margins of Lakes, Rivers and Wetlands

The objectives and policies in Section 5.7 seek to preserve and enhance the natural character of the City's coastal environment and lakes, rivers and wetlands and their margins, including preserving the action on the land of those processes which form that natural character.

6.5.9.7 Section 5.8 – Effects on the Spiritual Dimension (Mauri)

The objectives and policies in Section 5.8 seek to protect and maintain those aspects of the environment that are of significance to tangata whenua.

6.5.9.8 Section 5.10 – Effects on Amenity Values (Health and Safety)

The objectives and policies in Section 5.10 seek to maintain and enhance those natural and physical characteristics (amenity values) that contribute to the wellbeing of residents and workers.

6.5.9.9 Section 5.11 – Effects on Amenity Values – Landscapes, Local Areas and Neighbourhood Character

The objectives and policies in Section 5.11 seek to achieve a quality of settlement and associated activities within each of the City's Human Environments which is sympathetic to, and protects and enhances, the dominant natural and physical (including building) features which contribute to the amenity value and the neighbourhood character of an area.

6.5.9.10 Designations

As for the Auckland District Plan, there are a number of designations in the Waitakere District Plan affected by the Project. These are discussed further in Chapter 7 of the AEE and in the assessments relevant to each Sector (Part D).

6.5.10 Other Relevant Non-Statutory Documents

There are a number of non-statutory documents that are considered 'other matters' for the Project

There are a number of non-statutory documents that are considered 'other matters' for the Project, including the following:

- Government Policy Statement on Land Transport Funding 2009/10-2018/19;
- New Zealand Transport Strategy 2008;
- New Zealand Urban Design Protocol 2005;
- Auckland Regional Land Transport Strategy 2010;
- Auckland Regional Transport Plan 2009;
- Auckland Regional Public Transport Plan 2010;
- Auckland Regional Freight Strategy 2006;
- Auckland Regional Arterial Road Plan 2009;
- Auckland Passenger Transport Network Plan 2006-2016;
- Auckland Regional Growth Strategy 1999;
- Auckland Regional Economic Development Strategy 2002-2022;
- Auckland Regional Open Space Strategy 2005;
- ARTA Sustainable Transport Plan;
- Auckland City Growth Management Strategy 2003;
- Auckland Liveable Arterials Plan 2007;
- Auckland City Council Future Planning Framework 2008;
- Auckland City Draft Cycling and Walking Framework 2007;
- Auckland City Economic Development Strategy 2008;
- Auckland City - Our Collective Taonga: Places for people, places for nature 2008;
- Waitakere City Growth Management Strategy 2009;
- Waitakere City Transport Strategy 2006 - 2016;
- Waitakere Walking and Cycling Strategy 2005;
- the NZTA National State Highway Strategy 2007;
- the NZTA National Land Transport Programme 2009-2012;

- the NZTA State Highway Forecast 2008/09-2017/18;
- the NZTA Planning Policy Manual 2007;
- the NZTA Environmental Plan 2008; and
- the NZTA Walking and Cycling Strategy 2008.

6.5.10.1 Government Policy Statement on Land Transport Funding 2009/10 - 2018/19

The Government Policy Statement (GPS) highlights that the Government's main priority is national economic growth and productivity. Within the GPS the Government has identified seven 'Roads of National Significance' as a statement of national road development priorities. The completion of the Auckland Western Ring Route is identified as one of the seven Roads of National Significance.

6.5.10.2 New Zealand Transport Strategy 2008

The New Zealand Transport Strategy (NZTS) was developed in 2002, more recently updated in 2008. The vision of the NZTS is that by "2010 New Zealand will have an affordable, integrated, safe, responsive and sustainable transport system".

The Strategy's objectives are:

- assisting economic development
- safety and personal security
- access and mobility
- protecting and promoting public health
- ensuring environmental sustainability

The main themes under these headings include:

- Assisting economic development: Social, economic and environmental costs and benefits, minimising transport growth and energy consumption, a focus on non car modes and other alternatives to roading, management of the existing transport system, transport meeting its total costs, congestion pricing and the distribution of surface transport costs.
- Safety and personal security: reduce car use, road safety education, engineering, enforcement and management systems, regulation, safety for the aged and children, personal security and passenger transport.
- Access and Mobility: promote optimal use of different modes of transport through pricing and funding, improve access for the disadvantaged, sharing road space with other modes via road space management, provide choice, and improve passenger transport and pedestrian facilities.

- Protecting and promoting public health: promote walking and cycling, encourage reduced car use, reduce emissions, reduce run-off, noise and promote passenger transport use.
- Ensuring environmental sustainability: increase energy efficiency, enhance mobility by promoting alternatives to roads, reduce traffic growth, integration of transport modes, reduce the need for travel through increase use of public transport to 7% of all trips by 2040 and develop more efficient urban forms.

6.5.10.3 New Zealand Urban Design Protocol 2005 (NZUDP)

The New Zealand Urban Design Protocol (NZUDP) seeks to ensure that quality urban design is applied when designing networks and buildings. The NZUDP identifies seven essential key design qualities that together create quality urban design (context, character, choice, connections, creativity, custodianship and collaboration). The NZUDP has been taken into account in the development of the Urban Design and Landscape Plans (Part F.16). The Urban and Landscape Design Framework has also provided the broad urban design principles within the content of which detailed design has been developed (though it is noted that this has informed rather than been part of the Project).

6.5.10.4 Auckland Regional Land Transport Strategy 2010-2040

The LTMA 2003 requires regional authorities to produce regional land transport strategies that contribute to the overall aim of achieving an integrated safe, responsive, and sustainable land transport system. The Auckland Regional Land Transport Strategy 2010 (RLTS) provides policies to develop standards and guidelines on how the strategic and regional transport networks should be managed through to 2040. The strategy sets out what is needed to develop a transport network that supports Auckland as a great and successful society, economy and environment.

The objectives of the RLTS support the ARGS by providing focus on measures such as reducing reliance on private vehicles and providing for transport alternatives

The RLTS's vision is for a transport system that Aucklanders are proud of, *"where:*

- *people and goods are able to move when and where necessary;*
- *the transport supports vibrant, well designed, attractive and environmentally sustainable urban and rural centres, business and economic activity, and access to social, cultural and recreational activities;*
- *the streets are safe and attractive places for people and the community;*
- *the distinct volcanic and coastal (whenua, moana/awa) character of the region and the cultural values of its inhabitants (nga tangata katoa) is protected and enhanced;*

- *getting around by all modes is integrated, safe, effective, and accessible to all including people with disabilities;*
- *people have choices which enable them to participate equitably in society, especially those with mobility issues, such as children and the elderly, and those most disadvantaged;*
- *the natural environment and human health are protected and enhanced;*
- *the transport resources are used efficiently, supported by sustainable, innovative design practices and*
- *the transport system is resilient in the event of shocks and is adaptable to change.*

"The RLTS recognises the completion of the WRR and the Waterview Connection as key elements of the strategic land transport network (Map4 of the RLTS). The RLTS states that "the Western Ring Route… provides a strong connection between the North Shore, West Auckland and South Auckland and also provides an alternative north – south route through the region from a little south of Albany to Manukau City Centre… Completion of the Western Ring Route is scheduled for completion within the first 10 years of this strategy".

The strategic context provided by the RLTS is discussed in section 23 of this AEE.

6.5.10.5 Auckland Transport Plan 2009 (ATP)

The Auckland Transport Plan (ATP) has been prepared by the Auckland Regional Transport Authority (ARTA), in collaboration with the NZTA, KiwiRail, the Auckland Regional Council, and the seven territorial authorities in the region (Rodney District, North Shore City, Waitakere City, Auckland City, Manukau City, Papakura District and Franklin District Councils). It has been prepared as a single, comprehensive transport plan for the region until 2019 and beyond, and outlines priorities and the phasing of projects for the delivery of an integrated and efficient transport system.

The priorities are:

1) Greater focus on regional arterials;
2) Greater focus on safety engineering for streets and roads;
3) Optimising the use of the existing transport system to move people and goods;
4) Strong focus on transport investments that support the Regional Growth Strategy and integrated land use and transport planning; and
5) Completing the key elements of the strategic roading, passenger transport, walking and cycling networks.

The region's vision is for an integrated road, rail, bus, ferry, cycle and walking network, giving effective access to transport for people and goods, including an integrated

passenger transport system that provides an alternative to the use of private vehicles.

The ATP will assist cooperative action between all agencies involved in transport and will enable the prioritisation of funds. The Waterview Connection is included within the ATP.

6.5.10.6 Auckland Regional Public Transport Plan 2010

ARTA's Auckland Regional Public Transport Plan specifies how ARTA will give effect to the public transport components of the 2010 RLTS. The Plan also provides the policy framework for the transformation of Auckland's public transport system, building on the strategic direction established in the RLTS and the Passenger Transport Network Plan (PTNP). This involves the development of an integrated public transport network based on the a number of service layers including development of

- The Rapid Transit Network (RTN), which forms the backbone of the system and provides fast, high-frequency service in its own right of way, unaffected by traffic congestion;
- The Quality Transit Network (QTN), providing a network of high-frequency, high-quality services, mainly with buses, with bus priority measures operating between key centres and over major corridors; and
- The Local Connector Network (LCN), providing low to medium-frequency bus, ferry and train services that provide access to local centres and connect with the RTN and QTN.

6.5.10.7 Auckland Regional Freight Strategy 2006

This Auckland Regional Freight Strategy promotes the efficient, safe and environmentally sustainable distribution of freight within the Auckland region. The Strategy assesses the current situation and trends for freight in the region. It then sets out an agreed vision, key objectives, policies, actions and priorities for freight movement, both to address current issues and, over the longer term, deal with the evolving pattern of development across the region.

6.5.10.8 Regional Arterial Road Plan 2009

This Regional Arterial Road Plan has been prepared by ARTA, in collaboration with the region's road controlling authorities and other key transport stakeholders. The development of this Plan arises from the 2005 Auckland Regional Land Transport Strategy (RLTS), and recognises the important role that regional arterial roads play in Auckland's transport network. Regional arterial roads link districts or urban areas within the region, connect regionally significant facilities, and play a critical role in the movement of people and goods within the region. It is essential that they operate efficiently and effectively, and

are managed and developed in a manner that is sensitive to the surrounding environment.

The purposes of the Plan are four-fold:

- To define the existing and future role and function of regional arterial roads;
- To provide a framework for the integrated management of regional arterial roads, and their interaction with surrounding land uses and other parts of the road network;
- To provide a basis for project prioritisation; and
- To develop a rationale for more appropriate funding for regional arterial roads.

The Plan sets out regional policies for the integrated management of regional arterial roads, and provides guidance for road controlling authorities in the development of more detailed corridor management plans. The Plan identifies the proposed Waterview extension as a strategic arterial road.

6.5.10.9 Auckland Passenger Transport Network Plan 2006-2016

ARTA's 10-year Passenger Transport Network Plan (PTNP) has been developed in consultation with Auckland's territorial authorities (TAs) and is intended to help guide TAs, the NZTA and the New Zealand Railways Corporation in their long-term funding decisions.

Fundamental to the PTNP is the development of a rapid transit network, a quality transit network and an integrated network for the Auckland region. Essential elements of the Plan include: a modern electrified rail system which by the year 2030 could carry 30 million passengers per year; an expanded busway system based on the highly successful Northern Busway and associated services; the design of an integrated network which connects train, bus and ferry services; and an integrated ticketing system and simplified fare structure allowing residents to travel around the network with ease.

ARTA will be working with both the Auckland Regional Council and Central Government (and its various agencies) to ensure that the required level of investment is made available to fund and implement the PTNP.

6.5.10.10 Auckland Regional Growth Strategy 1999 (ARGS)

The ARGS was adopted by the regions councils in 1999. The purpose of the ARGS is to *"ensure growth is accommodated in a way that meets the best interests of the inhabitants of the Auckland Region".* The ARGS is a 50 year strategy which outlines at a broad level the Region's desired response to growth with a more compact urban form. This vision involves sustaining:

- Strong, supportive communities;
- A high-quality living environment;

- A region that is easy to get around; and
- Protection of the coast and surrounding natural environment.

Chapter 2 of the ARGS is relevant to the Project. It outlines desired regional outcomes, priorities and principles. Among the desired and critical outcomes is Access and Transport Efficiency, which is defined as *"more transport choices and high levels of access for all sections of the community, a closer relationship between home and work, activities, shopping, open space etc., managing traffic congestion and a better passenger transport system".*

A subsequent principle of the ARGS to be applied to the whole Auckland Region is recognising *"different types and functions of transport corridors and their relationship with adjoining land uses such as the location of freight forwarding/distribution near motorways and/or rapid the NZTA interchanges or the location of housing and community facilities near passenger transport."*

Chapter 3 of the ARGS details the key features of the ARGS by concept. In relation to accessibility, it is noted that the region's transport needs can be improved by *"completing…transport networks to provide alternative routes."* The ARGS notes the importance of maintaining north/south accessibility.

6.5.10.11 Auckland Regional Economic Development Strategy 2002

The Auckland Regional Economic Development Strategy (AREDS) was developed in partnership with a wide range of stakeholders throughout the Auckland region in 2002. The Strategy is primarily centred on a number of Programmes which are overarching objectives.

Programme 5 ('provide a high quality living environment') within the AREDS highlights the need for investment, coordination and capacity planning of transport which supports the Project. This Programme also recognises the historic under investment in the infrastructure and how this is an issue for the region. The AREDS emphasises the need to *"ensure that infrastructure and service provision supports key industries, companies and events, and is flexible and integrated across the region"*.

6.5.10.12 Auckland Regional Open Space Strategy 2005

The Auckland Regional Open Space Strategy (OSS) seeks to build a linked and integrated regional open space network that not only enhances our overall quality of life and provides all Aucklanders with opportunities to experience a diverse range of accessible open space, but also protects significant natural ecosystems, habitats and landscapes that contribute to the region's unique identity.

The OSS makes no reference to the relationship of provision of transport to the pressures placed upon open space by regional transport demands. However it does note the future '*opportunities to improve accessibility through the integration of open space planning with the planning and provision of transport infrastructure and urban services, such as stormwater management ('green infrastructure')'.* The OSS also highlights the need for transport corridors to facilitate increased accessibility to these open spaces and the potential transport corridors have in incorporating open space along the edges of these.

6.5.10.13 ARTA Sustainable Transport Plan 2006-2016

The Sustainable Transport Plan sets out action plans to improve walking and cycling networks and provides land-use guidelines for development across the regional network.

6.5.10.14 Auckland City Growth Management Strategy 2003

The Auckland City Growth Management Strategy has been developed by Auckland City Council in order to fulfil its obligations in respect of implementing the ARGS concept and principles within the Auckland Isthmus. The Strategy states that the completion of the Auckland motorway system is a priority, to complement investment in passenger transport including rail, bus and ferries.

Point Chevalier, Avondale, Mt Albert, Mt Roskill and Stoddard Road have all been identified as areas of residential and mixed use change within this Strategy, while Rosebank Peninsula and the Roma Road/Stoddard Road area have also been identified as business development areas.

6.5.10.15 Auckland City Council Liveable Arterials Plan 2007

The Liveable Arterials Plan is based on establishing a functionality plan and street network that will best enable good land use and development decisions. These will occur in the context of large-scale urban form changes over the next 25 years. The result of this process, the Liveable Arterials Plan, is then supported by detailed guidance of the type of outcomes envisaged for particular arterial corridors and parts of corridors.

6.5.10.16 Auckland City Council Future Planning Framework (FPF) 2008

The Future Planning Framework (FPF) has been developed to support Auckland City Council's overarching vision for Auckland City and its high-level strategies. The vision and strategies reflect the community outcomes defined in the Council's 10 year plan. The Framework comprises a synopsis of the research recently completed, a citywide spatial framework and ten area plans.

During the course of preparing the Framework, the Government announced its intention to create a single unitary council covering the whole of the Auckland region. The Future Planning Framework provides the future Auckland City administration with a basis for developing the future district plan for the Auckland Isthmus.

The FPF is a long-term planning tool, providing a three-tiered approach, as follows:

- Citywide spatial framework – a citywide overview of issues and opportunities creating a long-term spatial framework for the city.
- Area plans – the Auckland isthmus has been divided into 10 areas to consider issues like transport corridors, population, landscape, character, growth and ward boundaries at a community level.
- Precinct plans – these drill down on the six key themes in the future planning framework and look at how they specifically relate to the precinct, and refine the outcomes shown in the area plan.

The completion of the Project is a key element of Auckland City Council's strategic aims and plans, and is included in this FPF Plan. The future land use that is anticipated in the vicinity of the Project is included in the 'existing environment' Land Use Section in Section 23 of this AEE.

6.5.10.17 Auckland City Council – Draft Cycling and Walking Framework 2007

The Auckland City Council Draft Cycling and Walking Framework (CWF) sets out how to plan, improve and enhance pedestrian and cycling initiatives and facilities throughout Auckland city over the coming five to ten years. The framework will be complemented with cycling and walking implementation plans respectively.

ACC has an overall vision of a transport system for the city that is reliable, convenient, safe and flexible in meeting people's personal, business and recreational travel needs. The overall objective of the CWF is to better cater to pedestrians and cyclists so that more people choose to travel by foot or bike.

6.5.10.18 Auckland City Economic Development Strategy 2008

The Auckland City Economic Development Strategy (ACEDS) has a number of economic goals where specific outcomes and actions are sought. The primary goal is to create a 'globally and nationally connected economy'. This specifically targets:

- Influencing and investing in key transport projects (including Auckland-Manukau Eastern Transport Initiative (AMETI), State Highway 20);

- Influencing and investing in the delivery of improved transport services between key business areas within Auckland city, between Auckland city and the airport, and for Aucklanders to travel to and from work.
- Creating productive, dedicated business areas and a strong CBD hub. An aim of this is to achieve productive areas with high employment. The Rosebank area has been identified as an action area to invest in developing and implementing precinct plans to create a dedicated business area.

6.5.10.19 Auckland City: Our Collective Taonga, Places for People, Places for Nature 2008

The Auckland City: Our Collective Taonga, Places for People, Places for Nature generally focuses on providing a framework outlining the various needs to maintain, sustain and increase the accessibility to the city's open spaces, now and into the future. The document discusses the importance of open space to the city and its people's vitality. It also touches on how it is an exercise in integration of varying needs such as transport, economic, community, and lifestyle. There is little which relates directly to the Project due to the broadness of this document. It does however highlight how transport choices are important factor which impacts upon open space.

6.5.10.20 Waitakere City Council Growth Management Strategy 2009

The Growth Management Strategy focuses on the strategic context of growth management, including the issues faced by the city and the strategic direction which should be taken by the Council to deal with future growth. A key theme of this document in relation to the growth of Waitakere is to consolidate urban area and allow for increased density around main transport nodes and corridors without expanding the MUL. The Strategy identifies Te Atatu Peninsula as a town centre and Te Atatu South as a local centre.

6.5.10.21 Waitakere City Transport Strategy 2006 – 2016

This Strategy aims to get the best out of the existing roading network and encourage greater use of sustainable alternatives

It aims to develop a sustainable, integrated transport system that:

1. Enables Waitakere City to achieve desired social, economic, environmental and cultural benefits for both current and future communities;
2. Facilitates and promotes more sustainable modes of travel;

3. Supports implementation of the Auckland Regional Land Transport Strategy and Regional Growth Strategy in a collaborative manner;
4. Integrates land use and transport;
5. Facilitates and underpins development of town centres and supports employment growth.

The Strategy discusses Council's intention to investigate a second Whau River crossing to improve flows on the North Western Motorway and Great North Road, and to help alleviate congestion the Te Atatu motorway interchange, providing better access to business areas in Waitakere. The Strategy also discusses bus priority measures, HoV lanes and safer cycling and pedestrian networks.

6.5.10.22 Waitakere Walking and Cycling Strategy 2005

The Waitakere Walking and Cycling strategy focuses on increasing walking and cycling throughout the city. The strategy seeks to improve and increase linkages throughout the city so that these modes can be used more frequently and by more of the population. The Strategy aims to increase the use of these modes instead of more private vehicle trips.

6.5.10.23 the NZTA Planning Policy Manual 2007 (PPM)

The NZTA Planning Policy Manual (PPM) describes how the NZTA will undertake its activities and functions relating to the State highway system under the relevant legislative provisions (the NZTA Act, RMA and LTMA, amongst others). The PPM sets out the NZTA's policy, standards and guidelines on transport planning, land use planning and the integration of the two and the NZTA's ideals in terms of planning and environmental management.

The NZTA's selection of methods and ability to implement these policies is dependent on the availability of adequate funding. Individual roading projects, including mitigation measures and other conditions emanating from the RMA, are assessed and based on the funding allocation process of the NZTA through prioritisation of projects.

6.5.10.24 Transit [now the NZTA] Environmental Plan 2008 (TEP)

The Transit Environmental Plan (TEP) responds to the LTMA 2003 and the NZTS. The purpose of the TEP is to set a framework for managing the interface between the environment and the State highway system in a way that improves environmental sustainability and public health in New Zealand. The NZTA's environment policy is to be socially and environmentally responsible and improve the contribution of State highways to the environmental and social well being of New Zealand by:

- Protecting and enhancing the environment where appropriate;

- Avoiding adverse effects to the extent reasonable in the circumstances;
- Using and managing resources efficiently;
- Considering environmental issues early;
- Contributing to sustainable outcomes by working with others; and
- Continually improving environmental performance.

The TEP outlines the key social and environmental impacts that typically result from the construction and operation of the State highway network, and discusses how to address them (for example, noise, air quality, and heritage impacts).

6.5.10.25 NZTA New Zealand National State Highway Strategy 2007 (NSHS)

The NZTA New Zealand National State highway Strategy (NSHS) responds to the NZTS and describes the NZTA's goals, objectives, policies and priorities for the State highway system and sets out how the NZTA will move towards and manage the operation and development of the State highway system as part of a multi-modal transport system over 30 years. The NSHS sets out how the State highway system will support economic transformation and the objectives of the NZTS.

The underlying principles of the NSHS are:

- Safety;
- Operating the network;
- Asset management;
- Managing demand;
- Environment and communities;
- Integrated planning;
- Education; and
- Continual improvement

The NSHS notes that the completion of the 'ladder' motorway system in Auckland, which includes the WRR, is the key element for the State highway network.

6.5.10.26 NZTA State Highway Forecast 2008/09-2017/18 (SHF)

The NZTA's current and long-term strategy for Auckland's State highway network is set out in the NZTA State Highway Forecast (SHF). The SHF outlines major and minor projects that are scheduled to be in design, investigation or construction phase in the upcoming 10 years. The estimated funding costs of the Project are also included.

6.5.10.27 NZTA Land Transport Programme 2009-2012

This document establishes a funding structure and allocation rationale spanning the next three years for the investment in large (some RoNS) transport projects across New Zealand. The Programme has a direct impact upon the Project due to the regional importance of this Project and the funding implications noted within this document. This programme outlines how projects such as this will now be prioritised. It is intended that these projects can lead and facilitate development instead of falling behind or only keeping pace with growth.

6.5.10.28 NZTA New Zealand Cycling and Walking Strategy 2008

The purpose of the Strategy is to identify, assess and prioritise current and future walking and cycling projects across the State highway network in the Auckland region. The outcome of this Strategy involved a recommended list of walking and cycling projects to continue to project feasibility stage.

The NZTA aims to provide and maintain appropriate, safe, and cost-effective walking and cycling facilities on State highways, especially where specific safety concerns exist and/or where State highways form part of the most appropriate route for these modes of travel.

The development of the Strategy involved criteria to identify, assess and prioritise projects. A dedicated pedestrian and cycle route between New Windsor (the termination point of the Mt Roskill cycleway being constructed at present) and SH16 (along which the Northwestern cycleway runs) is considered a 'low ranking project' and the Project urgency is categorised as 'pending' under this Strategy.

7. Consents and Designations

Overview

The Project is being lodged with the Environmental Protection Agency (EPA). The Project requires alterations to designation (Auckland District Plan and Waitakere District Plan) and new designations (Auckland District Plan), as well as resource consents under the Auckland Regional Plans and under section 89(2) of the RMA.

In summary, the geographic location of the seven (7) Notices of Requirement is provided in Figure 7.1. There are also 54 resource consents sought for the following:

- Land Use Consents (3) – for works on reclaimed land and land disturbing activities;
- Land Use Consents (6) – for works in relation to the bed of a river (stream) including the use, erection and placement of structures, and disturbance;
- Coastal Permits (32) – for works in the Coastal Marine Area, including activities, temporary and permanent structures, temporary and permanent occupation, reclamation, disturbance, taking and use of water, damming, and discharge of contaminants;
- Discharge Permits (9) – for works that discharge contaminants (including sediment) to air and land during construction and to water during operation; and
- Water Permits (4) – for works to divert open surface water and the taking and use of groundwater.

7.1 Existing Designations

7.1.1 Existing Designations Affected by the Project

The Plans in Part F.1: Designation Plans provide a guide to the location of the following designations, and their relationship to the designations sought for the Project.

F.1 shows existing designations in relation to the Project

It is noted that those existing designations which are the subject of the Project (e.g. where the Project seeks their alteration) are not discussed below, but rather are referenced in Section 7.2 of this Chapter.

7.1.1.1 Sector 1

There are numerous existing designations in the Project area

In addition to the existing designation for which alteration is sought (discussed in Section 7.2), the following designations in the Operative Waitakere City District Plan are relevant to Sector 1:

- Reference V3 – Electricity supply purposes – substation, Requiring Authority Vector. There is a small take required from this designation. It is not expected to impact on the operation of the existing substation. Section 177(1)(a) RMA approvals will be required prior to construction of works on this designated site;
- Reference WSL9 – Wastewater purposes – pumping station, Requiring Authority: Watercare Services Ltd. There is a small take required from this designation. It is not expected to impact on the operation of the existing pump station. Section 177(1)(a) RMA approvals will be required prior to construction of works on this designated site.

7.1.1.2 Sector 3

The following existing designations apply to Sector 3 (which do not relate to the Project) (these designations have already been put into effect):

- Reference C01-06 – Motorway Interchange Ramps at end of Patiki Road and Rosebank Roads, Requiring Authority: NZ Transport Agency;
- C01-07 – Construction of a Public Road, at the end of Patiki Road, Requiring Authority: NZ Transport Agency (this designation has already been put into effect).

There are also development controls: C01-03 and C1-05, providing a building line setback for road widening, Patiki Road, applied by the Auckland City Council.

7.1.1.3 Sector 5

In Sectors 5 through to 9, the Project crosses existing Auckland City Council public roads. These have been designated under the District Plan: B08-04 – Public Road Network. This designation provides for all public roads in the City. Section 177(1) (a) RMA approvals will be required from the [Auckland Council] for works on these roads. These discussions are progressing[1]. In Sector 5, this relates to Cowley Street.

[1] Council has indicated in principle agreement to these works. However, they have also advised that they usually issue s177 approvals under the RMA, with Road Opening Notices, which will not be sought until construction programmes are confirmed.

7.1.1.4 Sector 6

While Sector 6 crosses Carrington Road as a public road, it is noted that the works are within the existing (and earlier) designation of A07-01. Other designations affected in this Sector include:

- Reference D04-09 – Council Carpark, Parr Road (North), Requiring Authority: Auckland City Council. Section 177(1)(a) RMA approvals will be required from Auckland City for works beneath this designation (albeit that it will not disrupt the purpose of this designation for parking). These discussions are progressing.

7.1.1.5 Sector 7

As for Sector 5 above, the proposed designation for the Project affects designation B08-04. In this Sector, the following public roads are affected: Great North Road, Herdman Street, and Oakley Avenue.

Works in this Sector also cross Designation Reference D04-03. This designation provides for Education Purposes (for the Waterview Primary School). While this designation provides for an unused accessway (which is not owned by the Ministry of Education), the NZTA will require the approval of the Ministry of Education (as the earlier Requiring Authority pursuant to section 177(1) (a) RMA). These discussions are progressing.

7.1.1.6 Sector 8

As for Sector 5 above, the proposed designation for the Project crosses designation B08-04 (albeit below ground in 'deep tunnel'). In this Sector, the following public roads are affected: Waterview Downs, Craddock Street, Powell Street and New North Road.

Similarly, the designation crosses beneath the following designations:

- Reference H13-09 – Railway Purposes: North Auckland Railway ('Western Line'), Requiring Authority: NZ Railways Corporation (ONTRACK); and
- Reference G08-05 – Railway Purposes Avondale Southdown Line, Requiring Authority: NZ Railways Corporation (ONTRACK).

To construct, maintain and operate the SH20 section of the Project, the NZTA will require the approval of ONTRACK as the earlier Requiring Authority pursuant to Section 177 (1) (a) of the RMA, where the Project overlaps with both G08-05 and H13-09 (albeit that the Project is in deep tunnel beneath these designations in this Sector. (See further discussion on designation G08-05 for Sector 9 below). These discussions are progressing.

7.1.1.7 Sector 9

As for Sectors 5 – 8 above, the proposed designation for the Project crosses designation B08-04. In this Sector, works are required on the following public roads: Richardson Road and Valonia Street.

In addition, the following designations in the Operative City of Auckland District Plan Isthmus Section are relevant to Sector 9:

- Reference F05-05 – Purpose: Proposed Motorway and Railway Proposed Road Hayr Road to Richardson Road, Requiring Authority: NZTA;

  F05-05 provides land for a "proposed motorway and rail" corridor from Hayr Road to Richardson Road. This designation predates the designations (H08-05, H08-06, and H08-07) which relate to the SH20 Mt Roskill extension, including the Maioro Interchange currently under construction. As such F05-05 is no longer relevant for motorway purposes.

- Reference H08-05 – Road for State Highway/Motorway Purposes (Extension of State Highway 20 from Hillsborough Road to Maioro Road), Requiring Authority: NZTA;

- Reference H08-06 – Road, Accessway or Service Lane for Access (Extension of State Highway 20 from Hillsborough Road to Maioro Road), Requiring Authority: NZTA;

- Reference H08-07 – Road for Access to and/or for State Highway/Motorway Purposes.

  H08-05, H08-06 and H08-07 all relate to the SH20 Mt Roskill Extension which has recently been constructed. The designation includes construction of a new grade separated interchange at Maioro Street with south facing ramps which is currently under construction. The Waterview Connection Project has been designed to connect in with the new interchange at Maioro Street.

- Reference G08-05 – Railway Purposes Avondale Southdown Line, Requiring Authority: NZ Rail;

  G08-05 is a designation for railway purposes which protects land for a railway connection between the North Auckland Line (NAL) Avondale and the North Island Main Truck (NIMT) at Southdown (via Onehunga). It also provides for a new rail station on Stoddard Road to the south of the Maioro Street Interchange.

  To construct the SH20 section of the Project, the NZTA will require the approval of ONTRACK as the earlier Requiring Authority pursuant to Section 177(1)(a) RMA, where the Project overlaps with G08-05.

7.1.2 Other Designations

Other designations in the Project area that are not affected by, but adjoin or are in close proximity to the Project, include:

In Sector 1:

- Reference WSL9 – Wastewater purposes – pumping station, Requiring Authority: Watercare Services Ltd.

In Sector 6:

- Reference D05-03 – Council Carpark, between Motorway and Great North Road, Requiring Authority: Auckland City Council.

In Sector 8:

- Reference E04-09 – Proposed Public Reserve, Trent Street, Requiring Authority: Auckland City Council.

7.2 Designations Sought by the Notices of Requirement

The Project includes 7 Notices of Requirement

The NZTA is seeking to designate four contiguous areas of land as new designation and alter three existing designations. Notices of Requirement have been prepared pursuant to sections 168 and 181 of the RMA to construct, operate and maintain a motorway, roads and ancillary activities associated with the Project. These NORs will be lodged with the consenting agency (the EPA) and served on the territorial authorities. Copies of the Notices of Requirement are provided in Volume I of this AEE and a summary of the geographic locations of the NORs in Figure 7.1. The designation for the whole Project is collectively shown on Plan F.0: Notice of Requirement Plans (Part F of this AEE).

7.2.1 Alterations of Designations (s181 RMA)

The alterations sought relate to the existing motorway designations and boundaries within the District Plans.

An alteration to designation in the Waitakere District Plan

One alteration to designation NZTA1[2] in the Waitakere City District Plan is sought, in Sector 1:

- Alteration of Designation NZTA1 along State Highway 16 from the western banks of the Whau River to Henderson Creek.

[2] Reference NZTA1 – Purpose: Auckland – Kumeu (SH1). Requiring Authority: the NZTA. It is noted that there is an inadvertent error in the Waitakere City District Plan (by reference to SH1) and that this designation includes SH16 from Westgate in the west to the Whau River in the east. There are conditions relating to this designation: requiring an Outline Plan of Works and erosion and sediment controls for works within the designated site.

This alteration proposes to include properties on either side of the existing SH16 including the Te Atatu Interchange, the Reserves (McCormick Green and Jack Colvin Park and the Harbourview-Orangihina Park) as well as residential properties. The Schedule of Properties required for the alteration to designation is provided in **NOR 1** (in the Notices of Requirement and Consent Applications Volume I).

Two alterations to designation for SH16 in the Auckland District Plan

Two alterations to designation A07-01 in the Auckland City District Plan are sought in relation to the Project over Sectors 3 through 6 (excluding Sector 5),

- Alteration to Designation A07-01 along State Highway 16 along the Causeway and Rosebank Peninsula (in existing terrestrial locations only).

  This will include those properties adjoining Rosebank Interchange and the Patiki bridges and the Recreation Reserve known as Rosebank Park Domain. The Schedule of Properties required for the alteration to designation is provided in **NOR 2** (in the Notices of Requirement and Consent Applications Volume I).

- Alteration to Designation A07-01 along State Highway 16 between Great North Road and St Lukes Interchanges.

  This will include minor take from properties on either side of the State Highway, including residential, vacant land and open space. The Schedule of Properties required for the alteration to designation is provided in **NOR 3** (in the Notices of Requirement and Consent Applications Volume I).

These alterations to the designation are required for the construction, operation and maintenance of State Highways (to be vested in part as "motorway"), including the new ramps connecting to SH20, significant changes to the interchanges at Te Atatu Road, stormwater treatment including a new pond at Jack Colvin Park and discharging to Meola Creek, noise barriers, ancillary safety and operational services (including communications equipment, signage, lighting and traffic management), temporary construction storage areas and office facilities, maintenance and access areas, vegetation removal and restoration works including relocation of services, footpaths, landscaping and planting.

7.2.2 New Designations (S168 RMA)

The new designations required for the Project are set out below. Schedules of Properties included in the proposed designations are attached to the relevant NOR's. A collation of the property requirements for the Project is provided in the Plans F.0: Notice of Requirement Plans.

Four new designations sought in the Auckland District Plan

The four new designations all relate to Sectors 5, and Sectors 7 through to 9:

- New Designation – Sectors 5 and 7 – Great North Road Underpass

  This is a surface designation for construction and operation of SH20 from the Great North Road underpass to the Great North Road Interchange and will include structures associated with tunnel operation (ventilation building and stack), mitigation and local road access. The Schedule of Properties required for the alteration to designation is

provided in **NOR 4** (in the Notices of Requirement and Consent Applications Volume I).

- New Designation – Sector 7 and 8 – Tunnels

  This is a substrata designation for the tunnel and deep tunnel sections which will provide for the Project from 4m below ground (in reserve and public road areas, and the properties at 1510 and 1550 Great North Road) and from 7m below ground for other residential and business properties. The Schedule of Properties required for the alteration to designation is provided in **NOR 5** (in the Notices of Requirement and Consent Applications Volume I).

- New Designation – Sector 8 – Emergency Exhaust

  This is a surface designation for construction, maintenance and operation of an emergency exhaust for the tunnels, located at 36 Craddock Street. The Schedule of Properties required for the alteration to designation is provided in **NOR 6** (in the Notices of Requirement and Consent Applications Volume I).

- New Designation – Sector 9 – Alan Wood

  This is a surface designation required for construction, maintenance and operation of the SH20 surface component from the southern tunnel portal to the connection of SH20 at the Maioro Street Interchange. This designation includes land required for the structures associated with tunnel operation (such as the ventilation building and stack), as well as works required for mitigation and local road access and north facing ramps to connect to the Maioro Street Interchange. The Schedule of Properties required for the alteration to designation is provided in **NOR 7** (in the Notices of Requirement and Consent Applications Volume I)[3].

The new designations for Sectors 5, and 7 through 9 are required for the construction, operation and maintenance of a State highway ('motorway') including ancillary works (including but not limited to portals, ramp connections south of Oakley Creek, safety and operational services (including communications, tunnel control and air quality/ ventilation facilities), tree/vegetation removal, stormwater treatment, temporary construction storage areas and office facilities, maintenance and access areas, mitigation and restoration works including relocation of services, footpaths landscaping and planting.

[3] This designation will overlay the existing NZTA designations F05-05 and H08-05 and H08-07 at Maioro Street in part.

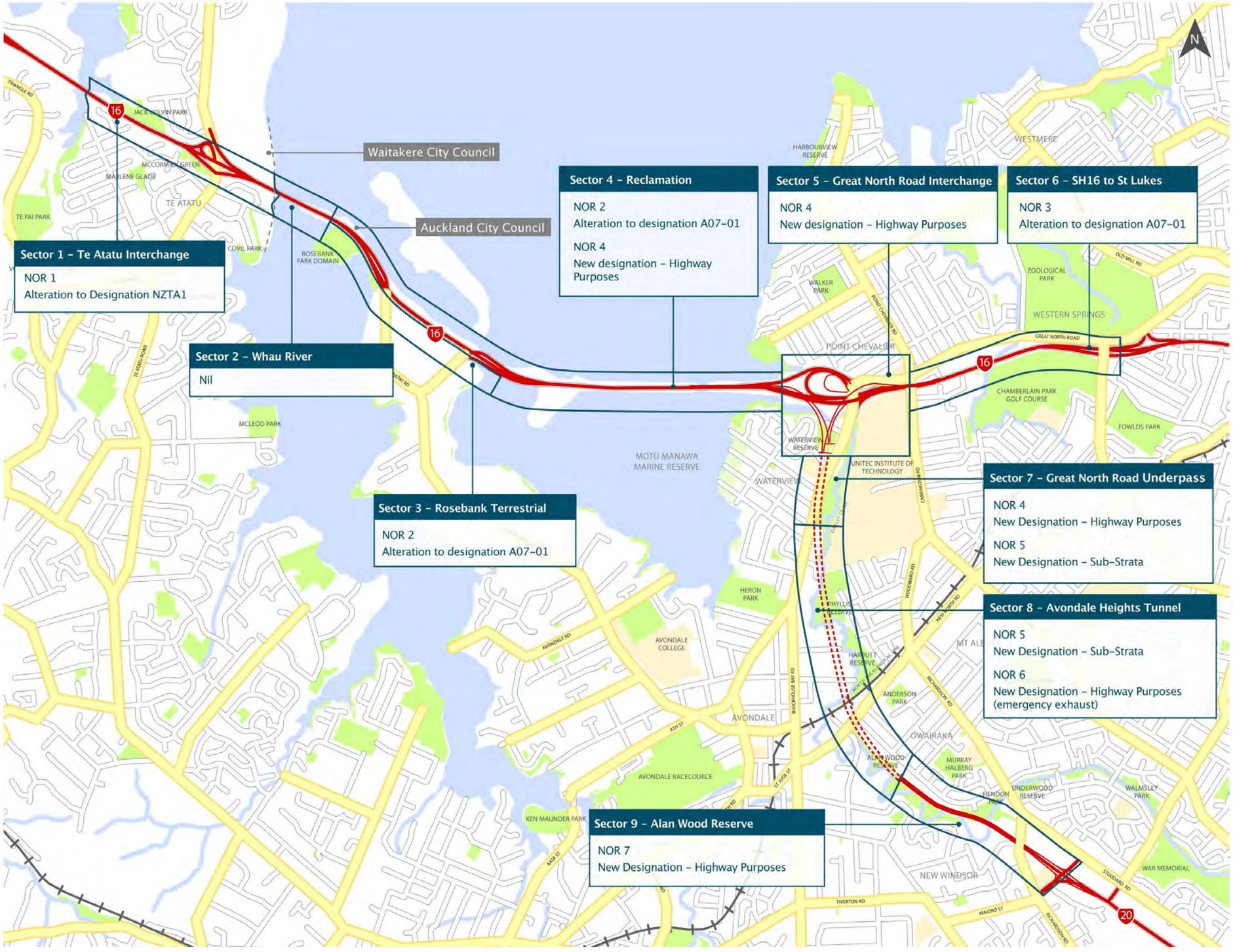


Figure 7.1: Summary of Geographic Location for Notices of Requirement

7.3 Resource Consents

The following tables list the resource consents required and applied for by the NZTA, in order to construct, operate and maintain the Project.

There are 53 consents required for construction maintenance and operation of the Project

Consents are required pursuant to the following District and Regional Plans:

- Transitional Regional Plan ('Transitional Regional Plan');
- Proposed Auckland Regional Plan; Air, Land and Water Indicating Provisions Appealed June 2005 (ARP: ALW 2005);[4]
- Proposed Auckland Regional Plan: Air, Land and Water Indicating Provisions Appealed March 2010 (PARP: ALW 2010);
- Operative Auckland Regional Plan: Coastal (ARP: C);
- Operative Auckland Regional Plan: Sediment Control (ARP: SC);
- Operative Waitakere City District Plan ('Waitakere District Plan'); and
- Operative City of Auckland – District Plan Isthmus Section ('Auckland District Plan').

7.3.1 Land Use Consents

Ref. No	Consents	Plan Ref	Status	Comments
RC 1.	Land Use Consents – Land Disturbance	Sediment Control Plan – Rule 5.4.3.1	Restricted Discretionary (RMA:s9(2))	Earthworks and roading/ tracking/ trenching during construction – within and outside the Sediment Control Protection Area (includes the associated discharge of sediment laden water as a discharge consent) Relates to Sectors 1 – 9 inclusive
RC 2.	Land Use Consents – Activity on Reclaimed Land	District Plan – Waitakere (Section 87B of RMA)	Innominate Activity – Discretionary (RMA: s89)	Land Use Consent pursuant to Section 89(2) for the construction, operation and maintenance and ancillary activities of a State highway. Relates to Sector 1

[4] As Section 5 (Discharges to Land and Water and Land Management) of the Proposed Auckland Regional Plan: Air, Land and Water Indicating Provisions Appealed March 2010 is still under appeal and has not yet been resolved by a consent order, the June 2005 Regional Plan Decisions Version is the relevant plan for Diversion and Discharge.

Ref. No	Consents	Plan Ref	Status	Comments
RC 3.	Land Use Consents – Activity on reclaimed land	District Plan – Auckland (Section 87B of RMA)	Innominate Activity – Discretionary (RMA: s89)	Land Use Consent pursuant to Section 89(2) for the construction, operation and maintenance and ancillary activities of a State highway. Relates to Sectors 2 and 4
RC 4.	Use, Erection or Placement of New Structures	PARP: ALW 2005 – Rule 7.5.12	Discretionary (RMA s13(1))	For a stormwater pipe underneath Oakley Creek as a permanent stream (over 50m). Relates to Sector 9
RC 5.	Use, Erection or Placement of New Structures	PARP: ALW 2005 – Rule 7.5.12	Discretionary (RMA s13(1))	For bridges constructed over Oakley Creek (Natural Stream) within Sector 9 – includes Hendon Park bridge and cycleway bridges. Relates to Sector 9
RC 6.	Use, Erection or Placement of New Structures	PARP: ALW 2005 – Rule 7.5.9	Restricted Discretionary (RMA s13(1))	Stormwater outfall structures in Sector 1 (Pixie Stream as a permanent stream or culvert, pipe or channel greater than 30m in length). Relates to Sector 1
RC 7.	Use, Erection or Placement of New Structures	PARP: ALW 2005 – Rule 7.5.12	Discretionary (RMA s13(1))	Stormwater outfall structures for Oakley Creek in Sectors 7 & 9. Relates to Sector 7 & 9
RC 8.	Use, Erection or Placement of New Structures	PARP: ALW 2005 – Rule 7.5.9	Restricted Discretionary (RMA s13(1))	Stormwater outfall structures for Meola Creek in Sector 6. Relates to Sector 6
RC 9.	Disturbance of Bed of Lakes and Rivers	PARP: ALW 2005 – Rule 7.5.23 (and/or 7.5.38 for same activity)	Non-Complying (RMA s13(1))	Excavation, drilling or tunnelling or other disturbance in, on, or under the bed of a permanent river or stream and any associated discharge of sediment, for the purpose of diverting a permanent river or stream to a new course, and the associated infilling of the existing bed and the diversion of water on Oakley Creek and unnamed tributary of Oakley Creek. Relates to Sector 9

7.3.2 Discharge Permits

Ref. No	Consents	Plan Ref	Status	Comments
RC 10.	Discharge to the Water Table of a Road	ARC Transitional Plan (General Authorisation 13)	Innominate Activity – Discretionary (RMA: s15)	Diversion and discharge of stormwater from impermeable areas into the water table of a road. Relates to Sectors 1 – 9 inclusive
RC 11.	Discharge of Water from Roads	ARC Transitional Plan (General Authorisation 15)	Innominate Activity – Discretionary (RMA: s15)	Diversion and discharge of stormwater into any watercourse for the purpose of draining roads. Relates to Sectors 1 – 9 inclusive
RC 12.	Stormwater Discharge – Network Operator Activities within Urban Areas	PARP: ALW 2005 – Rule 5.5.12	Discretionary (RMA: s15)	Stormwater discharge onto land and water. This includes discharges into Oakley Creek, Meola Stream & Pixie Stream. Relates to Sectors 1, 3, 5, 6, 7, 9
RC 13.	Discharge of contaminants from an industrial or trade process (that is listed as high risk in Schedule 3)	PARP: ALW 2005 – Rule 5.5.19	Discretionary (RMA: s15)	The discharge of contaminants to air, land and water from a rock crusher. Sector 9
RC 14.	Discharge of contaminants to land or water from contaminated land (that is undergoing disturbance or remediation)	PARP: ALW 2005 – Rule 5.5.44A	Restricted Discretionary (RMA: s15)	It cannot be determined at this time whether compliance with Rule 5.5.44 can be met and so, in an abundance of caution consent is being sought under Rule 5.5.44A. Relates to Sectors 1, 3, 5, 6, 7, 8[5] and 9

[5] While it is considered that the discharge of contaminants from contaminated groundwater is unlikely given the depth of tunnelling in Sector 8, it is proposed that this consent be sought in an abundance of caution.

Ref. No	Consents	Plan Ref	Status	Comments
RC 15.	Discharge of contaminants from an industrial or trade process	PARP: ALW 2005 – Rule 5.5.19	Discretionary (RMA: s15)	The discharge of contaminants to land and water from a concrete batching plant. Sectors 5 and 9
RC 16.	Discharge to Air – Crusher Activities	PARP: ALW 2005 – Rule 4.5.55	Restricted Discretionary (RMA: s15(2))	The discharge of contaminants into air from the temporary crushing of concrete, masonry products, minerals, ores and/or aggregates with a mobile crusher at a rate not exceeding a total on-site capacity of 60 tonnes per hour that does not comply with Rule 4.5.48. This consent is sought as the potential is that material from the crusher will be removed off-site (depending on the feasibility of reuse, which is the first preference). Sector 9
RC 17.	Discharge to Air – Concrete Batching Plant	PARP: ALW 2005 – Rule 4.5.54	Restricted Discretionary (RMA: s15(2))	The discharge of contaminants into air, through a bag filter system, from the mixing of cement powder with other materials to manufacture concrete or concrete products at a rate exceeding a total production capacity of 110 tonnes per day. Sectors 5 and 9
RC 18.	Discharge to Air – Roadworks	PARP: ALW 2005 – Rule 4.5H	Restricted Discretionary (RMA: s15(2))	Taking a precautionary approach consent is sought for discharges to air associated with roadworks (including dust emissions)[6].

[6] While it is considered that this activity could be managed within the permitted activity performance standards, in an abundance of caution consent has been sought for this activity.

7.3.3 Water Permits

Ref. No	Consents	Plan Ref	Status	Comments
RC 19.	Diversion of water other than open coastal water	PARP: ALW 2005 (Section 87B of RMA)	Innominate Activity – Discretionary (RMA: s14[7])	Structures for the road diverting the water flows of a floodplain and associated diversion and deposition of material in Sector 9. Relates to Sector 9
RC 20.	Taking and Use of Groundwater	PARP: ALW 2005 – Rule 6.5.39	Restricted Discretionary (RMA: s14(2))	The taking of groundwater for the purposes of groundwater diversion during construction, under Rule 6.5.69. Sectors 7 to 8
RC 21.	Taking and Use of Groundwater	PARP: ALW 2005 – Rule 6.5.39	Restricted Discretionary (RMA: s14(2))	The taking of groundwater for the purposes of groundwater diversion – operation, under Rule 6.5.69. Sectors 7 to 8
RC 22.	Diversion of Groundwater	PARP: ALW 2005 – Rule 6.5.69	Restricted Discretionary (RMA: s14(2))	Diversion of Groundwater for the tunnel (taking of groundwater for disposal). Relates to Sectors 7 and 8

7.3.4 Coastal Permits

Ref. No	Consents	Plan Ref	Status	Comments
RC 23.	Activities within the CMA	Regional Coastal Plan – Rule 11.5.5	Discretionary (RMA: s12(3))	For ongoing use of CMA by the State highway for transport purposes and associated construction activities including conveyance of spoil.

[7] Under section 14, no person may take, use, dam, or divert any water other than open coastal water, unless expressly allowed by an NES, a rule in a regional plan or a resource consent (s14(2)(a), s 14(3)(a) under the RMA.

Ref. No	Consents	Plan Ref	Status	Comments
RC 24.	Erection of Temporary Structures in the CMA	Regional Coastal Plan – Rule 12.5.18	Discretionary (RMA: s12(1)(b))	This consent relates to the erection of temporary (construction) structures within the CMA including piers, ramps, bridges, conveyor structures, temporary staging platforms, temporary bird roost, stormwater discharge outfalls and other consequential activities such as disturbance and/or vegetation removal. In GMA, CPA 2 and Mooring Management Area – Henderson Creek, Whau River and Pt Chevalier. Sectors 1, 2, 4 & 5
RC 25.	Erection of Permanent Structures in the CMA	Regional Coastal Plan – Rule 12.5.18	Discretionary (RMA: s12(1)(b))	This consent relates to the erection of permanent (operational phase) structures within the CMA including piers, ramps, bridges, stormwater discharge outfalls and other consequential activities such as disturbance and/or vegetation removal. In GMA, CPA 2 and Mooring Management Area – Henderson Creek, Whau River and Pt Chevalier. Sectors 1, 2, 4 & 5
RC 26.	Erection of Temporary Structures in the CMA	Regional Coastal Plan – Rule 12.5.22	Non complying (RMA: s12(1)(b))	This consent relates to the erection of temporary (construction) structures within the CMA including piers, ramps, bridges, conveyor structures, temporary staging platforms, stormwater discharge outfalls and other consequential activities such as disturbance and/or vegetation removal. In CPA 1 – Waterview Estuary. Sectors 3 & 4
RC 27.	Erection of Permanent Structures in the CMA	Regional Coastal Plan – Rule 12.5.22	Non complying (RMA: s12(1)(b))	This consent relates to the erection of permanent (operational phase) structures within the CMA including piers, ramps, stormwater discharge outfalls and other consequential activities such as disturbance and/or vegetation removal. In CPA 1 – Waterview Estuary. Sectors 3 & 4

Ref. No	Consents	Plan Ref	Status	Comments
RC 28.	Erection of Temporary Structures in the CMA	Regional Coastal Plan – Rule 12.5.22	Non complying (RMA: s12(1)(b))	This consent relates to the erection of temporary (construction) structures within the CMA including piers for ramps, conveyor structures, temporary staging platforms, stormwater discharge devices and other consequential activities such as disturbance and/or vegetation removal. In CPA 1 – Oakley Creek Inlet. Sector 5
RC 29.	Erection of Permanent Structures in the CMA	Regional Coastal Plan – Rule 12.5.22	Non complying (RMA: s12(1)(b))	This consent relates to the erection of permanent (operational phase) structures within the CMA including piers, ramps, stormwater discharge devices, heritage bridge and other consequential activities such as disturbance and/or vegetation removal. In CPA 1 – Oakley Creek Inlet. Sector 5
RC 30.	Reclamation in the CMA	Regional Coastal Plan – Rule 13.5.3	Non-complying (RMA: s12(1)(a))	This consent relates to the temporary reclamation for access and construction purposes and permanent reclamation associated with motorway widening in CPA 2. Sectors 1 (0.11ha) and 2 (approx 0.4ha)
RC 31.	Reclamation in the CMA	Regional Coastal Plan – Rule 13.5.4 (and 13.5.6 as non-complying)	Restricted Coastal Activity (RMA: s12(1)(a))	This consent relates to reclamation for access and construction purposes and permanent reclamation associated with motorway widening in CPA 1, north and south of causeway and includes associated vegetation removal and diversion of estuarine channels (including sediment works associated with diversion) required for the mitigation of effects on the reclamation. The Plan states that any non-complying consent under 13.5.3 is a restricted coastal activity in specific conditions. Sector 4 (approx 4.5ha)

Ref. No	Consents	Plan Ref	Status	Comments
RC 32.	Disturbance of Foreshore and Seabed	Regional Coastal Plan – Rule 16.5.15	Discretionary (RMA: s12(1)(c))	Disturbance of the foreshore and seabed during construction including vegetation removal, use of motor vehicles, disturbance of sediment, temporary structures and erosion and sediment control measures including, in a GMA, CPA2 and Mooring Management Area for construction: Sector 1 • Stormwater wetland and associated reclamation; • Outfall discharging into Henderson Creek; Sector 2 • Temporary staging platforms within Whau River; • Piles for Whau River Bridges; • Piles for new pedestrian/cycle facility; • Rock lined channels. Sectors 4 and 5 (north eastern side of causeway) • Temporary staging platforms adjacent to Pt Chevalier ; • Piles for ramps adjacent to Pt Chevalier.
RC 33.	Disturbance of Foreshore and Seabed	Regional Coastal Plan – Rule 16.5.16	Discretionary (RMA: s12(1)(c))	Removal of vegetation, including mangrove removal, in any CPA 2. This includes the removal of mangroves to the west of Rosebank Park Domain. Sector 2

Ref. No	Consents	Plan Ref	Status	Comments
RC 34.	Disturbance of Foreshore and Seabed	Regional Coastal Plan – Rule 16.5.21	Non Complying (RMA: s12(1)(c))	Disturbance of the foreshore and seabed during construction including vegetation removal and mangrove removal, use of motor vehicles, disturbance of sediment, temporary structures and erosion and sediment control measures including, in CPA1, to access existing lawful structures, but excluding the disturbance consequential to activities under which other consents are sought. This includes disturbance for activities such as machinery access to temporary construction areas in the CMA (e.g. the estuary, Causeway Bridges, pedestrian/cycle way facility, coastal protection works, rock revetment / batters, and temporary staging platforms within Oakley Inlet etc). Sectors 4 and 5
RC 35.	Disturbance of Foreshore and Seabed	Regional Coastal Plan – Rule 16.5.22	Non Complying (RMA: s12(1)(c))	The use of motor vehicles in any CPA 1 Sectors 4 and 5
RC 36.	Taking and use of inner coastal water	Regional Coastal Plan – Rule 19.5.5	Discretionary (RMA: s14)	The taking and use of inner coastal water for use in the proposed coffer dam (construction of the reclamation). Sectors 2 and 4
RC 37.	Damming and impounding of inner coastal water	Regional Coastal Plan – Rule 19.5.6	Discretionary Activity (RMA: s14)	The damming and impounding of inner coastal water in the coffer dam during construction – General Management Area Sectors 2 and 4
RC 38.	Damming and impounding of inner coastal water	Regional Coastal Plan – Rule 19.5.7	Non-complying (RMA: s14)	The damming and impounding of inner coastal water in the coffer dam during construction – CPA1 Sectors 2 and 4

Ref. No	Consents	Plan Ref	Status	Comments
RC 39.	Discharge of Contaminants	Regional Coastal Plan – Rule 20.5.6	Discretionary (RMA: s15)	This consent relates to the discharge of contaminants during construction into the CMA and discharge of contaminants in stormwater flows during construction along Sectors 1 – 5, including point source and sheet flow discharges. Sectors 1 through 5
RC 40.	Discharge of Contaminants	Regional Coastal Plan – Rule 20.5.13	Discretionary (RMA: s15)	This consent relates to the discharge of contaminants during construction into the CMA and discharge of stormwater during construction along Sectors 1 – 5, including point source and sheet flow discharges Sectors 1 through to 5
RC 41.	Discharge of Contaminants	Regional Coastal Plan – Rule 20.5.13	Discretionary (RMA: s15)	This consent relates to the permanent discharge of stormwater to the CMA for the operation of the Project – Sector 1 (Henderson Creek, CPA 2). Sector 1
RC 42.	Discharge of Contaminants	Regional Coastal Plan – Rule 20.5.13	Discretionary (RMA: s15)	This consent relates to the permanent discharge of stormwater to the CMA for the operation of the Project – Sector 2 (Whau River, CPA 2 and Mooring Management Area). Sector 2
RC 43.	Discharge of Contaminants	Regional Coastal Plan – Rule 20.5.13	Discretionary (RMA: s15)	This consent relates to the permanent discharge of stormwater to the CMA for the operation of the Project in Sector 4 (Causeway and Interchange, CPA1). Sector 4
RC 44.	Discharge of Contaminants	Regional Coastal Plan – Rule 20.5.13	Discretionary (RMA: s15)	This consent relates to the permanent discharge of stormwater to the CMA for the operation of the Project in Sectors 4 and 5 (Great North Road Interchange, Point Chevalier, General Management Area). Sector 5

Ref. No	Consents	Plan Ref	Status	Comments
RC 45.	Occupation of CMA	Regional Coastal Plan – Rule 10.5.9	Discretionary (RMA: s12(2))	Occupation of the CMA by permanent structures in, on and over the seabed and foreshore for general state highway widening including piles and piers for new and widened structures including, • Sector 1– Stormwater wetland pond • Sector 2– Whau River Bridge; Whau River pedestrian/cycle facility
RC 46.	Occupation of CMA	Regional Coastal Plan – Rule 10.5.9	Discretionary (RMA: s12(2))	This consent relates to the occupation of the stormwater outfalls for – Sector 1 (Henderson Creek, CPA 2). Sector 1
RC 47.	Occupation of CMA	Regional Coastal Plan – Rule 10.5.9	Discretionary (RMA: s12(2))	This consent relates to the occupation of the stormwater outfalls for – Sector 2 (Whau River, CPA 2 and Mooring Management Area. Sector 2
RC 48.	Occupation of CMA	Regional Coastal Plan – Rule 10.5.9	Discretionary (RMA: s12(2))	This consent relates to the occupation of the stormwater outfalls for – Sector 4 (Causeway _ Interchange (Waterview Inlet and surrounds, CPA 1). Sector 4
RC 49.	Occupation of CMA	Regional Coastal Plan – Rule 10.5.9	Discretionary (RMA: s12(2))	Occupation of the CMA for construction works in, on and over the seabed and foreshore for Project works including stormwater outfall and ancillary works in General Management Area. Sectors 4 and 5
RC 50.	Occupation of CMA	Regional Coastal Plan – Rule 10.5.9	Discretionary (RMA: s12(2))	Occupation of the CMA for construction works in, on and over the seabed and foreshore for Project works including piles and piers construction, reclamation construction and ancillary works in CPA2. Sectors 1 and 2.

Ref. No	Consents	Plan Ref	Status	Comments
RC 51.	Occupation of the CMA	Regional Coastal Plan – Rule 10.5.10	Non-Complying (RMA: s12(2))	Occupation of the CMA for construction works in, on and over the seabed and foreshore for Project works including piles and piers construction, reclamation construction and ancillary works in CPA1 Sectors 3 and 4
RC 52.	Occupation of the CMA	Regional Coastal Plan – Rule 10.5.10	Non-Complying (RMA: s12(2))	Occupation of the CMA by permanent structures in, on and over the seabed and foreshore for general motorway widening including piles and piers for new and widened structures including: • Sector 4– Causeway Bridges Causeway pedestrian/cycle facility Stormwater outfalls • Sector 5– Great North Interchange Ramps, Heritage bridge (pedestrian) Stormwater outfalls
RC 53.	Activities within the CMA	Regional Coastal Plan – Rule 11.5.5	Discretionary (RMA: s12(3))	This consent relates to the ongoing use, operation and maintenance of CMA by the State highway for transport purposes and associated stormwater discharge. Sectors 1–9
RC 54.	Activities within the CMA	Regional Coastal Plan – Rule 11.5.5	Discretionary (RMA: s12(3))	This consent relates to the ongoing use, operation and maintenance of CMA by the State highway for transport purposes and associated stormwater discharge (as an activity not provided for as a permitted, controlled or restricted discretionary activity, and is not prohibited by the Plan). Sectors 1 – 9

8. Existing Environment

8.1 Introduction

This Chapter provides a description of the existing physical and social environment through which the Project will be constructed and within which it will operate.

This section describes the existing natural, physical and social environment within which the Project will be constructed

The following description has been broken down into the nine Sectors described previously in Chapter 2 and shown in Figure 2.1. It draws on more detailed information that can be found in the Technical Reports (Part G). Specific reference has been made to the:

- Various ecology reports;
- Archaeology report;
- Noise report;
- Stormwater report;
- Traffic Assessment report; and
- Social Impact report.

8.2 Regional Context

8.2.1 Built and Physical Environment

The Project is located within the Auckland Region. The regional transport environment comprises links between central Auckland, the North Shore, west and south Auckland, as well as links to the Auckland International Airport, Ports of Onehunga and Ports of Auckland. The Project will complete the Western Ring Route, providing alternative regional connections across the Auckland Region. Figure 8.1 below illustrates the indicative location of the Project in the context of the regional environment/Western Ring Route.

The Project is located within the Auckland Region

The Project extends through a largely established urban environment located to the southwest of the Auckland CBD. A number of residential suburbs exist within the Project area; from west to east and north to south this includes the suburbs of Te Atatu, Point Chevalier, Waterview, Springleigh, Mt Albert, Owairaka and New Windsor as illustrated in Figure 8.2 below. A number of schools, educational facilities and institutions are located within these suburbs.

The Project extends through a largely established urban environment

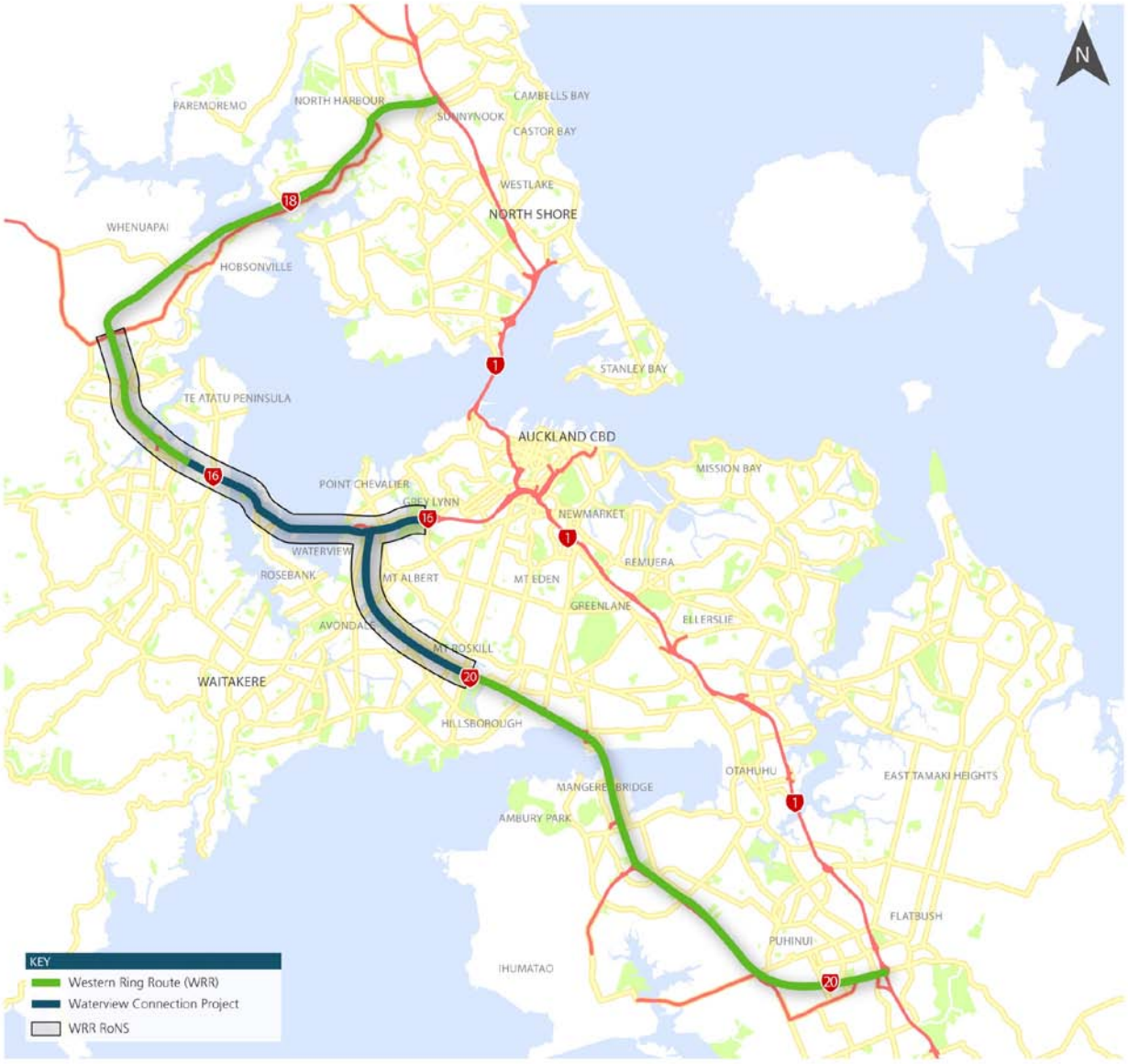


Figure 8.1: Auckland Regional Environment Transport Links

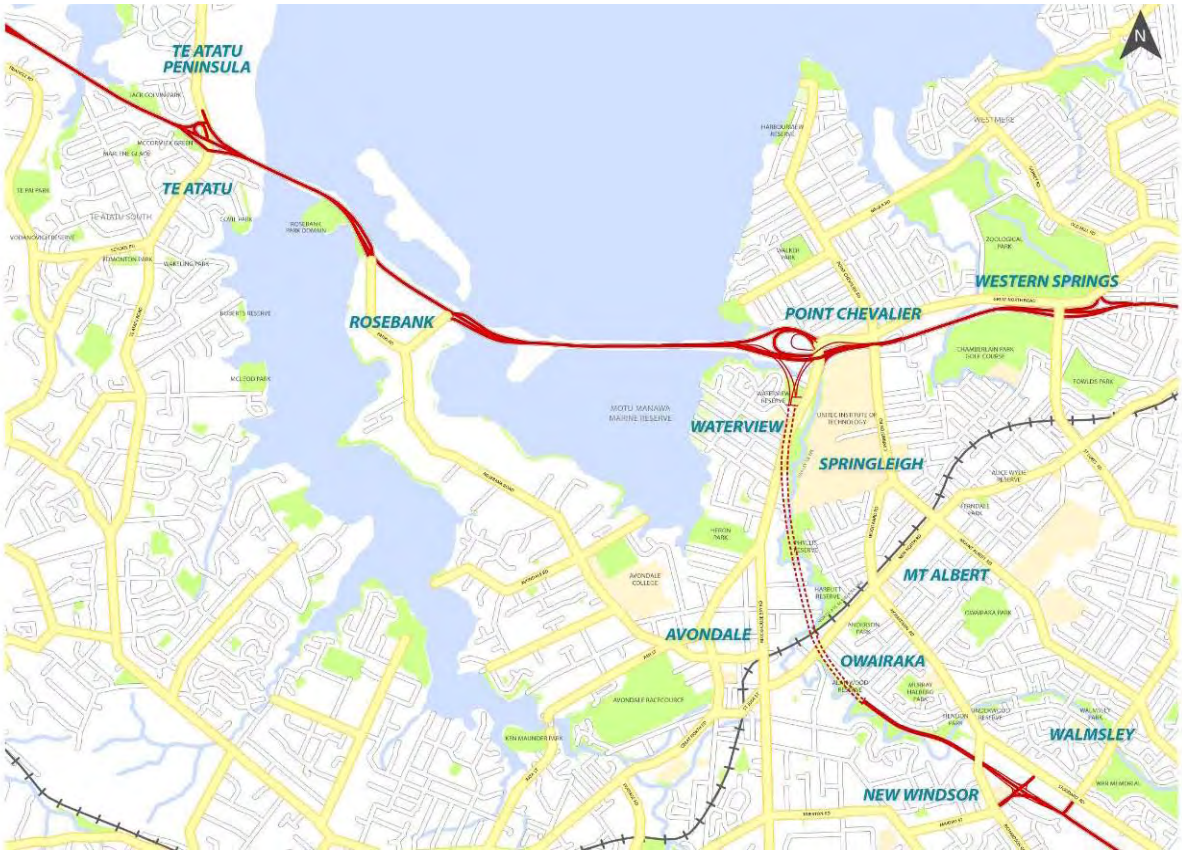


Figure 8.2: Project Location in relation to Surrounding Suburbs

A network of open space exists within these suburbs and includes recreational sports reserves such as Jack Colvin Park, Western Springs, Avondale Race Course, Waterview Reserve, Phyllis Reserve and Alan Wood Reserve.

The urban environment includes a number of significant industrial/commercial areas and local businesses and shops. Key commercial/industrial areas within the regional environment include Lincoln Road, Rosebank Road, Point Chevalier, Avondale, Richardson Road and Stoddard Road. The Auckland Regional Policy Statement Proposed Plan Change 6 identifies Henderson as a sub regional town centre; Avondale, Point Chevalier, Te Atatu Peninsula and Stoddard Road as town centres; and Lincoln Road as a growth corridor.

The coastal environment reflects a history of early Maori and European settlement with a number of archaeological sites identified within the area, including a tramway, drystone walls, a historic flour mill and tannery site, Karaka plantations, middens, pits and terraces.

A number of major transport networks exist within the Project area or are planned for development

A number of major existing and planned transport networks are located within the existing regional environment. These include:

- Motorway Networks (which comprise the future WRR through the Auckland Region) – including SH16, SH20 and the Upper Harbour Highway (SH18);
- Arterial Road Networks – Including Great North Road, Carrington Road, Stoddard Road, Richardson Road, Maioro Road, Rosebank Road and Te Atatu Road;
- Passenger Transport Services - SH16 along with Great North Road, Carrington Road, Te Atatu Road, Mt Albert Road and Lincoln Road are existing major roads within the regional area recognised as part of Auckland's Quality Transit Network as identified in the Auckland Passenger Transport Network Plan 2006-2016. These roads have the ability to provide fast, high frequency and high quality passenger transport services between key centres;
- Cycling and Pedestrian Networks – These include the Northwestern Cycleway which runs adjacent to SH16, a shared bus and cycle lane along Great North Road east of Point Chevalier and a cycle route along Te Atatu Road north of the Te Atatu Interchange. There are currently on-road lanes along both sides of the length of Carrington Road and Mt Albert Road to the intersection with Sandringham Road. A cycle route along the Mount Roskill extension has also been recently completed. Key pedestrian networks include the Oakley Creek Esplanade walkway, and a walking route between Alan Wood Reserve and Hendon Park;
- Rapid Transport Networks (Rail) – The North Auckland Rail Line which is utilised by Western Line services from Newmarket to Waitakere and the proposed Avondale-Southdown rail line which is proposed to connect the Western Line with the Southern Line at Auckland Freight Centre, Southdown;
- The Auckland International Airport (located to the south west of the regional Project area); and
- The Port of Onehunga (located to the south of the Project area) and the Port of Auckland (located to the east of the Project area).

Major services supporting the urban environment exist within the area and include high pressure gas mains, trunk sewer and stormwater lines, high voltage power cables, fibre optic communication cables, mobile phone mast and telephone lines.

8.2.2 Natural Environment

The natural environment is dominated by the coastal environment (Waitemata Harbour)

The Project and its surrounding regional environment also encompass a largely coastal environment adjoining the Waitemata Harbour on the Western side of the Auckland Isthmus. The Whau River and Henderson Creek are adjacent to and within the CMA. The Pixie Stream, Meola Creek and Oakley Creek water bodies also exist within the Project area and flow to the Waitemata Harbour. Pollen Island and Traherne Island also adjoin SH16. The Project area is also located within the Motu Manawa (Pollen Island) Marine Reserve (MMMR).

The Waitemata Harbour lies within the northeast coastal area within the Hauraki Gulf. Hauraki Gulf is characterised by inlets, harbours, bays and offshore islands with habitats ranging from estuarine to oceanic.

The Waitemata Harbour is a drowned river valley that extends from Riverhead in the northwest to the Tamaki River in the east however the Waitemata Harbour has tidal flats and mangroves in the upper reaches to the west and deep navigable channels and sheltered bays. Many waterways discharge into the Waitemata Harbour including those in the Project area: the Oakley Creek, Meola Creek, Whau River and Pixie Stream. Coastal fringes of the Harbour have been extensively modified including the Causeway constructed in the early 1950's.

The Motu Manawa Marine Reserve includes some 500ha of the inner reaches of the Waitemata Harbour. The Marine Reserve surrounds Pollen Island and Traherne Island, and encompasses part of the Waterview Estuary and an extensive area of intertidal and sub tidal flats on the northern side of SH16.

Much of this area is located within Coastal Protection Area 1 (Reference 53) and Coastal Protection Area 2 (Reference 54) as defined in the ARP:C. The CMA is also within the Hauraki Gulf Marine Park.

The Central Waitemata Harbour, being the area between the Auckland Harbour Bridge and the Upper Harbour Bridge, receives runoff from a 205km^2 land catchment area. The seabed material of the Harbour generally consists of sand with a higher proportion of fine grained sediment (muds and silts) typically found along the intertidal and sheltered embankment areas of the Harbour. The CMA surrounding Pollen Island on the northern (seaward) side of the Causeway is largely unmodified. The upper-intertidal morphology and associated chenier (shell) ridges also appear to have been relatively stable throughout the last 60 years and offshore chenier ridges do not appear to have been affected by the introduction of the Causeway.

The geology of the area varies from coastal clay and sand through to volcanic cones, tuff rings and lava flows. Basalt lava associated with Owairaka (Mount Albert) underlies the majority of the tunnel alignment. Owairaka itself is a key regional landscape feature within the broader Project area.

8.3 Sector 1 Te Atatu Interchange

Sector 1 includes SH16, Te Atatu Interchange and surrounding land uses

The Project area within Sector 1 is bounded on the western side by the Henderson Creek Bridge and on the eastern side by the Whau River Bridges, and includes the Te Atatu Interchange. Figure 8.3 depicts a view of this Sector orientated to the east with Te Atatu Peninsula and Harbourview Orangahina Park located to the left of the photograph and Te Atatu located to the right. SH16 and the Te Atatu Interchange are located in the centre of the photograph.

Figure 8.3: Existing Environment - Te Atatu Interchange (Looking East)

The land located within Sector 1 is within the jurisdiction of Auckland Regional Council and Waitakere City Council. Within this Sector residential activity is the predominant land use and includes the residential areas of Te Atatu South (south of SH16) and Te Atatu Peninsula (north of SH16). The land immediately south of SH16 is predominantly zoned Living 1 (for residential purposes) under the operative Waitakere City District Plan. To the north of the Te Atatu Interchange are two open space areas; Jack Colvin Park and Harbourview Orangahina Park. Within the surrounding residential area there are several schools - an early childhood centre (Te Puna Reo o Manuwanui), three primary schools (including one Kohanga Reo), and one secondary school (Rutherford College).

West of the Te Atatu Interchange and south of the motorway is residential development characterised by detached dwellings on relatively large sites. There are a few pockets of medium density living where properties have been subdivided into two or more lots however this area is largely characterised by detached houses on their own lots.

It is noted that there is a WCC pensioner housing unit close to the Te Atatu Peninsula town centre within the wider Sector environment.

Overall the area is characterised by a well established suburban neighbourhood (refer Figure 8.4) bisected into two separate smaller communities by SH16 (Te Atatu North and Te Atatu South). The Te Atatu South and the Te Atatu Peninsula town centres exist within the wider environment and support these communities. Both of these centres include a range of retail shops, medical facilities and commercial services. Residents within the area generally work within Auckland City or Waitakere City.

Te Atatu is a well established suburban neighbourhood

Figure 8.4: Existing Suburban Environment Sector 1

The areas of open space in Sector 1 are Jack Colvin Park, McCormick Green and Harbourview Orangihina Park. Jack Colvin Park and McCormick Green are subject to the Reserves Act 1977. Jack Colvin Park is an active sports field containing two formal sports field and a club room which are utilised year round for Rugby League by the Te Atatu Rugby League Club and the Auckland Rugby League Club.

Three open space areas in Sector 1

McCormick Green is a small reserve with very few facilities which appears to be a small 'remnant' area of open space resulting from the designation for SH16. There is an existing cycleway that runs at the northern edge of the Green.

Harbourview Orangihina Park is a large area of pasture land currently used for horse riding and equestrian events, being occupied by the Te Atatu Pony Club and a private horse grazer. This Park has also been identified within the District Plan as a potential location for a future marae.

The existing transport environment within Sector 1 includes SH16, public transportation facilities and pedestrian and cycle facilities along both sides of Te Atatu Road, through the Te Atatu interchange.

The existing SH16 is a major strategic corridor that influences the environment of this area

Within this Sector, SH16 provides two lanes in each direction. Te Atatu Interchange is a full interchange providing access to the local roading network north and south of the

Interchange and east along SH16 to the central City and west to Westgate. The Interchange currently has three on-ramps (two eastbound, one of which has a Priority Lane for HOV's, and one westbound) and two off-ramps (one eastbound and one westbound).

Ambient noise levels in this Sector are relatively high, due to the proximity to SH16, which is the dominant noise source (e.g. 68dB$L_{Aeq(24h)}$ at Titoki Street).

The Northwestern Cycleway runs along the southern side of SH16 and then connects into the local road network. There is public access to the CMA via Harbourview Orangihina Park or the Henderson Creek Walkway.

The topography in this area varies. Escarpments on the Te Atatu Peninsula and eastern side of Te Atatu South enjoy expansive views over the Waitemata Harbour above the Te Atatu Interchange. Lower lying relatively flat areas are located alongside the mainline SH16 carriageway west of the Te Atatu Interchange.

The existing geology of the area is composed of marine and stream alluvium containing silts and clays with varying sand and/or organic content. The area is well established with a number of large trees particularly around Titoki Street and Alwyn Avenue.

The ecology of the area is dominated by an urbanised environment

The existing ecology of the area is dominated by an urbanised environment however the Project area includes a small area of CMA adjacent to Jack Colvin Park. The Pixie Stream is piped along the northern boundary of Jack Colvin Park before discharging to the estuarine reaches of Henderson Creek. The Henderson Creek runs through residential and industrial areas, discharging into the Waitemata Harbour to the north-west of the Te Atatu Peninsula.

Mangroves and common estuarine epifauna, including mud crabs dominate the tidal habitat within the CMA. The motorway-side vegetation, and that in the vicinity of Jack Colvin Park, includes patches of mixed native and exotic scrubland and stands of mature trees. The remainder of the Project area is characterised by rough grass.

There are also trees located within Jack Colvin Park, McCormick Green and on Council road reserve. However it is noted that there are no 'scheduled trees' identified in the District Plan within this area. No archaeological sites are recorded within the current or proposed future SH16 designation, which has been extensively modified by earthworks. Two potential heritage features (which do not meet the criteria of archaeological sites) have been recorded in the proposed Harbourview-Orangihina Park construction yard - concrete foundations thought to have been part of a former cowshed and windmill, and some brick foundations in the vicinity of a former homestead. Midden along the coast of the Whau River and the Auckland Brick & Tile Co. brickworks site (scheduled in the Auckland Regional Plan: Coastal and WCC District Plan) are archaeological sites which have been identified outside of the project footprint.

8.4 Sector 2 – Whau River

Sector 2 includes the Whau River and the Whau River Bridge

The land within Sector 2 includes the structures and work within the Whau River. Figure 8.5 shows an aerial photograph looking north of the Whau River, including the Whau River Bridge and existing motorway.

Figure 8.5: Existing Whau River Bridge (Looking North)

Te Atatu Boating Club and mooring areas are major activities in the CMA

The area within Sector 2 is located within the jurisdiction of Auckland Regional Council and Auckland City Council. There are no residential areas in Sector 2. The motorway component of Sector 2 along the Whau River Bridge (refer Figure 8.5) is zoned as a Special Purpose Activity Zone (SH16) in the Auckland City District Plan.

The CMA is zoned Coastal Protection Area 1 on the northern side of the Whau River Bridge and Coastal Protection Area 2 on the southern side in the Auckland Regional Plan: Coastal. This Sector is also adjacent to a Mooring Management Area identified in the Regional Plan: Coastal. The CMA in Sector 2 is located within the Motu Manawa (Pollen Island) Marine Reserve.

Within Sector 2, SH16 has three lanes in each direction. The Northwestern Cycleway is adjacent to the westbound lanes of SH16, and there is an existing bus lane along SH16 within this Sector. The original embankments and Whau River Bridge were constructed around 1952 and in 1959–60, a second bridge was added to the south side of the original bridge, separating the eastbound and westbound traffic. The Whau Bridge was widened on both sides in 1990–91. There is a navigation channel under the Whau River which is used by pleasure craft moored in the Whau River.

A view protection shaft (identified as A13 in Proposed Plan Change 8 to the Regional Policy Statement) is located along the southern portion of this Sector. The view shaft exists to protect views of Owairaka (Mount Albert). Owairaka is considered as having significant natural value within the Auckland Regional Policy Statement. Owairaka is located outside of the project area.

The geology of the land within Sector 2 is composed of marine and stream alluvium containing silts and clays with varying sand and/or organic content.

The ecology of the Whau River adjacent to the SH16 bridge contains typical sub-tidal invertebrates (including mud crabs and worms), with low sediment contaminant concentrations due to the flushing out of fine sediment from the immediate area. Flora and fauna on the intertidal banks adjacent to the existing bridge predominantly comprise mangroves, some saltmarsh and exotic weed species.

Within Sector 2 SH16 is located entirely on reclaimed Causeway or the Whau River bridge and there are no known archaeological sites in this area. Although it is noted that historically the mouth of the Whau River was once used for seasonal settlement by Maori

8.5 Sector 3 – Rosebank Terrestrial

Sector 3 includes Rosebank Interchange, Patiki Road and Rosebank Park Domain

The land within Sector 3 includes the landward component of the Rosebank Peninsula including Rosebank Interchange, Patiki Interchange and the Rosebank Park Domain. Figure 8.6 shows a view looking west from the Patiki Cycleway.

Figure 8.6: Existing Environment – Rosebank

The land within Sector 3 is within the jurisdiction of Auckland Regional Council and Auckland City Council. There are no residential areas in Sector 3, and the District Plan zones this Sector as Open Space (Rosebank Park Domain), Business Activity (Rosebank Peninsula Industrial Area) and Special Purpose Activity (SH16).

The CMA on either side of the State highway in Sector 3 is zoned Coastal Protection Area 1 on the northern side and Coastal Protection Area 2 on the southern side in the Regional Plan: Coastal. The CMA in Sector 3 is also located within the Motu Manawa (Pollen Island) Marine Reserve.

Rosebank is a key employment and economic node of the City

The Rosebank Peninsula Industrial Area lies within the existing Sector 3 environment and is the largest employment area in, or close to, the entire Project area, with 813 business units in 2009. The Rosebank Industrial Area has a history of medium to heavy intensive industry dominated primarily by the manufacturing industry, however commercial buildings catering to predominantly office activity are developing in the area. The business hub attracts workers from the local and surrounding area as well as the wider Auckland regional catchment.

Rosebank Park Domain is the sole open space area within this Sector and is utilised almost solely for go-karting and as a speedway. The Domain is currently leased from Auckland City Council for this purpose. Figure 8.7 below shows the entrance to the Rosebank Park Domain.

Figure 8.7: Rosebank Park Domain

The existing transport environment within Sector 3 contains on-ramps and off-ramps from the local roading network to SH16, with west facing ramps at Patiki Road and east facing ramps at Rosebank Road. The eastbound on-ramp and off-ramp are flyovers over the main SH16 carriageway. The Northwestern Cycleway is provided alongside the westbound

carriageway of SH16.

At the northern end of the Rosebank Peninsula, a number of archaeological sites have been recorded within the current SH16 designation and immediately adjacent to it. These sites include middens, a tramway and limeworks site on Pollen Island (scheduled in the Auckland Regional Plan: Coastal) and the site of the former house of Mr Daniel Pollen (former Colonial Secretary and a noted historical figure in Auckland). Most of the recorded sites have already been damaged or destroyed by past activities including the motorway and related development.

Geologically, the composition of Sector 3 is marine/stream alluvium containing silts and clays with varying sand and/or organic content. Within the ecological environment of Sector 3, there is terrestrial habitat only which comprises just grass and weeds.

A view protection shaft (identified as A13 in Proposed Change 8 to the Regional Policy Statement) is located along the southern portion of this Sector. The view shaft exists to protect views of Owairaka (Mount Albert). Owairaka is considered as having significant natural value within the Auckland Regional Policy Statement. Owairaka is located outside of the project area.

There are a number of trees located within Sector 3, including several juvenile/semi-mature Pohutukawa trees. The majority of these trees are located within the existing Rosebank Speedway area. There are no 'scheduled trees' in the District Plan located within this Sector. The general vegetation includes mown grass adjacent to the motorway and bushes of marsh ribbonwood (Plagianthus divaricatus).

8.6 Sector 4 – Reclamation

Sector 4 is the largest coastal Sector of the Project and includes the northern side of SH16 from the Whau Bridge to the Waterview Interchange (terminating near the mouth of Oakley Inlet), encompassing the marine/estuarine habitat on both the southern and northern side of the existing motorway. This Sector includes parts of Traherne Island and the Causeway Bridge. Figure 8.8 shows the Causeway Bridge.

Sector 4 is the largest coastal Sector of the Project encompassing the marine habitat on both sides of SH16

The area within Sector 4 is within the jurisdiction of Auckland Regional Council and Auckland City Council. There are no residential areas or urban development in Sector 4. The District Plan zones this area as Special Purpose Activity (SH16) and Open Space (Pollen Island and Traherne Island).

Figure 8.8: Causeway Bridge

The Coastal Marine Area on either side of the Causeway is zoned Coastal Protection Area 1 in the ARP:C, and is also located within the Motu Manawa (Pollen Island) Marine Reserve and is part of the Hauraki Gulf Marine Park.

The existing transport environment of Sector 4 is dominated by SH16, and there are three lanes in each direction between Great North Road Interchange and the Rosebank Road Interchange. The Northwestern Cycleway runs alongside the westbound carriageway of SH16.

The geology of the area is marine/stream alluvium containing silts and clays with varying sand and/or organic content. The marine ecology within this area includes mangrove forest, saltmarsh, shellbanks, intertidal mudflats and sandflats, subtidal soft muds and man-made rocky shore. The ecological values within this Sector are variable, with an overall reduction in ecological values within increasing proximity to the Waterview Causeway and the mouth of Oakley Creek. The marine habitat provides feeding ground for several bird species, including white faced herons, pukeko, spotless crake and the endangered banded rail. Mimulus repens, a small creeping endemic maritime herb, presently classified as naturally uncommon and regionally endangered exists alongside the SH16 Causeway in the vicinity of Traherne Island.

SH16 crosses through the CMA traversing Motu Manawa (Pollen Island) Marine Reserve

Currently, for the Causeway, between Great North Road Interchange and Traherne Island, the stormwater runoff from the camber profile passes across the carriageway surface to the outer edge of the sealed shoulder. It then crosses a small area of grass (and paved cycleway - westbound only) before discharging onto the tidal mangrove flats. The passage of the stormwater across the grass area provides some quality treatment but by current water treatment standards the degree of treatment imposed is insufficient. Pavement drains are located on the outer edge of both carriageway shoulders, discharging typically at 100 metre centres, directly into the Harbour waters. There is a slotted median drain,

with interconnected cesspits, within this Sector, discharging directly into the tidal waters.

Most of the SH16 route in this Sector is on reclaimed Causeway where no archaeological sites are likely to be located. Traherne Island has been surveyed and has no known archaeological sites. Three midden sites are recorded within the wider environment at the eastern end of this Sector, to the south of the Waterview Inlet.

8.7 Sector 5 – Great North Road Interchange

Sector 5 geographically includes SH16 and surrounding urban areas of Point Chevalier and Waterview

This Sector of the Project comprises the area associated with the SH16/Great North Road Interchange. Geographically it includes the existing Interchange and the surrounding urban areas of Point Chevalier and Waterview. The land within Sector 5 is within the Auckland Regional Council and the Auckland City Council jurisdiction. The predominant land use within this Sector is the motorway/road (SH16 Interchange). This infrastructure is bound by open space and residential land uses.

Figure 8.9 depicts a west orientated view of this Sector with Unitec and Waterview located to the left of the photograph and Point Chevalier located to the right side of the photograph. SH16 is located down the centre of the photograph.

Figure 8.9: Great North Road Interchange (Looking West)

SH16 and the Great North Road Interchange is key transport infrastructure in this area

Within the existing Interchange there are three traffic lanes in each direction. Both the eastbound and westbound on-ramps have ramp signals and a Priority Lane to allow vehicles with two people or more (HOV's) to by-pass the ramp signals. The two off-ramps diverge from the main carriageway and the right turn movements are controlled by traffic signals at Great North Road, whilst left turn movements are controlled by a "Give Way" sign.

There are two passenger transport routes; SH16 provides a route from the west into the

CBD and the other route is along Great North Road through the Interchange. SH16 and the Interchange are designated for motorway purposes and zoned as Special Purpose 3 (Transport Environment) within the District Plan. Existing noise levels within Sector 5 are high due to the Interchange, SH16 and Great North Road (e.g. 65dB$L_{Aeq(24h)}$ at Herdman Street).

Pedestrian and cycle access is also provided for within this Sector and includes the Northwestern Cycleway running alongside SH16, a pedestrian and cycle link between Waterview and Point Chevalier, and the Oakley Creek Walkway.

Waterview and Point Chevalier are established residential neighbourhoods

The residential suburbs within this Sector are Waterview (south of SH16) and Point Chevalier (north of SH16). The residential environment is comprised of primarily detached single dwellings with some medium density development occurring where properties have been subdivided. These areas are separated by SH16 and the Great North Road Interchange. Waterview has a lower rate of home ownership and a higher rate of Housing New Zealand accommodation compared with the Auckland Region.

This Sector contains a number of educational facilities including Waterview Primary School, Waterview Kindergarten, St Francis School and Unitec (tertiary education provider).

The Waterview community typically accesses social and commercial services (e.g. medical facilities, retail outlets and libraries) at either Point Chevalier (described as part of Sector 6) or Avondale (described as part of Sector 8), both of which are walkable (within around 20-30 minutes from most locations within Waterview). Few local shops/services are located in Waterview itself. The majority of residents work within Auckland City.

The area to the north of the Interchange includes Eric Armishaw Park, and the area to the south of Interchange includes Waterview Reserve (an active recreation reserve which includes a playground and senior sportsfield), Waterview Esplanade, Cowley Reserve (a local purpose esplanade reserve), Saxon Reserve (a community park centrally located within the Waterview neighbourhood) and the northern portion of the Oakley Creek Esplanade Reserve (a passive recreation reserve). There is also an unnamed pocket of open space zoned land located between SH16 and Great North Road. A cycleway between Point Chevalier and Great North Road is located within this strip of land.

Waterview Reserve shown in Figure 8.10 below, Cowley Reserve and Oakley Creek Esplanade Reserve are subject to the Reserves Act 1977.

Figure 8.10: Waterview Reserve

The residential and open space zoned land directly south of the Waterview Inlet (located at the northern mouth of Oakley Creek) are subject to additional planning controls as they are within a Coastal Management Area overlay provided in the Auckland City District Plan. The Waterview Inlet is identified as Coastal Protection 1 within the Auckland Regional Plan: Coastal. There are no formal access points to the coast within the Great North Road Interchange area. The closest formal accesses in the vicinity of the Project are located to the north of SH16 at Point Chevalier, Eric Armishaw Park and the estuary at the end of Herdman Street, Waterview.

The Star Mill and surrounding sites represent a long history in the area

A number of archaeological sites have been recorded in close proximity to the Great North Road Interchange, reflective of the long history of human activity within the area. This is particularly prevalent around the coast and Waterview Inlet area, with middens, karaka trees, settlements, a stone wall, and the site of the Star Mill, which later became the Garrett Bros Tannery (1860 – 1890). The Star Mill site is located on both the northern and southern sides of Oakley Creek, and the archaeological site is considered to be in good condition – albeit that access is currently restricted by private property and the location of a dwelling above the site. The Star Mill/Tannery/Quarry site is scheduled in the Auckland Regional Plan: Coastal. The former Carrington Hospital (now part of Unitec) is a significant historic building in the vicinity of the Project, which is a NZHPT Category I registered Historic Place and the building and surrounds (extending to SH16) of which are scheduled in the Auckland City District Plan (Isthmus Section). The cluster of Maori habitation sites along Oakley Creek is scheduled in the Auckland City District Plan (Isthmus Section).

The geology within the area is a mix of fill or Tauranga Group alluvium (predominately silty clay with some sand, gravel and organic layers. The ecological values present within this area are considered to be low due to the disturbance reflective of an urbanised catchment. Figure 8.11 shows the estuarine environment looking north towards SH16. Mangroves inhabit the intertidal mudflats and the coastal edge vegetation comprises a narrow bank of native shrub, saltmarsh and exotic weed species. The Great North Road Interchange and Waterview Inlet site supports native bird species including the red-billed gull and silvereye. The most common aquatic invertebrates are leeches, segmented worms and midges.

There are a number of semi-mature trees within the area. The majority of these are located within Waterview Reserve. There are no 'scheduled trees' from the District Plan located within this Sector.

Figure 8.11: Estuarine Environment – Looking North towards SH16

8.8 Sector 6 – SH16 to St Lukes

Sector 6 geographically includes SH16 and open space, business, residential land uses surrounding SH16

This Sector of the Project geographically comprises SH16 and the land adjacent to it between St Lukes Road and the SH16 Interchange. The land within Sector 6 is within the jurisdiction of the Auckland Regional Council and Auckland City Council. The predominant land use within this Sector is motorway/road bound by open space, business and residential land uses. Figure 8.12 depicts an east orientated view of this Sector with Point Chevalier located to the left side of the photograph and Chamberlain Park Golf Course located to the right side of the photograph. SH16 and Great North Road are located to the centre of the photograph.

Figure 8.12: Sector 6 Environment (Looking East over Point Chevalier and Chamberlain Park Golf Course)

SH16 dominates the environment of this Sector

Within the existing transport environment, there are currently three lanes in each direction on SH16, with westbound ramps at St Lukes Road. There is an existing bus service operating along Great North Road and SH16. The Northwestern Cycleway runs alongside SH16, which is predominantly off-road in this location. There is also a pedestrian and cycle link across Carrington Bridge (over SH16). The noise environment within this Sector is relatively high due to SH16 and the other arterial roads within the area (e.g. 71dB$L_{Aeq(24h)}$ at 1102G Great North Road). SH16 is designated for motorway purposes and zoned as Special Purpose 3 (Transport Environment) within the District Plan.

Residential areas within this Sector are located to the northern and southern sides of SH16 within Point Chevalier and northern Mount Albert. There is a mix of housing types from low to medium density within these areas. There is a Housing New Zealand pensioner housing facility located on Parr Road South (directly below SH16).

The Point Chevalier shops front onto Great North Road on the northern side of SH16. The shops are occupied by a range of sub-urban retail and food outlets, including a supermarket. This area is zoned Business 2 within the District Plan and visible to the centre left of Figure 8.12 above. Most people that live in the area surrounding this Sector work in Auckland City.

There are no educational facilities within this Sector of the Project area; however educational facilities within the wider environment include Unitec, Gladstone Primary School, Point Chevalier Primary School and Pasedena Intermediate School. The 'Mason Clinic' is one of a few medical facilities also located within the area, and is a high security inpatient forensic psychiatric facility of sub-national and regional importance. All of the above sites are zoned in the District Plan for Special Purposes and attract people from outside of the Project area.

There are large areas of open space within this Sector adjoining SH16 and Great North Road. The Western Springs Gardens adjoin the regionally significant Zoological Park and Western Springs but are separated from this reserve area by Great North Road. This reserve area is zoned in the Auckland District Plan for community purposes – with buildings such as a community hall and a restaurant located within it. The Chamberlain Park Golf Course (private access) is located to the south of SH16 (refer to Figure 8.13). Additional areas of land zoned as Open Space in the District Plan include the RSA Bowls Club and a large parcel of private vacant land located at 1074 Great North Road.

Figure 8.13: Chamberlain Park Golf Course

The geology beneath the majority of this Sector is expected to comprise areas of fill overlying Tauranga Group alluvium overlying Waitemata Group sandstones and siltstones. Exposed basalt cut exists alongside SH16.

Stands of mature trees (Pohutukawa and Pinus species) exist at the edge of the Chamberlain Park Golf Course adjoining the Northwestern Cycleway and are a strong visual feature within the Sector. However it is noted that there are no 'scheduled trees' identified by the District Plan within this Sector.

In general the natural environment has been heavily modified within this Sector due to urbanisation and particularly the presence of SH16. Meola Creek flows within the Sector with its headwaters entirely piped above the Chamberlain Park Golf Course. Meola Creek is an urban stream in poor condition due to high levels of pollutants such as zinc and lead entering the stream from the heavily urbanised catchment. The catchment is characterised by an estimated 94% impervious surface area.

8.9 Sector 7 – Great North Road Underpass

Sector 7 includes Great North Road and surrounding areas of Waterview

This Sector of the Project comprises the area around Great North Road south of the SH16 Interchange and the surrounding areas of Waterview. The land within this Sector is within the Auckland Regional Council and Auckland City Council jurisdiction. Great North Road is the predominant land use feature surrounded by open space, special purpose and residential land uses. Figure 8.14 shows a short section of Great North Road looking north from the crossing of Oakley Creek.

Figure 8.14: Great North Road – Looking North Towards SH16 Intersection)

Great North Road bounds the eastern side of Waterview and the western side of Oakley Creek

Great North Road is identified as a strategic route within the Auckland City Council District Plan. It is a regional arterial road with restricted on-street parking. Along this section of Great North Road, four lanes are provided with a speed limit of 50 km/h. Existing bus services operate along Great North Road. There are also pedestrian and cycle ways, including a shared pedestian/cycle way running along Great North Road and continuing alongside Unitec, which connects to the Northwestern Cycleway. Noise levels for this Sector are dominated by traffic on Great North Road.

The residential area located within this Sector is Waterview (to the west). The residential environment contains primarily detached single dwellings with some medium density development occurring where properties have been subdivided. This Sector has a lower rate of home ownership and a high rate of Housing New Zealand accommodation.

An isolated residential zoned site also exists to the eastern side of Great North Road but is occupied by a petrol station (BP Waterview). The Waterview Superette located on the corner of Great North Road and Alford Street is the only land zoned for business purposes within the area. The majority of the residents within this area work within Auckland City.

Educational facilities include Waterview Primary School and Waterview Kindergarten. These are zoned for Special Purposes within the Auckland District Plan.

The Oakley Creek Esplanade Reserve is a large area of open space. The reserve runs north-south from Great North Road (near the cycle over bridge) down to Blockhouse Bay Road and includes both sides of the upper reaches of Oakley Creek. The reserve incorporates a scenic walkway (Refer Figure 8.15). The Reserve is zoned for Open Space 2 within the Auckland City District Plan and is subject to the Reserves Act 1977.

Oakley Creek is a significant natural and cultural feature

Figure 8.15: Oakley Creek Walkway

Oakley Creek meanders through the Oakley Creek Esplanade Reserve. Oakley Creek is Auckland's largest urban stream and in this reach is in relatively good condition compared to the upstream reaches in Sector 9, being mostly natural channel with riparian vegetation. However, it is noted that the culvert under Great North Road provides a barrier to fish passage at the downstream end, and the level of metals in the stream's sediment such as zinc, copper and lead are high, as is typical for highly urbanised catchments. The most common aquatic invertebrates within Oakley Creek are leeches, segmented worms and midges. It is noted that water quality along the entire length of Oakley Creek is considered to be poor due to the urbanised catchment in which it is located.

A number of archaeological sites have been recorded close to the banks of Oakley Creek in the vicinity of the Oakley Creek Esplanade Reserve reflecting an important transport route between the coast and inland areas such as Owairaka (Mt Albert) in the past as well as the comparative lack of development in this area more recently. In close proximity to the Creek there are many sites relating to Maori occupation, including midden, pits and terraces. There are also sites relating to early European industry and farming, including mill sites and dry stone walls. This area was identified at an early stage in the Project as an area of archaeological sensitivity, particularly along the northern part of the reserve area. The cluster of Maori habitation sites along Oakley Creek is scheduled in the Auckland City District Plan (Isthmus Section).

There are a number of existing semi-mature trees located along Great North Road and within the Oakley Creek Esplanade Reserve. The majority of these trees are exotic species and are not scheduled within the District Plan.

8.10 Sector 8 – Avondale Heights Tunnel

Sector 8 includes open space, residential, business and special purpose zoned land beneath Avondale Heights

The land within this Sector is diverse and includes a range of open space, residential, business and special purpose zoned land beneath 'Avondale Heights'. The land located within this area is within the jurisdiction of the Auckland Regional Council and Auckland City Council. (Refer to Figure 8.16 - Harbutt and Phyllis Reserve (central to photograph) and surrounding residential environment. Avondale Heights is situated to the left of the photograph; Springleigh/Mt Albert situated to the right of the photograph, and the North Auckland Rail Line and New North Road traverse across the bottom of the photograph).

Figure 8.16: Sector 8 Existing Environment (Looking North)

Avondale Heights is an established urban area within the city

The main arterial roads within this Sector are Great North Road, Blockhouse Bay Road, Carrington Road and New North Road. Great North Road, Carrington Road and New North Road are identified as regional arterial roads within the District Plan, while Blockhouse Bay Road is identified as a district arterial road. Mt Albert Road, Carrington Road and Great North Road form part of the Quality Transit Network.

The North Auckland Rail Line runs east-west parallel to New North Road and is utilised by Western Line services from Newmarket to Waitakere. The Avondale-Southdown Rail designation is in place for future rail (Auckland City District Plan Designation G08-05).

North-south pedestrian and cycle movement in this area is generally constrained by the rail corridor running along New North Road. However there is a shared pedestrian and cycle path located along Great North Road and footpaths between the Avondale commercial centre to the Pak 'n Save site, and to Phyllis Reserve. The Oakley Creek Walkway and Alan Wood Reserve are also features within this Sector.

Residential land use includes suburbs of Mt Albert, Avondale Heights and Owairaka. The housing development generally varies with a mix of low to medium density development. It is noted that there are also small pockets of high density development (Residential 7a Zoning) located close to New North Road (e.g. Soljak Place). Housing New Zealand accommodation in this Sector is generally clustered around south-east Waterview, around the intersection of New North Road and Mt Albert Road, and around Hendon Avenue. There is a block of ACC-provided pensioner flats located on New Windsor Road, close to the intersection with Blockhouse Bay Road.

There are a number of educational facilities within the wider environment of this Sector. There are a number of secondary schools (including Avondale College, Mt Albert Grammer and Hebron Christian College), one intermediate school (Avondale Intermediate School) and one primary school (Avondale Primary).

There are two town centres located in the vicinity of the Project Area. The Avondale Town Centre is identified within the wider environment as an important area for retail/commercial services and the Mt Albert Pak'n Save (zoned for business purposes, located along New North Road) is seen as a particularly important retail facility within this Sector. The Mt Albert Town Centre also provides for a mix of community, retail and commercial services within the wider environment.

Oakley Creek is a significant natural and cultural feature

The landscape in this area is dominated by the Oakley Creek corridor, which runs north-south through the Sector to its entry to the Waitemata Harbour at the Great North Road Interchange. Oakley Creek in this area can be described as similar to in Sector 7. Within the section, a natural barrier to fish passage exists created by the waterfall located in Oakley Creek Esplanade, approximately opposite Fir Street on Great North Road (Refer to Figure 8.17). The quality of the creek is impacted by urbanisation, supporting fauna and flora typical of low water quality habitat.

Figure 8.17: Oakley Creek Waterfall

The green open space corridor that follows the Creek is the largest and most connected portion of the open space network in the entire study area. Open spaces within the area include Phyllis Reserve, Harbutt Reserve, Oakley Creek Esplanade Reserve, and the northern end of Alan Wood Reserve. Phyllis Reserve is dominated by sports fields, and is home to the Mt Albert Football Club and Softball Club (refer to Figure 8.18). The Akarana Dog Obedience Association is also located to the southern end of Phyllis Reserve. Harbutt Reserve is used mainly for passive recreation; predominantly by use of its walking track.

Figure 8.18: Phyllis Reserve Sportsfields

Alan Wood Reserve continues running south into Sector 9 and contains an existing designation (for a future Avondale-Southdown Rail line, referenced G08-05 within the Auckland City District Plan), which bisects the Reserve. The Reserve is large in area and utilised for both active and passive recreation. The active facilities of the Reserve are generally located in Sector 9 however a training field is located on leased Kiwi Rail land within Sector 8. Alan Wood Reserve is subject to the Reserves Act 1977.

A number of archaeological sites have been recorded close to the banks of Oakley Creek within this Sector, including sites relating to Maori occupation, such as midden, pits and terraces. There are also sites relating to early European industry and farming, including dry stone walls located between Unitec and Oakley Creek. This area was identified at an early stage in the Project as an area of archaeological sensitivity.

There are two volcanic view shafts which exist within this Sector. The first view protection shaft (E05-29 in the District Plan) exists at the northern end of Alan Wood Reserve and the second view shaft (A13 in Proposed Change 8 to the Regional Policy Statement) is located at the southern end of the Oakley Creek Esplanade Reserve within this Sector. The view shafts exist to protect views to and from Owairaka (Mount Albert). Owairaka is considered as having significant natural value within the Auckland Regional Policy Statement. Figure 8.19 shows views from Owairaka to SH16 and Oakley Creek.

Figure 8.19: Views from Owairaka

The geology of the land is comprised of fill or basalt overlying Tauranga Group alluvium overlying Waitemata Group sandstone and siltstone. The fill has been identified within Harbutt and Phyllis Street Reserves, where it occupies voids created by quarrying of the basalt. The pockets of fill are variable in both nature and thickness, particularly within the parks and sport fields adjacent to Oakley Creek in Alan Wood Reserve, Phyllis Reserve and Harbutt Reserve. A significant thickness of Parnell Grit also underlies Phyllis Street Landfill, on the eastern side of Oakley Creek. There are no "scheduled trees' identified within the District Plan within this area.

8.11 Sector 9 – Alan Wood Reserve

Sector 9 includes Alan Wood Reserve and the Maioro Street Interchange

This Sector of the Project comprises the area associated with the southern end of Alan Wood Reserve and the Maioro Street Interchange. Geographically it includes the surrounding residential area of Owairaka and New Windsor, Alan Wood Reserve, Hendon Park, Richardson Road and the existing termination of Maioro Street. The land within Sector 9 is within the Auckland Regional Council and Auckland City Council jurisdiction. The predominant land use within this area is one of open space bound by residential and business land uses (refer to Figure 8.20 – the photograph is orientated north east across from New Windsor towards Owairaka; Alan Wood Reserve/Hendon Park is the open space located to the centre of the photograph).

Figure 8.20: Alan Wood Reserve/Hendon Park

The creek and open space separate Owairaka and New Windsor

This Sector is dominated by open space, Oakley Creek and an undeveloped (but designated) rail corridor, therefore the ambient noise environment is currently quite low (e.g. 48dB$L_{Aeq(24h)}$ in some locations on Hendon Avenue). Existing roads within this Sector are Richardson Road, Hendon Avenue and Valonia Street. The speed limit along all of these roads is 50km/hr and parking on both sides is permitted in most locations.

Alan Wood Reserve (bisected by the Avondale-Southdown rail designation G08-05), NZTA owned land, privately owned land (zoned for residential purposes) and Hendon Park comprise this large portion of open space. Alan Wood Reserve is the most significant of these open spaces, the irregular shape, open character of the Reserve and the undeveloped railway designation corridor together create a large linear open space area. The western portion of Alan Wood Reserve is subject to the Reserves Act 1977. As stated in Sector 8, Alan Wood Reserve contains a number of active sportsfields. These are generally located in the southern portion of the reserve within this Sector and include two sportsfields, half basketball court and public toilets. The crown owned land adjoining Alan Wood Reserve also contains a dilapidated league field. Hendon Park adjoins the southern

most end of Alan Wood Reserve.

Parallel to the Avondale-Southdown rail designation is land designated for the SH20 Mount Roskill Extension which is now completed. Designation references H08-05, H08-06 and H08-07 in the Auckland City District Plan are related to that Project. There is a pedestrian and cycleway connecting Hendon Park to Underwood Park and Walmsley Park (which are located in the wider Project environment). There are passenger transport facilities in the surrounding environment, which run along Richardson Road and Hendon Avenue.

Figure 8.21: Alan Wood Reserve – Oakley Creek

Residential areas within this Sector include the suburbs of Owairaka and Walmsley (to the north) and New Windsor (to the south). The majority of the residential land is occupied by low density suburban development. A resource consent granted in 2005 for 83 medium-density residential units on vacant land in Valonia Street, adjoining Alan Wood Reserve has not yet been implemented (this land while zoned residential, appears visually to be part of Alan Wood Reserve/Hendon Park). Housing New Zealand accommodation is heavily concentrated in the area, with high densities of social housing around Hendon Avenue, Hargest Terrace, Range View Road, and another significant cluster in the block between Mt Albert Road, Stoddard Road and the Sandringham Road Extension.

Christ the King primary school is located directly adjacent to the Project area, however there are a further three primary schools (New Windsor, Wesley and Owairaka District) located within the wider surrounding area. The intermediate school serving the local area around Sector 9 is Wesley Intermediate School, a state school located on Sandringham Road Extension. A number of early childcare centres also exist within the wider environment.

Stoddard Road is identified as a future town centre by the Auckland Regional and Auckland City Council. The existing retail environment includes a precinct of small retail and food outlets occupying Business 2 zoned land on the corner of Stoddard and

Richardson Roads. These businesses support the local community. Land surrounding this retail precinct is zoned Mixed Use, and currently occupied by a range of light industrial uses as well as other retail/food outlets and religious organisations. Other areas along Stoddard Road are zoned Business 4 and occupied by light industrial uses. A Business 8 zoned site (large scale business development) also exists along the northern side of Richardson Road and is currently occupied by the Richardson Road tavern and bottle store. Most people who live within this area work within Auckland City.

The 'open space' network dominates the local environment

Within Alan Wood Reserve, the geology generally comprises fill or basalt overlying Tauranga Group Alluvium. Much of the fill comprises reworked natural soils (silt and clay) though at some locations waste was encountered. Geology at the Maioro Street Interchange comprises fill or basalt overlying weathered Waitemata Group (clayey silt and sand).

There are no known archaeological sites within the area. Much of the area is former swampland unsuitable for human habitation in the past. Oakley Creek is an open channel within this Sector (significantly degraded compared with lower reaches of Oakley Creek). In this area the alignment of the stream follows the edge of the basalt geology, which forms sections of the true right bank. This is also the boundary of a volcanic aquifer and there are understood to be groundwater inflows into the stream. The true left bank is formed in Tauranga Group geology, the weathered soils of which are susceptible to erosion. The water quality of Oakley Creek is considered to be low and similar to other urban catchments in terms of physical habitat modification and diversity and sensitivity of macro invertebrates. This area supported a number of native bird species including red-billed gull, black-backed gull, spur-winging plover and pukeko.

The 1 in 100 year flood plain follows the low lying area along Oakley Creek. Figure 8.22 shows flooding within Hendon Park during June 2010.

Figure 8.22: Flooding within Alan Wood Reserve/Hendon Park June 2010