Appendix G

Grey Lynn Tunnel

Watercare

Objectives and Policies Assessment

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Grey Lynn Tunnel

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CHAPTER B – REGIONAL POLICY STATEMENT			
Reference	Objective/Policy	Is the Proposal Consistent?	Comment
B2 – Urban Growth and Form			
Objective B2.2.1 Urban growth and form	(1) A quality compact urban form that enables all of the following: (a) a higher-quality urban environment; (b) greater productivity and economic growth; (c) better use of existing infrastructure and efficient provision of new infrastructure; (e) greater social and cultural vitality; (f) better maintenance of rural character and rural productivity; and (g) reduced adverse environmental effects. (3) Sufficient development capacity and land supply is provided to accommodate residential, commercial, industrial growth and social facilities to support growth.	Yes	The Project is fundamental to the urban intensification of the Auckland Isthmus. By acting as a bypass of wastewater flows from the Orakei Main Sewer to the Central Interceptor, the Project will directly provide additional wastewater network capacity in the Orakei Main Sewer. This will subsequently provide a number of benefits to the community and local environment including a reduction in WWOs and infrastructure capacity to support planning urban intensification. In addition, the Project represents a prudent use of existing infrastructure given its role in the reorganisation of the metropolitan wastewater network and allowing the Orakei Main Sewer to support additional growth without the need for it to be upgraded itself. The completed Project will be largely underground, with a small number of structures and access points provided at a private property on Tawariki Street. This site will be screened and landscaped to maintain local amenity values. Lastly, Watercare will employ a range of measures during the Project's construction to minimise impacts on residents. This has

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			included the selection of the Tawariki Street site, which generates the least adverse effects of the five sites considered during optioning.
Objective B2.3.1 A quality built environment	(1) A quality built environment where subdivision, use and development do all of the following: (a) respond to the intrinsic qualities and physical characteristics of the site and area, including its setting; (c) contribute to a diverse mix of choice and opportunity for people and communities; (d) maximise resource and infrastructure efficiency; (e) are capable of adapting to changing needs; and (f) respond and adapt to the effects of climate change. (2) Innovative design to address environmental effects is encouraged. (3) The health and safety of people and communities are promoted.	Yes	The proposed construction methodology of the Project is an appropriate response to the existing urban environment. Most of the Project will be excavated using a TBM, thereby avoiding any disruption to surface development and residents. It is also noted that the Tawariki Street site will be appropriately designed to integrate into the existing urban character of the Grey Lynn area. The Project also represents a smart form of infrastructure investment, delivering increased network capacity and improved environmental performance in an integrated and cost-efficient fashion with the investment underway with the CI. It is also future proved to enable additional environmental improvement within the Grey Lynn catchment This approach to network investment and management is an efficient means of providing a lifeline utility to the community, while also minimising community disruption and costs.

Policy B2.3.2 A quality built environment	(1) Manage the form and design of subdivision, use and development so that it does all of the following: (a) supports the planned future environment, including its shape, landform, outlook, location and relationship to its surroundings, including landscape and heritage; (b) contributes to the safety of the site, street and neighbourhood; (d) achieves a high level of amenity and safety for pedestrians and cyclists; (e) meets the functional, and operational needs of the intended use; and (f) allows for change and enables innovative design and adaptive re-use.	Yes	The Project takes into consideration the adjacent land and zoning and Watercare will design the above ground infrastructure in a manner which maintains existing amenity values. The use of walls and boundary landscaping at the Tawariki Street will be designed to soften the appearance of the permanent about ground infrastructure, while ensuring that the site meets health and safety requirements. The provision of space for the second shaft allows for future network connections, while the proposed design will ensure that noise and odour effects from the operation of the Project are minimised and are no different from those currently generated by existing assets. Furthermore, there is a functional requirement for the Project's location, given the need to connect to the CI, the Orakei Main Sewer and the local network. In addition, the Project needs to be located in the local area in order to deliver both a reduction in WWOs, as well as support the intensification of the Isthmus. The assessment of alternatives, as undertaken by Watercare, highlights the appropriateness of the shaft site location, including the ease of access of the site to existing network assets.

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B3 – Infrastructure, Transport and Energy			
Objective B3.2.1 Infrastructure	(1) Infrastructure is resilient, efficient and effective. (2) The benefits of infrastructure are recognised, including: (a) providing essential services for the functioning of communities, businesses and industries within and beyond Auckland; (b) enabling economic growth; (c) contributing to the economy of Auckland and New Zealand; (d) providing for public health, safety and the well-being of people and communities; (e) protecting the quality of the natural environment; (3) Development, operation, maintenance, and upgrading of infrastructure is enabled, while managing adverse effects on: (a) the quality of the environment and, in particular, natural and physical resources that have been scheduled in the Unitary Plan in relation to natural heritage, Mana Whenua, natural resources, coastal environment, historic heritage and special character; (b) the health and safety of communities and amenity values. (4) The functional and operational needs of infrastructure are recognised. (5) Infrastructure planning and land use planning are integrated to service growth efficiently. (8) The adverse effects of infrastructure are avoided, remedied or mitigated.	Yes	The Project is a vital infrastructure investment for the Auckland Isthmus, delivering increased network capacity and helping reduce the frequency of WWOs into local watercourses and the Waitemata Harbour. There is also a functional need for the Project to located in the chosen locations given the presence of existing infrastructure, the current capacity of that infrastructure, the need to support the growth of the community and a desire to improve the environmental performance of the metropolitan network. The appropriateness of the Project location has been confirmed through an assessment of alternatives process, while Watercare have also proposed numerous measures to minimise and mitigate the adverse effects of the Project. As such, the Project supports the economic wellbeing of Auckland, protects the health and safety of the community and provides for restoration of the natural environment. The Project is also integrated with other investments in the metropolitan wastewater network, ensuring that it is an efficient use of infrastructure funding and contributes to the

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Policy B3.2.2 Infrastructure	(1) Enable the efficient development, operation, maintenance and upgrading of infrastructure. (2) Recognise the value of investment in existing infrastructure. (3) Provide for the locational requirements of infrastructure by recognising that it can have a functional or operational need to be located in areas with natural and physical resources that have been scheduled in the Unitary Plan in relation to natural heritage, Mana Whenua, natural resources, coastal environment, historic heritage and special character. (6) Enable the development, operation, maintenance and upgrading of infrastructure in areas with natural and physical resources that have been scheduled in the Unitary Plan in relation to natural heritage, Mana Whenua, natural resources, coastal environment, historic heritage and special character while ensuring that the adverse effects on the values of such areas are avoided where practicable or otherwise remedied or mitigated. (8) Avoid, remedy or mitigate the adverse effects from the construction, operation, maintenance or repair of infrastructure.	Yes	long-term objectives sought for the wider network. Lastly, the Project has been designed and sited to avoid significant adverse effects on the environment. This includes avoiding undertaking works in public reserves and minimising the scale of land disturbance required to provide added network capacity. The Tawariki Street site will be designed to maintain local amenity values, while the effects of its construction can be readily managed using standard construction practices.
B6 – Mana Whenua			
Objective B6.2.1 Recognition of Treaty of Waitangi/Te Tiriti o Waitangi partnerships and participation	(1) The principles of the Treaty of Waitangi/Te Tiriti o Waitangi are recognised and provided for in the sustainable management of natural and physical resources including ancestral lands, water, air, coastal sites, wāhi tapu and other taonga. (2) The principles of the Treaty of Waitangi/Te Tiriti o Waitangi are recognised through Mana Whenua participation in resource management processes.	Yes	The Project reduces wastewater overflows and will improve the water quality of the Grey Lynn catchment. The Project includes on-going engagement and consultation with iwi and provides for the on-going opportunity for mana whenua to participate in the design and consenting

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Policy B6.2.2 Recognition of Treaty of Waitangi/Te Tiriti o Waitangi partnerships and participation	(1) Provide opportunities for Mana Whenua to actively participate in the sustainable management of natural and physical resources including ancestral lands, water, sites, wāhi tapu and other taonga in a way that does all of the following: (a) recognises the role of Mana Whenua as kaitiaki and provides for the practical expression of kaitiakitanga; (b) builds and maintains partnerships and relationships with iwi authorities; (c) provides for timely, effective and meaningful engagement with Mana Whenua at appropriate stages in the resource management process, including development of resource management policies and plans; (d) recognises the role of kaumātua and pūkenga; (e) recognises Mana Whenua as specialists in the tikanga of their hapū or iwi and as being best placed to convey their relationship with their ancestral lands, water, sites, wāhi tapu and other taonga; (f) acknowledges historical circumstances and impacts on resource needs; (g) recognises and provides for mātauranga and tikanga; and (h) recognises the role and rights of whānau and hapū to speak and act on matters that affect them.	Yes	process. This engagement has concluded Watercare's Kaitiaki Forum. This forum involves contacting of all 19-mana whenua in the Auckland region. Following initial contact with mana whenua, four groups expressed an interested in the project: Te Rūnanga o Ngāti Whātua, Te Kawerau ā Maki, Ngāti Whātua Ōrākei and Ngāti Maru. Information was provided by e-mail to them and this was followed up by a presentation by Watercare to the forum in August 2018 and a meeting with representatives of Ngāti Whātua Ōrākei. Watercare proposes to continue this engagement through future phases of the Project.
Objective B6.3.1 Recognising Mana Whenua values	(1) Mana Whenua values, mātauranga and tikanga are properly reflected and accorded sufficient weight in resource management decision-making. (2) The mauri of, and the relationship of Mana Whenua with, natural and physical resources including freshwater, geothermal resources, land, air and coastal resources are enhanced overall. (3) The relationship of Mana Whenua and their customs and traditions with natural and physical resources that have been scheduled in the	Yes	As previously discussed, the Project includes on-going engagement and consultation with Mana Whenua, allowing for the incorporation of mana whenua values into the design and development of the Project. Furthermore, the Project seeks to assist in community efforts to improve the mauri of freshwater resources in the Auckland urban

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	Unitary Plan in relation to natural heritage, natural resources or historic heritage values is recognised and provided for.		area by reducing the frequency of WWOs into the Cox's Creek catchment.
Policy B6.3.2 Recognising Mana Whenua values	(1) Enable Mana Whenua to identify their values associated with all of the following: (a) ancestral lands, water, air, sites, wāhi tapu, and other taonga; (b) freshwater, including rivers, streams, aquifers, lakes, wetlands, and associated values; (c) biodiversity; (d) historic heritage places and areas; and (e) air, geothermal and coastal resources. (2) Integrate Mana Whenua values, mātauranga and tikanga: (a) in the management of natural and physical resources within the ancestral rohe of Mana Whenua, including: (i) ancestral lands, water, sites, wāhi tapu and other taonga; (ii) biodiversity; and (iii) historic heritage places and areas. (b) in the management of freshwater and coastal resources, such as the use of rāhui to enhance ecosystem health; (c) in the development of innovative solutions to remedy the long-term adverse effects on historical, cultural and spiritual values from discharges to freshwater and coastal water; and (d) in resource management processes and decisions relating to freshwater, geothermal, land, air and coastal resources. (3) Ensure that any assessment of environmental effects for an activity that may affect Mana Whenua values includes an appropriate assessment of adverse effects on those values.	Yes	In addition, the Project avoids the disturbance of any sites or places of significance to mana whenua, while an accidental discovery protocol will be employed during bulk earthworks. Lastly, the AEE has taken into regard mana whenua values. This includes a summary of these effects in Section 6.6 and details regarding mana whenua engagement in Section 7.3.

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	(4) Provide opportunities for Mana Whenua to be involved in the integrated management of natural and physical resources in ways that do all of the following: (a) recognise the holistic nature of the Mana Whenua world view; (b) recognise any protected customary right in accordance with the Marine and Coastal Area (Takutai Moana) Act 2011; and (c) restore or enhance the mauri of freshwater and coastal ecosystems. (6) Require resource management decisions to have particular regard to potential impacts on all of the following: (a) the holistic nature of the Mana Whenua (b) the exercise of kaitiakitanga; (c) mauri, particularly in relation to freshwater and coastal resources; (d) customary activities, including mahinga kai; (e) sites and areas with significant spiritual or cultural heritage value to Mana Whenua;		
B7 – Natural Resources			
Objective B7.3.1 Freshwater system	(3) The adverse effects of changes in land use on freshwater are avoided, remedied or mitigated.	Yes	As previously discussed, the Project is critical to the delivery of a metropolitan wastewater network which both supports the planned growth of Auckland and the improvement of wider environmental values. By diverting flows from the Orakei Main Sewer to the CI, the Project allows for the intensification of the Isthmus while also reducing the frequency of WWOs. As such, the Project will provide both increased network capacity and reduced frequency in overflows which will assist
Policy B7.3.2 Freshwater system	(1) Integrate the management of subdivision, use and development and freshwater systems by undertaking all of the following: (a) ensuring water supply, stormwater and wastewater infrastructure is adequately provided for in areas of new growth or intensification; (c) controlling the use of land and discharges to minimise the adverse effects of runoff on freshwater systems and progressively reduce existing adverse effects where those systems or water are degraded; and (d) avoiding development where it will significantly increase adverse effects on freshwater systems, unless these adverse effects can be adequately mitigated.	Yes	

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			Auckland Council's and community efforts to improve the water quality of urban watercourses. In addition, the Project represents the integrated management of water resources, with the improvement management of wastewater flows, as well as supporting the wellbeing of local natural freshwater systems.
Objective B7.5.1 Air	(1) The discharge of contaminants to air from use and development is managed to improve region-wide air quality, enhance amenity values in urban areas and to maintain air quality at appropriate levels in rural and coastal areas. (2) Industry and infrastructure are enabled by providing for reduced ambient air quality amenity in appropriate locations. (3) Avoid, remedy or mitigate adverse effects from discharges of contaminants to air for the purpose of protecting human health, property and the environment.	Yes	Any potential adverse effects resulting from the discharge of contaminants to air during the construction phase of the Project will be managed accordingly, including the potential for dust arising from bulk earthworks. Modelling undertaken for the Project also demonstrates that the operation of the shaft site will not generate any significant air quality effects or limit the ability for surrounding sites to be developed for residential or other sensitive land use activities. In addition, the shaft site is future proofed to provide an 8m high vent stack, should any odour issues arise following the commissioning of the Project.
Policy B7.5.2 Air	(1) Manage discharge of contaminants to air from use and development to: (a) avoid significant adverse effects on human health and reduce exposure to adverse air discharges; (b) control activities that use or discharge noxious or dangerous substances; (c) minimise reverse sensitivity effects by avoiding or mitigating potential land use conflict between activities that discharge to air and activities that are sensitive to air discharges;	Yes	

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	(d) protect activities that are sensitive to the adverse effects of air discharges; (e) protect flora and fauna from the adverse effects of air discharges		
B10 – Environmental Risk			
Objective B10.4.1 Land – contaminated	(1) Human health and the quality of air, land and water resources are protected by the identification, management and remediation of land that is contaminated.	Yes	Any contaminated land discovered during the works will be remediated with any associated potential adverse effects managed in accordance with the AUP's discovery protocols.
Policy B10.4.2 Land – contaminated	(3) Manage or remediate land that is contaminated where: (a) the level of contamination renders the land unsuitable for its existing or proposed use; or (b) the discharge of contaminants from the land is generating or is likely to generate significant adverse effects on the environment; or (c) development or subdivision of land is proposed	Yes	

CHAPTER E – AUCKLAND WIDE			
Reference	Objective/Policy	Is the Proposal Consistent?	Comment
E1 – Water Quality and Integrated Management			
Objectives E1.2	(1) Freshwater and sediment quality is maintained where it is excellent or good and progressively improved over time in degraded areas. (2) The mauri of freshwater is maintained or progressively improved over time to enable traditional and cultural use of this resource by Mana Whenua. (3) Stormwater and wastewater networks are managed to protect public health and safety and to prevent or minimise adverse effects of contaminants on freshwater and coastal water quality.	Yes	Appropriate sediment and erosion controls will be implemented throughout the construction phase to ensure that freshwater quality within the catchment is maintained. The Project will also assist in the reduction of WWOs, thereby supporting the restoration of, and reducing the adverse effects of contaminants on, local watercourses and further protecting public health.
E2 – Water Quantity, Allocation and Use			
Objective E2.2	(1) Water in surface rivers and groundwater aquifers is available for use provided the natural values of water are maintained and established limits are not exceeded. (2) Water resources are managed within limits to meet current and future water needs for social, cultural and economic purposes.	Yes	The potential groundwater effects of the Project are assessed in detailed in the AEE. The natural values of water and availability of water resources will be maintained. No existing groundwater users will be affected, and no buildings or services are predicted to be adversely impacted by the potential settlements. No scheduled historic heritage places or sites and places of significance to Mana Whenua will be affected. In addition, Watercare proposes to undertake monitoring prior to, during and after construction of the Project. This will provide information to confirm that the
Policy E2.3	(23) Require proposals to divert groundwater, in addition to the matters addressed in Policy E2.3(6) and (7) above, to ensure that: (a) the proposal avoids, remedies or mitigates any adverse effects on: (i) scheduled historic heritage places and scheduled sites and places of significance to Mana Whenua; and (ii) people and communities. (b) the groundwater diversion does not cause or exacerbate any flooding; (c) monitoring has been incorporated where appropriate, including: (i) measurement and recording of water levels and pressures; and (ii) measurement and recording of the movement of ground, buildings and other structures.	Yes	

CHAPTER E – AUCKLAND WIDE			
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	(d) mitigation has been incorporated where appropriate including: (i) minimising the period where the excavation is open/unsealed; (ii) use of low permeability perimeter walls and floors; (iii) use of temporary and permanent systems to retain the excavation; or (iv) re-injection of water to maintain groundwater pressures.		magnitude of impact, if any, is no greater than predicted in the AEE.
E11 – Land Disturbance – Regional			
Objectives E11.2	(1) Land disturbance is undertaken in a manner that protects the safety of people and avoids, remedies and mitigates adverse effects on the environment. (2) Sediment generation from land disturbance is minimised.	Yes	The Project does not affect areas of natural or physical resources that have been scheduled in the AUP. The Project includes the implementation of an accidental discovery protocol and aims to maintain cultural and spiritual Mana Whenua values and preserve wāhi tapu, and kaimoana gathering when and where required. The Project will include the implementation of an appropriate ESCP to manage any potential adverse effects resulting from the discharge of sediment from the work area during construction. The ESCP will incorporate the requirements of GD05 to ensure any significant adverse effects are avoided and that sediment discharge is minimised to the extent practicable. Lastly, the geotechnical and vibration assessments have demonstrated that the Project will only have negligible effects on the stability of surrounding land and
Policies E11.3	(1) Avoid where practicable, and otherwise mitigate, or where appropriate, remedy adverse effects on areas where there are natural and physical resources that have been scheduled in the Plan in relation to natural heritage, Mana Whenua, natural resources, coastal environment, historic heritage and special character (2) Manage land disturbance to: (a) retain soil and sediment on the land by the use of best practicable options for sediment and erosion control appropriate to the nature and scale of the activity; (b) manage the amount of land being disturbed at any one time, particularly where the soil type, topography and location is likely to result in increased sediment runoff or discharge; (c) avoid, remedy and mitigate adverse effects on accidentally discovered sensitive material; and (d) maintain the cultural and spiritual values of Mana Whenua in terms of land and water quality, preservation of wāhi tapu, and kaimoana gathering.	Yes	

CHAPTER E – AUCKLAND WIDE			
Reference	Objective/Policy	Is the Proposal Consistent?	Comment
	(3) Manage the impact on Mana Whenua cultural heritage that is discovered undertaking land disturbance by: (a) requiring a protocol for the accidental discovery of kōiwi, archaeology and artefacts of Māori origin; (b) undertaking appropriate actions in accordance with mātauranga and tikanga Māori; and (c) undertaking appropriate measures to avoid adverse effects. Where adverse effects cannot be avoided, effects are remedied or mitigated. (5) Design and implement earthworks with recognition of existing environmental site constraints and opportunities, specific engineering requirements, and implementation of integrated water principles. (6) Require that earthworks are designed and undertaken in a manner that ensures the stability and safety of surrounding land, buildings and structures. (7) Require any land disturbance that will likely result in the discharge of sediment laden water to a surface water body or to coastal water to demonstrate that sediment discharge has been minimised to the extent practicable, having regard to the quality of the environment; with: (a) any significant adverse effects avoided, and other effects avoided, remedied or mitigated, particularly in areas where there is: (i) high recreational use; (ii) relevant initiatives by Mana Whenua, established under regulations relating to the conservation or management of fisheries, including taiāpure, rāhui or whakatupu areas; (iii) the collection of fish and shellfish for consumption; (iv) maintenance dredging; or		structures, while the use of GWMCP will ensure that building damage is avoided.

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Reference	Objective/Policy	Is the Proposal Consistent?	Comment
	(v) a downstream receiving environment that is sensitive to sediment accumulation; (b) adverse effects avoided as far as practicable within areas identified as sensitive because of their ecological values, including terrestrial, freshwater and coastal ecological values; and (c) the receiving environments ability to assimilate the discharged sediment being taken into account.		
E12 – Land Disturbance – District			
Objective E12.2	(1) Land disturbance is undertaken in a manner that protects the safety of people and avoids, remedies and mitigates adverse effects on the environment.	Yes	The Project has been designed to efficiently manage soil and sediment through the use of the ESCP and standard erosion control practices. Soil/sediment will be retained on site where possible and erosion and sediment control measures will be implemented in accordance with GD05 to ensure the on-going safety of people and that the Project avoids, remedies and mitigates adverse effects on the environment. The Project avoids effects to natural or physical resources scheduled under the AUP, such as any Outstanding Natural Landscapes or SEAs. Where possible the Project will limit the disturbance of land to the extent necessary for the delivery of the Project, which will ultimately provide for people and communities social, economic and cultural well-being as well as their health and safety
Policies E12.3	(1) Avoid where practicable, and otherwise, mitigate, or where appropriate, remedy adverse effects of land disturbance on areas where there are natural and physical resources that have been scheduled in the Plan in relation to natural heritage, Mana Whenua, natural resources, coastal environment, historic heritage and special character. (2) Manage the amount of land being disturbed at any one time, to: (a) avoid, remedy or mitigate adverse construction noise, vibration, odour, dust, lighting and traffic effects; (b) avoid, remedy and mitigate adverse effects on accidentally discovered sensitive material; and (c) maintain the cultural and spiritual values of Mana Whenua in terms of land and water quality, preservation of wāhi tapu, and kaimoana gathering. (3) Enable land disturbance necessary for a range of activities undertaken to provide for people and communities social, economic and cultural well-being, and their health and safety	Yes	

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Reference	Objective/Policy	Is the Proposal Consistent?	Comment
	(4) Manage the impact on Mana Whenua cultural heritage that is discovered undertaking land disturbance by: (a) requiring a protocol for the accidental discovery of kōiwi, archaeology and artefacts of Māori origin; (b) undertaking appropriate actions in accordance with mātauranga and tikanga Māori; and (c) undertaking appropriate measures to avoid adverse effects, or where adverse effects cannot be avoided, effects are remedied or mitigated. (5) Design and implement earthworks with recognition of existing environmental site constraints and opportunities, specific engineering requirements, and implementation of integrated water principles. (6) Require that earthworks are designed and undertaken in a manner that ensures the stability and safety of surrounding land, buildings and structures.		with the provision of a new wastewater infrastructure. The effect of the Project will be further managed and mitigated through the use of a CNVMP, a CTMP and the ESCP. No significant ground settlement or stability effects from earthworks are anticipated, while Watercare also propose to employ a GWMCP during construction. The Project has included on-going engagement with Mana Whenua and includes an accidental discovery protocol and archaeological supervision of bulk earthworks to appropriately manage potential impacts on Mana Whenua. The Project has been designed in recognition of the existing environment, including its constraints and opportunities (such as the limited road access and the proximity of an overland flow path to the shaft site) This includes measures in the ESCP which will ensure that sediment discharges to the environment are avoided, as well as the use of an CTMP to minimise traffic disruptions to the local road network.

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E14 – Air Quality			
Objectives E14.2	(1) Air quality is maintained in those parts of Auckland that have high air quality, and air quality is improved in those parts of Auckland that have low to medium air quality. (4) The operational requirements of light and heavy industry, other location-specific industry, infrastructure, rural activities and mineral extraction activities are recognised and provided for.	Yes	Any discharge of contaminants to air (i.e. dust) during the construction phase will be appropriately managed, including the use of dust suppression measures. The operation of the Project will also be consistent with the AUP's air quality standards given the projected frequency of air discharges and dispersal modelling undertaken. The vent stack design with a 5m high structure allows for adequate dispersal during a high rainfall events. In addition, the structure can be raised to 8m height should further odour dispersal be needed.
Policies E14.3	(1) Manage the discharge of contaminants to air, including by having regard to the Auckland Ambient Air Quality Targets in Table E14.3.1, so that significant adverse effects on human health, including cumulative adverse effects, are avoided, and all other adverse effects are remedied or mitigated. (2) In the coastal marine area and in urban and rural zones, except for those zones and precincts subject to policies E14.3(4) to (7): (a) avoid offensive and objectionable effects from dust and odour discharges and remedy or mitigate all other adverse effects of dust and odour discharges; or (b) require adequate separation distance between use and development which discharges dust and odour to air and activities that are sensitive (8) Avoid, remedy or mitigate the adverse effects on air quality from discharges of contaminants into air by: (a) using the best practicable option for emission control and management practices that are appropriate to the scale of the discharge and potential adverse effects; or (b) adopting a precautionary approach, where there is uncertainty and a risk of significant adverse effects or irreversible harm to the environment from air discharges.	Yes	

CHAPTER E – AUCKLAND WIDE			
Reference	Objective/Policy	Is the Proposal Consistent?	Comment
	(9) Avoid, remedy or mitigate the adverse effects on air quality beyond the boundary of the premises where the discharge of contaminants to air is occurring, in relation to: (a) noxious or dangerous effects on human health, property or the environment from hazardous air pollutants; or (b) overspray effects on human health, property or the environment		
E25 – Noise and Vibration			
Objectives E25.2	(1) People are protected from unreasonable levels of noise and vibration. (2) The amenity values of residential zones are protected from unreasonable noise and vibration, particularly at night. (4) Construction activities that cannot meet noise and vibration standards are enabled while controlling duration, frequency and timing to manage adverse effects.	Yes	A Construction Noise and Vibration Management Plan (CNVMP) will be implemented throughout the construction period to ensure that construction noise and vibration is managed to acceptable levels at both the shaft site and along the tunnel alignment. Noisy works will also be concentrated during normal work hours to minimise disturbance, while regular communication with residents will be undertaken so that all parties are aware of potential disturbances. The operational noise effects from the Project will be largely limited to noise from maintenance crews, while the plant room will be designed to attenuate noise generated by its equipment.
Policies E25.3	(2) Minimise, where practicable, noise and vibration at its source or on the site from which it is generated to mitigate adverse effects on adjacent sites. (10) Avoid, remedy or mitigate the adverse effects of noise and vibration from construction, maintenance and demolition activities while having regard to: (a) the sensitivity of the receiving environment; and (b) the proposed duration and hours of operation of the activity; and (c) the practicability of complying with permitted noise and vibration standards.		

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Reference	Objective/Policy	Is the Proposal Consistent?	Comment
E26 – Infrastructure			
Objectives E26.2.1	(1) The benefits of infrastructure are recognised. (2) The value of investment in infrastructure is recognised. (3) Safe, efficient and secure infrastructure is enabled, to service the needs of existing and authorised proposed subdivision, use and development. (4) Development, operation, maintenance, repair, replacement, renewal, upgrading and removal of infrastructure is enabled. (5) The resilience of infrastructure is improved, and continuity of service is enabled. (9) The adverse effects of infrastructure are avoided, remedied or mitigated.		The Project is a vital wastewater infrastructure investment for Central Auckland, providing additional network capacity and assisting in the improvement of the network's environmental performance. The Project will assist the delivery of new urban growth through the intensification of the central suburbs, thereby underpinning the Plan's growth strategy. As previously identified, the Project may generate some adverse effects. However, the use of mitigation measures and locating the shaft site within the most beneficial location, will ensure that the scale of adverse effects is no more than minor. It is also noted that these adverse effects are outweighed by the Project's benefits of enabling growth, supporting public health and protecting the environment. Lastly, full consideration has been given to the location of the shaft site. As identified in the assessment of alternatives, the Tawariki Street site represents the best option available to provide both a practical construction solution, as well as minimise the social and property effects of the Project.
Policies E26.2.2	(1) Recognise the social, economic, cultural and environmental benefits that infrastructure provides, including: (a) enabling enhancement of the quality of life and standard of living for people and communities; (b) providing for public health and safety; (c) enabling the functioning of businesses; (d) enabling economic growth; (e) enabling growth and development; (f) protecting and enhancing the environment;	Yes	

CHAPTER E – AUCKLAND WIDE			
Reference	Objective/Policy	Is the Proposal Consistent?	Comment
	(2) Provide for the development, operation, maintenance, repair, upgrade and removal of infrastructure throughout Auckland by recognising: (a) functional and operational needs; (b) location, route and design needs and constraints; (c) the complexity and interconnectedness of infrastructure services; (d) the benefits of infrastructure to communities with in Auckland and beyond; (e) the need to quickly restore disrupted services; and (f) its role in servicing existing, consented and planned development. (4) Require the development, operation, maintenance, repair, upgrading and removal of infrastructure to avoid, remedy or mitigate adverse effects, including, on the: (a) health, well-being and safety of people and communities, including nuisance from noise, vibration, dust and odour emissions and light spill; (b) safe and efficient operation of other infrastructure; (c) amenity values of the streetscape and adjoining properties; (d) environment from temporary and ongoing discharges; and (e) values for which a site has been scheduled or incorporated in an overlay. (5) Consider the following matters when assessing the effects of infrastructure: (a) the degree to which the environment has already been modified; (b) the nature, duration, timing and frequency of the adverse effects; (c) the impact on the network and levels of service if the work is not undertaken; (d) the need for the infrastructure in the context of the wider network; and (e) the benefits provided by the infrastructure to the communities within		

CHAPTER E – AUCKLAND WIDE			
Reference	Objective/Policy	Is the Proposal Consistent?	Comment
	Auckland and beyond.		

CHAPTER H – ZONES			
Reference	Objective/Policy	Is the Proposal Consistent?	Comment
H5 – Residential – Mixed Housing Urban Zone			
Objectives H5.2	(4) Non-residential activities provide for the community's social, economic and cultural well-being, while being compatible with the scale and intensity of development anticipated by the zone so as to contribute to the amenity of the neighbourhood.	Yes	Given the brownfield nature of the Project area, it was necessary to construct the Project in proximity to existing wastewater assets (e.g. the Orakei Main Sewer). This avoids the need for additional works to connect new and existing infrastructure, thereby reducing the construction related disruption generated by the Project. Furthermore, this co-location of new and existing infrastructure avoids the need for costly and complicated retrofitting of existing infrastructure given that wastewater networks rely on being gravity feed within a narrow range of pipeline gradients. Furthermore, the Project was subject to an assessment of alternatives to confirm the most appropriate location of the shaft site. Following an MCA process involving 5 options, the Tawariki Street site was determined the most appropriate location given its proximity to existing network assets
Policies H5.3	(10) Recognise the functional and operational requirements of activities and development. (8) Provide for non-residential activities that: (a) support the social and economic well-being of the community; (b) are in keeping with the with the scale and intensity of development anticipated within the zone; (c) avoid, remedy or mitigate adverse effects on residential amenity;	Yes	

CHAPTER H – ZONES			
Reference	Objective/Policy	Is the Proposal Consistent?	Comment
			and its minimal adverse effects as compared to the other options. Watercare are also cognisant of the Project's residential location and have proposed a range of measures to manage and/or mitigate the effects of the Project on the amenity and character of the surrounding area. Furthermore, it will support the social and economic wellbeing of the community by providing improved wastewater network capacity and making best use of existing wastewater infrastructure investment.

Appendix H

Grey Lynn Tunnel

Watercare Services Limited

Proposed Conditions

IZ0027500-709-NP-RPT-003 | Final

February 2019

Grey Lynn Tunnel

Project No:	IZ027500
Document Title:	Proposed Conditions
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Client Name:	Watercare Services L
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Document history and status

Revision	Date	Description	By	Review	Approved
1	20/02/2019	Draft Issued to Watercare	A Tsang	T Hegarty	N Kay
2	26/02/2019	Final for Lodgement	A Tsang	T Hegarty	N Kay

Notice of Requirement Conditions

1. General conditions

1.1 Except as modified by the conditions below and subject to final design, the works shall be undertaken in general accordance with the information provided by the Requiring Authority in the Notice of Requirement dated February 2019, and supporting documents being:

a) Assessment of Effects on the Environment, titled "Grey Lynn Tunnel – Notice of Requirement, Resource Consent Application and Assessment of Environmental Effects" prepared by Jacobs, dated February 2019.

b) Drawings as detailed below:

.

c) Technical Reports as detailed below:

- Ecological Assessment, prepared by Bioresearches Group Ltd, dated
- Archaeological and Historic Heritage Assessment, prepared by Clough & Associates Ltd, dated
- Traffic Impact Assessment, prepared by Commute, dated
- Noise Assessment, prepared by Marshall Day Acoustics, dated
- Vibration Assessment, prepared by McMillen Jacobs Associates, dated
- Groundwater Assessment, prepared by Williamson Water & Land Advisory, dated
- Settlement Assessment, prepared by McMillen Jacobs Associates, dated
- Air Quality Assessment, prepared by AECOM, dated
- Contamination Report, prepared by AECOM, dated
- Visual Impact and Landscape Assessment, prepared by Boffa Miskell Ltd, dated
- Arborist Report, prepared by Greenscene NZ, dated

1.2 As soon as practicable following completion of commissioning of the Project, the Requiring Authority shall, in consultation with the Council:

a) review the extent of the area designated for the Project;

b) identify any areas of designated land that are no longer necessary for the ongoing operation, maintenance, renewal and protection of the Project and associated structures and activities;

c) identify any areas of the designation within road reserve that are no longer necessary as the completed infrastructure is otherwise provided for and adequately protected by provisions of the Local Government (Auckland Council) Act 2009 and Utilities Access Act 2010;

d) give notice to the Council in accordance with Section 182 of the RMA for the removal of those parts of the designation identified in (b) and (c) above, which are not required for the long term operation and maintenance of the Project; and

e) provide as-built plans to the Council's Team Leader, Compliance and Monitoring, Resource Consents.

1.3 A liaison person shall be appointed by the Requiring Authority for the duration of the construction phase of the Project to be the main and readily accessible point of contact for persons affected by the designation and construction work. The liaison person's name and contact details shall be advised to affected parties by the Requiring Authority. This person must be reasonably available for on-going consultation on all matters of concern to affected persons arising from the Project. If a liaison person will not be available for any reason, an alternative contact person shall be nominated to ensure that a Project contact person is available by telephone 24 hours per day seven days per week during the construction phase.

1.4 The designation shall lapse on the expiry of a period of 10 years after the date on which the last of any appeals on all consents and notices of requirement associated with the Project is withdrawn or determined, or, if no appeals are lodged, the date on which the notices of requirement are included in the AUP in accordance with section 184(1)(c) of the RMA, unless:

a) it has been given effect before the end of that period; or

b) the Council determines, on an application made within 3 months before the expiry of that period, that substantial progress or effort has been made towards giving effect to the designation and is continuing to be made, and fixes a longer period for the purposes of this subsection.

1.5 Except as provided for in Condition 1.6 below, the Requiring Authority shall submit an Outline Plan of Works (OPW) for the Project for each of the relevant Project stages in accordance with section 176A of the RMA.

1.6 An OPW need not be submitted if the Council has waived the requirement for an OPW in accordance with section 176A(2)(c) of the RMA.

1.7 The OPW shall include the following Management Plans for the Project:

a) Construction Management Plan (CMP);

b) Traffic Management Plan;

c) Communications Plan;

d) Construction Noise and Vibration Management Plan (CNVMP); and

e) Site Reinstatement Plan.

1.8 The OPW shall include architectural plans for any proposed new permanent building at designated shaft site. The architectural designs for the building shall take into account the following matters:

a) The extent to which the buildings are appropriate to their context and minimise potential adverse effects on the amenity of the surroundings (including neighbouring properties);

b) The use of building materials which are sufficiently robust and minimise the potential for graffiti and vandalism;

c) The extent to which the buildings are visually recessive through use of appropriate colours, textures and modulation;

d) The extent to which buildings are designed to achieve appropriate visual amenity and scale with their surroundings through such aspects as modulation of building form, articulation of building components, and use of architectural detail; and

e) The extent to which any planting visually anchors the building and enhances amenity and/or natural values of the surroundings.

1.9 The OPW shall include design plans for any other permanent at grade and above ground structures. The design of any permanent at grade and above ground structures shall take into account the following matters:

a) the location, landscape setting and adjoining land uses;

b) the layout, architectural form and detail, and the use of a consistent and appropriate palette of materials, to ensure these elements are visually recessive;

c) the configuration of multiple surface elements to minimise their prominence and visual clutter;

d) the use of materials which are sufficiently robust and minimise the potential for graffiti and vandalism;

e) landscaping to integrate with the Site Reinstatement Plan required in Condition 12.1; and

f) site configuration that maximises the use of Crime Prevention Through Environmental Design (CPTED) principles.

2. Construction Management

2.1 The Requiring Authority shall prepare Construction Management Plans (CMP) for each of the relevant Project stages. The purpose of the CMP(s) is to set out the detailed management procedures and construction methods to be undertaken in order to avoid, remedy or mitigate potential adverse effects arising from construction activities and to achieve compliance with the specific conditions of this designation that relate to the matters referred to items (c) to (p) of Condition 2.2 below. The CMP(s) shall be submitted to the Council with the relevant OPW for the stage to which they relate.

2.2 The CMP(s) required by Condition 2.1 above shall include specific details relating to the management of all construction activities associated with the relevant Project stage, including:

a) Details of the site or project manager and the construction liaison person identified in Condition 1.3, including their contact details (phone, postal address, email address);

b) An outline construction programme;

c) The proposed hours of work;

d) Measures to be adopted to maintain the land affected by the works in a tidy condition in terms of disposal / storage of rubbish, storage and unloading of construction materials and similar construction activities;

e) Location of site infrastructure including site offices, site amenities, contractors yards site access, equipment unloading and storage areas, contractor car parking, and security;

f) Procedures for controlling sediment run-off, dust and the removal of soil, debris, demolition and construction materials (if any) from public roads and / or other places adjacent to the work site;

g) Procedures for ensuring that residents, road users and businesses in the immediate vicinity of construction areas are given prior notice of the commencement of construction activities and are informed about the expected duration and effects of the works;

h) Means of providing for the health and safety of the general public and for pedestrian management as required by Conditions 6.1;

i) Procedures for the management of works which directly affect or are located in close proximity to existing network utility services;

j) Procedures for responding to complaints about construction activities;

k) Procedures for the refuelling of plant and equipment;

l) A Construction Noise and Vibration Management Plan (CNVMP) containing measures to address the management of noise and vibration as identified in Condition 3.1;

m) Measures for the protection and management of trees as identified in Condition 10.1; and

n) Measures to address CPTED issues within and around the site.

2.3 The CMP shall be implemented and maintained throughout the entire construction period for the Project or relevant Project stage to manage potential adverse effects arising from construction activities. The CMP or any specific component of the CMP shall be updated as necessary and provided to the Council in accordance with 2.1.

3. Construction Noise and Vibration

3.1 A Construction Noise and Vibration Management Plan (CNVMP) either as part of the CMP, or as a standalone plan, shall be prepared by a suitably qualified person, and shall be submitted to the Council with the OPW to which it relates. The purpose of the CNVMP is to provide a framework for the development and implementation of the Best Practicable Option ('BPO') for management of all construction noise and vibration effects and to define the procedures to be followed when full compliance with the construction noise and vibration standards of Conditions X to X are not met following adoption of the BPO.

3.2 Construction noise shall be measured and assessed in accordance with NZS6803:1999 Acoustics – Construction Noise, and shall comply with the following noise limits, unless varied in accordance with Condition 3.5:

Time and Day	Noise Limits	
	L_{Aeq} dB	L_{Amax} dB
Monday to Saturday 0730 – 1800	70	85
At All Other Times and Public Holidays	45	75

3.3 Construction works which exceed a level of LAeq 45dB at the most exposed receiver(s) are restricted to between 0730 to 1800 on weekdays and Saturdays, with no noisy works permitted on Sundays and Public Holidays. Each CNVMP shall define which activities will comply with a limit of LAeq 45dB and can therefore be undertaken outside of these hours in compliance with Condition 8.1.

3.4 Each CNVMP shall, in demonstrating compliance with Condition 3.2, as a minimum, address the following aspects with regard to construction noise:

a) a description of noise sources, including machinery, equipment and construction techniques to be used;

b) predicted construction noise levels;

c) hours of operation, including times and days when noisy construction work would occur;

d) physical noise mitigation measures, including prohibiting the use of tonal reverse alarms, maintenance of access roads (to ensure they are smooth), acoustic screening around the site, plant selection and maintenance procedures, and site layout;

e) construction noise criteria for any specific areas and sensitive receivers such as schools, child care centres, medical or aged care facilities;

f) the identification of activities and locations that will require the design of specific noise mitigation measures;

g) the consultation undertaken by the Requiring Authority with affected stakeholders to develop the proposed noise management measures and any feedback received from those stakeholders, along with the noise management measures that will be adopted based on this consultation;

h) methods for monitoring and reporting on construction noise;

i) methods for receiving and responding to complaints about construction noise; and

j) construction operator training procedures.

3.5 Where a CNVMP predicts that noise levels from a particular activity will or will likely exceed the noise limits set out in Condition 3.2, or where noise measurements show that compliance is not being achieved, the Requiring Authority shall prepare and submit for the approval of the Council an Activity Specific Construction Noise Management Plan (ASCNMP). The ASCNMP(s) shall be submitted to the Council for review and approval at least 7 working days prior to the proposed works commencing.

Works subject to the ASCNMP(s) shall not commence until approval is received from the Council. If monitoring shows that levels specified in an ASCNMP are being exceeded, work generating the exceedance shall stop and not recommence until further mitigation is implemented in accordance with an amended ASCNMP approved by the Council.

In addition to the requirements of 3.4, an ASCNMP must:

a) describe the activity (including duration), plant and machinery that is expected not to comply with the noise limits in Condition 3.2;

b) describe the mitigation measures proposed to reduce the noise levels as far as practicable, including any options that have been discounted due to cost or any other reason;

c) provide predicted noise levels for all receivers where the noise levels will not be compliant with the limits in Condition 3.2, including the effect of mitigation specified in 3.5(b);

d) provide a set of noise limits that are Activity – Specific;

e) describe the noise monitoring that will be undertaken to determine compliance with the Activity – Specific noise limits; and

f) describe any additional noise mitigation measures that may be implemented to maintain compliance with Activity Specific noise limits.

Note: It is accepted that the noise limits in Condition 3.2 may not be met at all times, but that the Requiring Authority will adopt the Best Practicable Option to achieve compliance and will obtain the written consent of affected persons to any exceedances.

3.6 Each CNVMP shall also describe measures adopted to meet the requirements of German Standard DIN4150-3:1999, and as a minimum shall address the following aspects with regard to construction vibration:

a) vibration sources, including machinery, equipment and construction techniques to be used;

b) preparation of building condition reports on 'at risk' buildings prior to, during and after completion of works, where for the purposes of this condition an 'at risk' building is one at which the levels in the German Standard DIN4150-3: 1999 are likely to be approached or exceeded;

c) use of building condition surveys to determine the sensitivity of the building(s) on the adjacent sites to ground movement in terms of the Line 1-3 criteria of the DIN standard;

d) identification of any particularly sensitive activities in the vicinity of the proposed works (e.g. commercial activity using sensitive equipment such as radiography or mass-spectrometry), along with the details of consultation with the land owners of the sites where the sensitive activities are located and any management measures that will be adopted based on this consultation;

e) the consultation undertaken by the Requiring Authority with affected stakeholders to develop the proposed vibration management measures and any feedback received from those stakeholders, along with the vibration management measures that will be adopted based on this consultation;

f) methods for monitoring and reporting on construction vibration; and

g) methods for receiving and responding to complaints about construction vibration.

3.7 Construction activities shall comply with the Guideline vibration limits set out in DIN 4150- 3:1999 unless varied in accordance with 3.8.

3.8 The Guideline vibration limits set out in DIN4150 must not be exceeded except where the Requiring Authority can demonstrate to the satisfaction of the Council:

a) that the receiving building(s) are capable of withstanding higher levels of vibration and what the new vibration limit is. The investigation required to demonstrate this must include an assessment of the building(s) by a suitably experienced and qualified structural engineer and a full pre-condition survey; and

b) that the Requiring Authority has obtained the written agreement of the building owner(s), that a higher limit may be applied.

3.9 Each CNVMP shall be implemented and maintained throughout the entire construction period. Each CNVMP shall be updated when necessary and any updated CNVMP shall be submitted to the Council in accordance with Condition 3.1.

4. Operational Noise

4.1 The noise arising from any operational activities undertaken on the designated land, shall not exceed the following noise limits when measured at or within the boundary of any site zoned as follows:

Residential	
Time	Noise Limit*
0700-2200 hours	50 dB L_{Aeq}
2200-0700 hours	40 dBL_{Aeq} 75 dB L_{Amax}
Business	
Time	Noise Limit
At all times	60 dB L_{Aeq}

***Notes:**

(1) These noise limits relate to noise generated by the normal operation of permanent works associated with the Project and do not apply to short term maintenance activities.

(2) Noise levels shall be measured and assessed in accordance with New Zealand Standards NZS6801:2008 Acoustics - Measurement of Environmental Sound and NZS6801:2008 Acoustics - Environmental Noise.

5. Traffic Management

5.1 A detailed Traffic Management Plan (TMP) or plans shall be prepared for the Project or relevant Project stage by a suitably qualified person and submitted as part of the CMP. The purpose of the CTMP is to:

a) Manage the road transport network for the duration of construction to manage congestion and minimise delays to road users;

b) Inform the public about traffic management on the road transport network for the duration of construction;

c) Protect public safety including the safe passage of pedestrians and cyclists;

d) Maintain pedestrian access to private property at all times;

e) Provide vehicle access to private property to the greatest extent possible; and

f) Manage traffic effects from construction yards on adjacent properties.

5.2 The TMP(s) shall describe the measures that will be taken to avoid, remedy or mitigate the traffic effects associated with construction of the Project or Project stage. In particular, the TMP(s) shall describe:

a) Traffic management measures to maintain traffic capacity or minimise the impact on traffic capacity during weekdays and weekends;

b) Any road closures that will be required and the nature and duration of any traffic management measures that will result, including any temporary restrictions, detours or diversions for general traffic and buses;

c) Methods to manage the effects of the delivery of construction material, plant and machinery;

d) Measures to maintain, existing vehicle access to property where practicable, or to provide alternative access arrangements;

e) Measures to maintain pedestrian and cyclist movements and reduce the impact on mobility impaired users on roads and footpaths adjacent to the construction works. Such access shall be safe, clearly identifiable and seek to minimise significant detours;

f) Any proposed monitoring to measure the impact of the works on traffic and the impact of the traffic management measures. If safety or operational issues are evident, measures to be implemented to address these issues;

g) Measures to manage the proposed access to the site should the access be unable to cater for two-way traffic passing at the same time, and in particular to minimise reverse movements and blocking of the road; and

h) The availability of on-street and off-street parking if the designated site is unable to accommodate all contractor parking. This shall include an assessment of available parking (if any) for contractors on street and identify measures to meet and/or reduce contractor parking demand should it be found that there is insufficient on-street parking to meet this demand.

5.3 The TMP(s) shall be consistent with the New Zealand Transport Agency Code of Practice for Temporary Traffic Management, which applies at the time of construction.

5.4 Any damage in the road corridor directly caused by heavy vehicles entering or exiting the site shall be repaired as within two weeks or within an alternative timeframe to be agreed with Auckland Transport.

6. Pedestrian Management

6.1 Any temporary accessways shall be designed as far as practicable in accordance with CPTED (Crime Prevention Through Environmental Design) principles and provide appropriate lighting and signage where necessary.

7. Work within Road Reserve

7.1 The Requiring Authority shall not require Auckland Transport or network utility operators with existing infrastructure within the road reserve to seek written consent under Section 176 of the RMA for on-going access, to enable works associated with the routine construction, operation and maintenance of existing assets.

7.2 Works within transport corridors shall be undertaken in accordance with the National Code of Practice for Utility Operators' Access to Transport Corridors (November 2011), or any approved update of that code, unless otherwise agreed between the Requiring Authority and the Corridor Manager.

8. Construction Hours

8.1 Construction hours shall be as follows, except where work is necessary outside the specified days or hours for the purposes specified in Condition 8.2 below.

a) Tunnelling activities – 24 hours a day, 7 days a week operations for all tunnelling activities, including the main tunnel works and the link tunnels.

b) General site activities – 7am to 6pm, Monday to Friday, 8am to 6pm Saturday.

c) Truck movements – 7am to 6pm, Monday to Friday, 8am to 6pm Saturday.

8.2 Purposes for which work may occur outside of the specified days or hours are:

a) where, due to unforeseen circumstances, it is necessary to complete an activity that has commenced;

b) where work is specifically required to be planned to be carried out at certain times;

c) for delivery of large equipment or special deliveries required outside of normal hours due to traffic management requirements;

d) in cases of emergency

e) for the securing of the site or the removal of a traffic hazard; and/or

f) for any other reason specified in the CMP or TMP.

Where any work is undertaken pursuant to paragraphs (a) – (f), the Consent Holder shall, within five working days of the commencement of such work, provide a report to Council detailing how the work was authorised under those paragraphs.

9. Community Information and Liaison

9.1 The Requiring Authority shall prepare a Communications Plan (CP) for the construction phase of the Project or for each Project stage, and submit the plan in accordance with Condition 1.8. The CP shall set out:

a) the method(s) of consultation and liaison with key stakeholders and the owners/occupiers of neighbouring properties regarding the likely timing, duration and effects of works;

b) details of prior consultation or community liaison undertaken with the parties referred to in (a) above, including outlining any measures developed with such persons or groups to manage or to mitigate any adverse effects or inconvenience that may arise;

c) full contact details for the person appointed in accordance with Condition 1.3 to manage the public information system and be the point of contact for related enquiries; and

d) the information required by Conditions 3.4(g) and (i) and 3.6(f) and (h).

10. Tree Management

10.1 The Requiring Authority shall provide details in the CMP as to how the potential impacts of construction on trees and vegetation will be managed. The details shall provide for the:

a) Identification of trees to be protected, pruned, removed, or transplanted and procedures for marking these out on site.

b) Procedures for identifying and protecting trees to be retained where works occur in the dripline of such trees as identified by a suitably qualified person.

11. Archaeology and Heritage

11.1 Detailed protocols for the management of archaeological and waahi tapu discoveries shall be developed by the Requiring Authority in consultation with tangata whenua and the Heritage New Zealand prior to construction. These detailed protocols shall confirm the names and contact details for tangata whenua, the Heritage New Zealand and Auckland Council to be contacted in accordance with Condition 11.2.

11.2 If any archaeological material, including human remains are exposed during site works then the following procedures shall apply:

a) Immediately after it becomes apparent that an archaeological or traditional site has been exposed, all site works in the immediate vicinity shall cease.

b) The Requiring Authority shall immediately secure the area so that any artefacts or remains are untouched.

c) The Requiring Authority shall notify tangata whenua, the Heritage New Zealand and the Council (and in the case of human remains, the New Zealand Police) as soon as practicable, and advise those parties that an archaeological site has been exposed so that appropriate action can be taken. Works shall not recommence in the immediate vicinity of the archaeological site until approval is obtained from the Heritage New Zealand.

12. Site Reinstatement

12.1 Prior to commencement of works at all surface construction sites, the Requiring Authority shall prepare a Reinstatement Plan for the site, in consultation with the landowner(s). The Reinstatement Plan shall be submitted to the Council in accordance with Condition 1.9. The Reinstatement Plan shall include:

a) Any existing structures or features on the site to be protected during works or reinstated on completion of works.

b) The location and design of permanent wastewater infrastructure to remain at the site including the design of lid structures and chamber covers including the associated contouring of ground.

c) The location and design of permanent access to the wastewater infrastructure. As far as practicable, permanent all-weather access for heavy vehicles shall minimise areas of new impermeable surfaces and, in open space areas, the use of grass cell, or similar, shall be preferred.

d) Details of proposed landscaping and planting, including implementation and maintenance programmes.

12.2 When contractors' yards or other temporary works areas are no longer required for any construction or operational purpose, site works, including site offices, storage and equipment sheds, fencing and hard stand areas shall be removed and the area reinstated in accordance with Conditions 12.1.

Resource Consent Conditions

1. General conditions

Plans and Information

1.1 Except as modified by the conditions below and subject to final design, the works shall be undertaken in general accordance with the plans and information submitted with the application including:

a) Assessment of Effects on the Environment, titled "Grey Lynn Tunnel – Notice of Requirement, Resource Consent Application and Assessment of Environmental Effects" prepared by Jacobs, dated February 2019.

b) Drawings as detailed below:

.

c) Technical Reports as detailed below:

- Ecological Assessment, prepared by Bioresearches Group Ltd, dated
- Archaeological and Historic Heritage Assessment, prepared by Clough & Associates Ltd, dated
- Traffic Impact Assessment, prepared by Commute, dated
- Noise Assessment, prepared by Marshall Day Acoustics, dated
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- Contamination Report, prepared by AECOM, dated
- Visual Impact and Landscape Assessment, prepared by Boffa Miskell Ltd, dated
- Arborist Report, prepared by Greenscene NZ, dated

Lapse

1.2 For construction related, or construction and operation related consents:

This consent shall lapse on the expiry of a period of 10 years after the date on which the last of any appeals on all consents and notices of requirement associated with the Project is withdrawn or determined, or, if no appeals are lodged, the date on which the notices of requirement are included in the AUP in accordance with section 184(1)(c) of the RMA, unless:

a) it has been given effect before the end of that period; or

b) the Council determines, on an application made within 3 months before the expiry of that period, that substantial progress or effort has been made towards giving effect to the consent and is continuing to be made, and fixes a longer period for the purposes of this subsection.

Construction Management

1.3 Prior to the commencement of works authorised by these consents, the Consent Holder shall prepare Construction Management Plans (CMP) for each of the relevant Project stages. The purpose of the CMP(s) is to set out the detailed management procedures and construction methods to be undertaken in order to avoid, remedy or mitigate potential adverse effects arising from construction activities and to achieve compliance with the specific conditions of this designation that relate to the matters referred to items (c) to (p) of Condition 1.4 below.

1.4 The CMP(s) required by Condition 1.3 above shall include specific details relating to the management of all construction activities associated with the relevant Project stage, including:

a) Details of the site or project manager and the construction liaison person, including their contact details (phone, postal address, email address);

b) An outline construction programme;

c) The proposed hours of work;

d) Measures to be adopted to maintain the land affected by the works in a tidy condition in terms of disposal / storage of rubbish, storage and unloading of construction materials and similar construction activities;

e) Location of site infrastructure including site offices, site amenities, contractors yards site access, equipment unloading and storage areas, contractor car parking, and security;

f) Procedures for controlling sediment run-off, dust and the removal of soil, debris, demolition and construction materials (if any) from public roads and / or other places adjacent to the work site;

g) Procedures for ensuring that residents, road users and businesses in the immediate vicinity of construction areas are given prior notice of the commencement of construction activities and are informed about the expected duration and effects of the works;

h) Means of providing for the health and safety of the general public;

i) Procedures for the management of works which directly affect or are located in close proximity to existing network utility services;

j) Procedures for responding to complaints about construction activities;

k) Procedures for the refuelling of plant and equipment;

l) A Construction Noise and Vibration Management Plan (CNVMP) containing measures to address the management of noise and vibration;

m) Measures for the protection and management of trees; and

n) Measures to address CPTED issues within and around the site.

1.5 The CMP shall be implemented and maintained throughout the entire construction period for the Project or relevant Project stage to manage potential adverse effects arising from construction activities. The CMP or any specific component of the CMP shall be updated as necessary and provided to the Council in accordance with Condition 1.3.

Dust Management

1.6 Beyond the boundary of the site, there shall be no dust caused by discharges from the site, which in the opinion of an enforcement officer, is noxious, offensive or objectionable.

1.7 All processes on site shall be operated in accordance with the CMP as required by Condition 1.3 of this consent.

1.8 The Consent Holder shall ensure that dust management during excavation works generally complies with the Good Practice Guide for Assessing and Managing the Environmental Effects of Dust Emissions, MfE (2001).

2. Earthworks

2.1 All earthworks shall be managed to minimise any discharge of debris, soil, silt, sediment or sediment-laden water beyond the site to either land, stormwater drainage systems, watercourses or receiving waters. In the event that a discharge occurs, the activity which resulted in the discharge shall cease immediately and the discharge shall be mitigated and/or rectified to the satisfaction of the Manager.

2.2 Prior to earthworks commencing at any site, a detailed Erosion and Sediment Control Plan ("ESCP") for that area which clearly identifies the type and location of the controls proposed, shall be submitted to the Council for certification. The ESCP(s) shall be in general accordance with GD05 and any amendments to that document.

2.3 Erosion and sediment control measures shall be carried out in accordance with the approved ESCP(s) required by this consent.

2.4 Any subsequent amendments to the approved ESCP(s) and / or methodology must be approved by the Manager in writing prior to any such amendment being implemented.

2.5 Prior to earthworks commencing at any site, a certificate signed by a suitably qualified person, confirming that the erosion and sediment controls have been constructed and completed in general accordance with the ESCP(s), shall be forwarded to the Manager.

2.6 The Consent Holder or their agent shall arrange and conduct a pre-construction site meeting between representatives of the Council, the Consent Holder and their contractor, prior to any works commencing on a site. The purpose of the pre-construction site meeting is to discuss the proposed site access arrangements, ESCP(s) and other measures to be taken to comply with conditions of this consent. If as a result of that meeting any amendments are required to the erosion and sediment control methodology, those amendments shall be submitted to the Manager for certification in accordance with Condition 2.2.

2.7 All perimeter controls shall be operational before earthworks begin.

2.8 All cleanwater runoff from stabilised surfaces including catchment areas above the site shall be diverted away from earthwork areas via a stabilised system, so as to prevent surface erosion.

2.9 All sediment laden runoff shall be treated on site by sediment control measures, as described in the consent application or modified under Condition 2.2. These measures are to be constructed or installed in accordance with best practice, be operational before commencement of works and be maintained to perform at full operational capacity until the site has been adequately secured against erosion.

2.10 Sediment control measures shall be inspected on a weekly basis and after a significant storm event to ensure effective operation.

2.11 The site shall be stabilised in accordance with the ESCP in a progressive manner as earthworks are completed across various areas of the site.

2.12 To prevent discharge of sediment-laden water or other debris into any public stormwater drainage systems or watercourses and therefore into receiving waters, and to prevent nuisance and amenity impacts on users of the road reserve, there shall be no deposition of earth, mud, dirt or other debris on any public road or footpath resulting from earthworks activity on the site. In the event that such deposition does occur, it shall immediately be removed. In no instance shall roads or footpaths be washed down with water without appropriate erosion and sediment control measures in place to prevent contamination of the stormwater drainage system, watercourses or receiving waters.

2.13 If works on a site are abandoned or will be unused for any reason, adequate preventative and remedial measures shall be taken to control sediment discharge and shall thereafter be maintained for as long as necessary to prevent sediment discharges from the site. All such measures shall be of a type and to a standard which are to the prior satisfaction of the Manager.

3. Groundwater

General Conditions

3.1 This consent shall expire on in 35 years from the granting of the consent unless it has lapsed, been surrendered or been cancelled at an earlier date pursuant to the RMA.

3.2 The Consent Holder shall ensure that all excavation, dewatering systems, retaining structures and associated works for the construction of the shafts, tunnels, underground structures and associated works, including all temporary and permanent works, shall be designed, constructed and maintained so as to avoid, as far as practicable, any damage to buildings, structures and services (including road infrastructure assets such as footpaths, kerbs, catch-pits, pavements and street furniture).

3.3 The Consent Holder shall ensure that all backfilling of temporary shafts is designed and constructed to the required engineering standard, so as to avoid any damage to buildings, structures and services.

3.4 The Consent Holder shall, at least 10 working days prior to the commencement of shaft sinking or tunnelling, advise the Manager, in writing, of the date of the proposed commencement of this work.

3.5 The Consent Holder shall, at least 10 working days following completion of shaft sinking or tunnelling, advise the Manager, in writing, of the date of completion. Monitoring and Contingency Plan.

Monitoring and Contingency Plan

3.6 The Consent Holder shall, before commencement of shaft sinking or tunnelling, prepare a Monitoring and Contingency Plan or Plans ("M&CP") addressing groundwater and settlement monitoring for each of the relevant Project stages. The M&CP shall demonstrate how the conditions of this consent will be implemented and shall include the following:

a) details of the building risk assessment process and building condition surveys required by Conditions 3.10 to 3.16 of this consent;

b) details of the groundwater monitoring programme required by Conditions 3.17 – 3.19, 3.21 and 3.23 of this consent;

c) details of the ground surface settlement and building movement monitoring required by Conditions 3.24 – 3.27, 3.29 and 3.32 of this consent;

d) location Plan of settlement monitoring marks and the location of existing and proposed groundwater monitoring bores;

e) details of the shaft retaining wall monitoring programme required by Conditions 3.24 and 3.27 of this consent;

f) the groundwater, deformation and settlement Alert and Alarm Levels (Trigger Levels) to be utilised for early warning of settlement with the potential to cause damage to buildings and services and details of the processes used to establish, and if necessary, to review these triggers;

g) details on the procedures for notification of the Manager in the event that Trigger Levels are exceeded;

h) options for additional investigations and analyses to determine the potential for groundwater effects or settlement and for damage to structures, including additional groundwater or settlement monitoring and building condition surveys;

i) details of the contingency measures to be implemented in the event of trigger levels being exceeded, including details on the practicable methodologies to avoid, remedy, or mitigate surface settlements with the potential to cause damage to buildings; and

j) A methodology to identify trenched sections where there is potential for ground settlement to cause damage to houses or buildings and the measures that will be taken to ensure such damage does not occur.

3.7 The Consent Holder shall submit to the Council for written approval:

a) at least 14 months prior to the Commencement of Dewatering for shaft sinking or tunnelling of any Project stage, those aspects of the M&CP dealing with preconstruction monitoring, including the pre-construction monitoring required under Conditions 3.10, 3.11, 3.19 and 3.26; and

b) at least 20 working days prior to Commencement of Dewatering for shaft sinking or tunnelling of any Project stage, the M&CP.

3.8 The Consent Holder shall comply with the M&CP at all times.

3.9 The Consent Holder may amend the M&CP from time to time, as necessary for the Project or any Project stage. Any amendments to the M&CP must be approved by the Council in writing prior to any such amendment being implemented.

Pre-construction Condition Survey

3.10 The Consent Holder shall consult with owners of the LDS Church on Surrey Crescent Street, the government buildings near Richmond Road, 30,2/30, 32, 34, 38 Sackville Street and 35, 37, 39, 41 and 42 Tawariki Street, and subject to the owner's approval on terms acceptable to the Consent Holder, undertake a detailed pre-construction condition survey of these structures to confirm their existing condition and enable the sensitivity of the existing buildings and structures to any groundwater and ground settlement changes to be accurately determined. The survey shall be completed at least three months prior to the Commencement of Dewatering of any Project stage involving shaft sinking or tunnelling. The intent of the survey is to assist in enabling the magnitude of allowable effects from changes in groundwater pressure and ground settlement movements to be reasonably determined. The survey shall include but not necessarily be limited to the following:

a) major features of the buildings and site developments, including location, type, construction, age and existing condition;

b) type and capacity of foundations;

c) existing levels of aesthetic damage;

d) existing level of structural distress or damage;

e) assessment of structural ductility;

f) susceptibility of structure to movement of foundations, including consideration of the local geological conditions; and

g) susceptibility of scheduled heritage buildings to movement of foundations. A photographic record of the inspection shall be included.

Note: ‘Commencement of Dewatering' means excavation below the groundwater table and/or commencing taking any groundwater from a shaft excavation (after construction of the pile walls (if required) and/or dewatering prior to excavation).

3.11 Where neighbouring building/property owners indicate, to the satisfaction of the Manager by way of a recommendation from a qualified and experienced vibration consultant, the presence of particularly sensitive structures (examples include old or brittle structures, vibration sensitive equipment, unusually heavy loads or settlement sensitive machinery) the Consent Holder shall undertake a full engineering assessment to determine what, if any, additional avoidance, design, remedial or monitoring works are required in this vicinity. The Manager may require an independent review of that assessment by a Chartered Professional Engineer.

3.12 The building condition surveys required by this consent shall be undertaken by an independent and suitably qualified person.

Post-construction Condition Surveys

3.13 Unless otherwise agreed in writing with the building owner that such survey is not required, the Consent Holder shall (subject to the owner(s) approval on terms acceptable to the Consent Holder), within six months of the Completion of Dewatering of any Project stage involving shaft sinking or tunnelling, undertake a postconstruction survey covering the matters identified in Condition 3.10 for any building located in an area where differential settlement of greater (steeper) than 1:1,000 occurs between two adjacent settlement monitoring points measured in accordance with the M&CP and a pre-construction condition survey was undertaken in accordance with Condition 3.10 or Condition 3.11. The Consent Holder may, if they are able to provide evidence to show the deformation was not caused by activities related to this consent, seek written approval from the Manager to waive this condition. If, since the pre-construction survey, any building damage is identified, the survey shall determine the likely cause of damage.

Note: 'Completion of Dewatering' means when all the permanent shaft lining, base slab and walls are complete and the tunnel lining is complete, and effectively no further groundwater is being taken for the construction of the shaft/tunnel.

3.14 The Consent Holder shall, at the direction of the Manager, and subject to the owner's approval on terms acceptable to the Consent Holder, undertake an additional survey on any existing building or structure surveyed in accordance with Condition 3.11, for the purpose of checking for damage and for following up on a report of damage to that building. The requirement for any such survey will cease six months after the Completion of Dewatering of any Project stage involving shaft sinking or tunnelling.

3.15 The Consent Holder shall ensure that a copy of the pre, post-construction and any additional building survey reports are forwarded to the respective property owner(s) and the Manager (unless the property owner(s) has instructed the Consent Holder not to do so) within 15 working days of completing the reports.

Repair of Damage

3.16 If the exercise of this consent causes any unforeseen damage to buildings, structures or services not assessed under Conditions 3.13 and 3.14, the Consent Holder shall notify the Manager as soon as practicable, and provide in writing to the Manager a methodology for repair of the damage caused that has been approved by a Chartered Professional Engineer and shall urgently undertake such repairs in accordance with the approved methodology, at its cost, unless written approval for this damage is provided from the owners.

Groundwater Monitoring

3.17 The Consent Holder shall install and maintain groundwater monitoring boreholes at the locations described in the M&CP for the period required by the conditions of this consent. Should any of the monitoring bores be damaged and become in-operable or unsuitable for monitoring, then the Manager is to be informed and a new monitoring bore shall be installed at a nearby location in consultation with the Manager.

3.18 The Consent Holder shall monitor groundwater levels in the groundwater monitoring boreholes and keep records of the water level measurement and corresponding date. All water level data shall be recorded to an accuracy of at least ± 5mm. These records shall be compiled and submitted to the Manager at six monthly intervals.

3.19 The Consent Holder shall monitor groundwater levels monthly in boreholes identified in the M&CP and keep records for a period of at least 12 months before the Commencement of Dewatering of any Project stage involving shaft sinking or tunnelling. The variability in groundwater levels over this period will be utilised to establish the seasonal groundwater level variability. The Consent Holder shall monitor groundwater levels monthly in any proposed boreholes for a period of at least two months (three readings indicating steady state) before the Commencement of Dewatering of any Project stage involving shaft sinking or dewatering.

3.20 Prior to the Commencement of Dewatering of any Project stage involving shaft sinking or tunnelling, the Consent Holder shall assess the potential groundwater effects resulting from the exercise of this consent. The output of this assessment shall be used to define the expected groundwater level at each borehole and to establish groundwater Trigger Levels for each borehole that minimise the potential for damage to existing buildings or structures. The process for establishing groundwater Trigger Levels shall be set out in the M&CP and shall be based upon the final tunnel alignment and construction methodology, and any groundwater monitoring required under this consent, and shall be based upon groundwater modelling completed using this data. A factor of natural seasonal variability shall be allowed for in this review based on the survey completed under Condition 3.19.

3.21 From Commencement of Dewatering of any Project stage involving shaft sinking or tunnelling, the Consent Holder shall monitor groundwater levels in each borehole at a minimum of monthly intervals and records shall be kept of each monitoring date and the corresponding water level in each borehole. In addition to the above, all boreholes located within 100 metres of the shaft construction site or within 100 metres of the tunnel excavation face shall be monitored for groundwater level at least once every week. These records shall be compiled and submitted to the Manager at six monthly intervals.

3.22 All monitoring data obtained pursuant to Condition 3.21 shall be compared to the predicted groundwater levels for each borehole. Where Trigger Levels are exceeded the actions as set out in the M&CP shall be undertaken and the Manager shall be notified within three working days, advising of the trigger exceedance, the risk of settlement causing damage to buildings, and details of the actions taken.

3.23 The Consent Holder shall continue to monitor groundwater levels in each borehole at monthly intervals for a period of 12 months following Completion of Dewatering of any Project stage involving shaft sinking or tunnelling, or for a lesser period if groundwater levels in any particular borehole show either:

a) recovery of the groundwater level to within 2 metres of the pre-construction groundwater level and is above trigger levels; or

b) a trend of increasing groundwater level in at least three consecutive monthly measurements and is above trigger levels, in which case monitoring at that borehole may cease.

After 12 months following the Completion of Dewatering of any Project stage involving shaft sinking or tunnelling, monitoring of groundwater levels shall continue at the direction of the Manager if groundwater levels are not recovering from construction effects and there is a risk of adverse effects.

Settlement Monitoring

3.24 The Consent Holder shall establish and maintain a settlement monitoring network of Ground Settlement Monitoring Marks to detect any deformation (vertical and/or horizontal movements) at the locations described in the M&CP and for the period required by the conditions of this consent. The Ground Settlement Monitoring Marks shall be located at least one mark within 5 metres of each of the groundwater monitoring boreholes described in Condition 3.17;

3.25 In the event of any of the monitoring marks required under Condition 3.24 being destroyed or becoming inoperable, the Consent Holder shall, unless otherwise agreed in writing by the Manager, replace the monitoring marks with new monitoring marks.

3.26 The Consent Holder shall survey and record the elevation of each Ground Settlement Monitoring Mark and record the corresponding date. Ground Settlement Monitoring Marks shall be surveyed at least three times over a 12 month period prior to commencement of any Project stage involving shaft sinking or tunnelling to establish seasonal variability, and the minimum level of these baseline surveys shall be used to establish the pre-construction reference ground level. All surveys are to be completed to an accuracy of at least ± 2mm for level and ± 5mm for plan position, or as otherwise achieved by best practice precise levelling.

3.27 The Consent Holder shall survey and record the readings of each inclinometer as required in condition 3.24 at an average of each 2 metres depth of shaft excavation, and at a minimum frequency of fortnightly intervals from the Commencement of Dewatering of any Project stage involving shaft sinking for a period of one month after the Completion of shaft Excavation, thence monthly until the Completion of Dewatering for any Project stage involving shaft sinking. At least two baseline surveys shall be completed before Commencement of Dewatering.

3.28 Prior to the Commencement of Dewatering of any Project stage involving shaft sinking or tunnelling, the Consent Holder shall assess the potential settlement effects resulting from the exercise of this consent. The output of this assessment shall be used to define the expected settlement levels and to establish settlement Trigger Levels (Alert Levels and Alarm Levels) that minimise the potential for damage to existing buildings or structures. The process for establishing settlement Trigger Levels shall be set out in the M&CP and shall be based upon the final tunnel alignment and construction methodology, any groundwater, deformation or settlement monitoring required under this consent, and groundwater and settlement modelling completed using this data. A factor of natural seasonal variability shall be allowed for in this review based on the survey completed under Condition 3.26.

Note: 'Alert Level' is the Differential and Total Settlement Limit set at a threshold less than the Alarm Level, at which the Consent Holder shall implement further investigations and analyses as described in the M&CP to determine the cause of settlement and the likelihood of further settlement.

'Alarm Level' is the Differential and Total Settlement Limit set in Condition 3.31, or which has the potential to cause damage to buildings, structures and services, at which the Consent Holder shall immediately stop dewatering the site and cease any activity which has the potential to cause deformation to any building or structure or adopt the alternative contingency measures approved by the Manager.

3.29 During construction in any Project stage involving shaft sinking or tunnelling, the Consent Holder shall survey the complete settlement network described in Condition 3.24 at six monthly intervals and keep records of each date and the corresponding ground surface and building level. In addition to the above, all Ground Surface Monitoring Marks located within 50 metres of the excavated tunnel and within 100 metres of an excavated shaft or the tunnel excavation face shall be monitored at least once every month. These records shall be compiled and submitted to the Manager at six monthly intervals.

3.30 The Consent Holder shall compare all settlement monitoring data obtained during shaft sinking and tunnelling construction work to the pre-construction minimum levels in accordance with the M&CP. Where Trigger Levels are exceeded the appropriate actions as set out in the M&CP shall be undertaken and the Manager shall be notified within three working days, advising of the trigger exceedance, the risk of settlement causing damage to buildings, and details of the actions taken.

3.31 The Consent Holder shall use all reasonable endeavours to ensure that the exercise of this consent does not cause:

a) greater (i.e. steeper) than 1:1,000 differential settlement (the Differential Settlement Limit) between any two adjacent settlement monitoring points required under this consent; or

b) greater than 50mm total settlement (the Total Settlement Limit) at any settlement monitoring point required under this consent.

3.32 The Consent Holder shall continue to monitor the Ground Settlement Monitoring Marks at six monthly intervals for 12 months after Completion of Dewatering of any Project stage involving shaft sinking or tunnelling, or for a shorter period if approved by the Manager. At 12 months following the Completion of Dewatering of any Project stage involving shaft sinking or tunnelling, monitoring of ground and settlement marks shall continue at the direction of the Manager if settlement marks have breached trigger levels and there is risk of adverse effects.

Appendix I

Bioresearches
A Babbage Company

ECOLOGICAL ASSESSMENT

Mt. Albert to Grey Lynn Tunnel

18 FEBRUARY 2019

Bioresearches
A Babbage Company

ECOLOGICAL ASSESSMENT

Mt. Albert to Grey Lynn Tunnel

DOCUMENT APPROVAL

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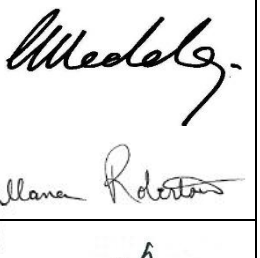
Authors:	Chris Wedding M.Sc. (Hons) Manager (Ecology) Jillana Robertson B.Sc., P.G. Cert (Sci) Ecologist	
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Cover Illustration: View through 44-48 Tawariki Street.

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CONTENTS

1. EXECUTIVE SUMMARY

1.1 Bioresearches Group (Bioresearches) was commissioned by Watercare Services (Watercare) to prepare an Ecological Effects Assessment of the proposed wastewater tunnel from Tawariki Street, Grey Lynn to Western Springs Reserve (Grey Lynn Tunnel). The assessments include effects of the Grey Lynn Tunnel on vegetation and potential fauna habitat values.

1.2 Actual and potential ecological values were assessed within the Tawariki Street Shaft Site. The existing vegetation within the site is almost entirely exotic and has low botanic value.

1.3 Similarly, the existing fauna habitat was generally low value, being weedy grass and a rock wall that has potential to support native skinks, including 'Not Threatened' copper skinks (*Oligosoma aeneum*) and "At Risk" ornate skinks (*O. ornatum)*. In the unlikely event that either species is present, their presence would qualify those habitats as moderate value.

Recommendations

1.4 Mitigation to avoid potential adverse effects on resident native lizards (copper skink and ornate skink) is recommended. This will involve precautionary capture and relocation during warm, settled weather when lizards are active.

1.5 Disposal of weed species should be to an approved landfill to minimise risk of further spread beyond the Project Area.

2. INTRODUCTION

2.1 Watercare Services Limited ("Watercare") is the water and wastewater service provider for Auckland. Watercare is proposing to construct a wastewater interceptor from Tawariki Street, Grey Lynn to Western Springs ("Grey Lynn Tunnel"). The Grey Lynn Tunnel will connect to the Central Interceptor at Western Springs. This report and assessment is submitted to accompany an application for resource consents and a notice of requirement by Watercare for the construction, operation and maintenance of the Grey Lynn Tunnel.

Project Overview

2.2 The Grey Lynn Tunnel involves the elements shown in the drawings and outlined in more detail in the reports which form part of the application. These elements are summarised as follows.

Grey Lynn Tunnel

2.3 The Grey Lynn Tunnel involves construction, operation and maintenance of a 1.6km gravity tunnel from Western Springs to Tawariki Street, Grey Lynn with a 4.5m internal diameter, at an approximate depth of between 15 to 62m below ground surface, depending on local topography. The tunnel will be constructed northwards from Western Springs using a Tunnel Boring Machine ("TBM"). The Grey Lynn Tunnel will connect to the Central Interceptor at Western Springs via the Western Springs shaft site.

Tawariki Street Shaft Site

2.4 The Grey Lynn Tunnel also involves construction, operation and maintenance of two shafts and associated structures at Tawariki Street, Grey Lynn ("Tawariki Street Shaft Site").

2.5 The Tawariki Street Shaft Site will be located at 44-48 Tawariki Street where the majority of the construction works will take place. Construction works will also take place within the road reserve at the eastern end of Tawariki Street and a small area of school land (St Paul's College) bordering the end of Tawariki Street (approximately 150m^2).

The Tawariki Street Shaft Site will involve the following components:

Main Shaft

- A 25m deep shaft, with an internal diameter of approximately 10.8m, to drop flow from the existing sewers into the Grey Lynn Tunnel;
- Diversion of the Tawariki Local Sewer to a chamber to the north of the shaft. This chamber will be approximately 12m long, 5m wide and 5m deep below ground, and will connect to the shaft via a trenched sewer;
- Diversion of the Orakei Main Sewer to a chamber to the south of the shaft. This chamber will be approximately 10m long, 5m wide and 11m deep below ground;
- Construction of a stub pipe on the western edge of the shaft to enable future connections (that are not part of this proposal) from the CSO network;
- Construction of a grit trap within the property at 48 Tawariki St to replace the existing grit trap located within the Tawariki Street road reserve. The replacement grit trap will be approximately 10m long, 5m wide and 13m deep below ground;
- Permanent retaining of the bank at the end of Tawariki Street to enable the construction of the chamber for the Orakei Main Sewer. The area of the bank requiring retaining will be approximately 44m long, 3m wide and 2m high; and
- An above ground plant and ventilation building that is approximately 14m long, 6m wide and 4m high. An air vent in a form of a stack will be incorporated into the plant and ventilation building and discharge air vertically via a roof vent. The vent stack will be designed with a flange to allow future extension of up to 8m in total height and approximately 1m in diameter in the unexpected event of odour issues.

Tawariki Connection Sewer Shaft – Secondary Shaft

2.6 A secondary shaft will be constructed at the Tawariki Street Shaft Site to enable the connection of future sewers (that are not part of this proposal) from the Combined Sewers Overflows ("CSO") network. This will involve the following components:

- A 25m deep drop shaft with an internal diameter of approximately 10.2m; and
- A sewer pipe constructed by pipe-jacking to connect the secondary shaft to the main shaft.

3. ASSESSMENT

3.1 Bioresearches was commissioned by Watercare to prepare an Ecological Effects Assessment of the construction and operation of the Grey Lynn Tunnel.

Assessment Methods

3.2 A desktop review was undertaken to determine locations and extents of vegetation, potential habitats and watercourses. The desktop review covered aerial imagery using the Auckland Council AUP (OP) planning maps viewer (GEOMAPS).

3.3 Two Ecologists visited the Project Area (Figure 1) on 21 June 2018 to assess the vegetation and potential habitats within and around the project footprint, and determine presence of predicted watercourses as modelled by GEOMAPS.

3.4 Fauna considered in this assessment included all those that are protected by the Wildlife Act 1953 (all native lizards and birds). Particular consideration was given where species with a conservation rating of nationally "At Risk" or higher had the potential to be present.

3.5 Ecological values are described in this report as being "high", "moderate" or "low" (Table 1), which broadly follows Ecological Impact Assessment (EcIA) guidelines developed by the Environment Institute of Australia and New Zealand (EIANZ 2015). The method has three steps:

(a) Assess the value of the habitat or species impacted, as shown in Table 1.

Determine the magnitude of the effect(s) as shown in

(b) Table 2

Evaluate the severity of the effect(s) using the matrix (

(c) Table 3) and determinations established from steps 1 and 2.

Table 1: Generalised Terrestrial Ecological Determining factors and Corresponding Valuations used in this Report (based on EIANZ 2015).

Determining factors	Ecological Value Descriptor
Supports nationally and locally common species. No threatened or at risk species.	Low
Locally rare or threatened, supporting no threatened or at risk species.	Moderate
Supporting one national priority type or naturally uncommon ecosystem	High
Supporting more than one national priority type	Very High

Table 2. : Generalised criteria for determining the magnitude of effect used in this Report (based on EIANZ 2015).

Magnitude	Description
Very High / severe	Total loss of, or very major alteration to, key elements/features/ of the existing baseline conditions, such that the post-development character, composition and/or attributes will be fundamentally change and may be lost from the site altogether; AND/OR Loss of a very high proportion of the known population or range of the element/feature
High	Major loss or major alteration to key elements/features of the existing baseline conditions such that the post-development character, composition and/or attributes will be fundamentally changed; AND/OR Loss of a high proportion of the known population or range of the element/feature
Moderate/medium	Loss or alteration to one or more key elements/features of the existing baseline conditions, such that the post-development character, composition and/or attributes will be partially changed; AND/OR Loss of a moderate proportion of the known population or range of the element/feature
Low / minor	Minor shift away from existing baseline conditions. Change arising from the loss/alteration will be discernible, but underlying character, composition and/or attributes of the existing baseline condition will be similar to pre-development circumstances or patterns; AND/OR Having a minor effect on the known population or range of the element/feature
Negligible	Very slight change from the existing baseline condition. Change barely distinguishable, approximating to the 'no change' situation; AND/OR Having negligible effect on the known population or range of the element/feature

Table 3. Criteria matrix for describing level of effects (based on EIANZ 2015).

Ecological Value → Magnitude ↓	Very High	High	Moderate	Low
Very High	**Very High**	**Very High**	**High**	Moderate
High	**Very High**	**Very High**	**Moderate**	Low
Moderate	**Very High**	**High**	Low	Very Low

Low	**Moderate**	Low	Low	Very Low
Negligible	Low	Very Low	Very Low	Very Low

4. DESCRIPTION OF RECIEIVING ENVIRONMENT

4.1 Above ground works will be restricted to the location of the Tawariki Street Shaft Site, located within the Project Area at the eastern end of Tawariki Street, Grey Lynn. Works are largely within the boundaries of the properties at 44-48 Tawariki Street, although a vegetated edge at St Paul's College, within which approximately 150 m^2 of works will occur, was also included in this assessment. There are no overland flow paths or watercourses within or around the Project Area.

4.2 The proposed works location is zoned Residential - Mixed Housing Urban under the Auckland Unitary Plan – Operative in Part and St. Pauls College is within Special Purpose – School Zone. There are no Natural Resource overlays associated with the Project Area (e.g. Significant Ecological Area).

Figure 1. Project Area (red), including property blocks 44-48 Tawariki Street. Auckland Council Geomaps overlay indicating modelled overland flow paths (blue).

Vegetation & Flora

4.3 A botanic assessment was undertaken during a site visit to the Project Area on 21 June 2018. Species composition and vegetation types were recorded and the ecosystem units were categorized using the Auckland regional terrestrial ecosystem classification system (Singers *et al*. 2017).

4.4 The vegetation composition at 44-48 Tawariki Street and the end of Tawariki Street is predominantly exotic, some of which includes amenity plantings. Four silverferns (*Cyathea*

dealbata), a few karamu seedlings (*Coprosma robusta*), and a small (> 3m), multi-stemmed pohutukawa (*Metrosideros excelsa*), were the only native species recorded. The botanical value of the area is low due to the overwhelming presence of non-native and/or invasive species. See Appendix I for a full species list.

Fauna

4.5 The vegetation within the Project Area was comprised almost exclusively of weed species. Some of these weeds may provide habitat to native fauna, including lizards and birds as discussed below.

Native Lizards

4.6 Native lizards in New Zealand include skinks and geckos. Within the Auckland Region, most species that have been recorded on the mainland have threat categories of 'Nationally At Risk' or higher (Table 4). However, within Auckland's urban Isthmus, only copper skink (Not Threatened) and ornate skink (At Risk) have been recorded. Nearby records for copper skink include parks and reserves at Waterview, Westmere, Point Chevalier, Western Springs, Mount Eden, Parnell and Newmarket. There are records for ornate skinks from Newmarket where it is associated with established, native vegetation.

4.7 Resident lizard populations may persist in much smaller habitat fragments than birds, where historic modifications have not resulted in their complete clearance and disconnection. Historic imagery suggests that the scrub at St Pauls College, while disconnected from other areas, has been present since at least 1940 and therefore may support a relict native lizard population.

4.8 Both copper skinks and ornate skinks can occur in rough grass and weedy vegetation mats, wherever ground cover is dense and / or supports log or debris piles that provide cover. Ornate skinks are uncommon and their persistence in weedy habitats tends to be associated with connectivity to established or mature native vegetation. Potential lizard habitat was limited within the Project Area to the small (150 m^2) area within the St. Pauls College property.

Table 4- Threat classification of native lizards from the mainland Auckland Region. Threat category as per Hitchmough et al. (2016).

Species	Threat Category	Threat Status
Copper skink (*Oligosoma aeneum*)	Not Threatened	-
Ornate skink (*Oligosoma ornatum*)	At Risk	Declining
Moko skink (*Oligosoma moco*)	At Risk	Relict
Striped skink (*Oligosoma striatum*)	At Risk	Declining
Shore skink (*Oligosoma smithi*)	At Risk	Naturally Uncommon
Tatahi skink (Oligosoma aff. *smithi* "Western Northland"	At Risk	Declining
Forest gecko (*Mokopirirakau granulatus*)	At Risk	Declining
Pacific gecko (*Dactylocnemis pacificus*)	At Risk	Relict
Elegant gecko (*Naultinus elegans*)	At Risk	Declining
Muriwai gecko (*Woodworthia* aff. *maculata* "Muriwai"	Threatened	Nationally Critical

4.9 Within the Project Area on St Pauls College land, dense ground cover is present in weedy, mat forming vegetation, including rank grass and *Agapanthus* clumps that partially overhang a rock wall Figure 2. This area may support low habitat value to native skinks, including 'Not Threatened copper skinks, and, much less likely, 'At Risk' ornate skinks, given that the area is relatively small and isolated.

Figure 2. Rock wall with weedy grass and agapanthus clumps at 48 Tawariki Street.

Native Birds

4.10 No native birds were recorded in the survey area, although a tui (*Prosthemadera novaeseelandiae)* was seen nearby. Grey warbler (*Gerygone igata*), fantail (*Rhipidura fuliginosa*), silvereye (*Zosterops lateralis*) and kingfisher (*Todiramphus sanctus*) are common native birds with small home ranges that may be intermittent visitors to the Project Area. It is unlikely that any rare or threatened species use the Project Area in any capacity, even on an intermittent basis.

4.11 Common native birds are relatively mobile and robust, and have the ability to colonise available habitats from nearby areas, such as Bayfield Park in the current instance. These species may visit the site intermittently for foraging. The value of the vegetation as habitat to common native birds is low.

5. ASSESSMENT OF EFFECTS

Vegetation & Flora

5.1 The vegetation within the Project Area was almost exclusively exotic and amenity value, with only three native species recorded within the Project Area. Removal of vegetation within the Project Area will represent a minor change from current conditions, which consists of predominantly exotic vegetation that prevails around the surrounding edges of St. Pauls

College. Therefore, any vegetation removal within the Project Area will have a very low ecological effect. Further, removal of weed species such as *Tradescantia*, *Agapanthus* and bamboo will be a positive effect. However, given the invasive nature of many of the pest species present, careful removal and disposal at an approved landfill should be required as a condition of consent, given the potential adverse effect of further spread beyond the site during removal and disposal.

Fauna

5.2 The potential fauna habitats within the Project Area are within an urban environment where naturally occurring native vegetation is scarce and most potential habitats for lizards and birds in the wider landscape are heavily modified (Figure 3).

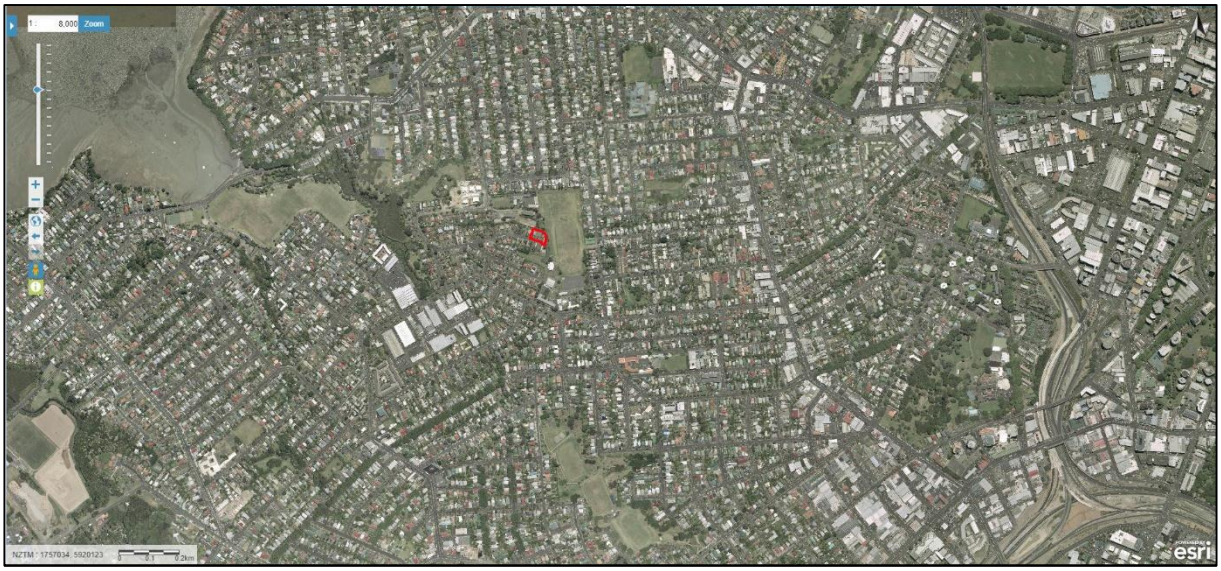

Figure 3. Project Area in surrounding urban environment. Base image taken from Auckland Council AUP(OP) GEOMAPS.

Native Lizards

5.3 As discussed previously, 'At Risk' ornate skinks have been recorded near the Auckland CBD although their presence within the Project Area is unlikely. If they are present, the removal of their habitat (i.e. vegetation clearance) will have a moderate level effect due to their threat status.

5.4 Works are largely within the boundaries of the properties at 44-48 Tawariki Street, where the potential habitat for native lizards does not occur. The level of the effect of potential habitat loss in this area will be negligible.

5.5 Approximately 150 m^2 of works extend into St Pauls College (Figure 1), which contains approximately 3500 m^2 of low value potential lizard habitat around the edges of carparks and buildings at the school. The moderate level effect of potential habitat loss can be mitigated through undertaking precautionary management by way of capture and relocation of any native lizards during the removal of the rock wall and any vegetation, within St. Pauls College, by a suitably qualified ecologist. Such removal should be undertaken during warm,

settled weather when lizards are active. With the recommended mitigation measure being implemented, the effects will be less than minor.

Native Birds

5.6 The effect of removal of low value habitat on common native birds within the Project Area will be very low.

6. SUMMARY AND CONCLUSIONS

6.1 The overall ecological values within the Project Area, including vegetation and fauna habitat, are low.

6.2 The potential habitat value for native lizards within the Project Area on St. Pauls College land is low to moderate, although the occurrence of ornate skinks within the Project Area is unlikely.

6.3 Disposal of weed species should be to an approved landfill to minimise risk of further spread.

6.4 Mitigation to avoid potential destruction of resident native lizards (copper skink and ornate skink) and potentially significant wildlife habitat ('At Risk' ornate skinks) is also recommended. This will involve precautionary capture and relocation during warm, settled weather when lizards are active.

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APPENDIX I: Plant Species List

Species list of plants present at #44, #46, #48. The list also includes plants at the end of the street on the road/school boundary. All native plants are highlighted in green.

Common Name	**Species name**
Karamu	*Coprosma robusta*
Silver fern	*Cyathea dealbata*
Pohutukawa	*Metrosideros excelsa*
Agapanthus	*Agapanthus praecox*
Arum lily	*Zantedeschia aethiopica*
Bamboo	*Bambusa glaucescens*
Blackberry	*Rubus fruticosus*
Buttercup	*Ranunculus repens*
Canna lily	*Canna indica*
Chinese privet	*Ligustrum sinense*
Cyprus	*Cupressus sp.*
Fennel	*Foeniculum vulgare*
Giant reed	*Arundo donax*
Gorse	*Ulex europeaus*
Hydrangea	Hydrangea macrophylla
Kikuyu	*Cenchrus clandestinus*
Madeira vine	*Anredera cordifolia*
Monkey apple	*Syzygium smithii*
Monstera	*Monstera deliciosa*
Moth plant	*Arauja hortorum*
Nasturtium	*Tropaeolum majus*
Oak	*Quercus robur*
Oleander	*Nerium oleander*
Olive	*Olea europaea*
Phoenix palm	*Phoenix canariensis*
Silver wattle	*Acacia dealbata*
Smilax	*Smilax china*
Purple-flowered hedge	*Teucrium fruticans*
Tradescantia	*Tradescantia fluminensis*
Tree aloe	*Aloe arborescens*
tree privet	*Ligustrum lucidum*
Wattle	*Acacia sp.*
Woolly nightshade	*Solanum mauritianum*

Appendix J

GREY LYNN TUNNEL: ARCHAEOLOGICAL AND HISTORIC HERITAGE ASSESSMENT

Prepared for Watercare Services Ltd

February 2019

By

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1. EXECUTIVE SUMMARY

Watercare Services Ltd is proposing to construct a wastewater interceptor from Tawariki Street in Grey Lynn to Western Springs, Auckland. Known as the Grey Lynn Tunnel (GLT) Project this wastewater interceptor will connect to the Central Interceptor (CI) at Western Springs and increase the capacity of the metropolitan wastewater network. The proposed tunnel is approximately 1.6km in length with 4.5m internal diameter, at an approximate depth ranging between 20 and 60m below ground level. It will involve a mixture of both deep and shallow underground construction, utilising the Central Interceptor shaft at May Road and a two new shafts and associated works at Tawariki Street (which will require the removal of three dwellings between 44 and 48 Tawariki Street). Tunnelling will be undertaken by Tunnel Boring Machine (TBM).

No archaeological or other historic heritage sites were identified within the Western Springs Reserve during the archaeological assessment for the Central Interceptor or during this field survey. It was determined that the likelihood of unidentified remains being uncovered was considered low based on the early 20th century modification to the area during the construction of the playing fields and the swampy nature of the landscape in this area.

Similarly, no known archaeological or other historic heritage sites are located near the proposed works on Tawariki Street. No historically recorded activities were identified in the area from the background research and field survey. It was determined that the likelihood of unidentified remains being uncovered was considered low based on the early 20th century modification to the area during the construction of the residential subdivision and college playing fields.

This assessment has established that the proposed activity will have no effect on any known archaeological remains, and has little potential to affect unrecorded subsurface remains.

If suspected archaeological remains are exposed during development works, the Accidental Discovery Rule (E12.6.1) set out in the (Auckland Unitary Plan – Operative in Part (AUP OP) must be complied with. Under the Accidental Discovery Rule works must cease within 20m of the discovery and the Council, Heritage NZ, Mana Whenua and (in the case of human remains) NZ Police must be informed.

If modification of an archaeological site does become necessary, an Authority must be applied for under Section 44(a) of the HNZPTA and granted prior to any further work being carried out that will affect the site.

Recommendations

- There should be no constraints on the proposed Grey Lynn Tunnel on archaeological and other historic heritage grounds, since no archaeological or other historic heritage sites are known to be present and it is considered unlikely that any will be exposed during development.
- If subsurface archaeological evidence should be unearthed during construction (e.g. intact shell midden, hangi, storage pits relating to Maori occupation, or cobbled floors, brick or stone foundation, and rubbish pits relating to 19th century European occupation), or if human remains should be discovered, the Accidental Discovery

Rule (section E.12.6.1 of the AUP OP) must be followed. This requires that work ceases within 20m of the discovery and that the Auckland Council, Heritage NZ, Mana Whenua and (in the case of human remains) the NZ Police are notified. The relevant authorities will then determine the actions required.

- If modification of an archaeological site does become necessary, an Authority must be applied for under Section 44(a) of the HNZPTA and granted prior to any further work being carried out that will affect the site. (*Note that this is a legal requirement*).
- Since archaeological survey cannot always detect sites of traditional significance to Maori, such as wahi tapu, the tangata whenua should be consulted regarding the possible existence of such sites in the project area.

2. INTRODUCTION

Watercare Services Ltd (Watercare) is the water and wastewater service provider for Auckland. Watercare is proposing to construct a wastewater interceptor from Tawariki Street, Grey Lynn to Western Springs Reserve in Auckland ('Grey Lynn Tunnel') (Figure 1 and Figure 2). The GLT will connect to the Central Interceptor at Western Springs and increase the capacity of the metropolitan wastewater network.

This report and assessment is submitted to accompany an application for resource consents and a notice of requirement by Watercare for the construction, operation and maintenance of the GLT. It also identifies any requirements under the Heritage New Zealand Pouhere Taonga Act 2014 (HNZPTA). The specialist area of this report is to assess the potential effects of the proposed activity on historic heritage and archaeological values, and the significance of those effects.

This report does not include an assessment of Maori cultural values. Such assessments should be made by the mana whenua. Maori cultural concerns encompass a wider range of values than those associated with archaeological sites. Consultation with mana whenua is ongoing throughout this Project.

Project Overview

The GLT involves the following elements (described in more fully in the Assessment of Environmental Effects) and as shown in the following drawing and outlined in the reports which form part of the application:

Grey Lynn Tunnel

a) The GLT involves construction, operation and maintenance of a 1.6km gravity tunnel from Western Springs to Tawariki Street, Grey Lynn with a 4.5m internal diameter, at an approximate depth of between 15 to 62m below ground surface, depending on local topography. The tunnel will be constructed northwards from Western Springs using a Tunnel Boring Machine ("TBM"). The Grey Lynn Tunnel will connect to the Central Interceptor at Western Springs via the Western Springs shaft site.

Tawariki Street Shaft Site

a) The GLT also involves construction, operation and maintenance of two shafts and associated structures at Tawariki Street, Grey Lynn ("Tawariki Street Shaft Site").

   The Tawariki Street Shaft Site will be located at 44-48 Tawariki Street where the majority of the construction works will take place. Construction works will also take place within the road reserve at the eastern end of Tawariki Street and a small area of school land (St Paul's College) bordering the end of Tawariki Street (approximately 150m^2).

   The Tawariki Street Shaft Site will involve the following components:

   Main Shaft

· A 25m deep shaft, with an internal diameter of approximately 10.8m, to drop flow from the existing sewers into the Grey Lynn Tunnel;

- Diversion of the Tawariki Local Sewer to a chamber to the north of the shaft. This chamber will be approximately 12m long, 5m wide and 5m deep below ground, and will connect to the shaft via a trenched sewer;
- Diversion of the Orakei Main Sewer to a chamber to the south of the shaft. This chamber will be approximately 10m long, 5m wide and 11m deep below ground;
- Construction of a stub pipe on the western edge of the shaft to enable future connections (that are not part of this proposal) from the CSO network;
- Construction of a grit trap within the property at 48 Tawariki St to replace the existing grit trap located within the Tawariki Street road reserve. The replacement grit trap will be approximately 16m long, 5m wide and 13m deep below ground;
- Permanent retaining of the bank at the end of Tawariki Street to enable the construction of the chamber for the Orakei Main Sewer. The area of the bank requiring retaining will be approximately 44m long, 3m wide and 2m high; and
- An above ground plant and ventilation building that is approximately 14m long, 6m wide and 4m high. An air vent in a form of a stack will be incorporated into the plant and ventilation building and discharge air vertically via a roof vent. The vent stack will be designed with a flange to allow future extension of up to 8m in total height and approximately 1m in diameter in the unexpected event of odour issues.

Tawariki Connection Sewer Shaft – Secondary Shaft

A secondary shaft will be constructed at the Tawariki Street Shaft Site to enable the connection of future sewers (that are not part of this proposal) from the Combined Sewers Overflows ("CSO") network. This will involve the following components:

- A 25m deep drop shaft with an internal diameter of approximately 10.2m; and
- A sewer pipe constructed by pipe-jacking to connect the secondary shaft to the main shaft.

The Grey Lynn Tunnel represents a key component for the upgrading and reorganisation of Auckland's metropolitan wastewater network, as it will:

a) increase the capacity of the metropolitan wastewater network, thereby supporting the intensification of the Auckland urban area;

b) assist in reducing the frequency of storm-related overflow events from the combined wastewater / stormwater network;

c) improve network reliability and enable future upgrades and improvements to the network.

Assessment Methodology

The New Zealand Archaeological Association's (NZAA) site record database (ArchSite), Auckland Council's Cultural Heritage Inventory (CHI), AUP OP and the Heritage New Zealand Pouhere Taonga (Heritage NZ) New Zealand Heritage List/Rārangi Kōrero were searched to determine whether any archaeological or other historic heritage sites had been recorded on or in the immediate vicinity of the Project area. Literature and archaeological reports relevant to the area were consulted (see Bibliography). Early survey plans and aerial photographs were checked for information relating to past use of the property. Archival research was carried out to establish the history of the Project area.

A visual inspection of the Project area was conducted on 3 July and 1 August 2018. The ground surface was examined for evidence of former occupation (in the form of shell midden, depressions, terracing or other unusual formations within the landscape, or indications of 19th century European settlement remains). Exposed and disturbed soils were examined where encountered for evidence of earlier modification, and an understanding of the local stratigraphy. Subsurface testing with a probe and spade was carried out within Western Springs Reserve to determine whether buried archaeological deposits could be identified or establish the nature of possible archaeological features. Photographs were taken to record the topography and features of interest/the area and its immediate surrounds.

Archaeological sites beneath modern buildings and sealed surfaces in urban environments can rarely be identified prior to being exposed during site works. Therefore, the approach to archaeological assessment is to identify historically recorded activities on the site and assess the potential for archaeological evidence to have survived on the basis of later modifications to the site.

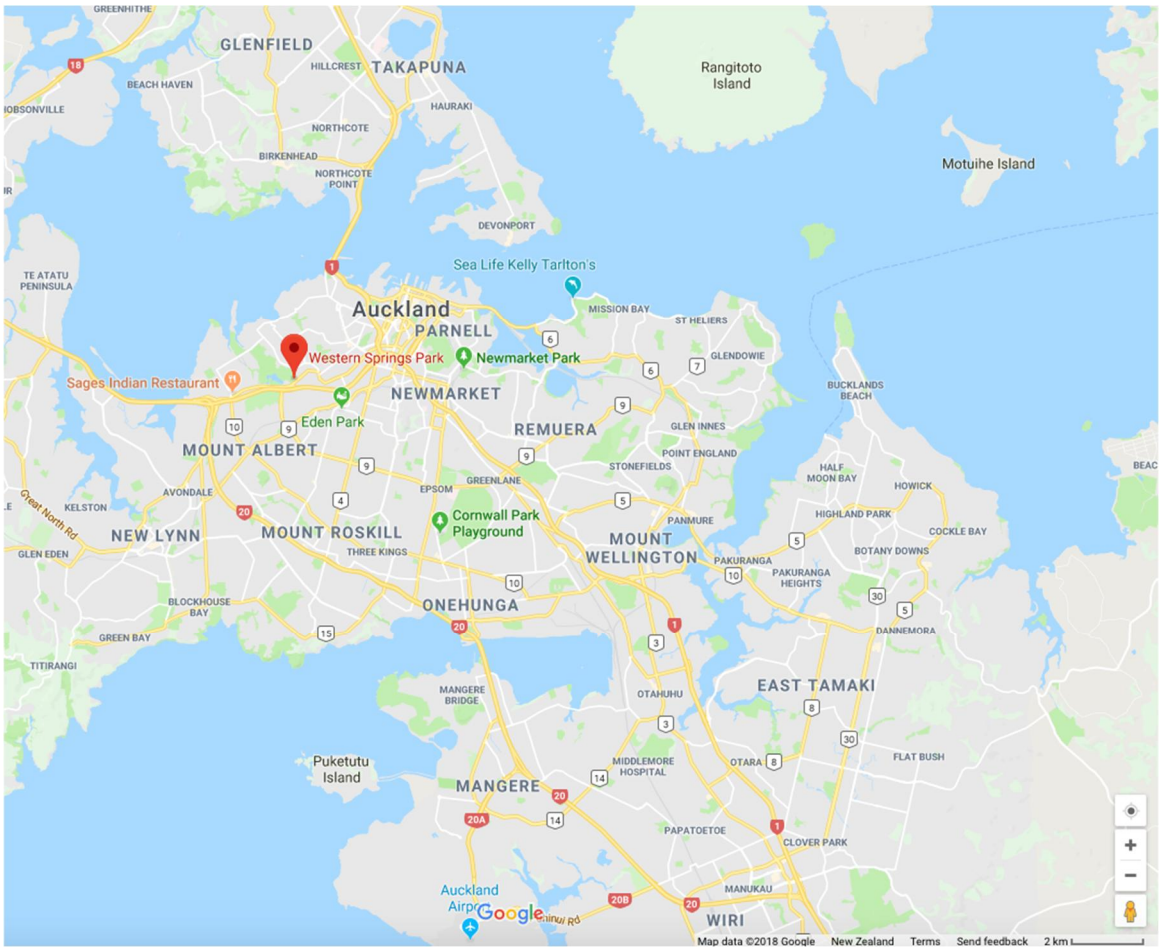

Figure 1. The location of suburbs Western Springs and Grey Lynn indicated by the red marker (Google Maps 2018)

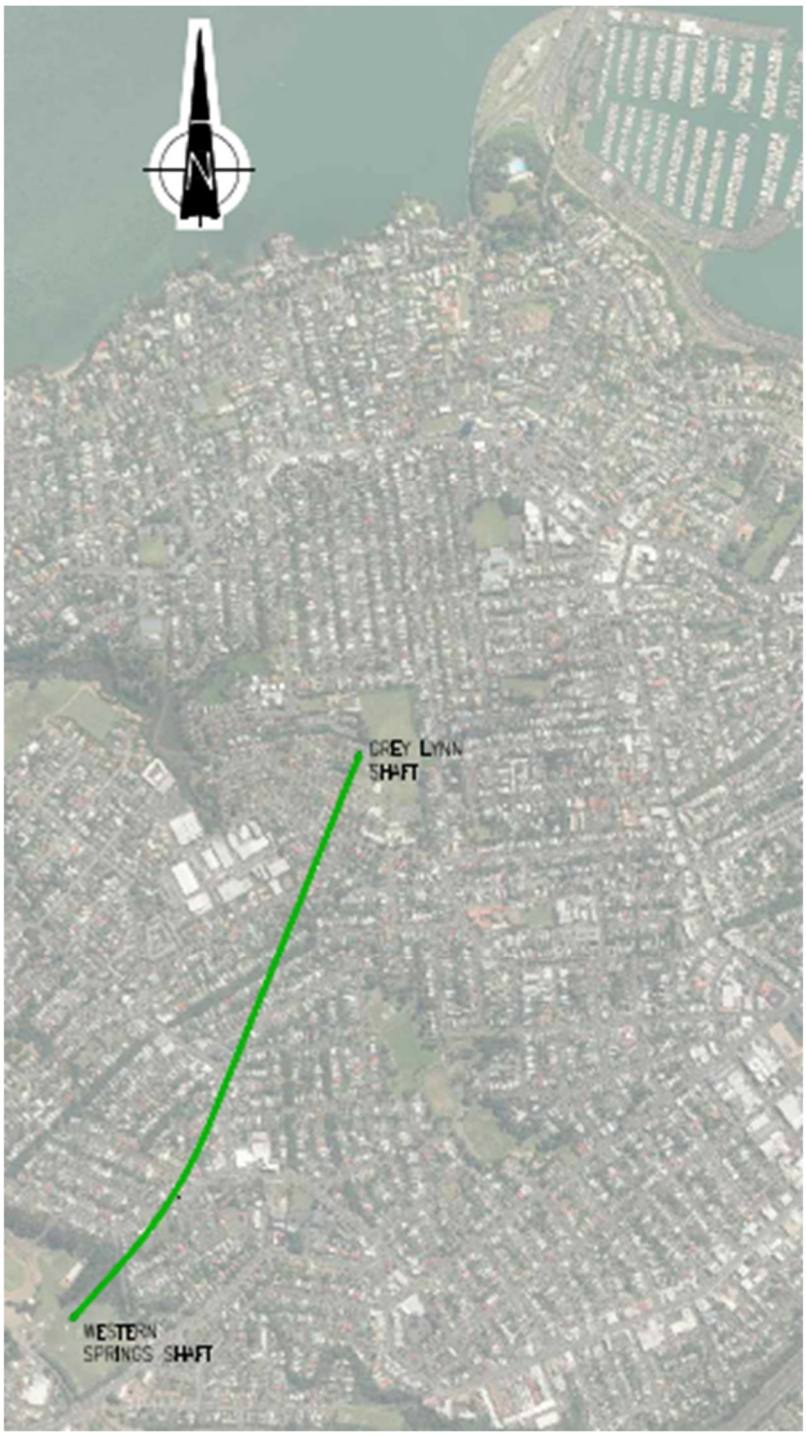

Figure 2. Grey Lynn Tunnel (source: Watercare)

3. HISTORICAL BACKGROUND

Maori Settlement

While based on reliable documentary sources, this information should not be viewed as complete or without other context. There are a large number of iwi historically associated with the Auckland region and many other histories known to mana whenua.

Auckland and the upper Waitemata Harbour has a long history of traditional associations with Maori, depicted in the complex traditional record relating to the region that reflects the migrations, conquests and occupations that have taken place in this area over centuries.

The Maori name for the Auckland Isthmus (the 'Isthmus') was Tamaki-makau-rau, 'The bride sought by a hundred suitors'. It was also often described as 'Tamaki Herenga Waka' or the resting place of many waka – a reference to the layers of tribal associations with the Auckland area. Many tribes descended from ancestral waka, including Te Arawa, Mataatua, Aotea, Tainui and Mahuhu, have flourished in Tāmaki as the volcanic soils provided rich material for gardening across the Isthmus.

The land within Tamaki-makau-rau was highly valued and many battles were fought for supremacy. The isthmus had many settlement sites, including fortified Pa, supporting one of the most concentrated Maori populations in New Zealand. The short distance between the east and west coast was also attractive as resources could be obtained easily from both. There are no fewer than eight waka portages between Waitemata and the Manukau.

The Waitemata and Manukau Harbours contained extensive shellfish beds, fisheries and birds, while the fertile soils of the volcanic fields were excellent for growing crops. The harbours, with their various portages, were the centre of an extensive water-based transport network and were rich in marine resources. Maori had their food production organised into gardening and fishing circuits and there were many fishing stations supported by gardens throughout the Isthmus.

Through the leadership of Hua Kaiwaka in the 16th century, the various tribes of the Isthmus were united under the confederation known as Te Waiohua. The Hauraki confederation of tribes also had periodic incursions into the isthmus as well as fishing camps in the Waitemata. The Te Taou hapu of Ngati Whatua, domiciled in the north-west, attacked Te Waiohua and killed their chief Kiwi Tamaki in the mid-17th century, eventually settling in the central isthmus (Blair Jun 2013: 4). From this battle came a new people through the Ngaoho line. Remnants of Waiohua returned gradually from hiding to join Ngaoho.

Ngati Whatua was not to have an easy time following the collapse of Waiohua ascendency in Tamaki. There were conflicts with Ngati Paoa who had fortified villages on the Tamaki River and an increasing presence of Europeans. By 1820 Te Tou were back at Kaipara and only the Ngaoho, with Apihai Te Kawau as chief and based at Mangere, remained on the isthmus with Ngati Paoa and possibly others.

From the 1820s, when the acquisition of muskets sparked tribal warfare, Maori settlements in Tamaki-makau-rau were deserted, and Maori did not return to the area until the 1830s. Close to the bush and western ranges Apihai and a number of his people stayed along with Ruka Taurua of Te Taou, and some Ngati Tahinga from the Waikato,

at Te Rehu beside the mangrove estuary of Waioteao (Motions Creek). During nearly two years according to evidence given in 1868 at the Native Land Court hearing, Te Rehu was their main settlement in the 1820s (Hiyama 19913-4).

In March 1840 Ngati Whatua chief Apihai Te Kawau signed the Treaty of Waitangi and invited Governor Hobson to found a settlement in Auckland. With the loss of land in 1840 and the outbreak of war in the 1860s Maori no longer traditionally occupied the Grey Lynn – Western Springs area.

Cox's Bay (Ōpoutūkeha) -

Opoutukeha or Opou (Cox's Bay) is named after the ancestor Poutukeha. The creek (Cox's Creek) is an ancient boundary line between Ngati Huarere and Ngati Pou (AUPOP schedule). Ngati Huarere (Huarere being Tamatekapua's grandson) are the source of the Arawa decent lines for the Maori of Tamaki (Hiyama 1991:2). The soil and north-facing slopes above Opou were cultivated for kumara (Simmons 1987). The traditional name Tuki-tuki-muka is also associated with Cox's Bay, which relates to the customary harvest and preparation of flax for the making of garments and lashings (Figure 3).

Western Springs (Te Waiorea) -

Western Springs and the creek that drains it are known to Maori as Te Waiorea for the long-finned eels (orea) that lived in the clear waters of the springs. Next to Waiorea is Te Rehu, the historic settlement of Te Taou, Ngaoho and Te Uringutu, along with their Tainui relations, Ngati Tahinga. In the 1820s these tribes stayed here under the chiefs Apihai Te Kawau and Ruku Taurua (Hiyama 1991). Te Rehu is usually cited as being beside the estuary where the creek from Waiorea meets the waters of the Waitemata (which according to Stone (2001) carried the name of Te Rehu), but gardens, waka routes, fishing and shellfish-gathering sites, mahinga kai, food preparation sites and the like would have extended out beyond this. Waiateao or Motion's Creek drains to Waiorea and thence to the sea beside Titokaroa (Meola Reef) (Figure 3).

David Simmons records that Kawharu, a warrior raised on the Manukau, led an attack from the north on the people of Tamaki in 1680. Kawharu came close to Waiorea at some point on the campaign and Nga Kauaewhati, 'the broken jaw bones', places a battle of this time overlooking Waiorea. Back along the ridge where Surrey Crescent runs today is Te Raeokawharu, 'Kawharu's brow', marking a spot where the invading chief rested, and hence tapu for nearly 200 years (Hiyama 1991:2).

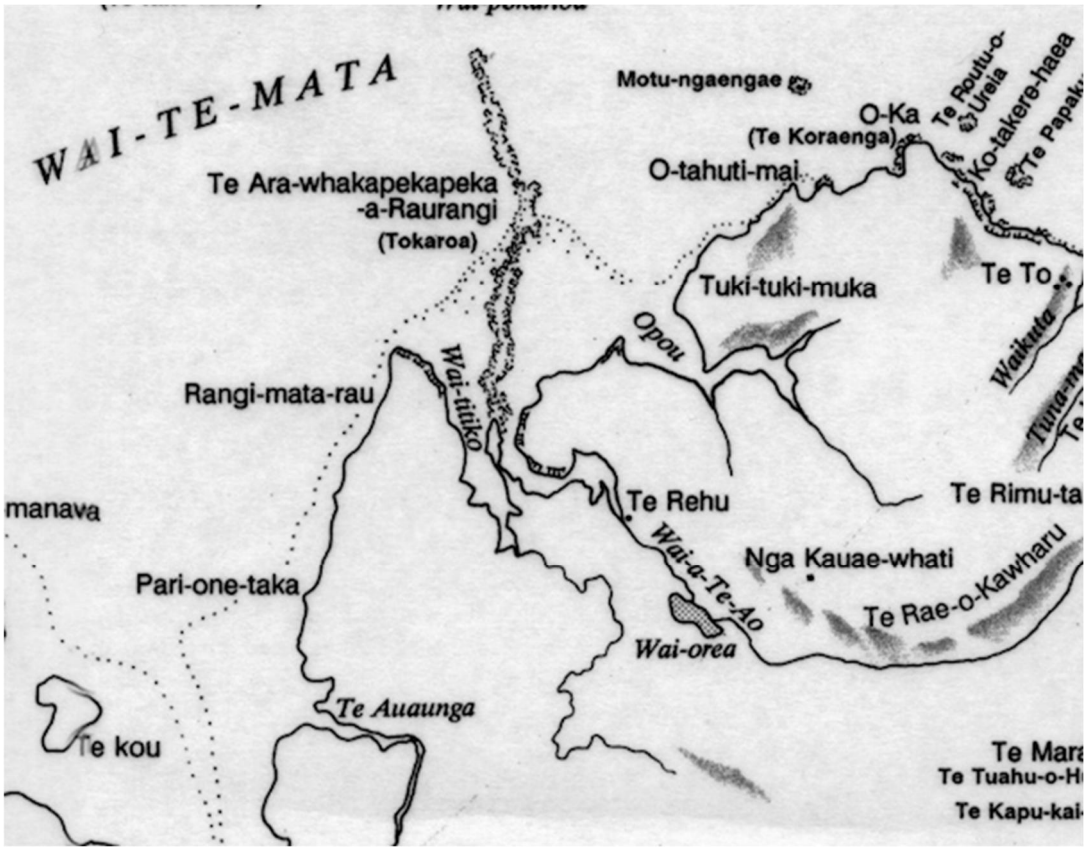

Figure 3. Detail of 'Map of the Tamaki Isthmus with Maori place names' showing the Grey Lynn – Westmere – Western Springs area (from Kelly and Surridge 1990, Map of Tamaki-Makau-Rau)

European Settlement

Western Springs and Grey Lynn were part of the Mataherehare, Opou and Whau Block (1840) and the large Waitemata to Manuka Block (1841) acquired by Governor Hobson from Apihai Te Kawau and Ngati Whatua, being the first Crown 'purchases' in Auckland. The new town of Auckland was established in 1841 and the Crown was offering Crown Grants for sale in the mid-1840s. From June of 1844, the 'suburban lands' in Sections 8 and 9 of the County of Eden, which included Grey Lynn, Westmere and Western Springs began to be publicly auctioned. The lots were often in lieu of land 'bought' before 1840 and since reclaimed by the Crown, or 'allowed for credit transferred' (Hiyama 1991:7-8). Potential purchasers were advised to use water transport to arrive at Cox's Creek for viewing, due to the difficulty of land access (McEvoy 2015:12).

Allotments in Grey Lynn and Westmere areas were largely purchased by speculators, hoping for a quick profit and properties were quickly on-sold, sometime repeatedly. The Project area within the Western Springs sports fields was originally part of Allotment 14 of Section 9 - Suburbs of Auckland (Figure 4), and Tawariki Road was part of Allotment 28 Section 8 - Suburbs of Auckland.

Western Springs

A notable exception of early land speculation and on-selling was at Western Springs where William Motion, in business with Joseph Low, purchased several allotments on which he grew wheat that was processed by his mill (which was built in 1845-46 in what is now Old Mill Road (Figure 4). The mill used Waiateao (Motions Creek) to transport wheat and flour to and from the mill.[1] Previously the firm of Low and Motion had operated a flour mill where Carlaw Park was located on Stanley Street above Mechanics Bay, but restricted water supply necessitated a move outside the city boundaries.

Prior to 1874 the Auckland settlement was largely supplied with water from a spring in Auckland Domain (Duck Ponds) to standpipes in the town. By the 1850s shortage of supply and contamination of wells by sewage and other waste seeping into the water table led to water-borne diseases and occasional epidemics. Pressure for a new reticulated water supply in 1874 led eventually to Council voting to proceed with a steam pumping scheme based at Western Springs, which at that time was located well outside the city, where there was a series of uncontaminated natural springs fed by an underground water supply. There springs seem to have been known as the Western Springs from the earliest days of European settlement (Pearson Apr 2000:25).

Auckland City Council purchased 152 acres of the Motion's property to establish the Western Springs pumping station. The area purchased is shown in Figure 5 – Allotments 12, 13, 14 and 17 as well as 18A on the northwestern side of Old Mill Road. Design and construction began immediately and in July 1877 the Western Springs Waterworks were commissioned (Figure 6). Auckland now had a permanent reticulated supply of good quality water that was designed to meet the needs of the city until the turn of the 20th century (Murdoch n.d.). Part of this system is illustrated on an early plan entitled 'Auckland west showing pipe lines from Western Springs to reservoir in Ponsonby Road' dating to the 1880s (Figure 7).

As well as the pumping station a 6-acre reservoir or impound pond (the main Western Springs lake) was created in the swampy ground to the west of the pumping station. The lake was 6ft deep and was designed to hold some 22 million gallons (100 million litres). This required the construction of an embankment around the lake some 12m wide at the base and 3m wide at its top (Foster 2012:3).

After the collapse of the Otago Goldfields in the mid-1860s many Chinese workers moved to the warmer Auckland area. Some of the largest expanses of early European gardens were located in the Grey Lynn, Arch Hill and Western Springs area. The soils were fertile and natural spring waters presented an ideal location for vegetable gardens. Industrious Chinese created extensive market gardens either side of Great North Road below the Surrey Crescent ridge and over the Western Springs plateau. Over time the Great North Road hill became known as 'Chinaman's Hill' (McEvoy 2015:21).

By the end of the 19th century Auckland had outgrown the Western Springs water supply and reservoirs were constructed in the Waitakere Ranges that provided gravity supply to Auckland. Without the need for the water supply from Western Springs the land became redundant. It was unsuitable for housing development and, apart from some commercial gardening along the Great North Road, the land became overgrown and was used as an illegal rubbish tip. In 1922 Council decided to allocate 40 acres to be a zoo for the city and allocated £10,000 for its development (Bush 1971:279). The remainder of the area

[1] Hiyama (1991) places the mill "near where the Zoo's (old) elephant house is now located

remained in its derelict condition, apart from a camping ground on the corner of Great North Road and Motions Road.[2]

From 1927 the unemployed were put to work on public relief schemes around New Zealand at pay rates sufficiently low as to not attract men from other work they could find. The City Council saw the potential for Western Springs for facilities besides the zoo, and the use of unemployed labour was ideal for the plans it had in mind. In 1929 40 to 50 men were employed to drain and level 12 acres for the Western Springs Stadium, with a running and cycling track, and another 10 acres of outer playing fields (Figure 8) (Hiyama 1991:84). It was reported that,

> 'It will be necessary to move 30,000 cubic yards of topsoil, rock and clay, and the job, together with what is needed at the stadium, will provide six months' labouring work for 40 men. The cost is put down at £8800 …'.[3]

In the early 1960s the City Council cleared and landscaped the lake and started to develop the modern Western Springs Reserve around it.

Figure 4. Detail from survey plan SO 677 (May 1845) showing the location of 'Low & Motion Mill' and 'Landing Place' (red arrow) immediately to the north of Old Mill Road and Allot 14 (blue arrow)

[2] The camp was used as a transit camp for the American military during WWII
[3] *New Zealand Herald* Vol LXVI, Issue 20358, 12 Sep 1929.

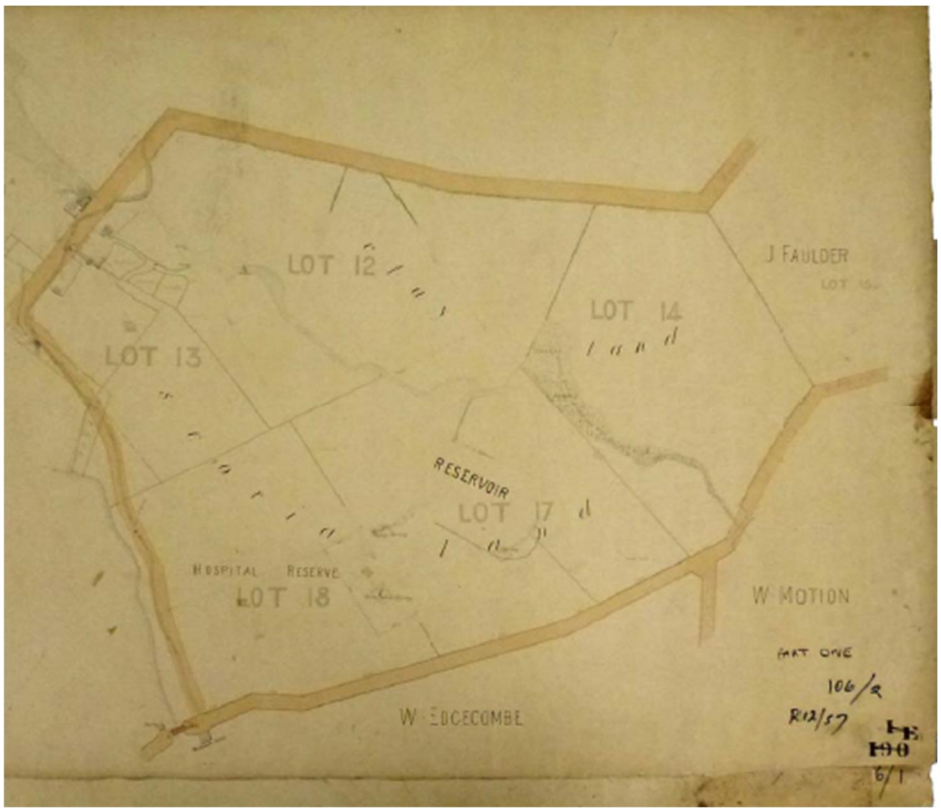

Figure 5. Detail from survey plan of Lots 12, 13, 14 and 18, Western Springs (by H. N. Warner, April 1876, Auckland Council Archives)

Figure 6. Looking south in the vicinity of the top of the Bullock Track showing the Western Springs pumping station and the surrounding farmland in 1898. The Western Springs Stadium of today would be to the right of the photograph, and the playing fields in the foreground (Sir George Grey Special Collections, Auckland Libraries, 7-A11122)

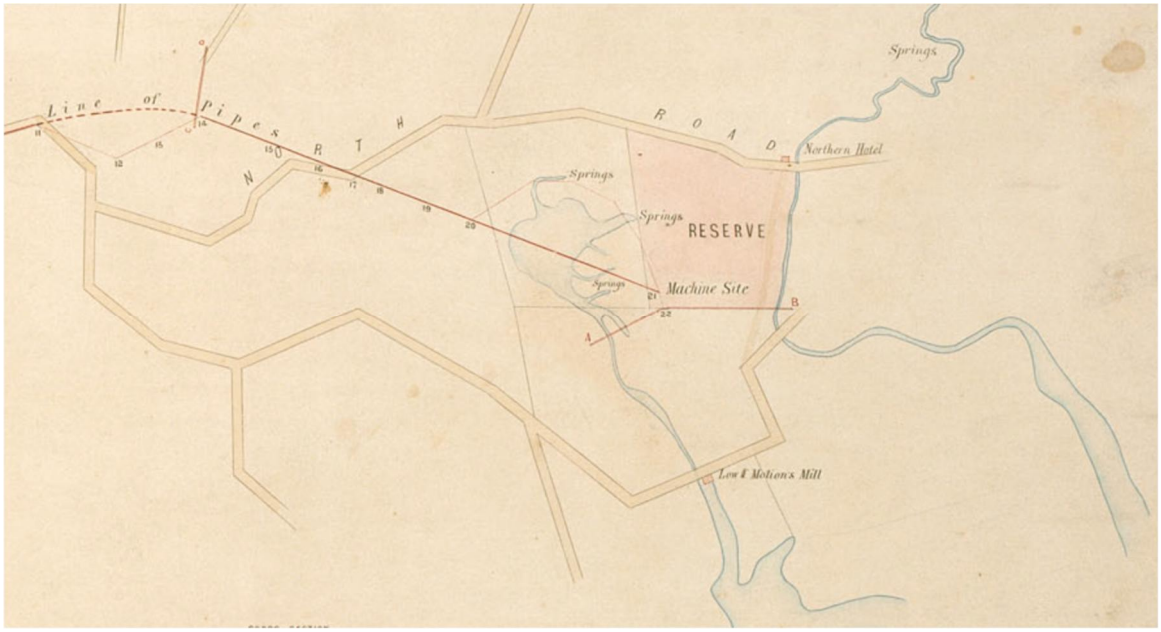

Figure 7. Detail from an 1880s map - 'Auckland west showing pipelines from Western Springs to reservoir in Ponsonby Road,' showing the Western Springs reserve, 'Machine Site' (Pump Station) and Low & Motion's Mill on Motions Creek (Sir George Grey Special Collections, Auckland Libraries NZ Map 4679)

Figure 8. Western Springs playing fields. This photograph is undated but appears to be around the time the fields were formed (Auckland Museum Library PH-NEG-C26286)

Tawariki Street

The earliest European settlement in the Cox's Creek area dates from the 1840s, when John Cox started a market garden in the area (Hiyama 1991:10). In 1859 an area on the southern side of the bay was subdivided as the 'Village of Richmond' within Sections 8 and 9 of the County of Eden, which includes the modern Regina, Kingsley, Livingstone, Webber and Edgars Streets (Figure 9 and Figure 10). Logs to build at least one of the houses here were floated to Cox's Bay and up the tidal estuary and pit sawn on site (Hiyama 1991:11).

In 1896 a tannery was started on Regina Street in an area now covered by housing, and in 1899 the Cashmore Brothers started a steam-powered sawmill just below West End Road on the northern side of the bay (Figure 11). This operated until 1920 when the mill burnt down.

St Paul's College, located on Richmond Road near the south-eastern shoreline of Cox's Creek, was originally Sacred Heart College which moved to this Grey Lynn site in 1903 from the corner of Pitt and Wellington Streets in the city (Waters 2003). A new three-storey building was built on spacious grounds, part of a 47-acre (19 hectare) block that had been gifted to the Catholic diocese in 1852 for religious and educational purposes by Hugh Coolahan, an Auckland Catholic businessman. The Marist Brothers owned and ran the College, leasing approximately 13.5 acres (5.5 hectares) of land from the Bishop (Waters 2003:22).

The Sacred Heart College land included Allotments 27 & 28 Section 8 - Suburbs of Auckland (Figure 10), which commanded a wide view to the northwest down the gentle sloping gully to Cox's Creek where Cashmore's Sawmill was located. There were no dwellings in this direction at that time, and the rolling land was treeless and covered in weeds and the odd patch of gorse (Figure 12). While Jervois Road and Ponsonby Roads to the northeast were almost fully lined with buildings, most of the land from Jervois Road, John Street and Richmond Road up to Ponsonby Road was undeveloped, with only a scattering of buildings on the western flank of Ponsonby Road (Waters 2003:25-26).

During the early years much work was necessary to improve the college grounds as a gully ran through the middle of the property and it had a rolling, uneven contour. It was not long before several cricket pitches were formed on the lower slopes of what was to become the 'near field' (Figure 13). In 1909 this area was levelled for a sports field and a drainage system installed. The gully and 'far field' were fenced off and farming activities were confined to the gully area (Waters 2003:26). As many of the boys were from rural districts and had farming backgrounds, the college provided practical agriculture as a subject and ran its own farm on the lower part of the property, which ran down to Cox's Creek. By 1915 ploughing was done around the gully, the nearby fields and what was known as the 'Casey Estate' (the stretch of land to the north-western side of the grounds where the gully widens out towards Cox's Creek (Waters 2003)). Cows, horses, sheep and chickens were farmed and crops of oats and barley were harvested (Carlyon and Morrow 2008:83-84) (Figure 14 and Figure 15).

In 1919-23 the Catholic diocese subdivided off part of the Sacred Heart College property and by 1928 the northern portion of this area was occupied by a Marist Convent and the Trinity Street Catholic School and Church, now all part of the Kelmana Avenue complex, and the eastern half of Allotment 28 became a sports field for the Sacred Heart School (Figure 16). In 1927 the 'far field' was developed into the college's main sports ground. In 1931 a bowling green, an additional tennis court and a shooting range were developed

in the near side of the gully (Waters 2003). Around this period the rest of the property was sold by the Catholic diocese and subdivided as the Casey (residential) Estate in 1937. The land is described as in 'Heavy Gorse' and 'Scattered Blackberry' immediately prior to development (Figure 17 and Figure 18).

Plans were started as early as 1909 to fill the mudflats of Cox's Bay to create a recreation reserve. However, official filling only began in the 1950s and continued for a number of years. In 1976, after the fill had settled the Cox's Bay Reserve was developed as a park and sporting recreation grounds (Foster Oct 2012:5).

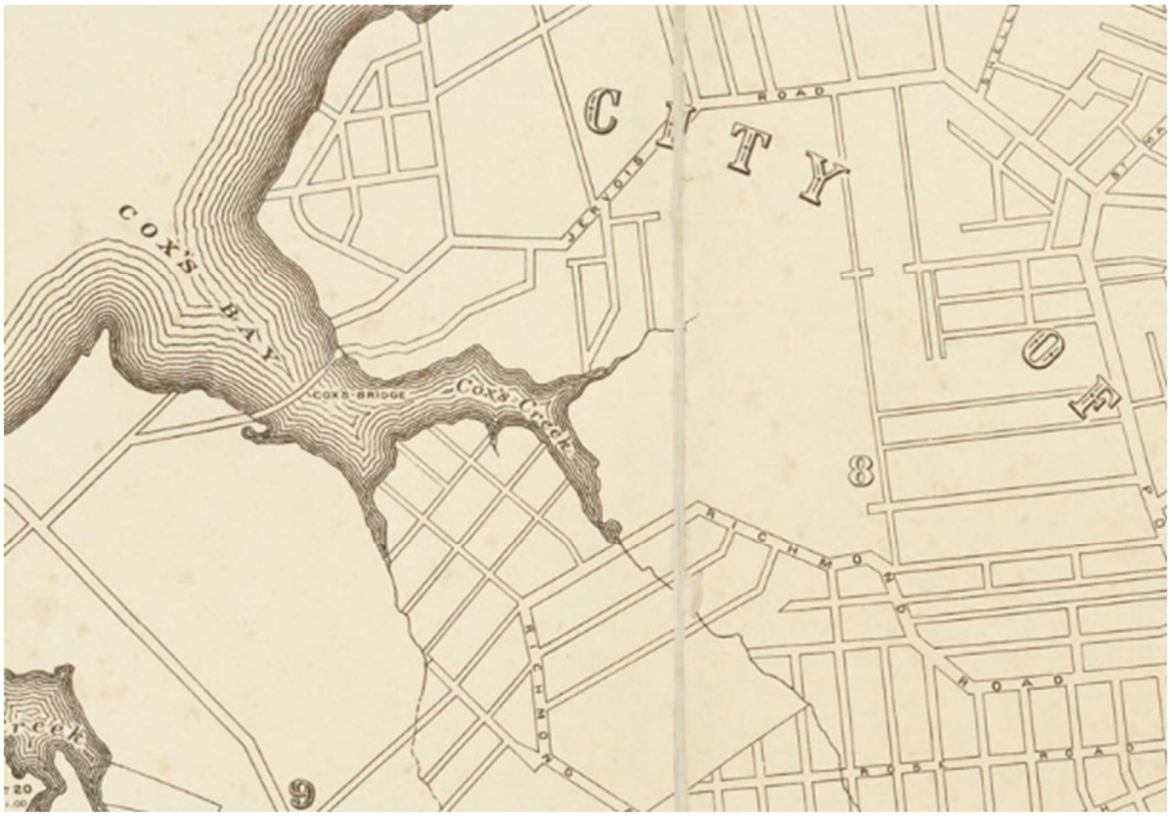

Figure 9. Detail from NZ 4785 (1892) Sheet 1 of a cadastral map of Eden County (Auckland City) ('Sir George Grey Special Collections, Auckland Libraries)

Figure 10. Detail from Upton & Co.'s New Map of City and Suburbs of Auckland 1886 (Sir George Grey Special Collections, Auckland Libraries, NZ Map 198) showing the location of the eastern end of Tawariki Street (red arrow) and the Western Springs sports field (blue arrow)

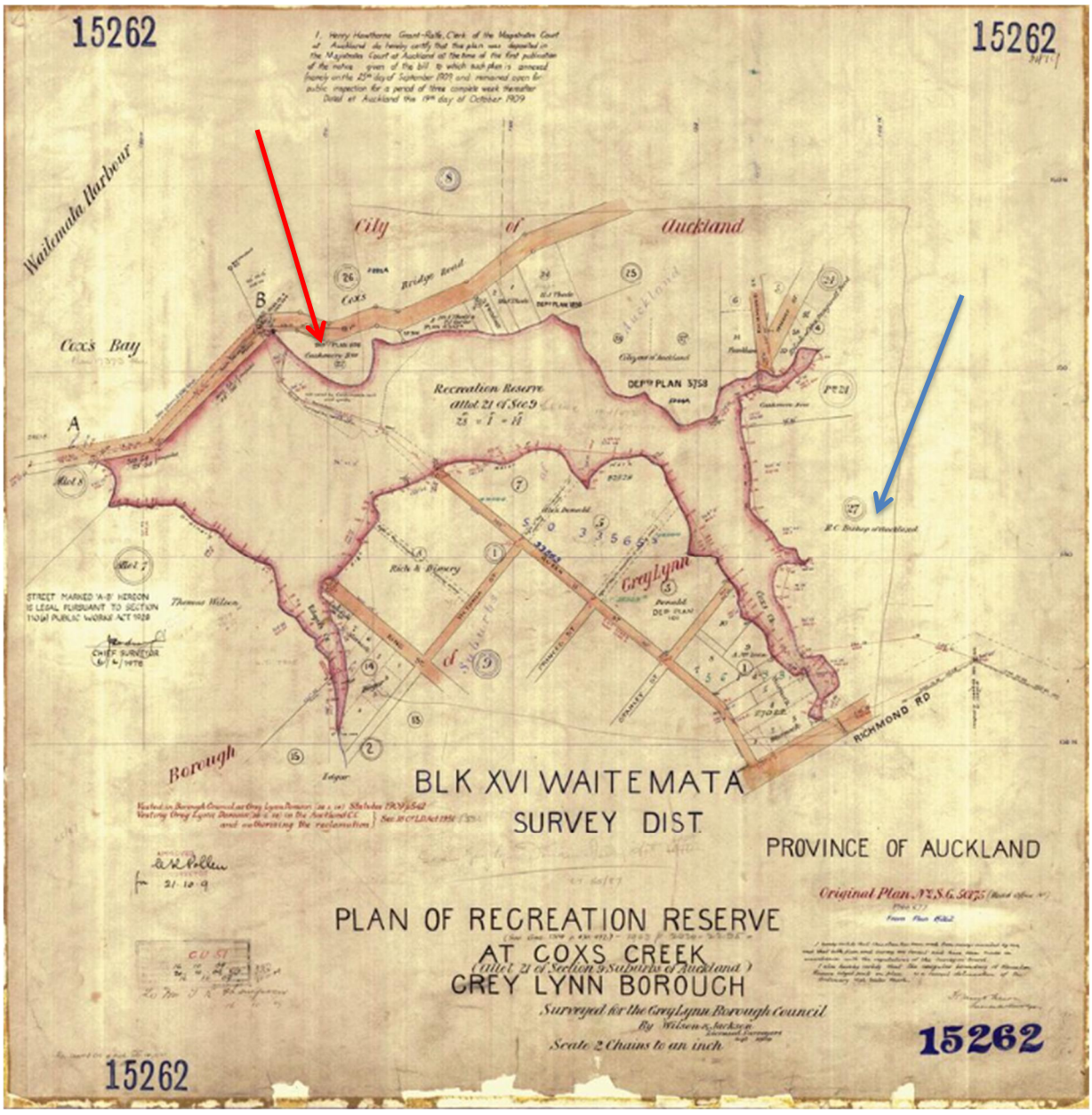

Figure 11. Survey Plan SO 15262 (1909) Plan of Recreation Reserve at Cox's Creek Grey Lynn Borough showing Allot 27 owned by the R C [Roman Catholic] Bishop of Auckland (blue arrow). The location of Cashmore Bros sawmill on the northern side of Cox's Bay is also shown (red arrow)

Figure 12. Looking towards Ponsonby across the farm land from Cox's Creek ca. 1900 (Unknown photographer, Auckland Museum Library PH-RES-4511)

Figure 13. The cricket pitch on the 'near field' looking northeast towards Jervois Road across the rolling farmland of the Sacred Heart College grounds (in Waters 2003)

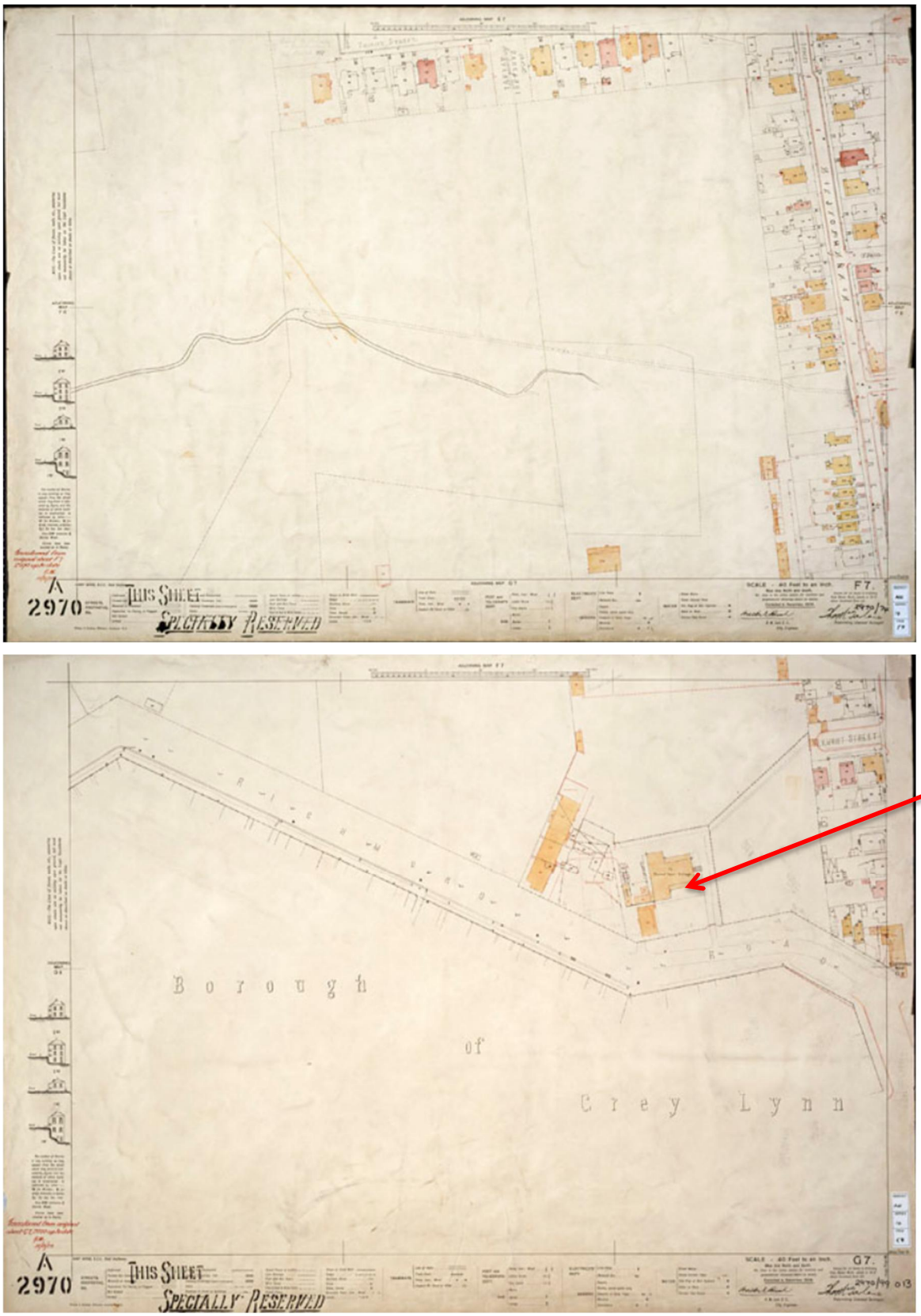

Figure 14. 1908 Wrigg City Plan of Auckland Maps F7 & G7 (annotated to July 1919) showing the Sacred Heart Boys School buildings (arrowed) adjacent to Richmond Road and the undeveloped school farm across Allotments 27 & 28

Figure 15. 1908 Wrigg City Plan of Auckland Maps F6 (annotated to July 1919) showing the upper reaches of Cox's Creek. Note a 'Bridge' located within Allotment 27 in the approximate position of the intersection of Parawai and Tawariki Streets today (arrowed)

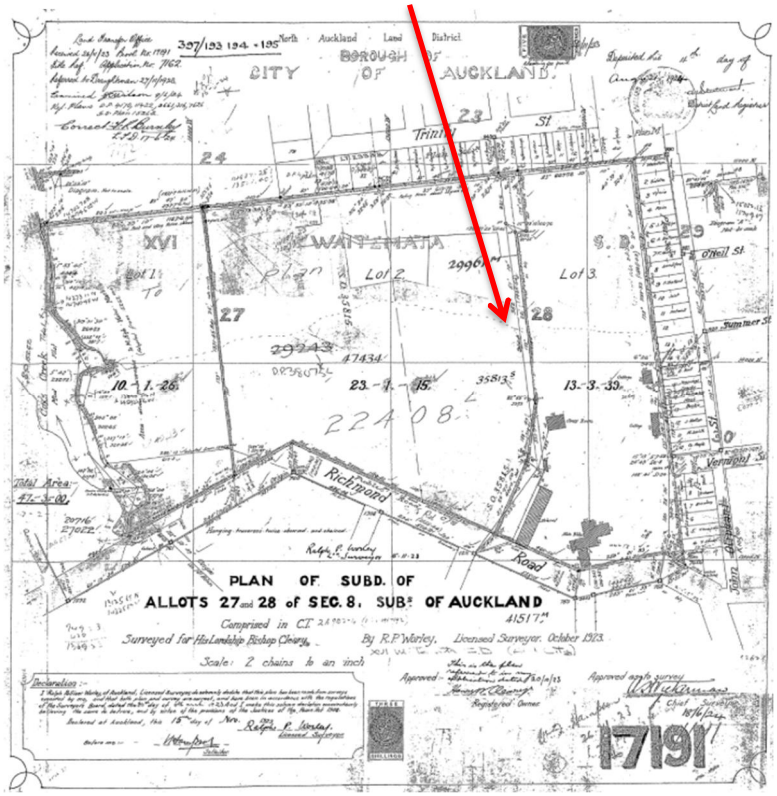

Figure 16. Survey plan DP 17191 (October 1923) Plan of Subd [subdivision] of Allots 27 and 28 Sec 8 Subs [suburbs] of Auckland, Surveyed for His Lordship Bishop Cleary. The approximate location of the eastern end of Tawariki Street is arrowed

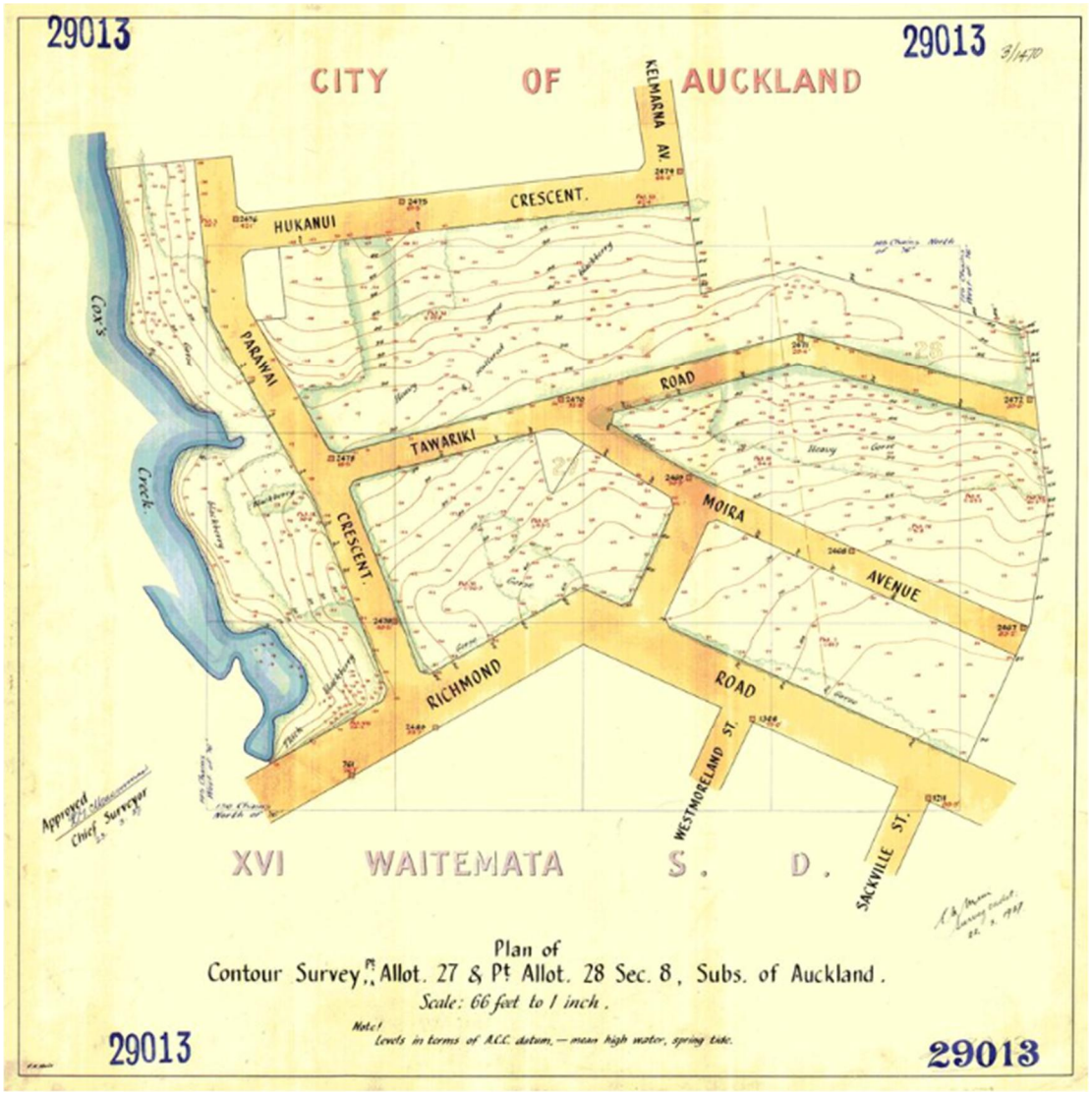

Figure 17. Survey plan SO 29013 (Mar 1937) Plan of Contour Survey Allot 27 & 28 Sec 8, Subs of Auckland describing the land with 'Heavy Gorse' and 'Scattered Blackberry' prior to development

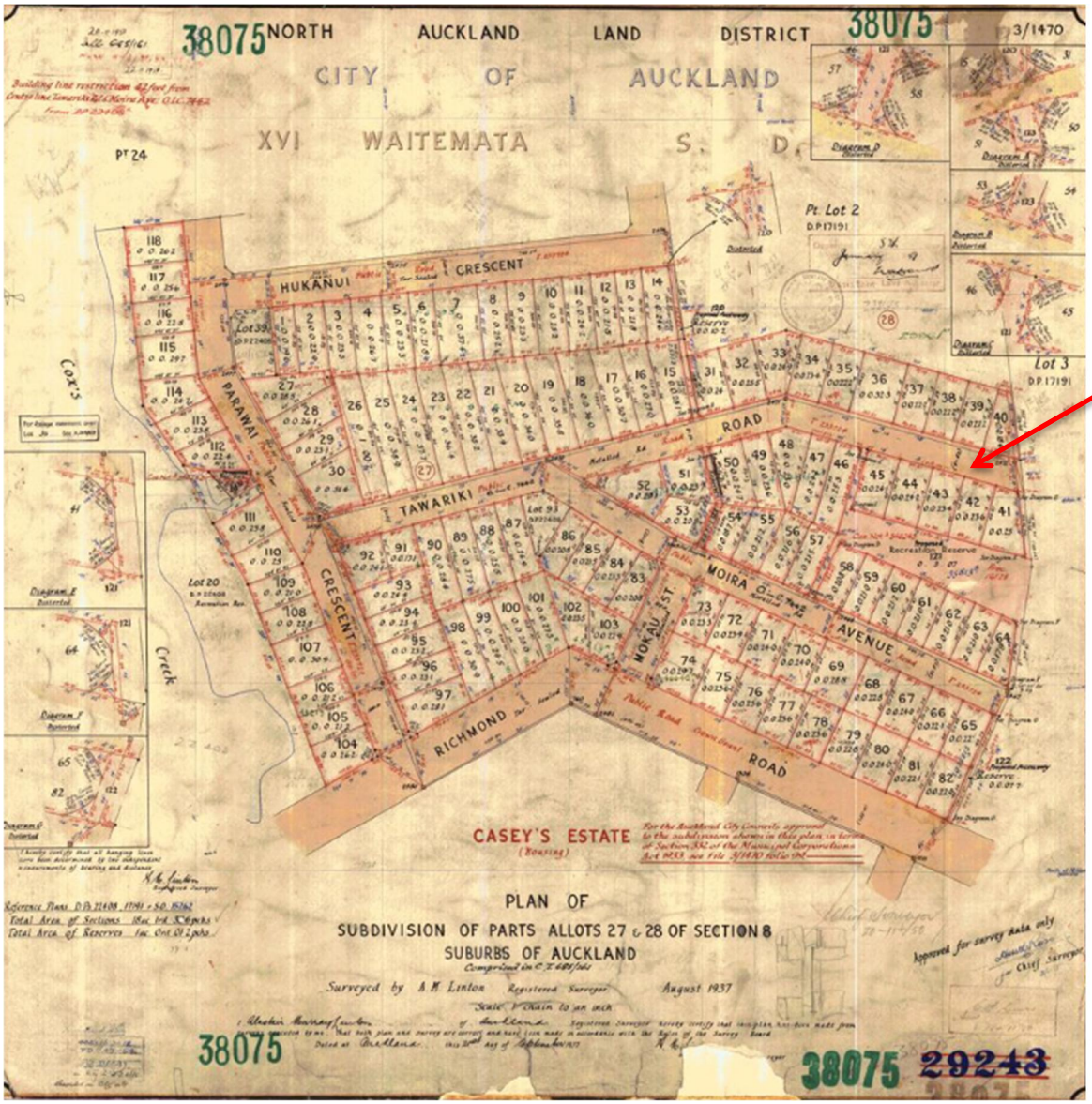

Figure 18. Survey plan DP 38075 (Aug 1937) Casey Estate (Housing) Plan of Subdivision of Parts Allots 27 & 28 of Section 8 Suburbs of Auckland

4. ARCHAEOLOGICAL BACKGROUND

Western Springs

Five archaeological sites, three historic structures, and three Maori Heritage Sites (Wai Orea, Nga Kauaewhati and Te Rehu – the first two of which are scheduled in the AUPOP) are located at Western Springs, with other sites located in the wider area (Figure 19 - Figure 21; Table 1).

Of the archaeological sites related to Maori settlement, two are related to a former pa. On the hillside off Old Mill Road and Surrey Crescent overlooking Western Springs Park is the reported location of a pa called Nga Kauaewhati (R11/537). Nga Kauaewhati was associated with a battle that took place in Kawharu's time. Simmons (1987) notes it was in the Arch Hill area, but provides an approximate grid reference in the location of Western Springs Stadium, well to the west of Arch Hill. More recently Simmons (2013) records that the battle took place at Te Rae o Kawharu (Great North Road ridge, roughly between Ponsonby Road and the eastern end of Surrey Crescent, and also well east of the given grid reference (CHI record)). Nga Kauaewhati is also recorded on the Auckland Council CHI as a Maori Heritage Area and a scheduled Site and Places of Significance to Mana Whenua (SPSMW) in the AUPOP (UPID004) (Figure 21).

Little of Nga Kauaewhati remains except for two small terraces (23m x 14m and 18m x 10m) located in the north-western corner of Western Springs Stadium and recorded as site R11/1149. Shell midden site R11/1148, southeast of the pa location, was located within tree roots in Western Springs Park. The NZAA site record describes it as consisting of a small number of oyster shells and in generally poor condition. Located slightly further afield to the north-west is another midden site R11/104, now destroyed, but previously thought to relate to a Maori settlement named Te Rehu. Site R11/349, located further to the west is a destroyed burial site.

The springs within the Western Springs Reserve are also recorded on the Auckland Council CHI as a Maori Heritage Area, and the Western Springs main lake is a scheduled SPSMW in the AUP OP (UPID008) (Figure 21). This water source would have played an important role in settlement selection by Maori, and the springs were also important to later industrial development in 19th century Auckland.

There is a significant collection of historic buildings at MOTAT (Museum of Transport and Technology) adjacent to the Western Springs Reserve, three of which are recorded on the CHI and scheduled in the AUP OP. These are related to the history of the Western Springs Waterworks. The first two are the former Pumping Station/Pumphouse (CHI #2690, UPID01678 Category A) and the former Engineer's House built in 1879 (CHI #19083, UPID01679 Category B). The Pumping Station is also a Category 1 Listed Historic Place (#114) on the Heritage New Zealand List. A historic tram shelter (CHI #18449; UPID01672 Category B) located within this area is also part of this group of historic structures related to early industry in Auckland (Figure 21).

The engineer's house, the pumphouse and their associated landscape setting have been internationally recognised for their exceptional contribution to the establishment of Auckland, receiving a UNESCO award in 2009 (Auckland Council Assessment 2010).

On the northern side of the Western Springs Park between Old Mill Road and Motions Road is the location of the former Low & Motions Flour Mill (CHI #756, R11/2794). The

mill was constructed in 1848 after Joseph Low and Henry Motions moved their mill to Western Springs, establishing the 'New Mills' (Murdoch n.d.).

A United States Military Camp has also been recorded on the CHI (#16977), and this is located to the south of the former Mill site. The Western Springs camp was one of a scattering of camps in Auckland, from Pukekohe and Papakura in the south to Mechanics Bay and Western Springs, as well as various parks on the Isthmus, where 29,500 US soldiers found accommodation from 1942 to 1944.[4]

In 2011-2012 archaeological assessments were undertaken as part of the AEE for the CI, a new wastewater tunnel to collect wastewater flows from the Isthmus and transfer them across the Manukau Harbour to the Mangere Wastewater Treatment Plant (WWTP) (Shackles et al. Dec 2011; Shakles et al. Mar 2012). The project extends across the Isthmus from Western Springs to the WWTP in the south. The main tunnel, link sewers, local connections and many of the associated structures will be underground and constructed by tunnelling methods, with access provided from a number of surface construction sites. One of three main construction sites is on the northern extent of the Western Springs playing fields. This is also the location of the proposed Western Springs Drop Shaft for the GLT, which will link here to the CI. As part of the archaeological work for the CI field survey and subsurface testing was carried out within the northern corner of the Western Springs playing fields for the northern extent of the CI and combined sewer overflow (CSO) collector sewer pipeline (CC2 Western Springs to Ivanhoe Rd, Western Springs). No archaeological remains were identified and it was determined that the likelihood of unidentified remains being uncovered was considered low based on the early 20th century modification to the area during the construction of the playing fields and the swampy nature of the landscape in this area (Shakles et al. Mar 2012:18).

Tawariki Street

A number of archaeological and other historic heritage sites relating to Maori occupation and early European industry are recorded around the original foreshore of Cox's Bay and creek (Figure 19, Figure 20, Figure 22; Table 2). There include three shell midden sites – R11/1153, R11/1154 and R11/1161 – along the eastern shoreline of Cox's Bay. Two SPSMW are also recorded attributing to the significance of Cox's Bay to Maori. Tukituki Muka Maori Heritage Area (UPID001) relates to the customary harvest and preparation of flax for the making of garments and lashings. This Maori Heritage Area was originally identified for the Auckland City District Plan (Isthmus Section) by the late Hariata Gordon as an area of mudflats at the end of Webber Street. In conversation with Mrs Gordon in 2006 she commented that the site was identified largely to put on record the significance of Cox's Bay to Maori, and not as a specific location where physical evidence might be found (Foster Apr 2012). The area shown on the AUP OP maps would originally have been tidal mudflats, with the original shoreline in this location marked by the boundaries of the properties at the end of Webber Street with the reserve. The other SPSMW is Opoutukeha (Waahi whakahirahira), marking Cox's Creek as an ancient boundary line between Ngati Huarere and Ngati Pou (UPID054) (Figure 22).

In 2012 an archaeological assessment was carried out for the proposed upgrade to the existing footpath through the Cox's Bay reserve along Cox's Creek from West End Road

[4] http://www.nzhistory.net.nz/war/us-forces-in-new-zealand/the-camps

to Richmond Road (Foster Apr 2012, Oct 2012). This assessment confirmed the location of many of the recorded sites in Cox's Bay.

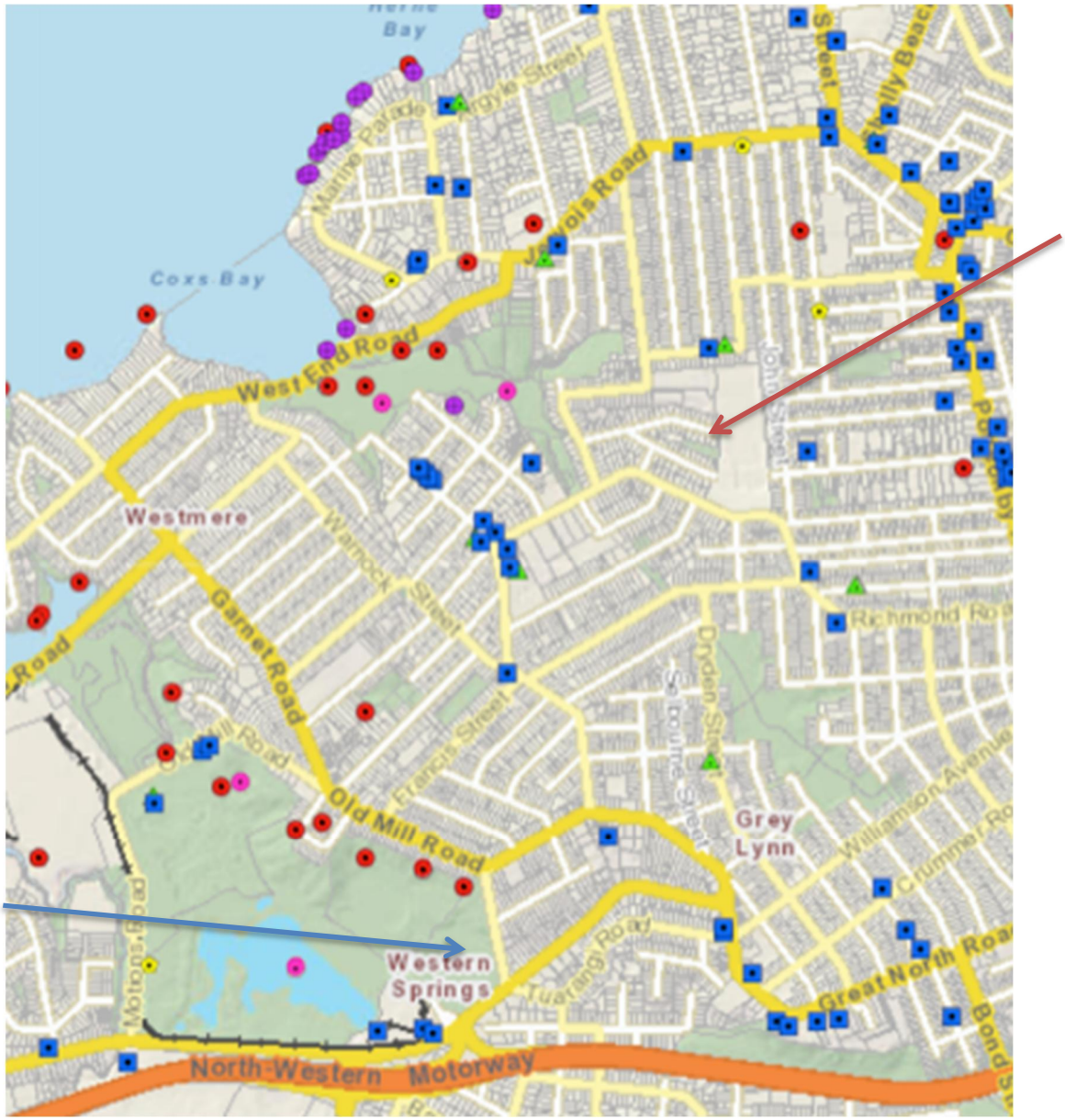

Figure 19. Recorded archaeological and historic heritage sites in the Western Springs and Grey Lynn area. Western Springs Drop Shaft (blue arrow) and Grey Lynn – Tawariki Street Drop Shaft (red arrow) (source: Auckland Council GeoMaps)

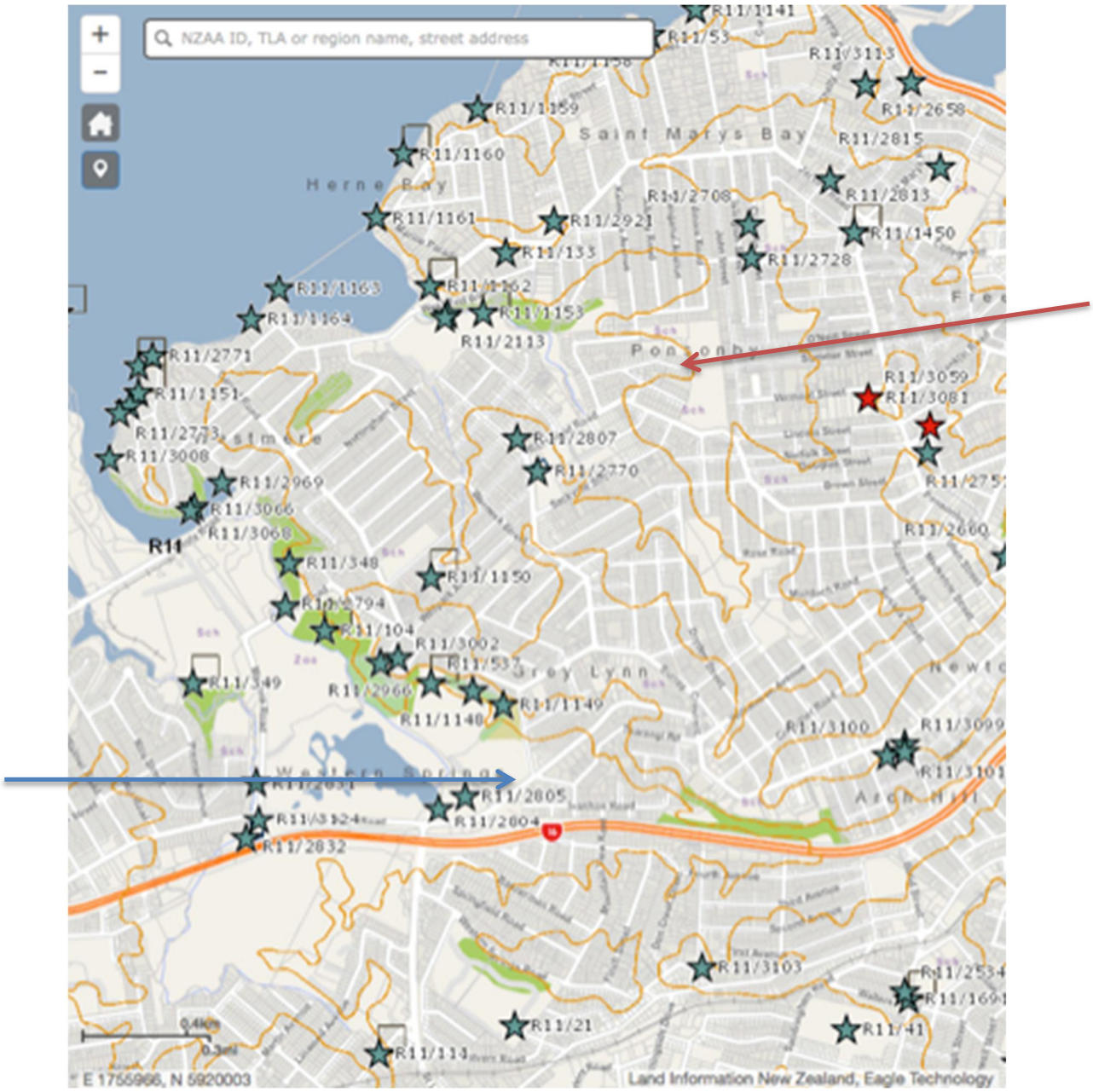

Figure 20. Recorded archaeological sites in the Western Springs and Grey Lynn area. Western Springs Drop Shaft (blue arrow) and Grey Lynn – Tawariki Street Drop Shaft (red arrow) (source: NZAA ArchSite)

Table 1. List of archaeological and other heritage sites in the vicinity of the GLT drop shaft at Western Springs (listed in numerical order based on their CHI record number)

CHI No.	NZAA ID	Site Type	Name	Location	NZTM Easting	NZTM Northing	AUPOP	Heritage NZ List
756	R11/2794	Flour Mill Site | Jetty Site	Low & Motions Flour Mill	Western Springs | Motions Creek | Old Mill Road	1753317	5919186		
2690	R11/2804	Industrial Building	Western Springs Pumphouse	Western Springs | 805 Great North Road	1753902	5918419	UPID01678 Category A Historic Heritage (Schedule 14.1)	List Number 114 Historic Place Category 1
5776	R11/104	Midden/ Settlement |	Te Rehu	Western Springs | Auckland Zoo	1753468	5919095		
5835	R11/348	Midden (shell) | Historic Midden	Te Rehu?	Western Springs | Motions Creek	1753335	5919348		
6061	R11/1148	Shell Midden		Western Springs	1754024	5918864		
6847	R11/537	Reported Ridge Pa? |	Nga Kauae Whati	Western Springs | Old Mill Road	1753868	5918896		
8554	R11/1149	Terraces		Western Springs	1754139	5918613		
11500	R11/349	Burials/Findspot	Te Rehu?	Western Springs |	1752968	5918894		

CHI No.	NZAA ID	Site Type	Name	Location	NZTM Easting	NZTM Northing	AUPOP	Heritage NZ List
				Meola Creek				
12771		Maori Heritage Area	Wai Orea	Western Springs | Main Lake	1753673	5918593	UPID008 Sites and Places of Significance to Mana Whenua (Schedule 12)	
16977		U.S. Military Camp	Western Springs Camp	Western Springs	1753270	5918600		
18449		Historic Structure	Bus/Tram Shelter (former)	Western Springs | 805 Great North Road	1754052	5918412	UPID01672 Category B Historic Heritage (Schedule 14.1)	
19083	R11/2805	Building /Dwelling - Engineers House	Historic Structure	Western Springs | 805 Great North Road	1754028	5918423	UPID01679 Category B Historic Heritage (Schedule 14.1)	
19759		Maori Heritage Area	Nga Kauaewhati	Western Springs | Old Mill Road	1753527	5919105	UPID004 Sites and Places of Significance to Mana Whenua (Schedule 12)	
20123	R11/2966	Midden		Western Springs | West View Road	1753677	5918973		
21878	R11/3002	Industrial Site	Public Abattoir	Western Springs | West View Road	1753746	5918991		

Table 2. List of archaeological and other heritage sites in the vicinity of the GLT drop shaft and associated works at Tawariki Street (listed in numerical order based on their CHI record number)

CHI No.	NZAA ID	Site Type	Name	Location	NZTM Easting	NZTM Northing	AUPOP	Heritage NZ List
759	R11/2113	Industrial | Timber Mill	Cashmore's Mill	West End Road | Cox's Creek | Herne Bay	1753865	5920195		
760		Bridge Site | Wharf Site	Cox's Bridge | Road	West End Road | Cox's Bay	1753765	5920295		
6065	R11/1153	Midden (Shell)		West End Road | Cox's Creek	1754065	5920296		
6066	R11/1154	Midden (Shell)		West End Road | Cox's Creek	1753965	5920296		
6073	R11/1161	Midden (Shell)		Cox's Creek | Herne Bay	1753765	5920195		
12764		Maori Heritage Area	TukiTuki Muka	Cox's Creek Walkway adjoins boundaries of 47 and 49 Webber Street, Grey Lynn	1754255	5920186	UPID001 Sites and Places of Significance to Mana Whenua (Schedule 12)	
17862		Chimney Stack	Former Tattersfield Textiles Industry Chimney	57 Livingstone Street | 271 Richmond Road | Grey Lynn	1754327	5919987	UPID02555 Category B Historic Heritage	

CHI No.	NZAA ID	Site Type	Name	Location	NZTM Easting	NZTM Northing	AUPOP	Heritage NZ List
							(Schedule 14.1)	
18890		Historic Heritage Area - Edwardian villas	Ardmore Road, Wanganui Avenue, Albany Road and Trinity Street	Ardmore Road, Wanganui Avenue, Albany Road and Trinity Street	1754816	5920302	UPID02516 Historic Heritage Area (Schedule 14.2)	
19882		Buildings - Residential	State Housing Complex	97 Vermont Street | Ponsonby	1755086	5920019	UPID02484 Category B Historic Heritage (Schedule 14.1)	
20065		Maori Heritage Area	Opoutukeha (Waahi whakahirahira. Named after the ancestor Poutukeha. The creek is an ancient boundary line between Ngati Huarere and Ngati Pou.	Cox's Bay, Westmere	1753914	5920148	UPID054 Sites and Places of Significance to Mana Whenua (Schedule 12)	

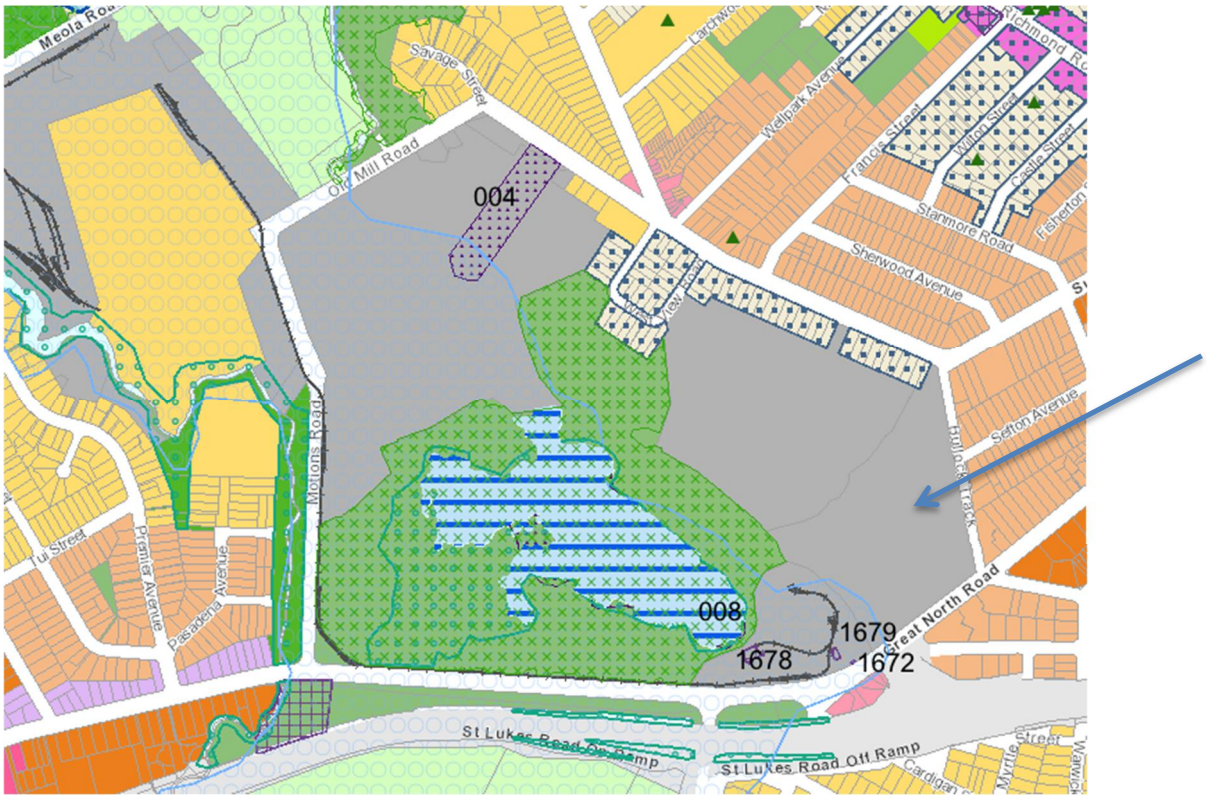

Figure 21. AUP OP map of Western Springs showing scheduled Historic Heritage Sites and Areas, and Sites and Places of Significance to Mana Whenua. The location of the Western Springs Drop Shaft arrowed

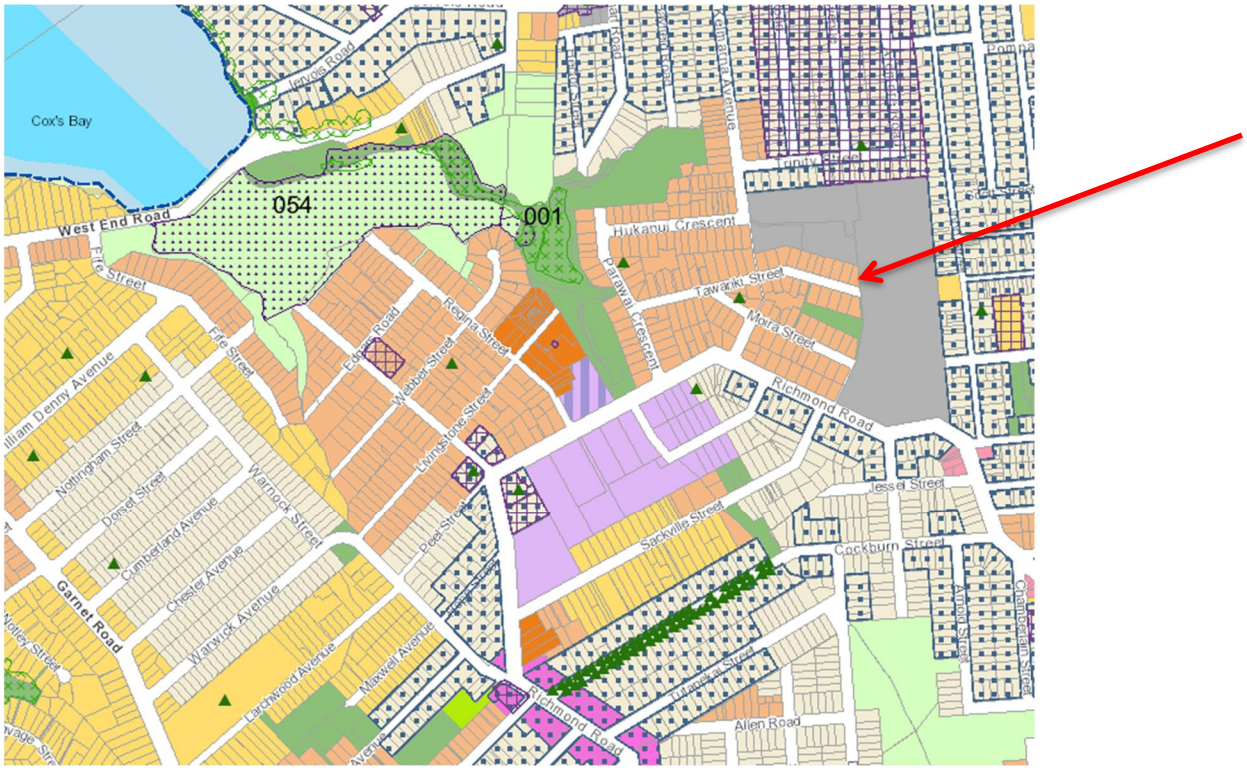

Figure 22. AUP OP map of Grey Lynn showing scheduled Historic Heritage Sites and Areas, and Sites and Places of Significance to Mana Whenua. The location of the proposed Tawariki Street drop shaft arrowed

Information from Early Aerials

An examination of early aerial photographs shows the two main construction areas at the Western Springs Reserve playing fields and Tawariki Street in Grey Lynn from the 1930s and 1940s.

At Western Springs, Figure 23 is a 1940 aerial showing the recently levelled and drained land for the Western Springs Stadium, with a running and cycling track and the adjacent outer playing fields. This is now clearly a significantly modified landscape in comparison to the rolling farmland across this area shown in Figure 6. A 1959 aerial (Figure 24) shows additional earthworks above and in the north-eastern corner of the playing fields and below the Bullock Track, and on the steep hillside above the Western Springs Stadium.

An aerial photograph from 1930 (Figure 25) of the Sacred Heart College grounds and playing fields in Grey Lynn shows the remaining part of the property to the west sold by the Catholic diocese still undeveloped prior to being subdivided as the Casey residential estate. However, the alignment of Tawariki Street and Moira Street appears to have been formed running up to the edge of the college grounds. The 1940 aerial (Figure 26) shows the newly developed Casey residential subdivision on this land. In the 1960s, further extensive filling and levelling occurred across the St Paul's College (formerly Sacred Heart) sports fields above and to the east of Tawariki Street (Figure 27).

Figure 23. 1940 aerial photograph of the recently formed Western Springs sports fields (source: Auckland Council Geomaps)

Figure 24. 1959 aerial photograph of the Western Springs sports fields. Note the recent earthworks above and in the north-eastern corner of the fields and the access road along the eastern side of the fields (arrowed) (source: Auckland Council Geomaps)

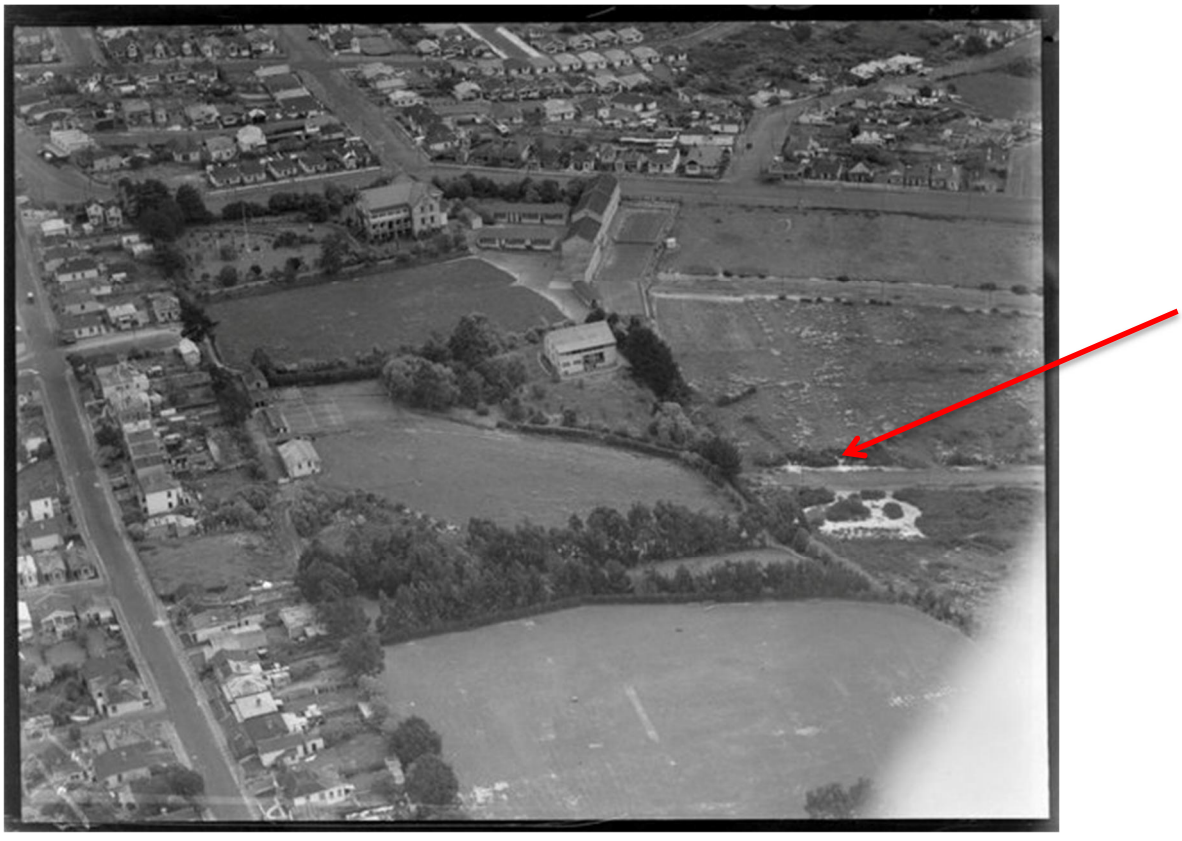

Figure 25. Sacred Heart College, Grey Lynn, Auckland. 1930. The arrow shows the eastern end of Tawariki Street. Ref: WA-62745-G. Alexander Turnbull Library, Wellington, New Zealand. /records/22566571

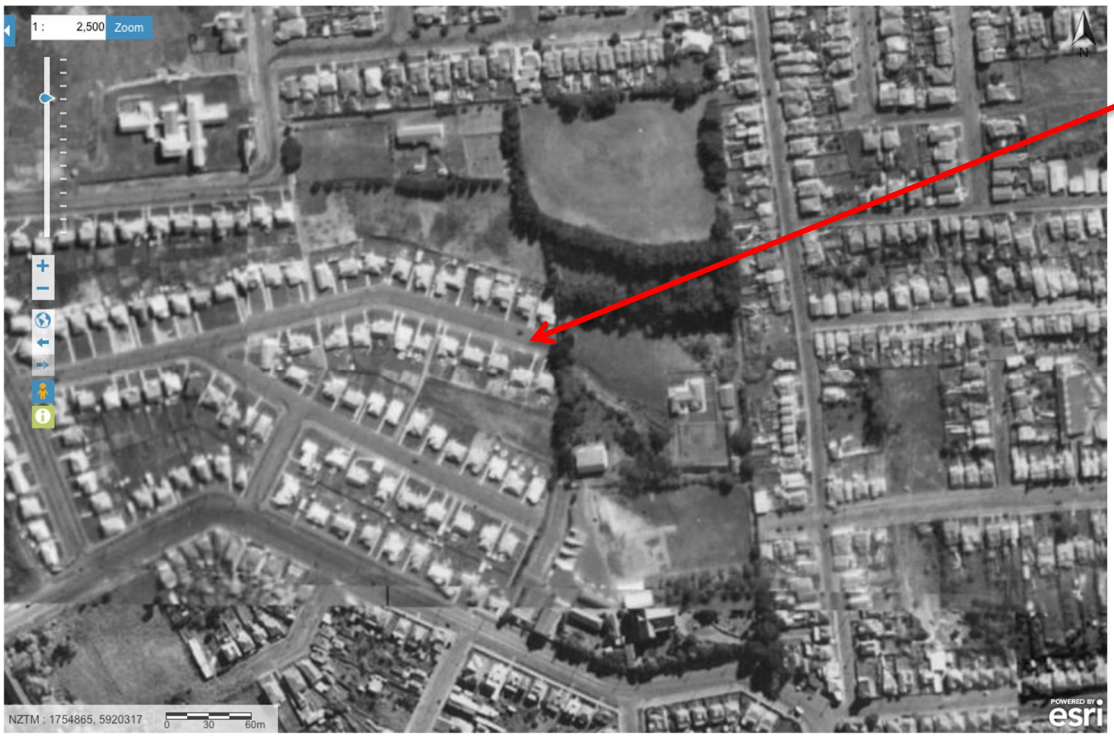

Figure 26. 1940 aerial photograph of the recently constructed Casey Subdivision including Tawariki Street source: Auckland Council Geomaps)

Figure 27. Detail from NZ Map 7331 1960-1969 showing extensive filling and levelling for the development of the St Paul's sports fields. Aerial photograph from Auckland City Council, Department of Works and Services. Town Planning Division 24-25 (APL)

5. FIELD ASSESSMENT

Western Springs

The southern end of the Grey Lynn Tunnel and proposed construction works are situated at the Western Springs playing fields to the north and northeast of the three rugby pitches. Works will involve a mixture of both deep and shallow underground construction, utilising the CI shaft for the TBM. This Western Springs site is also a primary construction site for the CI covering an area of 7000m² (Figure 28 - Figure 31).

The Western Springs playing fields are located below and south of the recorded archaeological sites R11/537, Nga Kauaewhati ridge pa, and its surviving terraces (R11/1149) and midden site R11/1148, which are located on the hillside off Old Mill Road and Surrey Crescent overlooking the park. Nga Kauaewhati is a scheduled SPSMW in the AUP OP. The proposed tunnel alignment will extend from the CI and Western Springs Drop Shaft in the playing fields at a depth under this hillside and the Bullock Track / Surrey Crescent and therefore, will not impact on these recorded sites.

The Western Springs playing fields are also located near the springs and Western Springs lake (Wai Orea, CHI #12771), which is also a scheduled SPSMW. The MOTAT heritage area opposite the playing fields contains three historic structures – the Engineers House (CHI #19083), the Western Springs Pumphouse (CHI #2690) and tram shelter (CHI #18449), all of which are scheduled in the AUPOP. These sites are located well clear of the proposed works.

The extent of landscaping used to form the playing fields is not accurately known, therefore, it is difficult to assess the potential survival of any archaeological remains within this area, although the construction of playing fields generally involves significant levelling and drainage works. An archaeological field survey including subsurface testing with a probe and the excavation of test pits was undertaken to assess the area for unidentified archaeological remains. No archaeological sites were identified in this specific area during the archaeological assessment for the CI (Shakles et al. Mar 2012) or during this field survey and it was determined that the likelihood of unidentified remains being uncovered was considered low based on the early 20th century modification to the area during the construction of the playing fields and the swampy nature of the landscape in this area.

Tawariki Street

The northern end of the Grey Lynn Tunnel and proposed construction works are located within the road reserve at the end (east) of Tawariki Street in Grey Lynn. However, a new shaft sunk and associated works at this location will require the removal of three dwellings at 44 - 48 Tawariki Street (Figure 32). These houses are located on the northern side of the road.

Tawariki Street and the houses along it were constructed from the late 1930s as part of the Casey residential subdivision. The street runs along the bottom of a gully and prior watercourse in the upper reaches of Cox's Creek (Figure 33). The topography and house sites rise up on either side of the gully from the street level. The end of the street finishes at a steep, retained bank, which forms the western side of the St Paul's College playing fields (Figure 34 and Figure 35).

The houses at 44 - 48 Tawariki Street, like most along this street and elsewhere within the Casey residential estate, are of a similar New Zealand Housing single storey design with timber weatherboards and tile roofs (Figure 36). There are no recognised heritage values associated with these dwellings.

There are no known archaeological or other historic heritage sites located near the proposed works on Tawariki Street. Archaeological sites beneath modern buildings and sealed surfaces in urban environments can rarely be identified prior to being exposed in the course of redevelopment work. However, no historically recorded activities were identified in the area from the background research and field survey. It is also unlikely that any previous archaeological evidence would have survived on the basis of later modifications to the area. Therefore, it was determined that the likelihood of unidentified remains being uncovered was considered low based on the early 20th century modification to the area during the construction of the residential subdivision and college playing fields.

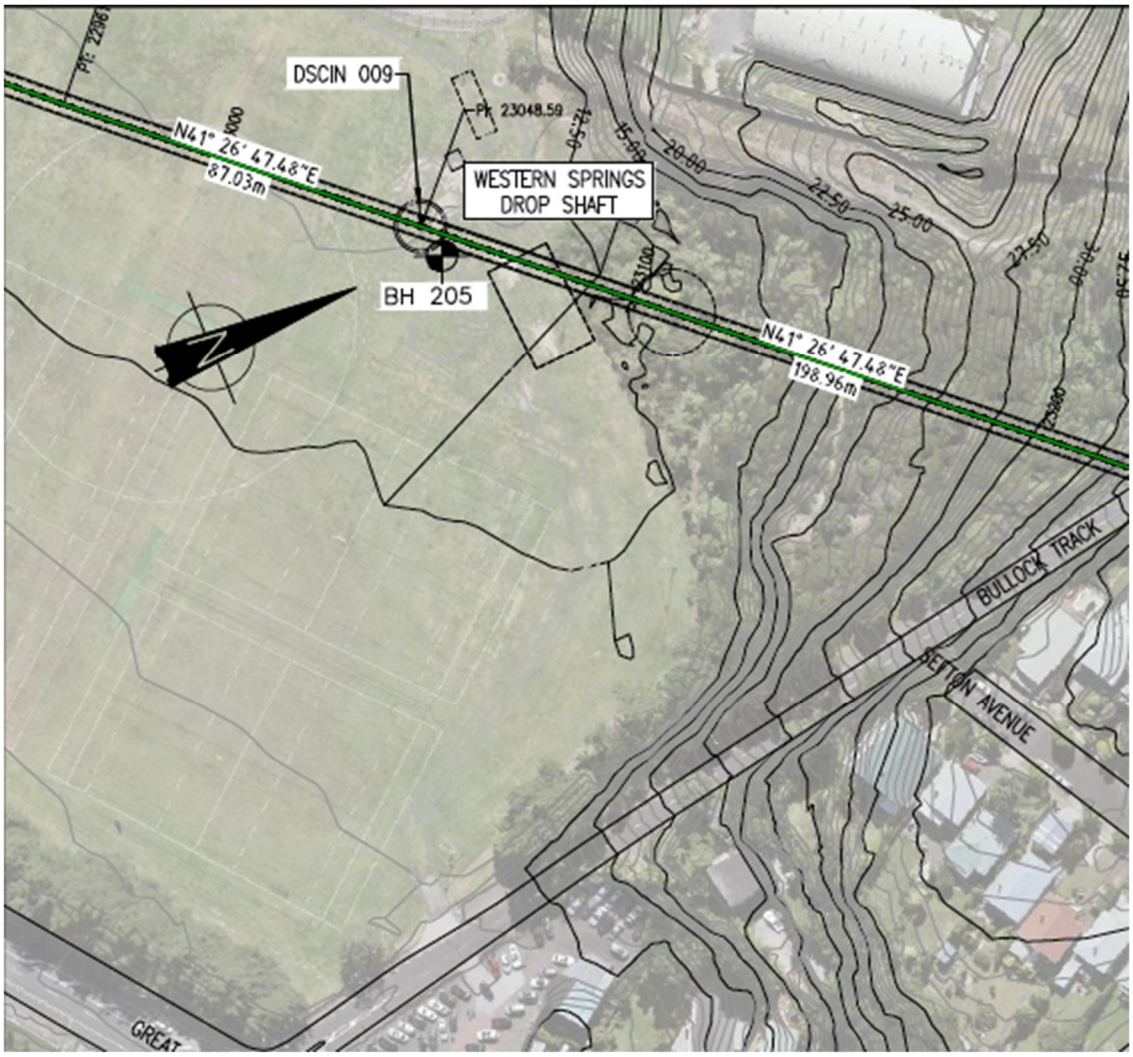

Figure 28. The location of the Western Springs Drop Shaft within the north-eastern corner of the Western Springs sports fields

Figure 29. Looking northwest from the bottom of the Bullock track across the Western Springs playing fields

Figure 30. Looking east across the Western Springs playing fields from the stadium fence line. The proposed drop shaft is located in the foreground centre of the photo

Figure 31. Looking north towards the Western Springs Stadium at the proposed drop shaft location between the goal posts and the bush line

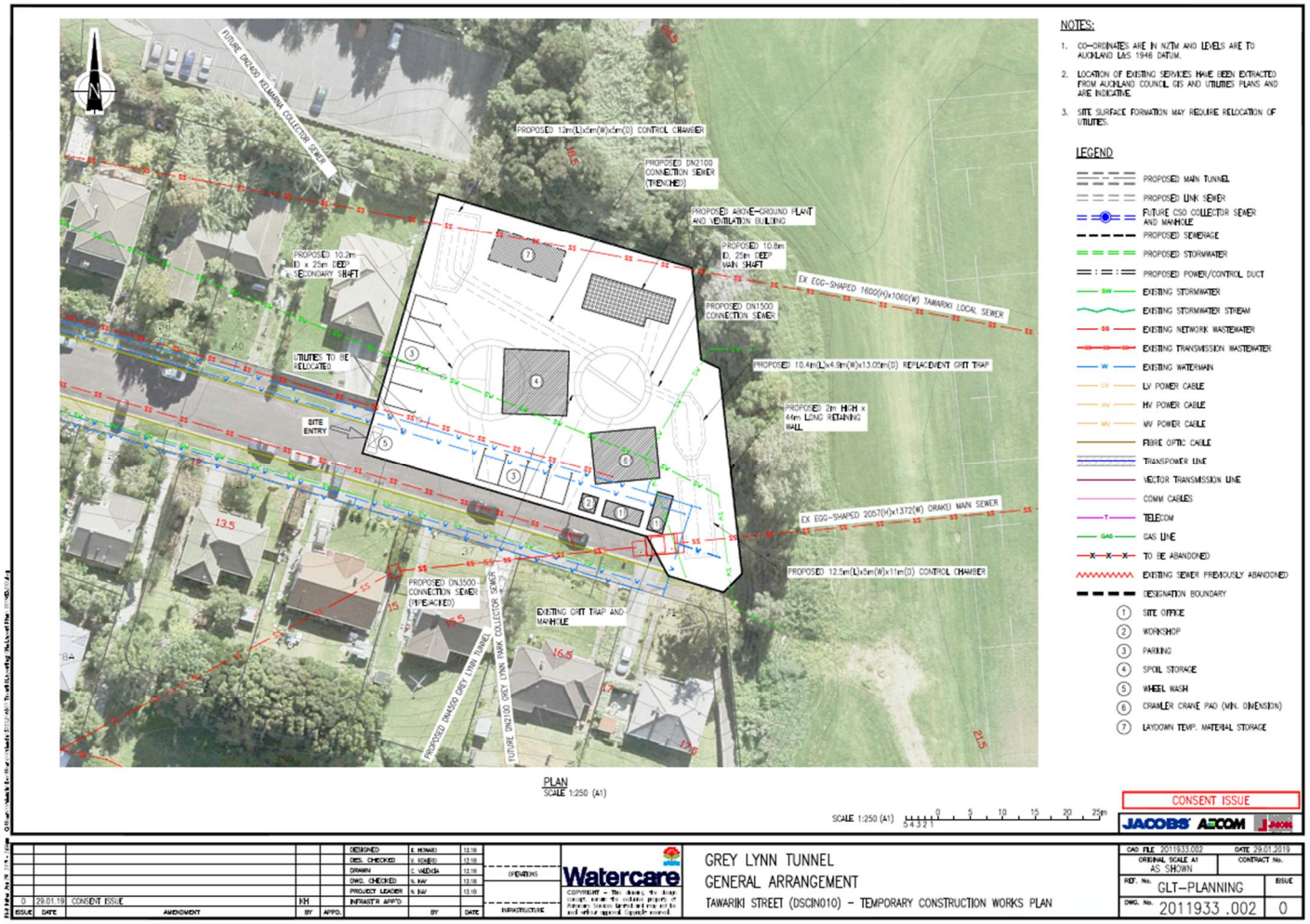

Figure 32. Tawariki Street layout plan of proposed works (source: Watercare)

Figure 33. Looking east along the end of Tawariki Street towards the elevated sports fields of St Paul's College

Figure 34. Looking west along Tawariki Street from the raised sports fields of St Paul's College

Figure 35. Looking east from the end of Tawariki Street in the vicinity of the proposed location of the Grey Lynn Shaft up to the St Paul's College sports fields

Figure 36. No.s 44, 46 & 48 Tawariki Street

6. DISCUSSION AND CONCLUSIONS

Summary of Results

No archaeological or other historic heritage sites have been identified within the Western Springs Reserve during the archaeological assessment for the CI or during the field survey for this report. It was determined that the likelihood of unidentified remains being uncovered was considered low based on the early 20th century modification to the area during the construction of the playing fields and the swampy nature of the landscape in this area.

Similarly, no known archaeological or other historic heritage sites are located near the proposed works on Tawariki Street. No historically recorded activities were identified in the area from the background research and field survey. It was determined that the likelihood of unidentified remains being uncovered was considered low based on the early 20th century modification to the area during the construction of the residential subdivision and college playing fields.

Maori Cultural Values

This is an assessment of effects on archaeological values and does not include an assessment of Maori cultural values. Such assessments should only be made by the tangata whenua. Maori cultural concerns may encompass a wider range of values than those associated with archaeological sites.

The historical association of the general area with the tangata whenua is evident from the recorded sites, traditional histories and known Maori place names. A number of Sites and Places of Significance to Mana Whenua (SPSMW) are scheduled on the AUP OP in the general vicinity.

Survey Limitations

It should be noted that archaeological survey techniques (based on visual inspection and minor sub-surface testing) cannot necessarily identify all sub-surface archaeological features, or detect wahi tapu and other sites of traditional significance to Maori, especially where these have no physical remains.

Archaeological sites beneath modern buildings and sealed surfaces in urban environments such as Tawariki Street can rarely be identified prior to being exposed in the course of redevelopment work. Therefore, the approach to archaeological assessment is to identify historically recorded activities on the site, and assess the potential for archaeological evidence to have survived on the basis of later modifications to the site.

Archaeological Value and Significance

The AUP OP Regional Policy Statement (RPS) identifies several criteria for evaluating the significance of historic heritage places. In addition, Heritage NZ has provided guidelines setting out criteria that are specific to archaeological sites (condition, rarity, contextual value, information potential, amenity value and cultural associations) (Heritage NZ 2006: 9-10).

The archaeological value of sites relates mainly to their information potential, that is, the extent to which they can provide evidence relating to local, regional and national history using archaeological investigation techniques, and the research questions to which the site could contribute. The surviving extent, complexity and condition of sites are the main factors in their ability to provide information through archaeological investigation. For example, generally pa are more complex sites and have higher information potential than small midden (unless of early date). Archaeological value also includes contextual (heritage landscape) value. Archaeological sites may also have other historic heritage values including historical, architectural, technological, cultural, aesthetic, scientific, social, spiritual, traditional and amenity values.

Western Springs has buildings related to the development of Auckland's water supply in the late 19th and early 20th centuries. The presence of a former ridge pa overlooking the springs, two terraces of which have been identified archaeologically, also attest to it being an important settlement locale for Maori prior to European settlement. In addition, the scheduling of the pa and the Western Springs main lake as SPSMW stresses the traditional significance of the area. As the field survey did not identify any archaeological remains in the sports field and the former nature of the area was swampy, the potential for any subsurface remains is considered low.

A number of archaeological and other historic heritage sites relating to Maori occupation and early European industry recorded around the original foreshore of Cox's Bay and creek. Two SPSMW are also scheduled due to the significance of Cox's Bay to Maori. Field survey and background research did not identify any archaeological remains or historically recorded activities in the upper reaches of Cox's Creek at Tawariki Street. Similarly, the potential for any subsurface remains is considered low given the 20th century development of this area.

Effects of the Proposal

No known archaeological or other historic heritage sites will be affected by the proposed construction of the GLT. In any area where archaeological sites have been recorded in the general vicinity it is possible that unrecorded subsurface remains may be exposed during development. While it is considered unlikely in this situation based on the early 20th century modification to these areas, the possibility can be provided for by putting procedures in place ensuring that the Council and Heritage NZ are contacted should this occur.

Archaeological features and remains can take the form of burnt and fire cracked stones, charcoal, rubbish heaps including shell, bone and/or 19th century glass and crockery, ditches, banks, pits, old building foundations, artefacts of Maori and early European origin or human burials.

Resource Management Act 1991 Requirements

Section 6 of the RMA recognises as matters of national importance: 'the relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga' (S6(e)); and 'the protection of historic heritage from inappropriate subdivision, use, and development' (S6(f)).

All persons exercising functions and powers under the RMA are required under Section 6 to recognise and provide for these matters of national importance when 'managing the

use, development and protection of natural and physical resources'. There is a duty to avoid, remedy, or mitigate any adverse effects on the environment arising from an activity (S17), including historic heritage.

Historic heritage is defined (S2) as 'those natural and physical resources that contribute to an understanding and appreciation of New Zealand's history and cultures, deriving from any of the following qualities: (i) archaeological; (ii) architectural; (iii) cultural; (iv) historic; (v) scientific; (vi) technological'. Historic heritage includes: '(i) historic sites, structures, places, and areas; (ii) archaeological sites; (iii) sites of significance to Maori, including wahi tapu; (iv) surroundings associated with the natural and physical resources'.

Regional, district and local plans contain sections that help to identify, protect and manage archaeological and other heritage sites. The plans are prepared under the rules of the RMA. The Auckland Unitary Plan Operative in Part 2016 (AUP OP) is relevant to the proposed activity.

There are no scheduled historic heritage sites located within the Project area. This assessment has established that the proposed activity will have no effect on any known archaeological remains, and has little potential to affect unrecorded subsurface remains. If resource consent is granted, consent conditions relating to archaeological monitoring or protection would not be required.

However, if suspected archaeological remains are exposed during earthworks, the Accidental Discovery Rule (E12.6.1) set out in the AUP OP must be complied with. Under the Accidental Discovery Rule works must cease within 20m of the discovery and the Council, Heritage NZ, Mana Whenua and (in the case of human remains) NZ Police must be informed. This rule would no longer apply in respect to archaeological sites if an Authority from Heritage NZ was in place.

Heritage New Zealand Pouhere Taonga Act 2014 Requirements

In addition to any requirements under the RMA, the HNZPTA protects all archaeological sites whether recorded or not, and they may not be damaged or destroyed unless an Authority to modify an archaeological site has been issued by Heritage NZ (Section 42).

An archaeological site is defined by the HNZPTA Section 6 as follows:

> '**archaeological site** means, subject to section 42(3), –
>
> (a) any place in New Zealand, including any building or structure (or part of a building or structure) that –
>
> (i) was associated with human activity that occurred before 1900 or is the site of the wreck of any vessel where the wreck occurred before 1900; and
>
> (ii) provides or may provide, through investigation by archaeological methods, evidence relating to the history of New Zealand; and
>
> (b) includes a site for which a declaration is made under section 43(1)'[5]

[5] Under Section 42(3) an Authority is not required to permit work on a pre-1900 building unless the building is to be demolished. Under Section 43(1) a place post-dating 1900 (including the site of a wreck

Authorities to modify archaeological sites can be applied for either in respect to archaeological sites within a specified area of land (Section 44(a)), or to modify a specific archaeological site where the effects will be no more than minor (Section 44(b)), or for the purpose of conducting a scientific investigation (Section 44(c)). Applications that relate to sites of Maori interest require consultation with (and in the case of scientific investigations the consent of) the appropriate iwi or hapu and are subject to the recommendations of the Maori Heritage Council of Heritage NZ. In addition, an application may be made to carry out an exploratory investigation of any site or locality under Section 56, to confirm the presence, extent and nature of a site or suspected site.

An archaeological authority will not be required for the proposed activity as no known sites will be affected, and it is unlikely that any undetected sites are present. However, should any sites be exposed during development the provisions of the HNZPTA must be complied with.

Conclusions

This assessment has established that the proposed activity will have no effect on any known archaeological remains, and has little potential to affect unrecorded subsurface remains.

If suspected archaeological remains are exposed during development works, the Accidental Discovery Rule (E12.6.1) set out in the AUP OP must be complied with. Under the Accidental Discovery Rule works must cease within 20m of the discovery and the Council, Heritage NZ, Mana Whenua and (in the case of human remains) NZ Police must be informed.

If modification of an archaeological site does become necessary, an Authority must be applied for under Section 44(a) of the HNZPTA and granted prior to any further work being carried out that will affect the site.

that occurred after 1900) that could provide 'significant evidence relating to the historical and cultural heritage of New Zealand' can be declared by Heritage NZ to be an archaeological site.

7. RECOMMENDATIONS

- There should be no constraints on the proposed Grey Lynn Tunnel on archaeological and other historic heritage grounds, since no archaeological or other historic heritage sites are known to be present and it is considered unlikely that any will be exposed during development.
- If subsurface archaeological evidence should be unearthed during construction (e.g. intact shell midden, hangi, storage pits relating to Maori occupation, or cobbled floors, brick or stone foundation, and rubbish pits relating to 19th century European occupation), or if human remains should be discovered, the Accidental Discovery Rule (section E.12.6.1 of the AUP OP) must be followed. This requires that work ceases within 20m of the discovery and that the Auckland Council, Heritage NZ, Mana Whenua and (in the case of human remains) the NZ Police are notified. The relevant authorities will then determine the actions required.
- If modification of an archaeological site does become necessary, an Authority must be applied for under Section 44(a) of the HNZPTA and granted prior to any further work being carried out that will affect the site. (*Note that this is a legal requirement*).
- Since archaeological survey cannot always detect sites of traditional significance to Maori, such as wahi tapu, the tangata whenua should be consulted regarding the possible existence of such sites in the project area.

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Appendix K

GREY LYNN TUNNEL

CONSTRUCTION TRAFFIC EFFECTS

21st February 2019

Prepared by Commute Transport Consultants

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TABLE OF FIGURES

1. EXECUTIVE SUMMARY

1.1 Watercare Services Limited ("**Watercare**") is the water and wastewater service provider for Auckland. Watercare is proposing to construct a wastewater interceptor from Tawariki Street, Grey Lynn to Western Springs Reserve ("**Grey Lynn Tunnel**"). The Grey Lynn Tunnel will connect to the Central Interceptor at Western Springs.

1.2 This assessment considers that Grey Lynn Tunnel and in particular the shaft site at Tawariki Street ("**Tawariki Street Shaft Site**") can be established with less than minor traffic effects on the operation of the surrounding road and pedestrian network during the works period, provided that the following mitigation measures are generally implemented at the Site:

(a) Where possible, construction truck routes generally follow arterial routes as detailed in the Construction Truck Route Diagram for the Site.

(b) Restrict heavy vehicles to the largest recommended truck size (a 450-tonne portable crane) as shown on the Vehicle Tracking Curve diagrams; and

(c) Implementation of a site-specific detailed Construction Traffic Management Plan.

1.3 With the above measures in place, it is considered that the Grey Lynn Tunnel and the Tawariki shafts can occur with less than minor effects to the surrounding roading network.

2. INTRODUCTION

2.1 Watercare is the water and wastewater service provider for Auckland. Watercare is proposing to construct the Grey Lynn Tunnel a wastewater interceptor from Tawariki Street, Grey Lynn to Western Springs Reserve. The Grey Lynn Tunnel will connect to the Central Interceptor at Western Springs.

2.2 This report provides an assessment of the temporary construction traffic effects and the ongoing operational traffic effects of the Grey Lynn Tunnel and Tawariki Shafts.

2.3 It is considered that the proposed development, as detailed in this report, will have less than minor traffic effects to the function, capacity and safety of the surrounding transport network.

2.4 This report and assessment is submitted to accompany an application for resource consents and a notice of requirement by Watercare for the construction, operation and maintenance of the Grey Lynn Tunnel.

3. PROJECT DESCRIPTION

3.1 The Grey Lynn Tunnel involves the elements shown in the drawings and outlined in more detail in the reports which form part of the application. These elements are summarised as follows.

Grey Lynn Tunnel

3.2 The Grey Lynn Tunnel involves the construction, operation and maintenance of a 1.6km gravity tunnel from Western Springs to Tawariki Street, Grey Lynn, with a 4.5m internal

diameter, at an approximate depth of between 15m to 62m below ground surface, depending on local topography. The tunnel will be constructed northwards from Western Springs using a Tunnel Boring Machine ("**TBM**"). The Grey Lynn Tunnel will connect to the Central Interceptor at Western Springs via the Western Springs shaft site.

Tawariki Street Shaft Site

3.3 The Grey Lynn Tunnel also involves construction, operation and maintenance of two shafts (a main shaft and a secondary shaft) and associated structures at the Tawariki Street Shaft Site.

3.4 The Tawariki Street Shaft Site will be located at 44-48 Tawariki Street, where the majority of the construction works will take place. Construction works will also take place within the road reserve at the eastern end of Tawariki Street and a small area of school land (St Paul's College) bordering the end of Tawariki Street (approximately 150m^2).

3.5 The Tawariki Street Shaft Site will involve the following components:

Main Shaft

(a) A 25m deep shaft, with an internal diameter of approximately 10.8m, to drop flow from the existing sewers into the Grey Lynn Tunnel;

(b) Diversion of the Tawariki Local Sewer to a chamber to the north of the shaft. This chamber will be approximately 12m long, 5m wide and 5m deep below ground, and will connect to the shaft via a trenched sewer;

(c) Diversion of the Orakei Main Sewer to a chamber to the south of the shaft. This chamber will be approximately 10m long, 5m wide and 11m deep below ground;

(d) Construction of a stub pipe on the western edge of the shaft to enable future connections (that are not part of this proposal) from the CSO network;

(e) Construction of a grit trap within the property at 48 Tawariki St to replace the existing grit trap located within the Tawariki Street road reserve. The replacement grit trap will be approximately 16m long, 5m wide and 13m deep below ground;

(f) Permanent retaining of the bank at the end of Tawariki Street to enable the construction of the chamber for the Orakei Main Sewer. The area of the bank requiring retaining will be approximately 44m long, 3m wide and 2m high; and

(g) An above ground plant and ventilation building that is approximately 14m long, 6m wide and 4m high. An air vent in the form of a stack will be incorporated into the plant and ventilation building, and will discharge air vertically via a roof vent. The vent stack will be designed with a flange to allow future extension of up to 8m in total height and approximately 1m in diameter in the unexpected event of odour issues.

Tawariki Connection Sewer Shaft – Secondary Shaft

3.6 A secondary shaft will be constructed at the Tawariki Street Shaft Site to enable the connection of future sewers (that are not part of this proposal) from the Combined Sewers Overflows ("**CSO**") network. This will involve the following components:

(a) A 25m deep drop shaft with an internal diameter of approximately 10.2m; and

(b) A sewer pipe constructed by pipe-jacking to connect the secondary shaft to the main shaft.

Assessment

3.7 This report assesses the transport-related matters of the Grey Lynn Tunnel, including:

(a) A description of the Tawariki Street Shaft Site and its surrounding transport environment;

(b) A description of the key transport-related aspects of the Grey Lynn Tunnel; and

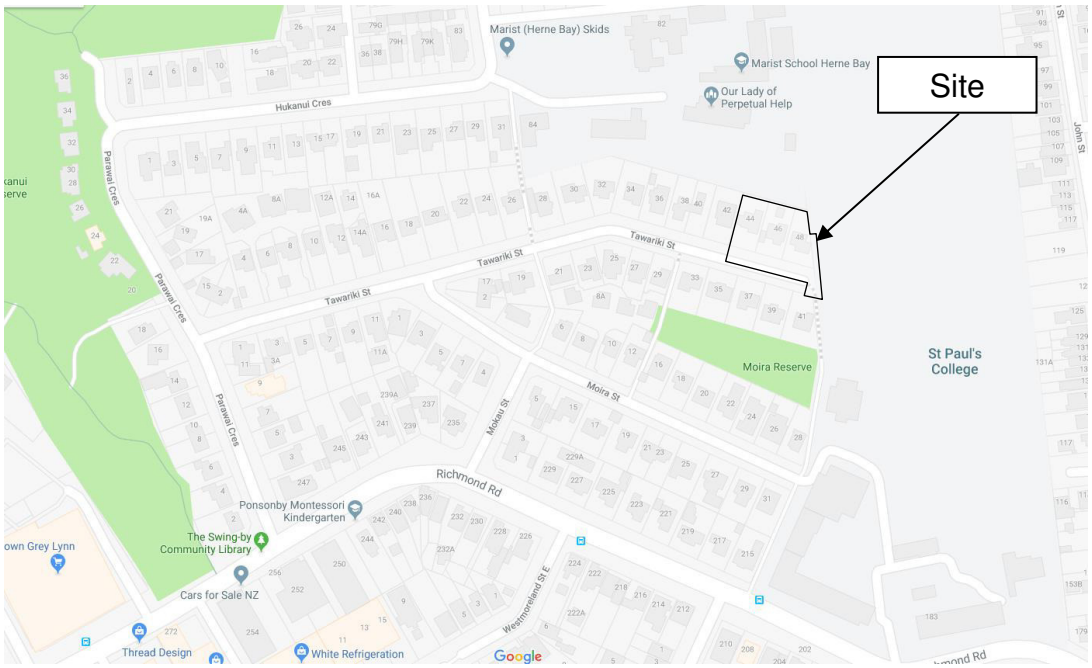
(c) The anticipated effects on the local road network of the construction activities.

4. SITE DESCRIPTION

4.1 The Tawariki Street Shaft Site will be located within the properties at 44-48 Tawariki Street. Construction works will take place within the shaft site and the road reserve of Tawariki Street and a small area of adjacent St Paul's College land.

4.2 Figure 1 below shows the location of the Site in relation to the surrounding road network.

Figure 1: Site Location



4.3 Tawariki Street runs in a general east-west direction and connects to Parawai Crescent at its western end and terminates in a cul-de-sac to the east. Tawariki Street provides for a single traffic lane in either direction with on-street parking provided on both sides of the road near the Site. Pedestrian footpaths are also provided along Tawariki Street near the site.

4.4 Currently the surrounding area of the Tawariki Street Shaft Site is residential in nature, as well as St Paul's College to the east. The posted speed limit in the area is 50km/h.

4.5 Parawai Crescent runs in a general north-south direction and connects to Hukanui Crescent at its northern end and Richmond Road to the south. Parawai Crescent provides for a single traffic lane in either direction with on-street parking provided on both sides of the road. Pedestrian footpaths are also provided along Parawai Crescent near the site. It is noted that traffic islands are located within the carriageway that only allow one-way movement for vehicles to encourage a low-speed environment.

4.6 Moira Street runs in a general east-west direction and connects to Tawariki Street at its western end and to a St Pauls College accessway to the east to the east. Moira Street provides for a single traffic lane in either direction with on-street parking provided on both sides of the road near the site. Pedestrian footpaths are also provided along Moira Street.

4.7 Mokau Street runs in a general north-south direction and connects to Moira Street at its northern end and Richmond Road to the south. Mokau Street provides for a single traffic lane in either direction with on-street parking provided on both sides of the road. Pedestrian footpaths are also provided along Mokau Street near the site.

4.8 It is anticipated that Richmond Road to the south will provide the main route connecting to Tawariki Street. Richmond Road in the vicinity of the Site runs in a general east-west direction and connects to Warnock Street at its western end and Ponsonby Road at its eastern end. Richmond Road provides for a single traffic lane in each direction and is separated by a flush median. Pedestrian footpaths and kerbside parking is also provided along both sides of Richmond Road near the site.

4.9 Figure 2 below details the location of the site in relation to the surrounding transport environment.

Figure 2: Roading Environment

4.10 With reference to the Auckland Unitary Plan – Operative in Part ("**Unitary Plan**"), the site is zoned Residential – Mixed Housing Urban and St Paul's College is zoned Special Purpose – School. The nearby roads (Tawariki Street and Richmond Road) are classified as non-arterial roads under the Unitary Plan.

4.11 Figure 3 below shows the Unitary Plan zoning map.

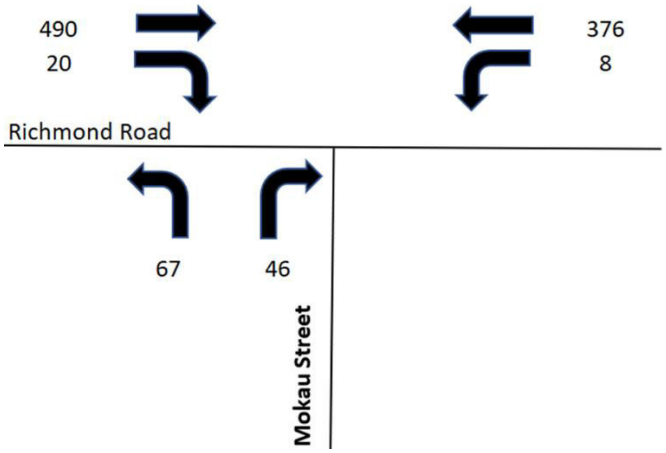
Figure 3: Unitary Plan Zoning Map

5. TRAFFIC VOLUMES

5.1 Traffic data obtained from Auckland Transport ("**AT**") reveals that Richmond Road (between Jessel Street and Cockburn Street) had a 5-day average annual daily traffic (AADT) volume of 13,105 vehicles (two-way) in May 2013. Furthermore, it indicates that the morning peak volume (8.00am) is 1,415 vehicles per hour (vph) and the evening peak volume (5.00pm) is 1,327 (vph).

5.2 A traffic survey of the Mokau Street / Richmond Road intersection was also undertaken on Thursday 15 November 2018 between 2.30pm and 4.30pm (coinciding with the busy period of nearby schools). The evening peak hour movements are shown in Figure 4 below.

Figure 4: Traffic Volumes



5.3 A pedestrian survey was also undertaken on Tawariki Street on Thursday 15 November 2018. This revealed a total of 19 pedestrian movements in the critical peak hour from

2.30pm to 3.30pm (coinciding with the busy period of nearby schools). As such, the local traffic network is considered to feature low pedestrian volumes

5.4 Overall, it is considered that volumes on Richmond Road are typical of an arterial road (as classified in the Unitary Plan) in this location and surveyed volumes on Mokau Street are low, typical of a local road in a residential area. No traffic volumes are available for Tawariki Street, however these are considered to be in the same order as Mokau Street, due to it also being an adjacent non-arterial road (as classified in the Unitary Plan) in the same residential area.

6. ROAD SAFETY ASSESSMENT

6.1 A search of the NZ Transport Agency ("**NZTA**") CAS database has been undertaken for all reported crashes occurring on the entire length of Tawariki Street and Mokau Street, as well as the Tawariki Street / Moira Street, Moira Street / Mokau Street and Mokau Street / Richmond Road intersections for the five-year period from 2013-2017, including all available data for 2018. One crash was identified by the crash search, involving a vehicle on Tawariki Street striking a parked vehicle.

6.2 There is no history of accidents occurring relating specifically to movements into or out of the area of the Tawariki Street Shaft Site nor a pattern of accidents around the Site. The local network is considered to feature a crash record typical of a residential network adjoining an arterial road (Richmond Road), as evidenced by the crash search only identifying one crash in the search area. From the assessment of the crash history, there is no indication of any significant safety concerns from the Tawariki Street Shaft Site.

7. PROPOSED WORKS

7.1 The Tawariki Street Shaft Site will be located within the properties at 44, 46 and 48 Tawariki Street. Access to the site will be from Tawariki Street, via Moira Road and Mokau Street, before connecting to Richmond Road to the south. Figure 5 below details the proposed site works.

7.2 The proposed works detailed above and below in Figure 5 are for works at the Tawariki Street Shaft Site only. The Tunnel Boring Machine works and spoil removal will occur elsewhere, and is detailed in separate reporting.

Figure 5: Proposed Site Works

8. ACCESS AND SIGHT DISTANCE

8.1 Access to the Tawariki Street Shaft Site will be from the eastern end of Tawariki Street. The subject site is detailed in Photograph 1 below:

Photograph 1: Tawariki Street

8.2 Attachment A1 details an 8m truck accessing the Tawariki Street Shaft Site and exiting onto Tawariki Street. It is noted that no specific access points have been developed as yet, and this vehicle tracking is indicative only. The tracking shows than an 8m truck can safely and efficiently manoeuvre to and from the Site via Tawariki Street.

8.3 Attachment A2 details vehicle tracking of a low-loader carrying plant accessing and egressing the Tawariki Street Shaft Site. The vehicle will need to reverse down Tawariki Street to unload plant and materials and, as such, will require specific traffic management during these deliveries. This traffic management should be detailed in the associated site-specific Construction Traffic Management Plan.

8.4 Attachment A3 details vehicle tracking of a 450 tonne portable crane accessing and egressing the site. This vehicle will require specific traffic management during these activities. This traffic management should be detailed in the associated site-specific Construction Traffic Management Plan.

8.5 Attachments A4 and A5 detail vehicle tracking of a 450 tonne portable crane accessing and egressing the site respectively. This vehicle will require specific traffic management during these activities. This traffic management should be detailed in the associated site-specific Construction Traffic Management Plan.

8.6 The speed limit on Tawariki Street east of Moira Street will be lowered during construction (likely to be 30km/h as is in line with standard industry practice), with good sight distances from the Site access available. It is therefore considered that sufficient sight distance is provided for all vehicles access the Site, and effects on residents travel times will be minimal.

8.7 It is recommended that parking on the southern side of Tawariki Street for the length of the proposed site works is removed, to enable vehicles to access and egress these southern properties.

8.8 Parking along the length of Tawariki Street, Moira Street and Mokau Street will be required to be temporarily removed during large vehicle movements (cranes, plant etc.).

8.9 The temporary removal of parking can be achieved through the detailed site-specific Construction Traffic Management Plan approval process. This temporary removal of parking is indicatively shown in Figure 6 below.

Figure 6: Parking Removal

8.10 As detailed in Figure 6, the indicative removal of parking is required for the full project duration, and temporarily during plant delivery. The project duration removal is required to ensure access is provided to the dwellings located on the southern side of Tawariki Street and to allow site vehicle to access and egress the site safely and efficiently.

8.11 Approximately 14 parking spaces are required to be removed for the project duration. It is noted that on-street parking is available on Tawariki Street, Mokau Street and Moira Street nearby, suitable for accommodating residential parking demand in this area. Further, three dwellings will be removed as part of the site works, reducing this parking demand.

8.12 Temporary parking removal will be required when large vehicles are accessing the site. These deliveries will occur infrequently, for only a few hours at a time, and can be scheduled for off-peak times when Tawariki Street is lightly trafficked.

8.13 Overall, given the parking availability on the surrounding streets, the maintaining of property accesses, and the infrequent nature of large vehicle deliveries, the effects on residents and visitors are considered to be less than minor.

9. PEDESTRIAN ACCESS

9.1 Any pedestrian connections affected by the Grey Lynn Tunnel can be mitigated with temporary pedestrian diversions. However, no diversions are expected to be required for the Grey Lynn Tunnel, with pedestrian connections from Moira Street to Tawariki Street and from Tawariki Street to Hukanui Crescent maintained during construction.

9.2 The existing pedestrian connections are considered to be satisfactory to provide safe and efficient movement throughout the local traffic network with the additional construction traffic volumes during the project works.

10. CONSTRUCTION TRAFFIC TRIP GENERATION

10.1 The construction programme will occur in four stages, as detailed below:

(a) Stage 1 – shaft excavation (main shaft and chambers). This will occur over a period of 12 months.

(b) Stage 2 – preparation for TBM arrival at termination point of Tawariki Street Shaft Site. This will occur over several months. Truck volumes will be significantly lower than those generated in Stage 1. Stage 3 – TBM removal and final construction. This will occur over a period of 9 months. Truck volumes are expected to be of a similar or lower level to those generated in Stage 1. The TBM removal will be a one-off event.

(c) Stage 4 - Secondary shaft – This will occur at a later date, over a period of 12 months. Truck volumes are expected to be of a similar level to those generated in Stage 1.

10.2 Based on the information above, Stage 1 is considered the critical stage due to the largest truck volumes expected. The expected Stage 1 and Stage 4 construction truck volumes are detailed below.

Table 1: Anticipated Trip Generation

STAGE	ACTIVITY	VEHICLE TYPE	ASSUMPTIONS	PEAK VEHICLES PER DAY	PEAK MOVEMENTS PER DAY
Stage 1	Shotcrete delivery	6m^3 concrete truck	Total volume of shotcrete at site is 1,280m^3; Intermittent over 2-3week period.	4	8
	Labour	Standard vehicle	Constant duration of project	7	14
	Site supervision	Standard vehicle	As needed	2	4
	Maintenance	3-axle truck	-	1	2
	Rock bolt, soil nail and steel delivery	Semi-trailer truck with flatbed	Intermittent over 2-3 week period and does not occur on the same day as concrete delivery	-	-
	Spoil removal	15m^3 spoil removal truck	Average excavation rate of 400m^3 per day; 6-day work week; Constant for 20 week period	27	54
Total				**41**	**82**

10.3 Approximate traffic generation in Stage 1 and Stage 4:

(a) 18 standard vehicle movements per day.

(b) 64 heavy vehicle movements per day (average of 5 heavy vehicles movements per hour over a 12 hour day).

10.4 In total, it is estimated that the proposed works at the Tawariki Street Shaft Site will generate a maximum of no more than 82 vehicle movements per day during Stage 1 and Stage 4 of the works.

10.5 The additional traffic volumes are well within the capacity of the surrounding roads and are well within the typical hourly fluctuations of the nearby roads. Less than minor effects on the surrounding road network are therefore expected.

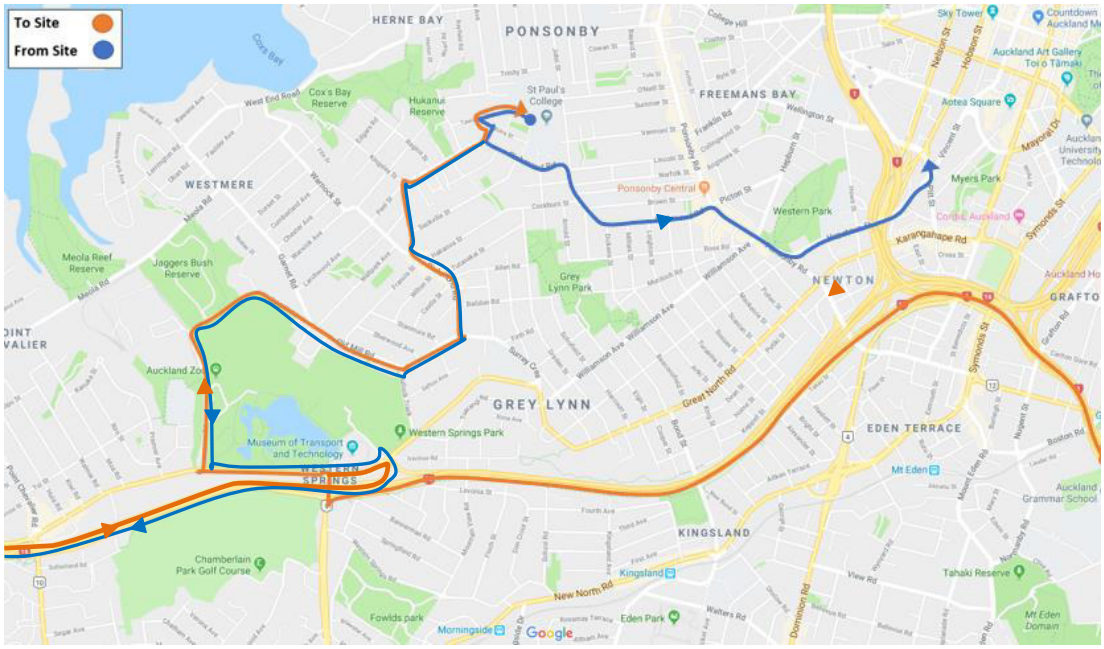
10.6 Accordingly, it is considered that the existing roading environment can cater for the expected temporary truck movements associated with the works in Stage 1 (with detailed traffic management of the Site). It is noted that vehicle movements in the subsequent stages are

expected to be similar to or lower than those in Stage 1, and therefore these volumes are considered to also be readily accommodated by the existing roading environment.

11. CONSTRUCTION TRAFFIC TRUCK ROUTES

11.1 Figure 7 below displays the recommended truck routes between the site and the nearest motorway interchange.

Figure 7: Truck Routes



11.2 These routes have been chosen to minimise heavy vehicles undertaking uncontrolled right turns and maximising the arterial roading network (which are generally more appropriately designed to accommodate large heavy vehicles).

12. TRAFFIC GENERATION DURING OPERATION

12.1 The Tawariki Street Shaft Site is proposed to provide long-term maintenance access to the Grey Lynn Tunnel and as such ongoing maintenance access to part of the Site is required. After construction, the temporary site facilities and access path will be removed, while the residual land will be reinstated. However, it is proposed to have a permanent maintenance access in the same location as the temporary access with a lockable gate. Maintenance vehicles will park on-site. The traffic generation post construction will be limited to regular maintenance of site facilities. It is estimated that traffic generated by the site will normally be one vehicle per month. The access design will be confirmed at detailed design stage.

13. SUMMARY AND CONCLUSIONS

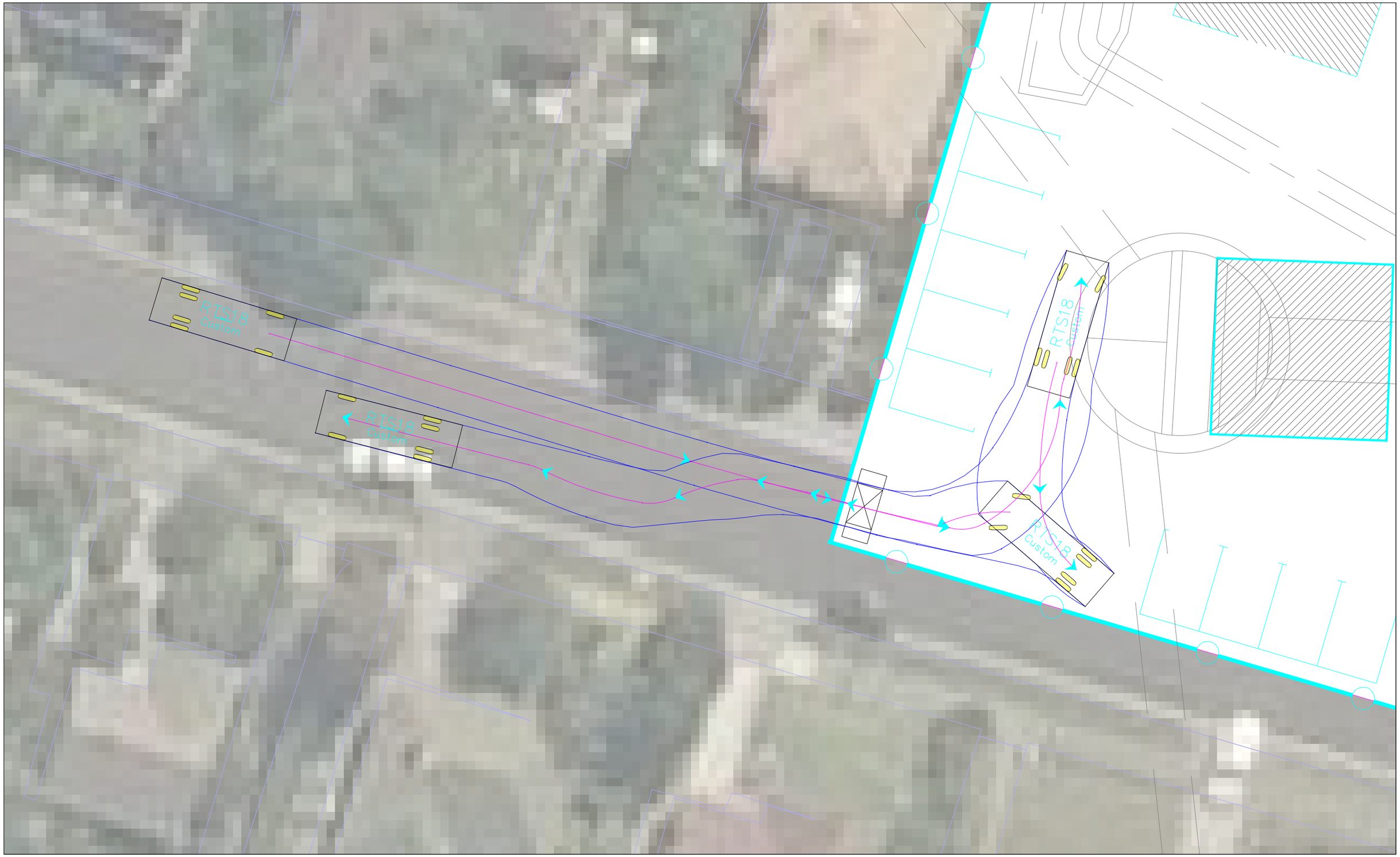
13.1 On the basis of this transport assessment, it is concluded that the Tawariki Street Shaft Site can be established with less than minor traffic effects on the operation of the surrounding road and pedestrian network during the works period, provided that the following mitigation measures are generally implemented at each site:

(a) Where possible, construction truck routes generally follow arterial routes as detailed in the Construction Truck Route Diagram for the Site.

(b) Restrict heavy vehicles to the largest recommended truck size (a 450-tonne portable crane) as shown on the Vehicle Tracking Curve diagrams; and

(c) Implementation of a site-specific detailed Construction Traffic Management Plan.

13.2 With the above measures in place it is considered that the Grey Lynn Tunnel can be constructed and operated with less than minor effects to the surrounding roading network.



Revision notes:

Rev:	Date:	Notes:

Drawn by: JB

Client:

Project: Grey Lynn Tunnel

Drawing Title: 8m Truck Entry and Exit

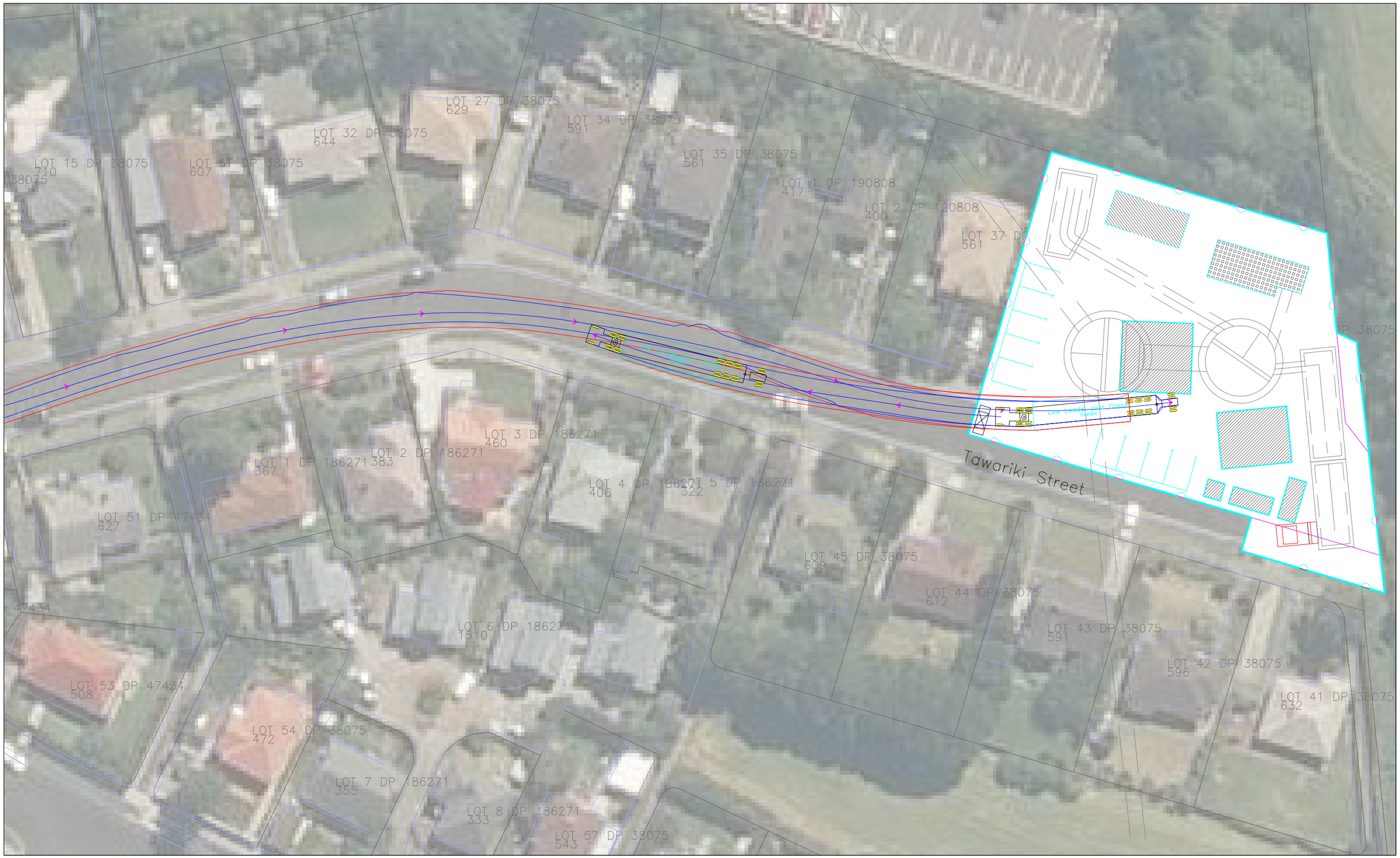
Date: 15 February 2019

Scale @ A3: 1:200

Revision: A

commute TRANSPORTATION CONSULTANTS

Figure: A1



Revision notes:

Rev:	Date:	Notes:

Drawn by: JB

Client:

Project: Grey Lynn Tunnel

Drawing Title: Low Loader plus Crane Entry & Exit

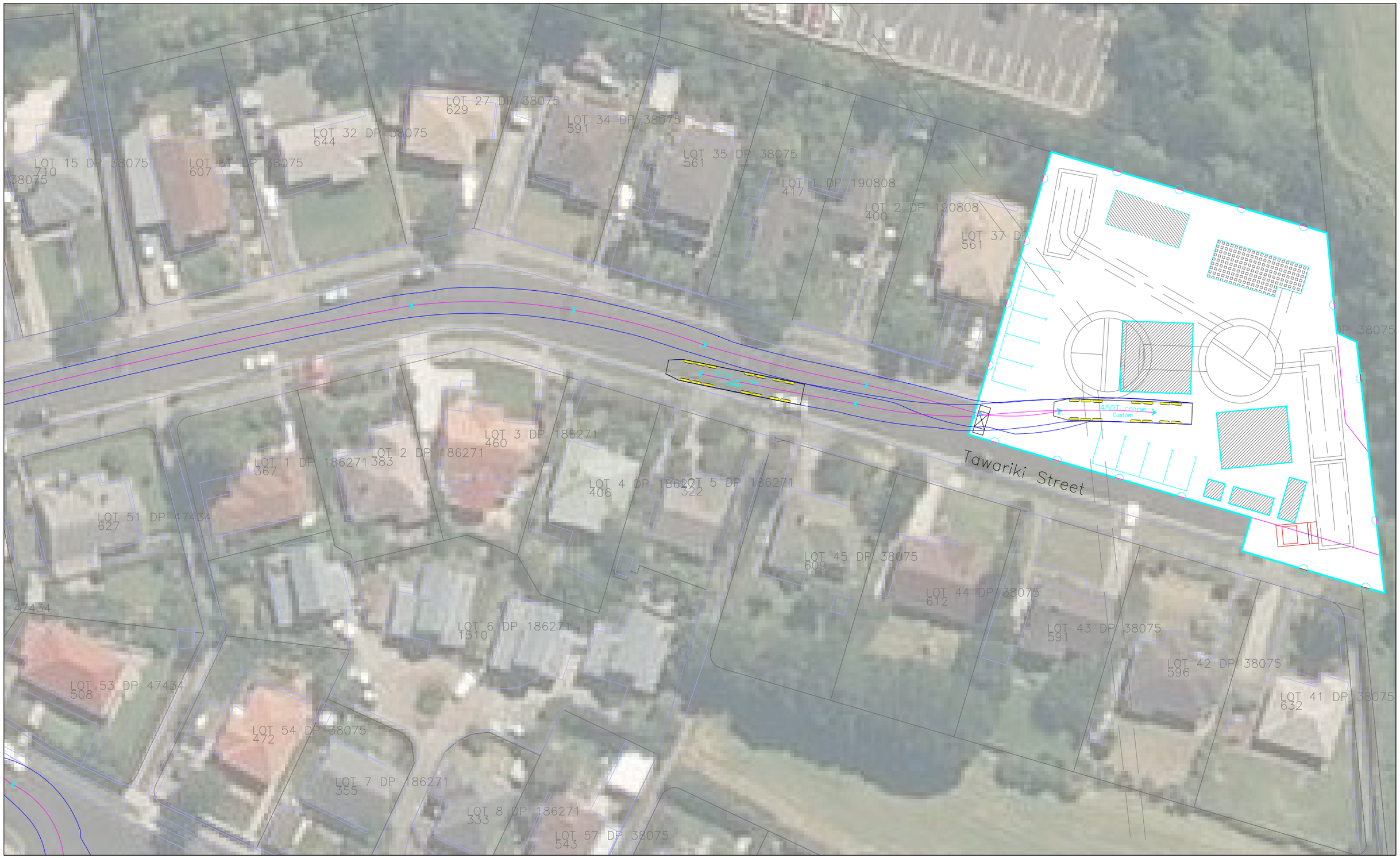
Date: 4 February 2019

Scale @ A3: 1:500

Revision: A

commute TRANSPORTATION CONSULTANTS

Figure: A2



Revision notes:

Rev:	Date:	Notes:

Drawn by: JB

Client:

Project: Grey Lynn Tunnel

Drawing Title: 450 tonne Crane Entry & Exit

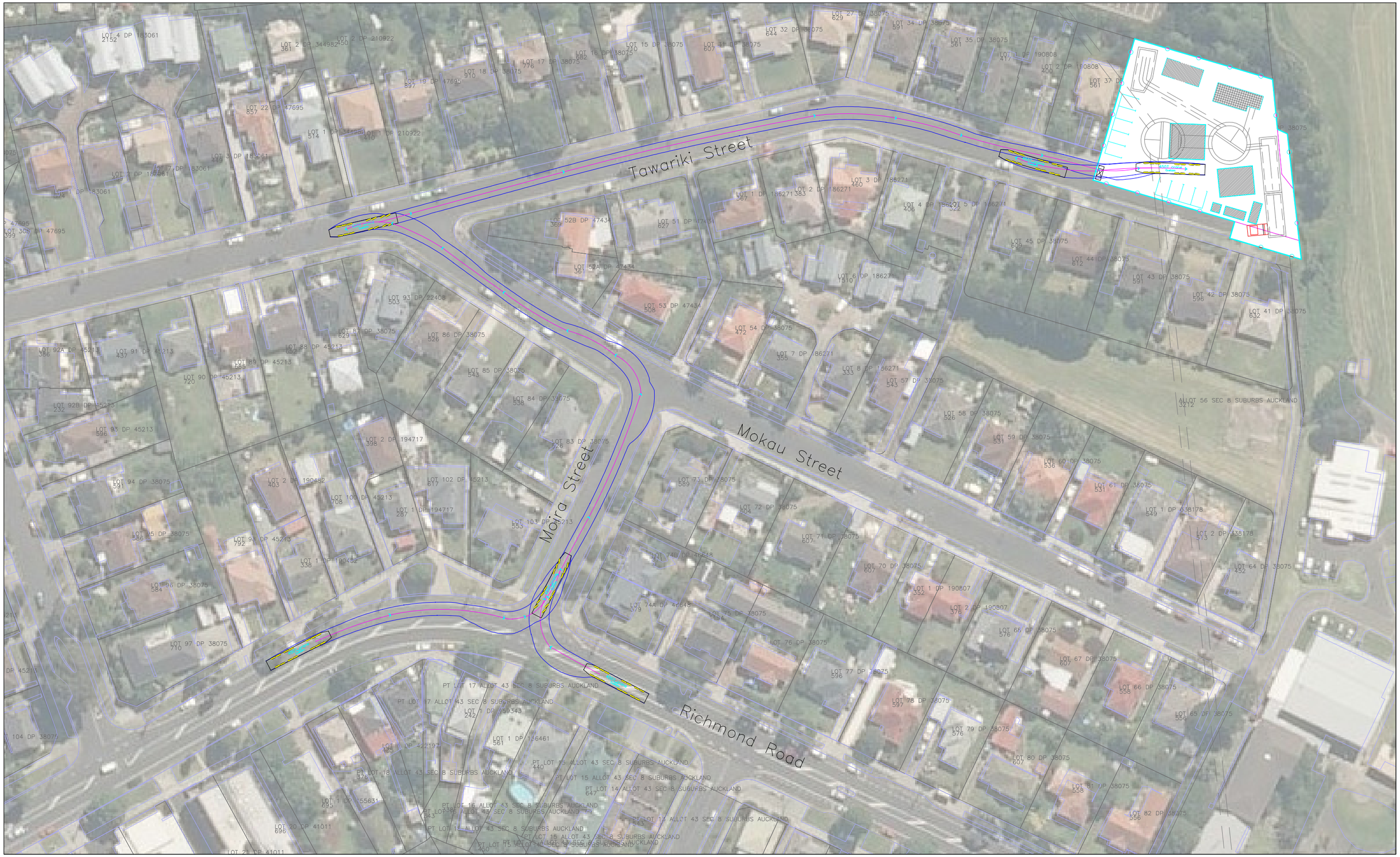
Date: 4 February 2019

Scale @ A3: 1:500

Revision: A

commute TRANSPORTATION CONSULTANTS

Figure: A3



Revision notes:		
Rev:	**Date:**	**Notes:**

Drawn by: JB

Client:

Project: Grey Lynn Tunnel

Drawing Title: 450t Crane Entry (wide)

Date: 4 February 2019

Scale @ A3: 1:1000

Revision: A

commute TRANSPORTATION CONSULTANTS

Figure: A4

Revision notes:		
Rev:	Date:	Notes:

Drawn by: JB	Project: Grey Lynn Tunnel	Date: 4 February 2019	commute TRANSPORTATION CONSULTANTS	Figure: A5
Client:	Drawing Title: 450t Crane Exit (wide)	Scale @ A3: 1:1000		
		Revision: A		