

Porirua City Council

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**SUBMISSION – Porirua Proposed District Plan
PUKERUA BAY– MT WELCOME STATION
Pukerua Bay, Porirua**

Client: Pukerua Property Group Limited - November 2020



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DELIVERING INNOVATIVE PROPERTY, COMMUNITY AND ENVIRONMENTAL SOLUTIONS



SUBMISSION FOR: Pukerua Property Group Limited

Prepared by:

A handwritten signature in blue ink, appearing to read "B. S. Holmes", written over a horizontal line.

Bryce S Holmes
Principal Planner and Director

Date: November 2020
Version: **FINAL**
Job Ref: J568

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RMA FORM 5

Submission on publicly notified Proposed Porirua District Plan

Clause 6 of the First Schedule, Resource Management Act 1991

To: Porirua City Council

1. **Submitter details:**

Full Name		
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2. This is a **submission** on the **Proposed District Plan** for Porirua.
3. I could not gain an advantage in trade competition through this submission.

If **you could** gain an advantage in trade competition through this submission please complete point four below:

4. I am directly affected by an effect of the subject matter of the submission that:



(a) adversely affects the environment; and

(b) does not relate to trade competition or the effects of trade competition.

Note:

If you are a person who could gain an advantage in trade competition through the submission, your right to make a submission may be limited by clause 6(4) of Part 1 of Schedule 1 of the Resource Management Act 1991.

- 5. I wish to be heard in support of my submission.

- 6. I will not consider presenting a joint case with other submitters, who make a similar submission, at a hearing.

Please complete section below (insert additional boxes per provision you are submitting on):

The specific provision of the proposal that my submission relates to:
See part 3.
Do you: Support? Oppose? Amend?
See part 3.
What decision are you seeking from Council?
What action would you like: Retain? Amend? Add? Delete?
Reasons:
See part 3.



1. BACKGROUND AND INTRODUCTION

Porirua City Council (PCC) has reviewed its Growth Strategy to guide how the City changes over the next 30 years. The Growth Strategy includes a review of the Northern Growth Area 2014 (NGA). Porirua City Council is looking to implement its Growth Strategy through its new District Plan. The draft District Plan is open for comment. This document is a submission on Porirua's Proposed District Plan.

Mt Welcome Station is just to the south of Pukerua Bay on the eastern side of the current State Highway 1. Part of that property (upwards of 55ha) is the subject of an agreement between the current owner and Pukerua Property Group Limited (PPGL or Pukerua Property Group Limited) or nominee. Pukerua Property Group Limited and its Classic Builders partners have an expanding presence in the city through developments at Brookside, Navigation Heights and Adventure Drive. Classic are now the second biggest house builder in the country and can provide a more controlled and comprehensive development model by being able to package the land and building into one 'turn key' transaction. Track record and local employment are 2 key aspects benefiting the City economy from the new owners of part of Mt Welcome Station.

This document briefly describes the land, the general parts of the Proposed District Plan Pukerua Property Group Limited wish to have amended and gives reasons for the suggested amendments.

2. THE LAND

The land is located south of Pukerua Bay in Porirua. The property details are:

- Address: 422, 422A and 422B State Highway 1, Pukerua Bay
- Area: 65.1700ha

3. THE SUBMISSION AND CHANGES SOUGHT

Pukerua Property Group Limited generally **supports** the following parts of the Proposed District Plan:

1. Showing part of the land as appropriate for **Urban Development** on the Planning Maps.

Pukerua Property Group Limited generally **opposes** the following parts of the Proposed District Plan:

1. Identification of the land as part of the Future Urban Zone (FUZ);
2. The location of the Stream Corridor and ponding Flood Hazards;
3. The restrictive nature of the planning provisions in the FUZ including the objectives, policies, and rules.

Pukerua Property Group Limited **seek** the following general amendments to the document to better achieve the Purpose of the RMA and the Principles of the Growth Strategy:

- A. **Amendments to the planning maps** to either identify the subject land as part of the General Residential Zone (GRZ) or create a Specific Precinct (Mt Welcome) within the General Residential Zone to give effect to the Structure Plan prepared by Construkt on behalf of the Pukerua Property



Group Limited.

Reasons: Pukerua Property Group Limited has undertaken extensive research consistent with the intent of policy FUZ-P2 1 and the guidelines in APP22 that has culminated in a structure plan prepared by Construkt.

Pukerua Property Group Limited have commissioned appropriate planning, urban design, geotechnical, landscape, ecological, heritage, contamination, transportation, and infrastructure experts to prepare its structure planning for the land. The structure plan is **attached** to this submission. The land has been identified for many years as a future residential area and its development will compliment and expand on the existing Pukerua Bay settlement.

B. Amend or remove the FUZ provisions to provide for a more flexible approach to development including the possibility of consenting new residential areas (discretionary activity) and a more flexible approach under policy FUZ-P1.

Reason: A key principle in policy FUZ-P1 is to ensure residential areas are serviced by existing or planned infrastructure. However, the draft District Plan does not provide for flexibility and private investment into servicing. The land can be effectively serviced according to Pukerua Property Group Limited’s infrastructure experts and that infrastructure report (by Orogen) is **attached** to this submission. The policy direction to require landowners to go through a second plan change process to enable urban expansion is inefficient and will ‘sterilise’ investment for growth and giving effect to the Growth Strategy.

C. Without limiting the general opposition in A and B above, the specific parts of the plan the submitter seeks.

Plan Provision	Support/ Oppose	Reason	Relief Sought
Part 2 – Strategic Objectives: UFD-02 and UFD-04	Support	It is important for Council to make provision for new urban development where it can be serviced.	Retain the objectives as proposed.
Part 2 – Subdivision: SUB-04	Oppose	If Council is going to continue with a FUZ the objectives and policies need to provide for flexibility for investment/funding options for landowners/developers. The objective should also reflect that services can be provided where the impact on current infrastructure can be minimized.	Amend Objective SUB-04 to (or similar intent): Subdivision within the Future Urban Zone <u>to support investment and funding of new urban development including does not result in the fragmentation of sites that would compromise the potential of: 1. The Judgeford Hills and Northern Growth Areas of the Future Urban Zone to accommodate integrated serviced and primarily for residential urban development:</u>
Part 2 – Subdivision: SUB-P5	Oppose	Parts 1, 3 and 5 of the policy do not promote innovation	Amend Policy SUB-P5 to (or similar intent):



		<p>or alternate means of infrastructure provision. The policy would be improved with some flexibility.</p>	<p><u>Require Encourage infrastructure to be provided in an integrated and comprehensive manner by:</u> 1. Ensuring infrastructure meets Council standards and has the capacity to accommodate the development or anticipated future development in accordance with the purpose of the zone, and is in place, <u>provided for or funded at the time of allotment creation;</u> 3. <u>Generally Requiring reticulated wastewater, reticulated water and stormwater management systems in all Urban Zones to meet the performance criteria of the Wellington Water’s Regional Water Standard May 2019.</u> <u>Alternatives solutions for infrastructure will be supported where information is provided that proposals meet a similar level of performance.</u> 5. Ensuring telecommunications and power supply is provided to all allotments, <u>including consideration of wireless solutions for telecommunication.</u></p>
<p>Part 2 – Subdivision: SUB-P7</p>	<p>Oppose</p>	<p>The policy has been formulated in a rigid manner and is can be improved through provision of flexibility.</p>	<p><u>Amend Policy SUB-P7 to (or similar intent):</u> Avoid <u>Manage subdivision within the Future Urban Zone so that may result in one or more of the following does not occur:</u> 2. The need for significant upgrades, provisions or extensions to the reticulated wastewater, reticulated water supply or stormwater networks, or other infrastructure in advance of integrated urban development <u>where that infrastructure is not otherwise provided for within the development and/or contributed to through fair</u></p>



			<i>funding;</i>
Part 2 – Subdivision: SUB-R1 & SUB-S1 Future Urban Zone 7.	Oppose	A non-complying activity rule and the standards requiring a 40ha minimum lot size is restrictive and will not provide a planning frameworks to encourage necessary investment for development funding.	<i>Amend the rules and standards for the FUZ to match the General Rural Zone. Delete non-complying activities as they relate to the FUZ and replace with Discretionary Activity rules.</i>
Part 3 – Future Urban Zone (FUZ). Entire Chapter provisions FUZ-01 to FUZ-S7. Including APP11 – Future Urban Zone Structure Plan Guidance and planning maps as they relate to the land that the submitter has an interest in.	Oppose	The suite of provisions relating to the FUZ are essentially monopolizing future urban land supply to one area of the City. This approach does not provide appropriate market forces and choice on the land supply side.	<p><i>Delete the Future Urban Zone provisions from the District Plan and provide for the submitters land interest in the General Residential Zone: or (in the alternative); Identify the submitters land interest as 'The Mt Welcome Precinct' and adopt provisions similar to Proposed Plan Change 18 for the precinct for relevant parts of the land: or (in the alternative); amend the objectives, polices and rules to provide a resource consenting path for urban development in the FUZ including (but not limited to)-</i></p> <p><i>FUZ-01</i> <i>The Future Urban Zone allows ...</i> <i>1. The ... Northern Growth Area to accommodate integrated, serviced and primarily residential urban development;</i></p> <p><i>FUZ-02</i> <i>The Future Urban Zone supports appropriate rural use and development, and maintains the character and amenity values of the General Rural Zone until such time as it is rezoned <u>or consented</u> for urban purposes.</i></p> <p><i>FUZ-P1</i> <i>Identify areas for future urban development as the Future Urban Zone where these:</i> <i>2. Are of a size, scale and</i></p>



			<p><i>location which could accommodate comprehensive and integrated future development that:</i></p> <ol style="list-style-type: none"> <i>1. Is serviced by infrastructure or planned to be serviced by infrastructure in the Council's Long Term Plan or the effects on existing infrastructure can be mitigated through provision of new services within the development site;</i> <i>2. Is connected to or planned to be connected to the transportation network where the effects on the network are minor and/or can be mitigated.</i> <p>FUZ-P2 <i>Only provide for urban development within a Future Urban Zone when:</i></p> <ol style="list-style-type: none"> <i>1. A comprehensive structure plan for the area has been developed in <u>general</u> accordance with the guidelines contained in APP11 – Future Urban Zone Structure Plan Guidance and adopted by Porirua City Council; and</i> <i>2. The area has been rezoned or consented as a Development Area which enables urban development.</i> <p><u>FUZ-R16A Subdivision and Development in the Mt Welcome Precinct Area</u></p> <p><u>1. Activity Status:</u> <u>Discretionary</u> <u>Notification and Natural Hazards:</u></p> <ul style="list-style-type: none"> • <u>An application under this rule is precluded from being publicly</u>
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			<p><u>notified in accordance with section 95A of the RMA.</u></p> <ul style="list-style-type: none"> <u>Activities considered under this rule are exempt from the rules relating to Natural Hazards (NH) and those District Wide Matters will be considered under section 106 of the RMA.</u> <p>APP11 – Future Urban Zone Structure Plan Guidance <u>Where applicable, relevant and appropriate a structure plan is to identify, investigate and address the matters set out below.</u></p>
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In general, there is an opportunity to master plan the Mt Welcome property for the benefit of Council and stakeholders with an interest in the area. We consider the opportunity to manage over 65ha of the Taupo Swamp catchment through a structure plan is a strategic decision in line with the overall intent of the Growth Strategy. Potential outcomes can include catchment protection, environmental enhancement through planting, and controls on future land use to manage the urban form of this area. The general thrust of this submission to enable the subject land as part of the residential zone is supported by the following technical information (also **attached**):

- Appendix 1:** Mt Welcome Station – Urban Design Report (Konstrukt Limited)
- Appendix 2:** Preliminary Geotechnical Investigation and Natural Hazard Assessment (Tonkin & Taylor)
- Appendix 3:** Mt Welcome Station – Vehicular Access Assessment (Tim Kelly Transportation Planning)
- Appendix 4:** Preliminary Site Investigation – Pattle Delamore Partners Limited
- Appendix 5:** Mt Welcome Station – Archaeological Appraisal (Clough & Associates Ltd)
- Appendix 6:** Civil Engineering and Infrastructure Report (Orogen Limited)
- Appendix 7:** Mt Welcome Station – Preliminary Ecology Survey (RMA Ecology)



APPENDIX 1



MT WELCOME STATION

Urban Design Report

Classic Developments NZ Ltd and Quest Projects Ltd
August 2019

konstrukt

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INTRODUCTION

Purpose

This is an Urban Design Report for the Mt Welcome Station project. The purpose of this report is to support the development of the site, to explain how the proposed development is based on sound urban design principles, and to make recommendations for the next stages of the design process.

Team

The preparation of this application has been supported by a team of experienced design and technical consultants.

Construkt Associates Ltd. Urban Design

Classic Developments NZ Ltd. Client

Quest Projects Ltd. Client

Orogen Ltd.
Civil Engineering & Infrastructure

Tonkin & Taylor Ltd.
Geotechnical Engineers.

Land Matters Ltd.
Planning

Site Landscape Architects Ltd.
Landscape Architecture

RMA Ecology Ltd.
Ecology

Clough and Associates Ltd.
Archeology

Pattle Delamore Partners Ltd.
Contaminated Land Assessment

Tim Kelly Transportation Ltd.
Traffic & Transportation



Figure 1: Google Earth view.

CONTEXT

Regional Context

- The site is located in the south-eastern side of Pukerua Bay, a small seaside community of 1900 residents (as per Census 2013) that are clustered around State Highway 1 and a railway line.
- It is in a rural area that offers sea and Kapiti Island views to the north and southerly views to the South Island.
- It is approximately 14km north of Porirua, 8km north of Plimmerton, and 9.5km south-west of Paekakariki.
- The sites primary link is along State Highway 1, the longest and most significant road in the country. The status of this road will downgrade once Transmission Gully is complete in 2020.
- The site is near the Paekakariki Escarpment Track, a 10km long walkway, that links Pukerua Bay with Paekakariki. The walk features views to Kapiti Island.

Legend

- ↙ SH1
- ||||| Rail Line
- Transmission Gully
- Paekakariki Escarpment Track
- Distance Radius
- Site

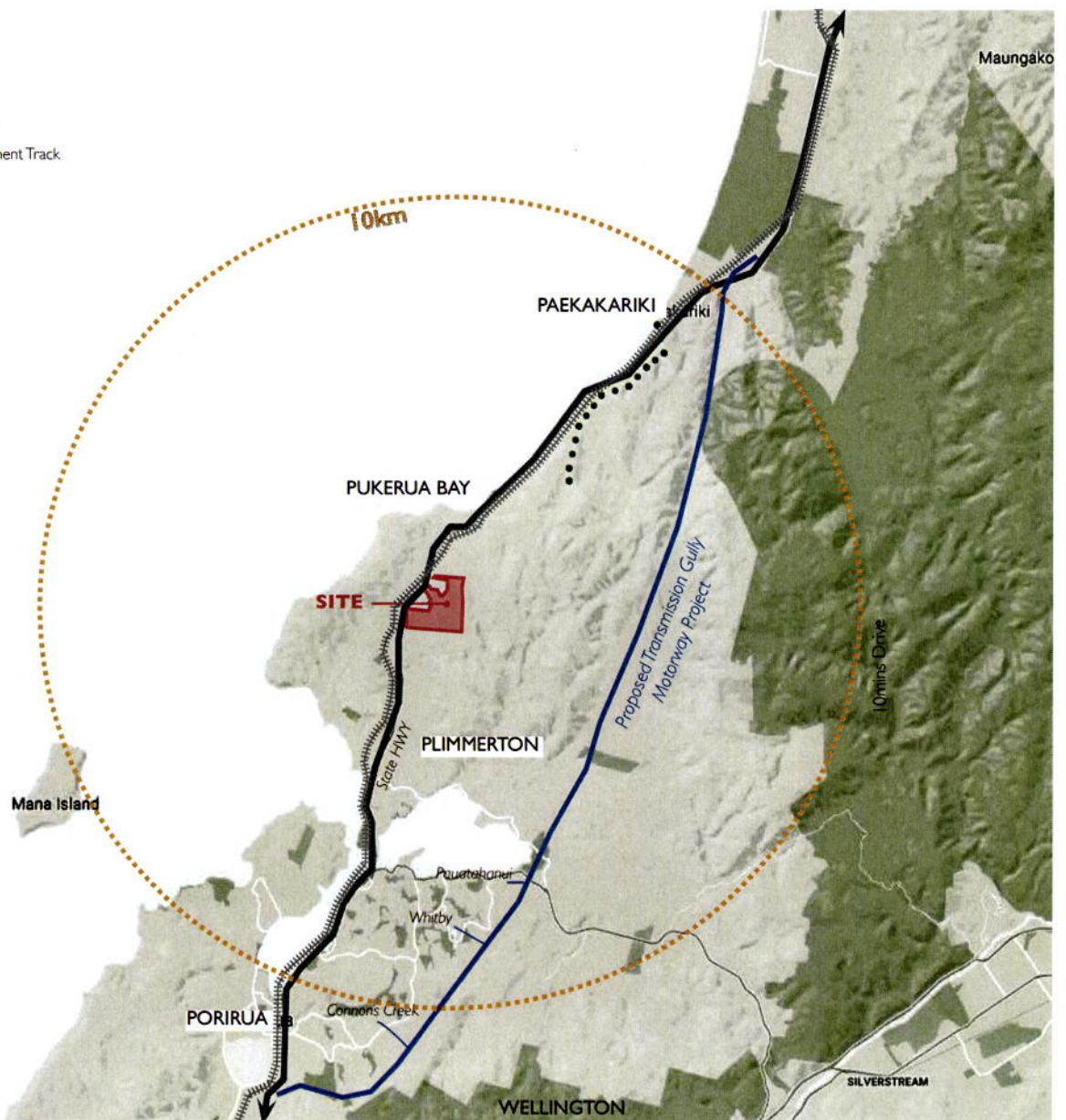
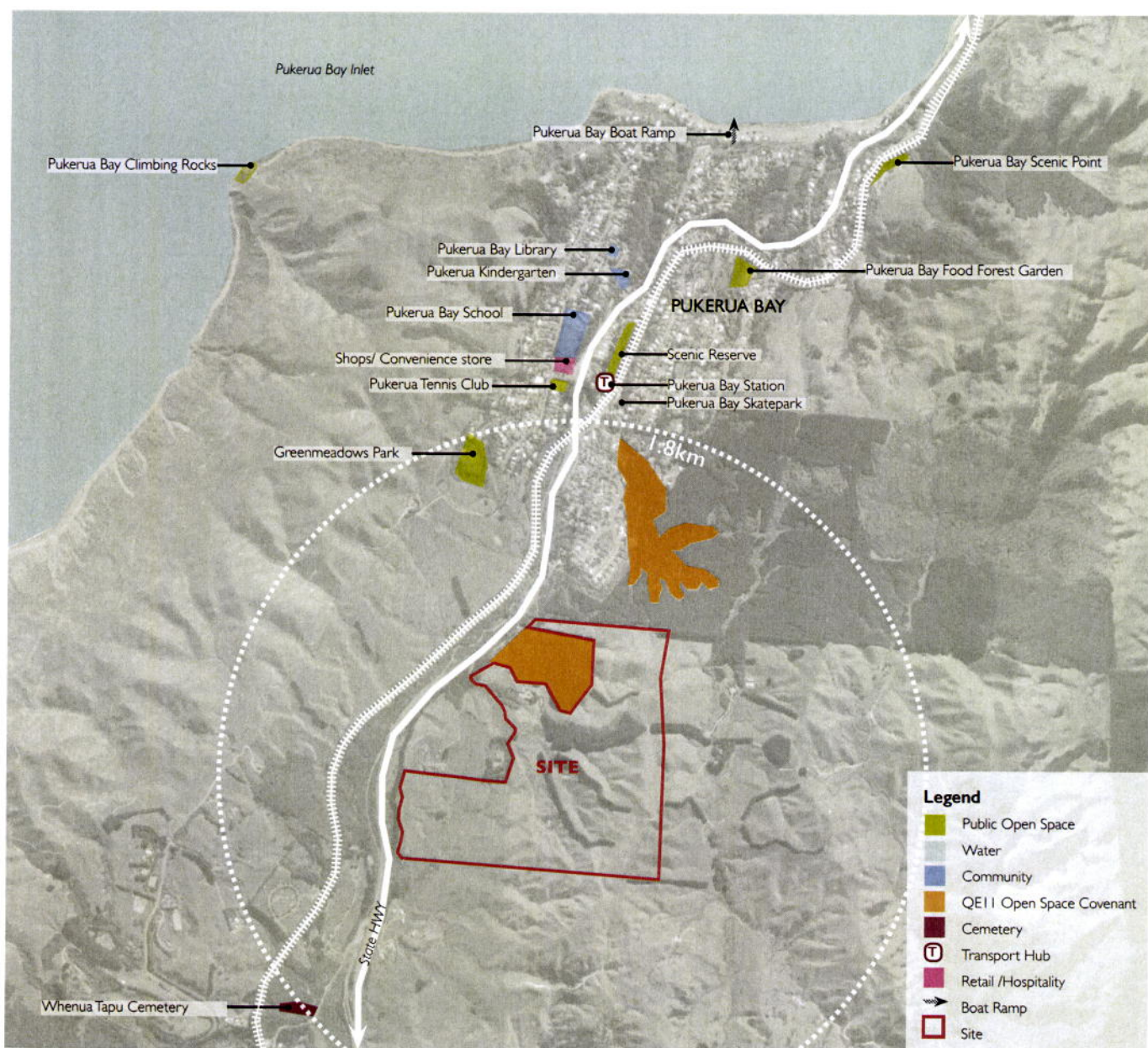


Figure 2: Regional Context Plan



Local Context

- It is surrounded by open countryside to the East, South, and West, and bush areas to the north - with one area having a QEII Open Space Covenant.
- The site's entrance lies 1km from the Pukerua Bay Train Station and Pukerua Bay shops located on State Highway 1. This cluster includes a selection of small retail facilities including a convenience store, bookshop, and a beauty salon.
- It is 1.5km from a cluster of community facilities including a library, primary school, and kindergarten. The closest secondary school is Aotea College, which is approximately 11 km from the site or 12 minute drive.
- In terms of leisure and recreation, tennis courts and Greenmeadows Park are within 1.8km of the site. Furthermore, Pukerua Bay Beach offers opportunities for water activities such as surfing, fishing and boating.
- In the current state, the only suitable form of transport in and out of the site is via private vehicles due to the fast-speed character of State Highway 1.



Planning Context

District Plan Review and Growth Strategy

Porirua City is expected to grow by 25,000 with an additional 10,000 homes over the next 30 years, with significant changes in land use following the completion of the Transmission Gully Motorway and other large scale projects planned for the city. To cope with these changes Porirua City Council is undergoing a District Plan review process in parallel to implementing a new 30 year Growth Strategy. The Growth Strategy provides high level direction around 'why' and 'where' the city will grow, and the District Plan review will create rules around 'how' to change and 'what' this will look like, while also directing how to protect the environment. The Growth Strategy was adopted early 2019 and the Draft District Plan was released for feedback in November 2018.

Porirua Growth Strategy 2048

Porirua City Council's growth aspirations for the region over the next 30 years have been released in the form of six growth principles in the Growth Strategy. They are:

- Tahī: a diverse and inclusive city
- Rua: a harbour-centred city
- Toru: a compact and liveable city
- Whā: a connected and active city
- Rima: a city of opportunities and prosperity
- Ono: a resilient city.

In regards to the subject site, the Strategy shows the entire area between Pukerua Bay and Whenua Tapu as a medium term new residential area.

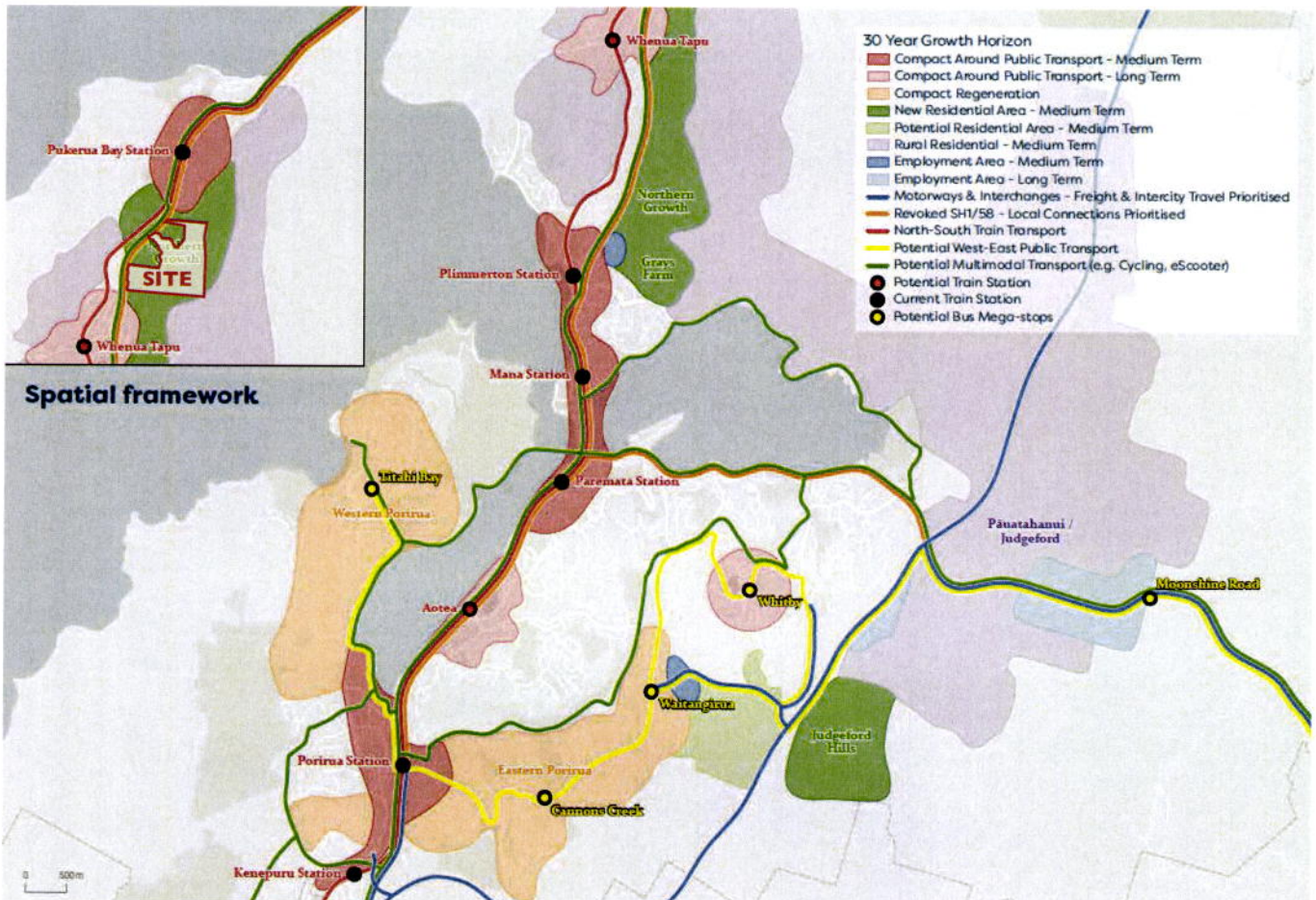


Figure 4: Porirua Growth Strategy 2048 Spatial Framework

Operative Plan

While the District Plan is under review, the Operative Plan provides the zoning controls for the site. Under this plan, the subject site has a Rural zone.

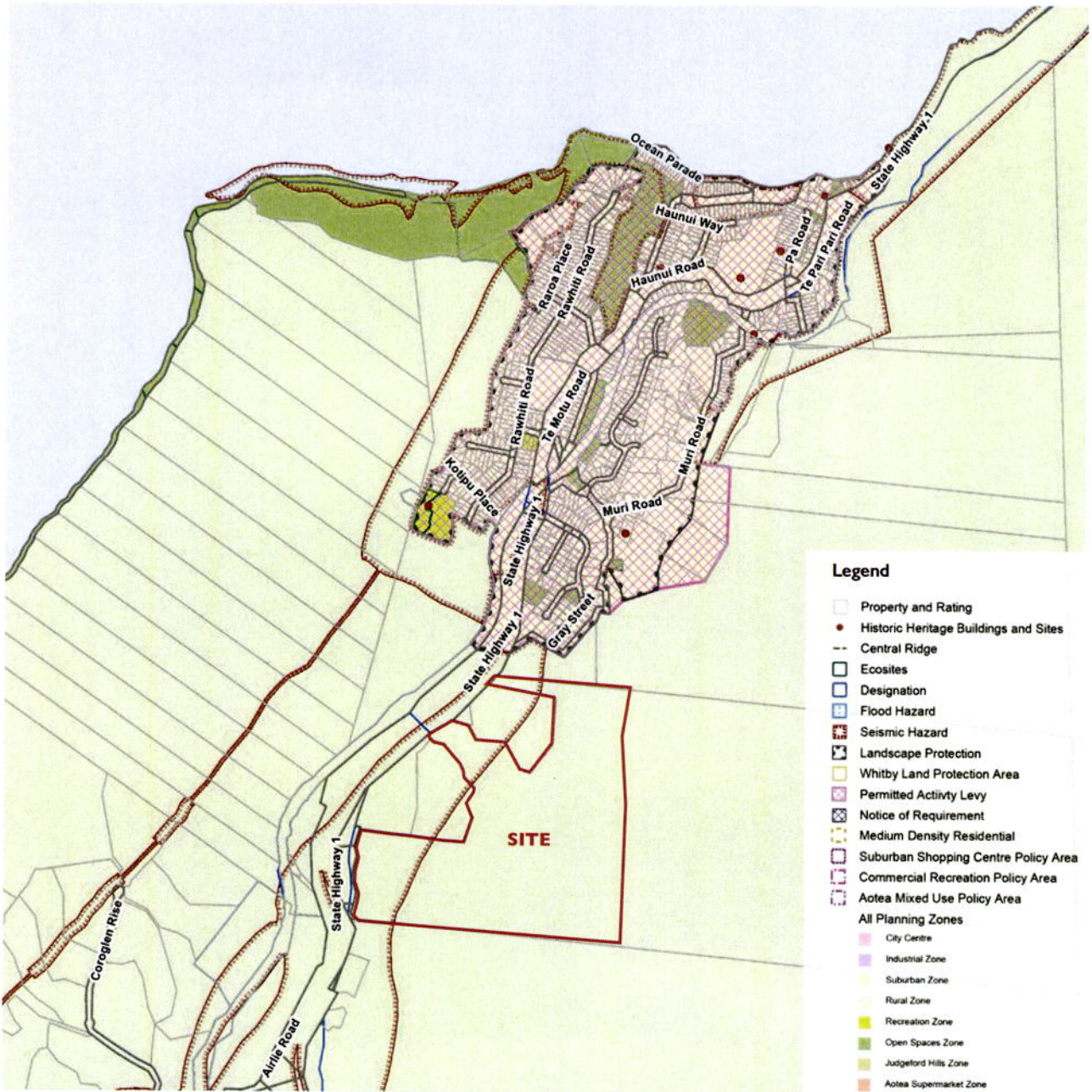


Figure 5: Operative Plan

Historical and Cultural Context

Pukerua Bay has a rich history. The following is a summary of the early historic events outlined by the Pukerua Bay Residents Association (PBRA).

- In Maori, the words puke rua means 'two hills'.
- Pukerua is on the main route for Maori travelers going north or south.
- The earliest people known to have lived at Pukerua are the Ngāti Ira, who built a pa near Pa Road.
- Later, the Muaūpoko live in the area from Lake Horowhenua to Pukerua, where they built Waimapihi Pa near Rawhiti Road's northern end. In 1822 Ngāti Toa took over the area.
- Blocks were originally surveyed in the 1870s and granted to various members of Ngāti Toa. These were sold on and by 1922 there are less than a dozen families living in the area.
- 1880-1920: The railway line is extended through Pukerua and the Post Office opens.
- 1922: Land along Ocean Parade is subdivided into residential sections. Pukerua experiences tremendous growth over the next decade.
- 1923: Charles Gray builds his family's homestead, the oldest building in Pukerua Bay.
- 1926: On March, 20th, a ceremony is held

to open the roads leading from Pukerua Bay station to the beach.

- 1927: Pukerua Bay School is officially opened and electricity is put through from Plimmerton to Pukerua Bay. Pukerua Bay now comprises about 100 houses.
- In the 1950s and 1960s, Pukerua Bay sees significant growth of its residential population. The completed highway and electric train services make Pukerua Bay a viable choice to live in for people commuting to work as far as to Wellington.
- 1969: The present group of shops between Rawhiti Road and State Highway 1 is built.
- 1973: Pukerua Bay joins Porirua City, mainly to get the issue of water and sewerage addressed.
- 1989: The over-bridge over State Highway 1 is opened.
- 1997: The act to restore Waimapihi Stream gully, (known as the Secret Valley) to its native state is initiated.
- 2011: Muri Station is closed due to safety risks.
- 2012: A six meter high carved Pou Tangaroa is placed on the Pukerua Bay foreshore at the end of Ocean Parade.

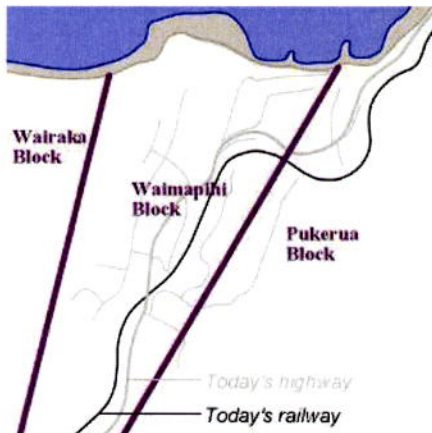


Figure 6: Blocks originally surveyed in the 1870s (PBRA).



Figure 7: Pukerua Bay Golf Club 1935-1950 (PBRA).



Figure 8: Ice cream shop at the beach operated by the Ames family in the early 1920s (PBRA).

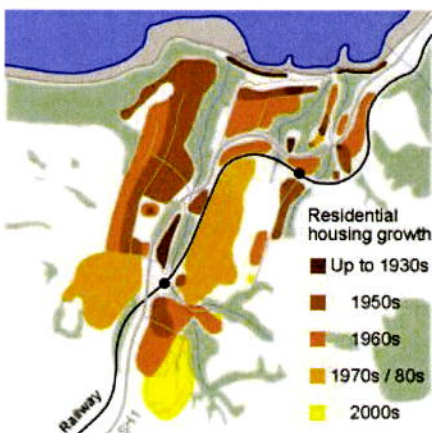


Figure 9: Residential housing growth pre-1930 to present day (PBRA)..



Figure 10: Pou Tangaroa located on the Pukerua Bay foreshore.

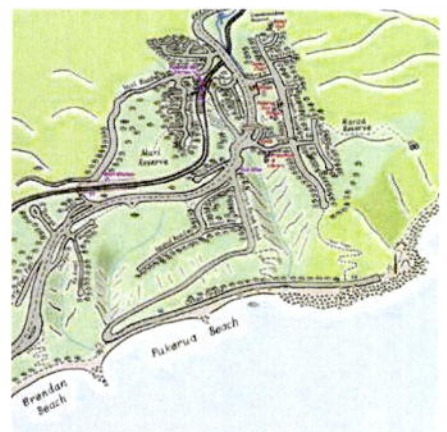


Figure 11: Current birds eye view of Pukerua Bay and amenities (PBRA).

Note: information on this page was sourced from the following website: <https://www.pukeruabay.org.nz>

SITE ANALYSIS

Site Characteristics

Site Area

The site has an area of 55ha, with the prospect of adding a further 10ha to the west.

Existing Land Use

The site is currently being used as a deer farm.

Sun Exposure

- The higher and north facing parts of the site have good sun exposure. Areas that are low and are on the South facing side of valleys will receive less sunlight.
- Generally the site is well orientated for afternoon sun due to the peaks being on the eastern side of the site.
- It is expected that the hills on the western side of SH1 will cause overshadowing to lower parts of the site when the sun is low.

Wind Exposure

The site is exposed to strong winds, especially in the eastern / higher portion of the site.

Protected Vegetation

The site has a cluster of significant vegetation that is located in the centre of the site.

Built Features

- A stone entrance feature is located at the gateway to the site
- A cluster of buildings including a Wool-shed Building are located near the entrance of the site.

Movement

A driveway runs between Stage Highway One to a large house located on the neighbouring property east of the site.



Figure 12: Deer residing at Mt Welcome Station.

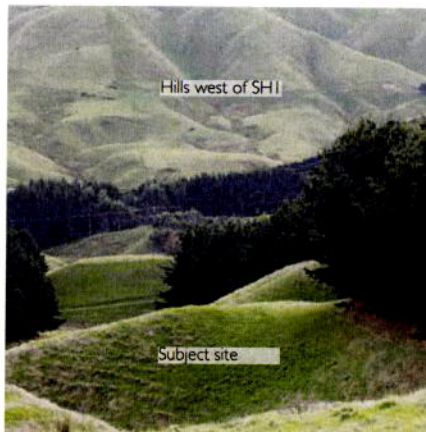


Figure 13: Photo showing the hills to the west of the site that will cause overshadowing.



Figure 14: The driveway providing access to buildings on the site.



Figure 15: Gateway to Mt Welcome Station.



Figure 16: The Wool-shed



Figure 17: There are a lot of insignificant pine trees on the site.

Topography

The site possess steadily undulating terrain throughout. The peaks that offer views out to Kapiti Island and the South Island are 130-160m above sea level, and are located on the eastern side of the site. The lowest points of the site are South-west of the site ear State Highway 1, with the lowest point being 30m above sea level.

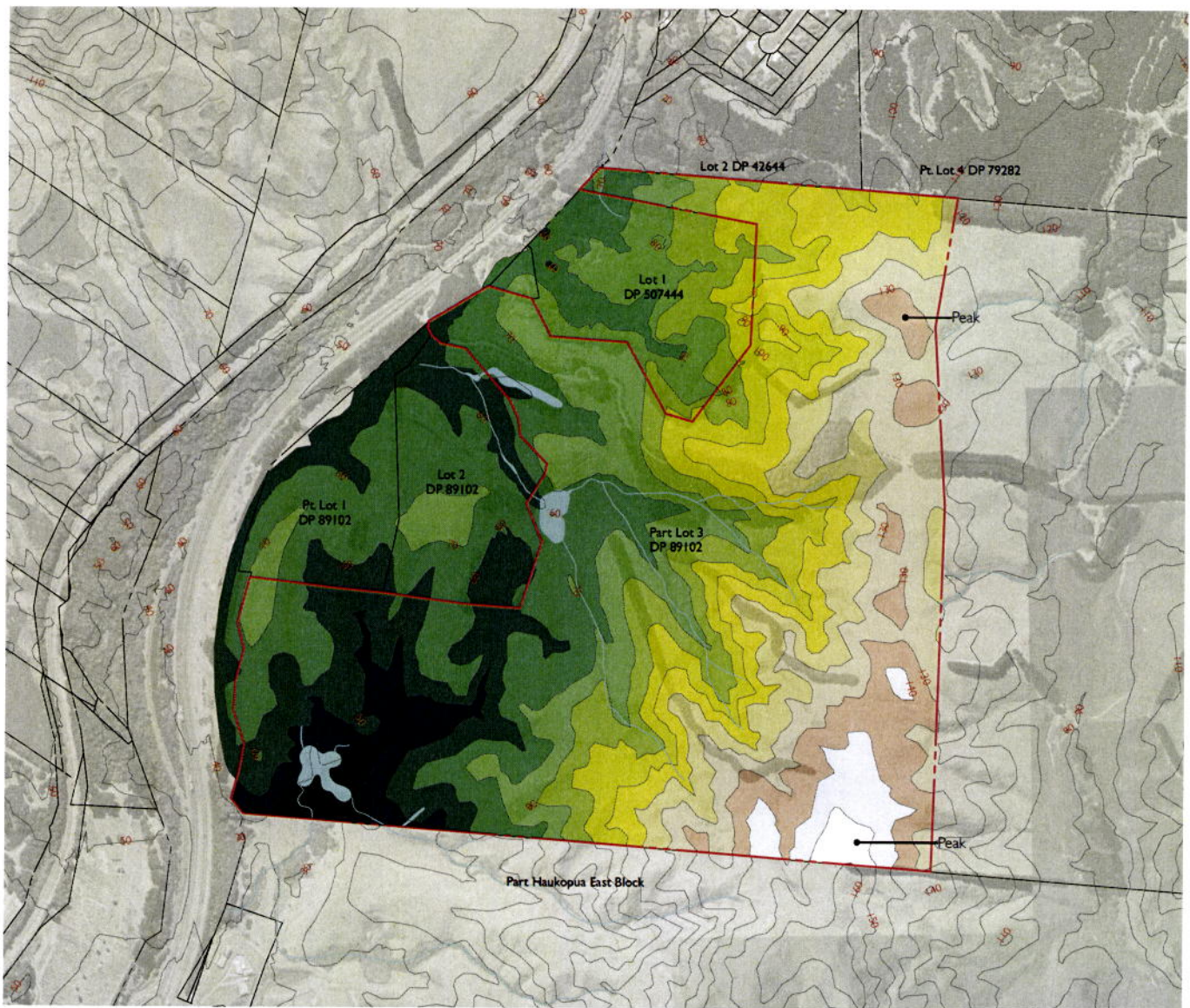
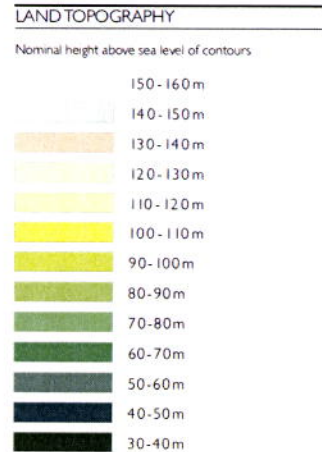


Figure 18: Contour Map (10m contours)

Existing Landscape Character

The following images capture the site's rural aesthetic and rolling landscape. The inherent features of the site are undulating landscapes, two major peaks, existing vegetation, existing built features and services, and an array of views to and from the site.



Figure 19: View from the site towards Kapiti Island

Strengths, Weaknesses, Opportunities, and Constraints

Strengths

- S1.** The site benefits from views from the high points of the site - with views out to Kapiti Island, Pukerua Bay settlement, and the South Island from the north and south eastern portion of the site.
- S2.** The site has a Significant Natural Area.
- S3.** Its close proximity to amenities: Pukerua Bay Train Station, beach, library, parks in Pukerua Bay.
- S4.** The site is on the western side of the hill - allowing good solar access in the afternoon/evening in the months that the sun is high.
- S5.** Its proximity to State Highway 1 - allowing direct access to neighbouring centres.
- S6.** Possible future development and expansion on an neighbouring property south of the site.
- S7.** Proximity to Paekakariki Escarpment Track.
- S8.** Site is designated for growth in the Porirua Growth Strategy.
- S9.** The adjacent QEII protected vegetation is likely to attract native bird life and could be attractive to overlook.
- S10.** The completion of Transmission Gully will result in the downgrade of State Highway 1.

Weaknesses

- W1.** Like most other urban areas in the city, the site's undulating topography will require retaining walls, batters, and potentially stepped buildings.
- W2.** Noise from the existing road network could possibly impact lots near the western boundary. Although this will recede over time with Transmission Gully.
- W3.** Exposed high wind zones.
- W4.** Pukerua Bay Settlement has a limited amount of retail and educational amenities.
- W5.** Hills to the west will cause overshadowing during winter.
- W6.** Access into the site is difficult, especially in peak hour traffic. SH1 currently creates severance to the existing cycle and walking tracks.

Opportunities

- O1.** There is an opportunity to implement good design to create a place that the city is proud of.
- O2.** Create pedestrian/cycle connections to the Paekakariki Escarpment Track - creating connectivity to Pukerua Bay and Plimmerton.
- O3.** Opportunity to improve access into the site from SH1.

- O4.** Opportunity to revitalise and create new wetland areas for stormwater regeneration.
- O5.** Opportunity to create a community node at the gateway of the site, featuring retail and community amenities and open space. These amenities could include a superette, a cafe, and a daycare centre.
- O6.** Opportunity to utilise valley areas as biodiversity links, public open space amenity, and pedestrian and cycle links.
- O7.** Opportunity to allow for future connectivity to adjacent sites and the future downgraded SH1.
- O8.** The greenfield site is a blank canvas for future residential development in the Porirua area which is in demand for housing.

Constraints

- C1.** Currently connectivity to SH1 is limited to one intersection due to contour constraints.
- C2.** The shape and location of the neighbouring QEII protection area will cause geometrical difficulties north of the site.
- C3.** The site's undulating topography is likely to impact the connectedness of the development.
- C4.** Location of the Significant Natural Area will have an impact on the design.

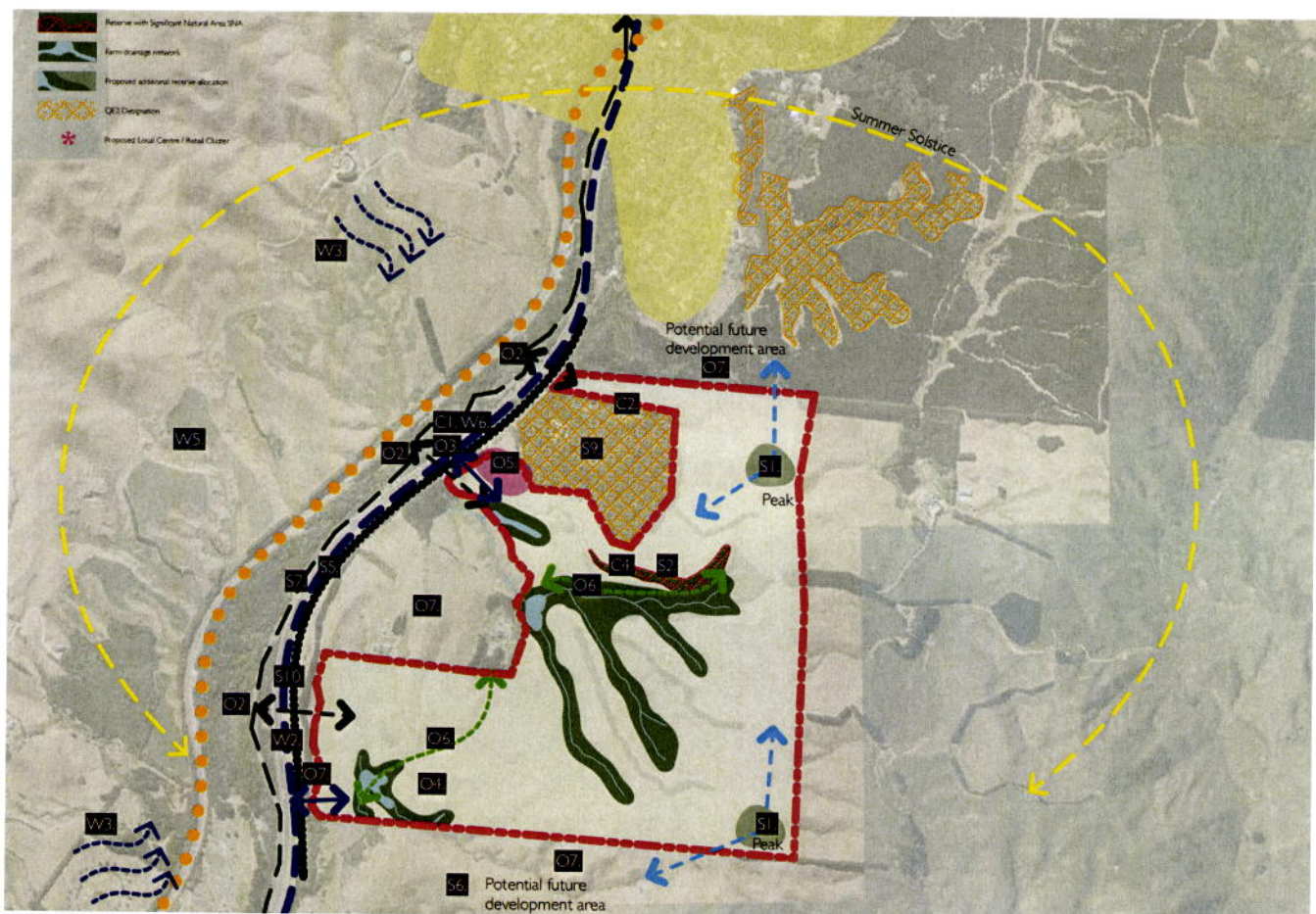


Figure 20: Strengths, Weaknesses, Opportunities, and Constraints diagram

MASTERPLAN

Vision

To create a diverse hillside community with a strong sense of place

The Pukerua Bay expansion offers an opportunity to diversify the Pukerua Bay community while also supporting Porirua's growth. The proposal will enhance Pukerua Bay through the provision of improved access to vantage points, new public green amenity, and a potential local centre with opportunity for a childcare centre. Furthermore, due to its close proximity to the Pukerua Bay train station, it will help support the catchment of existing services that connect to Wellington City.

A high quality community living environment will be achieved through well-designed modern dwellings, attractive streets, large green open spaces, and visual amenity. Following best practice place making principles the design embraces the authentic and complex landscape features of the site, shaping a unique hillside character.

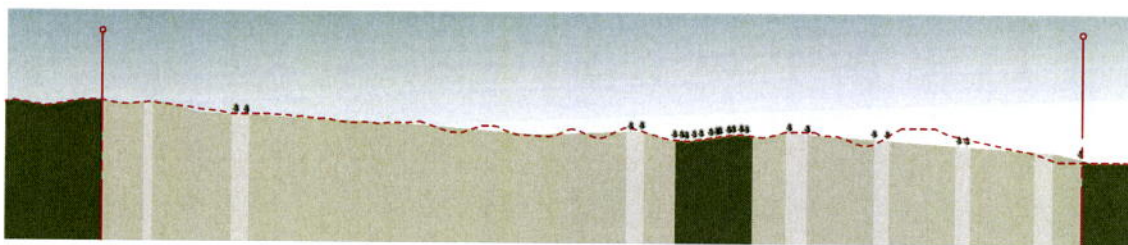
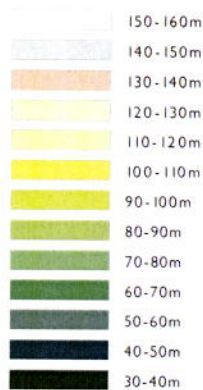


Figure 21: Illustrative Masterplan
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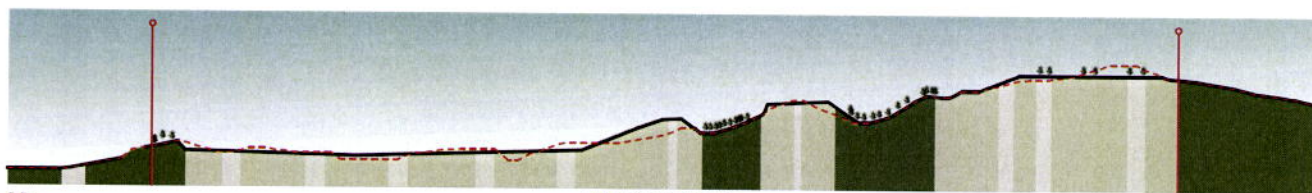
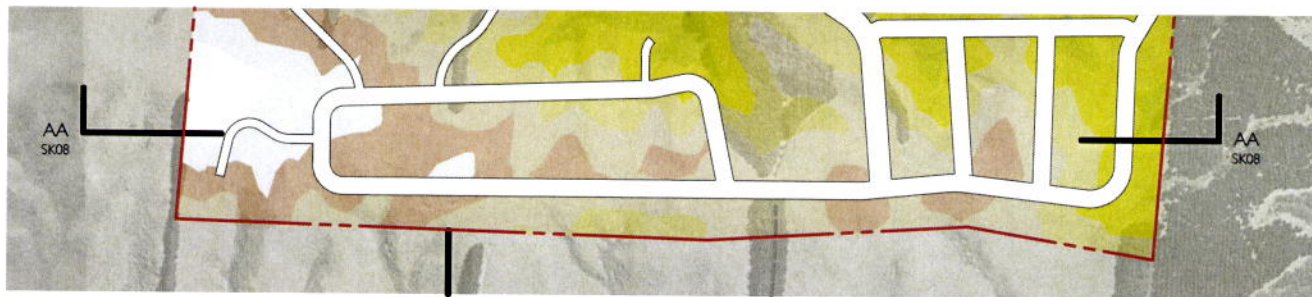


Topography Analysis and Sections Through Site

- It is proposed that the undulating terrain is adjusted in areas to create lots suitable for residential dwellings. The following sections illustrate the planned earthworks in relation to the existing contours.



AA SK08 SITE SECTION A



BB SK08 SITE SECTION B



Figure 22: Topography Analysis and Sections.



Street Sections

- A high quality street network is planned that in addition to vehicle movement allows for lot access, parking, footpaths and street trees.
- Three indicative street sections have been designed in order to create streets that serve different purposes whilst considering the needs of Porirua City Council.
 - An 18m Residential Road designed for movement and connection to the wider area. This has a 7m carriageway, 2.5m wide parking bays, and 1.8m footpaths.
 - A 16m Residential Road designed for access to lots. This has a 6m carriageway, 2.2m wide parking bays, and 1.8m footpaths.
 - An 8m Residential Road designed for slow movement and access - pedestrians, cyclists, and vehicles share the 5.8m carriageway.

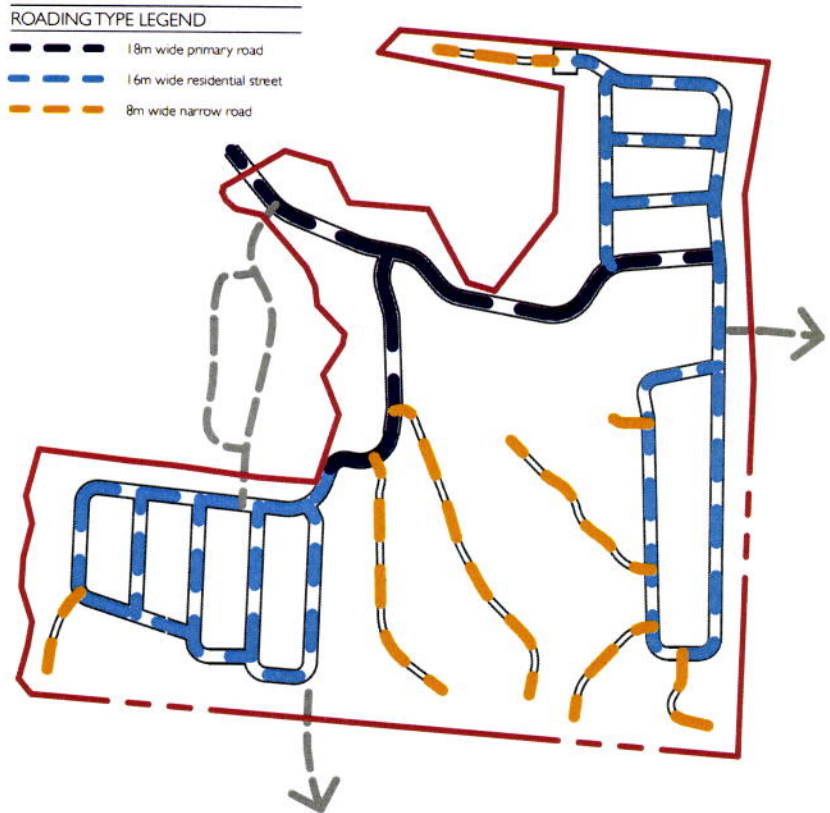
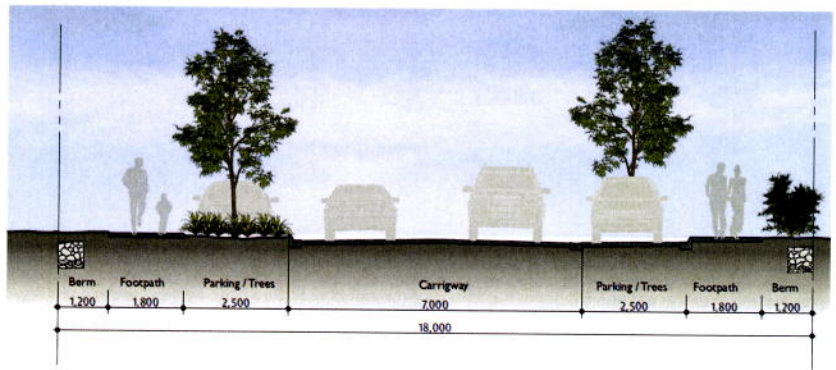
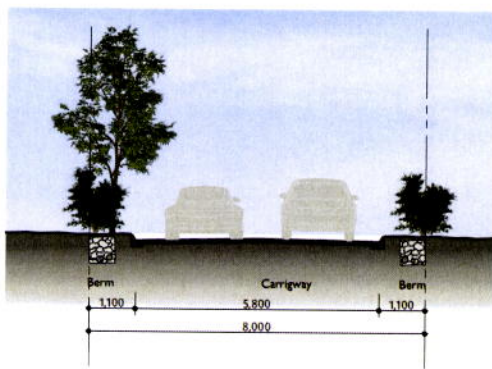


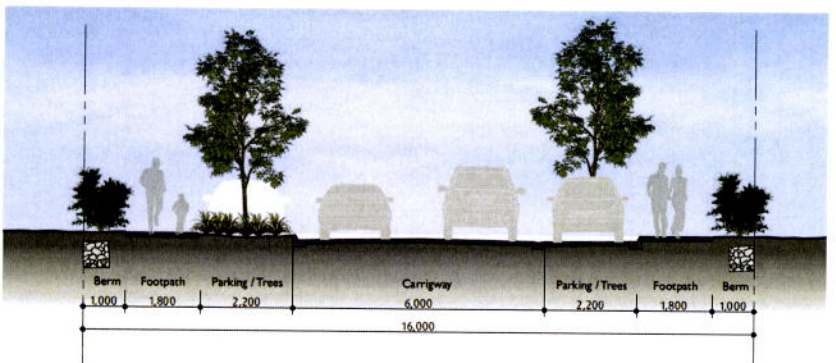
Figure 24: Street Hierarchy Plan



18m Residential Road



8m Residential Road



16m Residential Road

Figure 23: Street Cross Sections



DESIGN RATIONALE

Design Principles

Alignment with the Porirua Growth Strategy 2048

This proposal aligns with the city's six growth principles. The key design considerations are:

Tahi: a diverse and inclusive city:

The proposal includes a wide variety of lot sizes to suit different budgets and lifestyles.

Rua: a harbour-centred city

There are vantage points for views to Pukerua Bay and there is the potential for an underpass for cyclists and pedestrians to access the Paekakariki Escarpment Track that provides access to Pukerua Bay.

Toru: a compact and liveable city

The development is located within land that is identified as a New Residential Area under the Porirua Growth Strategy. The site is at the edge of the Pukerua Bay community, ensuring new residents have easy access to a wide range of amenities including a train station.

Wha: a connected and active city

The proposal includes a logical street network that is connected where possible. The extensive open space network provides public areas where residents have the opportunity to be active.

Rima: a city of opportunities and prosperity

The proposal includes a potential cluster of retail and community amenities that give opportunities for employment and to service the neighbourhood.

Ono: a resilient city.

Understanding and embracing the topographical constraints of the site to ensure development is on stable land that is suitable for dwellings.



Figure 25: Plan highlighting the city's six growth principles

Design Rationale Diagrams

Building on the vision and design principles, a series of design rationale diagrams have been created to explain the proposed masterplan.

Green Network

- Areas that include protected vegetation will be preserved to maintain biodiversity habitats and links.
- Public open space areas in the form of green fingers are located along valleys and adjacent to protected vegetation to retain existing green character and encourage recreational activity.

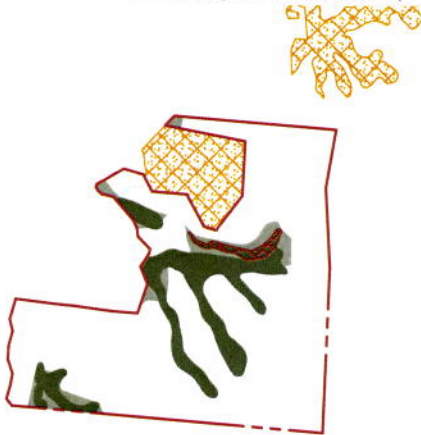


Figure 26: Proposed green network

Blue Network

- Existing water bodies that follow the valleys across the site, where appropriate, will be regenerated within natural amenity areas alongside pedestrian links in accordance with the ecology report.
- Two stormwater ponds are proposed.

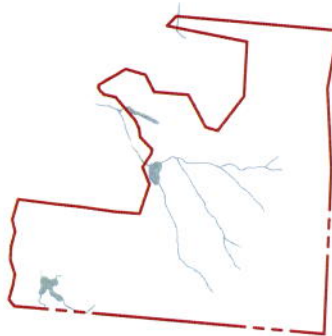


Figure 27: Proposed blue network

Street Network

- Access to the site is provided solely from one entrance from State Highway 1.
- Two primary roads will provide connection within the site.
- Secondary roads loop and connect to primary roads to provide access to lots.
- Tertiary routes follow ridgelines of steep topography.

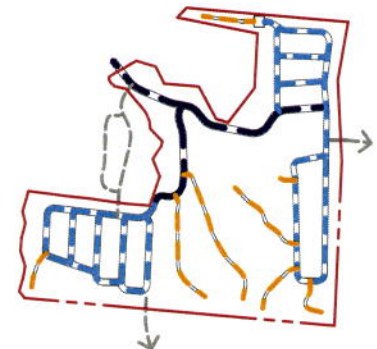


Figure 28: Proposed street network

Pedestrian Links

- Pedestrian links connecting green amenity areas and focal points will provide safe, accessible and attractive routes to the local node, vantage point, and public green open spaces.
- Pedestrians / cyclists are envisioned to have access to both the street and green network for additional connectivity.

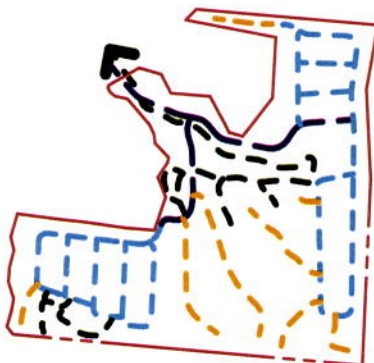


Figure 29: Proposed pedestrian links

Land Use

The bulk of this development has been proposed to be residential because:

- Porirua has a housing shortage
- It is near to an existing settlement with public transport connections and access to amenities.
- The reasonably steep site is more suited to residential lots than other uses.
- High amenity area – residential zoning will mean more people will be able to enjoy the site features i.e. views, landscape component.
- The development consist of 500 lots. The western end of the site is more gentle in topography in comparison to the remainder of the site, therefore it has been allocated higher density lots.



Figure 30: Proposed land use plan

Views and Vistas

- With the intention of embracing the site's natural strength, this scheme has been carefully considered to ensure the public has access to the extensive views from the site. Due to the complexity of the sites landscape, streets connect to the major peaks in a way that is logical for the contours. Key views are towards Kapiti Island, Pukerua Bay, and the South Island.

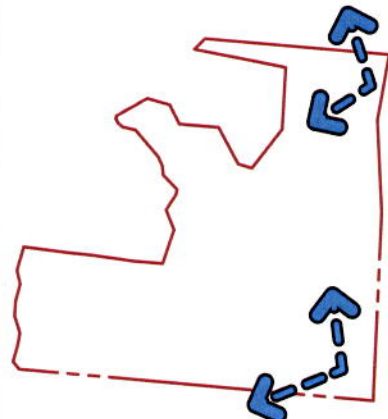


Figure 31: Views and vistas

Character Precincts

Due to the scale and varied typography of this proposal, the development has been broken up into character precincts. These include the Community node, suburban living, and hillside living

A. Community node

A community node can be located at the entrance of the development. It is an ideal location due to its visibility from State Highway 1 which will be important for retail uses as it will form a potentially vibrant and sustainable community focal point. It will also help with wayfinding by acting as a gateway to the development.

Being within the gateway of the site, it is appropriate that this area supports a small amount of commercial activities which will benefit the local community. These activities could be a superette store, a daycare centre to support young families, and a local cafe facing reserve areas which can facilitate a gathering space for residents. These buildings should reflect contemporary architectural characteristics in material treatment and design detailing, to maintain a cohesive streetscape.

B. Suburban living

This precinct can inherit a suburban character that is typical for new developments in New Zealand. The design should aim to have a contemporary aesthetic that includes strong roof forms, simplicity in design, articulated front facades, and engagement with the street.

- Front yards should be designed for street appeal and passive surveillance between dwellings and the street.
- The majority of this precinct will be in the traditional front to street / back to back pattern in order to have a clear definition between private and public.

C. Hillside living

This precinct will have residential lots nestled into the terrain with pockets of indigenous bush throughout. Made up of large sites with challenging topography, this precinct will have varied building forms with materiality and colour palettes that have a recessive/natural aesthetic that the site possessed prior to its development.

- The architecture and landscape design should be inspired by elements commonly found in the countryside including, sheds, cottages, post and rail with wire mesh fences, and greenery.
- Many sites will have a direct interface to green open spaces that will could be planted alongside black post and rail fencing with black wire mesh. These could be developed as part of a wider arrangement with design guidelines and a residents association.

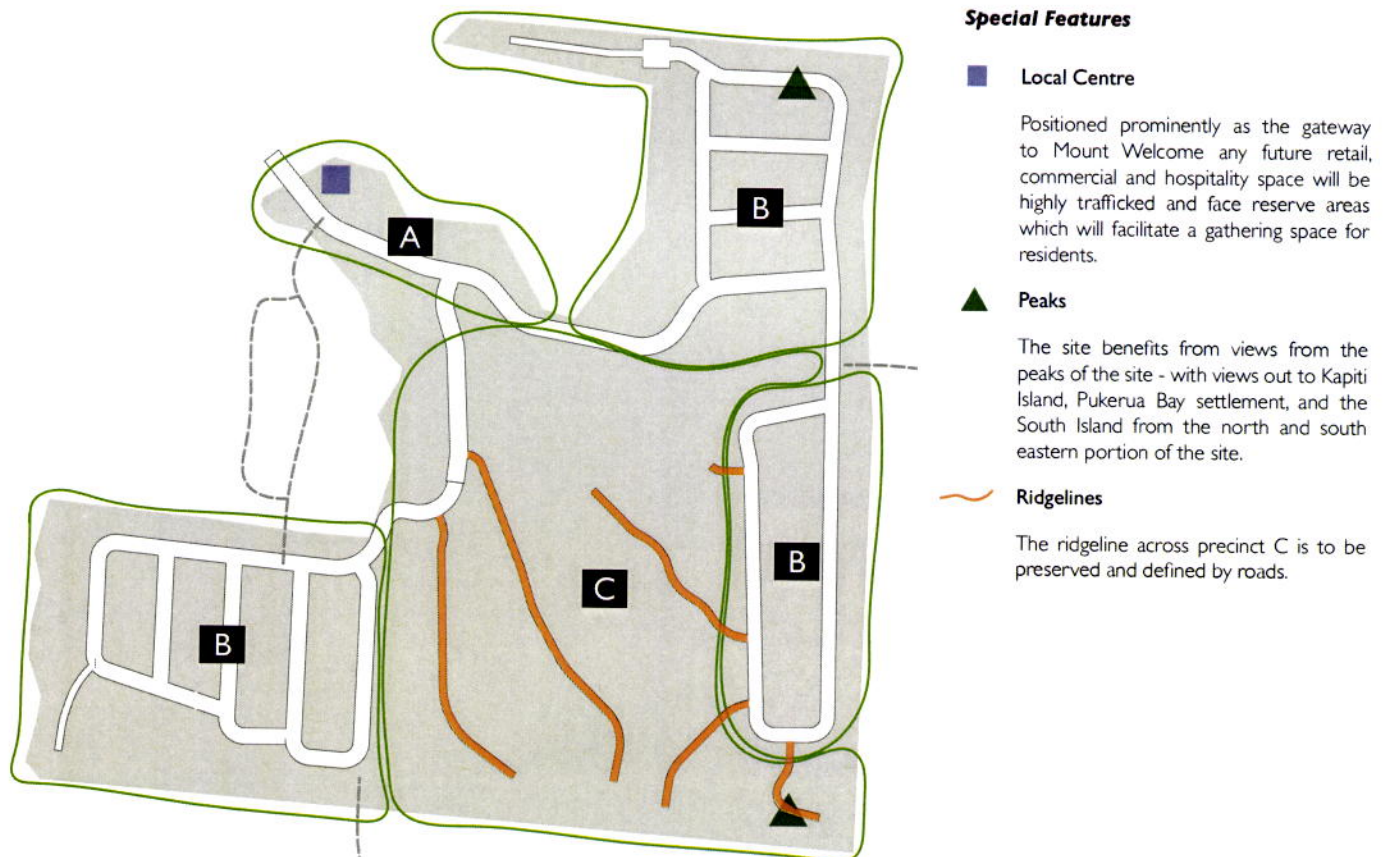


Figure 32: Proposed Character Precincts.

ARCHITECTURAL CHARACTER

Built Form Aesthetic

Although not imperative given the greenfield nature of the site, it is recommended that buildings in Mt Welcome are designed under the guidance of a Design Guideline that includes the following:

A. Focal point (community node)

- Mix of natural and dominant colours.
- Active and engaging front facades.
- Connection to public open space.
- Contemporary architectural characteristics.

B. Simplicity in design (suburban living)

- Strong roof forms such as gabled or single pitch.
- Simplify by grouping/arranging elements together vertically.
- Push and pull the form to create depth.
- Use contrast in colour and materiality to enhance the sense of depth.



Figure 39: Community node: natural material palette with connection to the outdoors.

C. Recessive/natural style (hillside living)

- Form influenced by the landscape
- Strong roof forms such as gabled or single pitch.
- Using traditional and rustic cladding materials including weatherboards, stained timber, stone and bricks.
- Using natural and recessive colour palette with contrasting features.

Connection to the outdoors (all precincts)

- Include plenty of windows
- Indoor/outdoor flow
- Prefer planted batters over retaining walls
- Black post and rail fencing with black wire mesh will be utilized at the interface between the edges of green fingers and backs of properties for continuity and passive surveillance.



Figure 40: Community node: childcare centre in a dominant colour, connection to the outdoors.



Figure 41: Black post and rail fencing with black wire mesh between green fingers and properties.

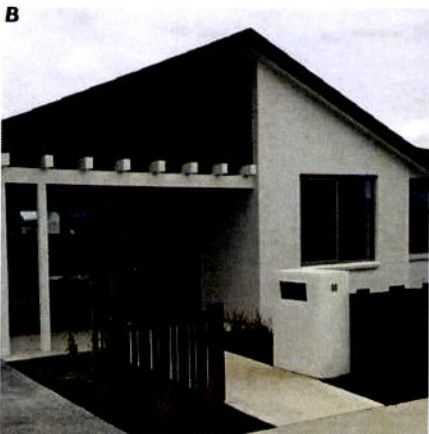


Figure 33: Suburban living: gabled roof, depth in facade, simple window configuration, contrast in colour



Figure 34: Suburban living: cross-gabled roof, depth in facade, recessed garage, vertical lines accentuated



Figure 35: Suburban living: double storey home with simple but bold geometrical forms, contrast, and depth.



Figure 36: Hillside living: gabled roof, materiality inspired by countryside, muted colours.



Figure 37: Hillside living: gabled roof, home nestled into the slope - cladding has a rustic aesthetic

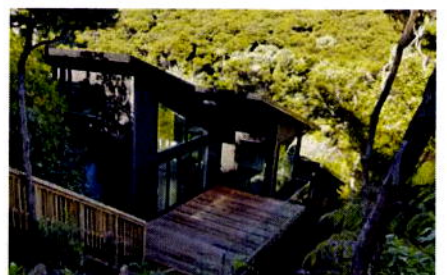


Figure 38: Hillside living: single pitch roof, recessive colour, nestled into the hill overlooking greenery

RECOMMENDATIONS

Future Considerations

This urban design report recognizes that this a conceptual masterplan that illustrates that residential development can occur on the subject site despite the site's natural challenges and varied landscape. The plan is at an early stage in the design process. At an appropriate stage more design work will need to occur before the masterplan captures all of the principles of urban design best practice.

Connectivity

Connectivity is a fundamental urban design principle – ideally a development will give residents choice in what direction they travel, and will provide connections to future neighbouring developments. In regards to the current plan, there is potentially a few more opportunities for road linkages and it is recommended that the intersection into Mt Welcome is designed to make the site more accessible for pedestrians, cyclists, and vehicles from all directions at all times of the day.

Urban structure – fronts and backs

Residential lots should have their fronts facing public spaces such as streets and reserves, and their backs facing other backs of properties. This is for visual amenity, privacy, and CPTED reasons. As this is a core urban design principle, it is recommended that future design work focuses on achieving this principle where the terrain makes it possible. The interface between public open space and backs of lots, recommend that post and rail with wire mesh fencing is used alongside high quality landscaping and hedging.

Urban structure – block depths

Ideally all lots are front lots, where individual dwellings can interact with the public street with activities in semi-public front yards, and visual surveillance from

street-facing habitable rooms. With challenging contours, it is very difficult to achieve on this site. However; this report recommends that rear lots are avoided where possible.

CPTED

Safety is a key consideration, especially in regards to public green spaces. Reserves should have maximum surveillance and public movement. In regards to the current plan, there are a few reserves that could benefit from additional thought. Crime prevention through environmental design principles need to be applied to all public open spaces and pedestrian pathways.

Lot testing

This plan is at conceptual stage of the design process; thus it has not been appropriate to assess individual lots under a microscope. It is recommended that detailed site lot testing is introduced as early as possible to ensure the residential development is viable in areas with challenging topography. It can also have an influence on block depths and the street network.

Design guidelines

Architectural design guidelines are recommended for all precincts. This will ensure a high level of consistency throughout the development.



Figure 42: Suburban streetscape with fronts of housing fronting the street with large windows for passive surveillance.

Conclusion

This Urban Design Report for Mt Welcome has set out the layers of thinking behind the illustrative masterplan. It has also made recommendations about how the plan can develop as the design progresses. The masterplan sets out to achieve the vision "to create a diverse hillside community with a strong sense of place". The following summarizes the benefits this proposal will bring to the wider context. Going forward, key recommendations have been summarized and listed.

Housing

- Approximately 500 new homes on varied lot sizes for a diverse community - this will be a crucial addition to the existing housing shortage.

An attractive / well-designed community

- Accessible recreational spaces and public open spaces.
- A design which is sensitive to the site's topographical challenges.
- Retention of existing vegetation with special characteristics.
- A proposed community node providing an alternative to what is currently on offer.

Connections

- Pedestrian and cycle links between the Paekakariki Escarpment Track and site's features via an underpass.
- Visual connections from peaks for new vistas out to Pukerua Bay, Kapiti Island, and the South Island.

Wider Social and Economic Benefits

- Increased expenditure in Pukerua Bay and other nearby centres from the new resident population.
- Increased employment opportunities through construction, maintaining the completed housing stock, and from the community node.

Key recommendations

- Create a connected street network where the topography allows, and enable future connections to neighbouring developments.
- Focus on creating a successful community node with a prominent location, quality landscaping treatment, car parking, and an attractive streetscape.
- Connect to the Paekakariki Escarpment Track via a pedestrian/cyclist link. Alternatively focus the design of the intersection with SH1 to allow for the safe crossing of pedestrians and cyclists to the track on the western side.
- Locate density adjacent to amenity.
- Structure residential blocks so fronts of dwellings face the public realm, and their backs face the backs of adjacent residential properties.
- Avoid rear lots where possible.
- Add special design elements in key areas to create a sense of place.
- Ensure the public has access to key vistas.
- Provision for kids play areas in parks.
- Rules in place to ensure the interface between housing and reserves meets CPTED requirements and best practice urban design expectations.
- Prepare a detailed landscape plan for riparian reserves and storm water ponds (these should have a natural aesthetic).
- Lot testing should be carried out to ensure lots are appropriately sized.
- Create a design guideline document to guide residential quality and style. This could include rules on retaining walls i.e. walls over to 1.5m high must have a built-in planter box in front of it that is 400-800mm high.

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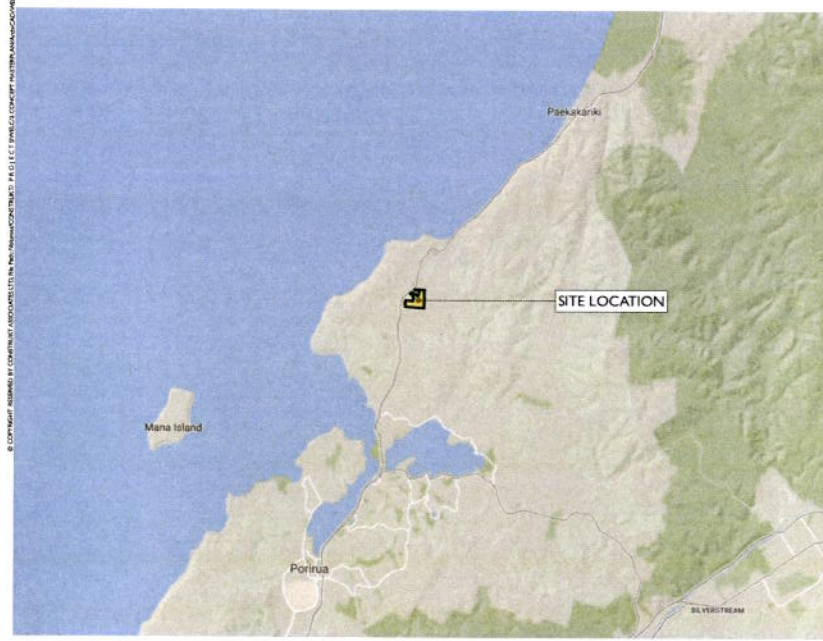
MASTERPLAN		PUBLISHED	REV
LAYOUT			
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SKD2	SITE SWOC	☑	C
SKD3	SITE TOPOGRAPHY ANALYSIS	☑	C
SKD4	CONCEPT MASTERPLAN	☑	D
SKD5	ROADING LAYOUT	☑	C
SKD6	ROAD SECTIONS	☑	C
SKD7	CONCEPT CHARACTER PREINCT	☑	B
SKD8	SITE TOPOGRAPHY SECTIONS	☑	B

MT WELCOME STATION

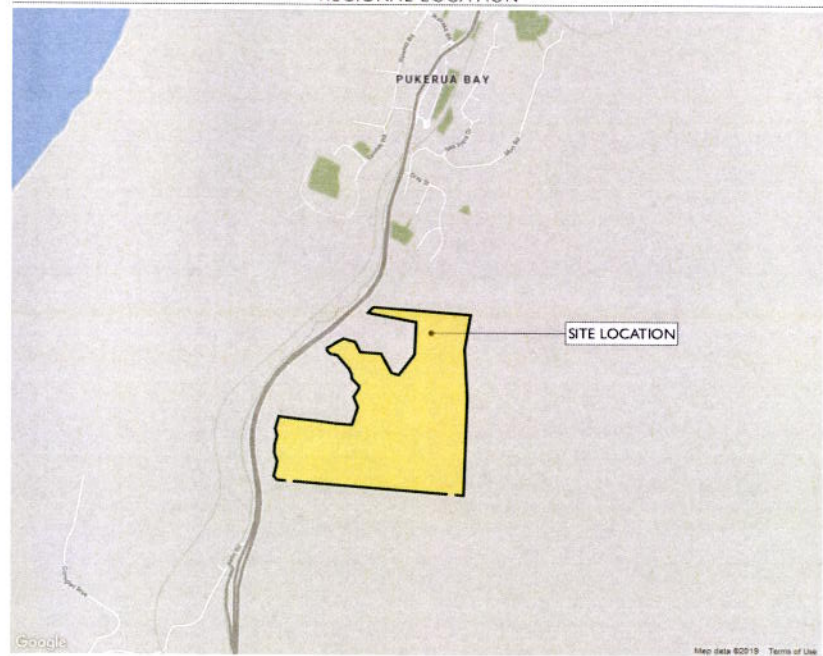
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Friday, 30 August 2019



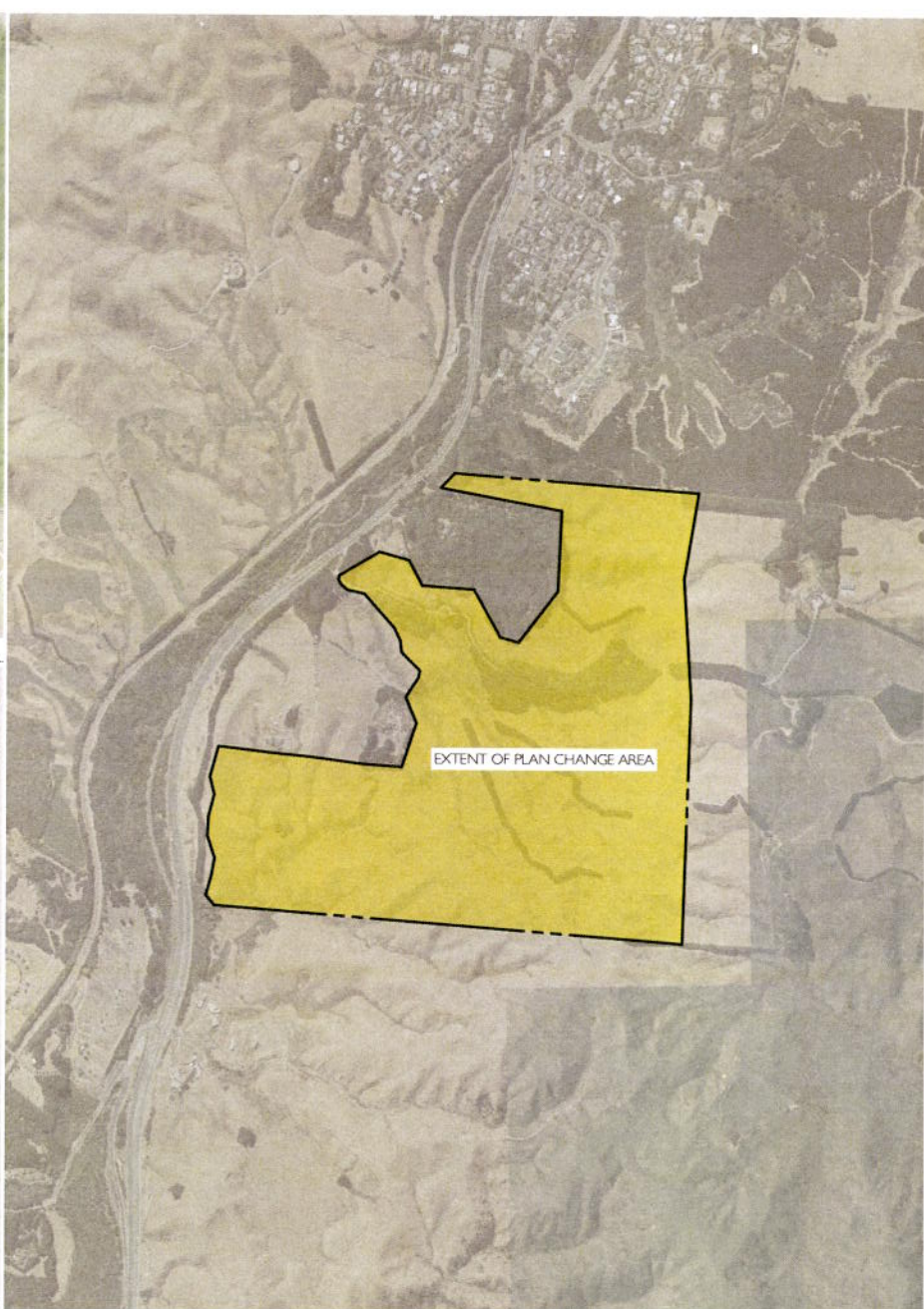
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1 REGIONAL LOCATION



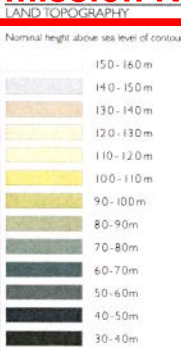
2 LOCAL AREA LOCATION

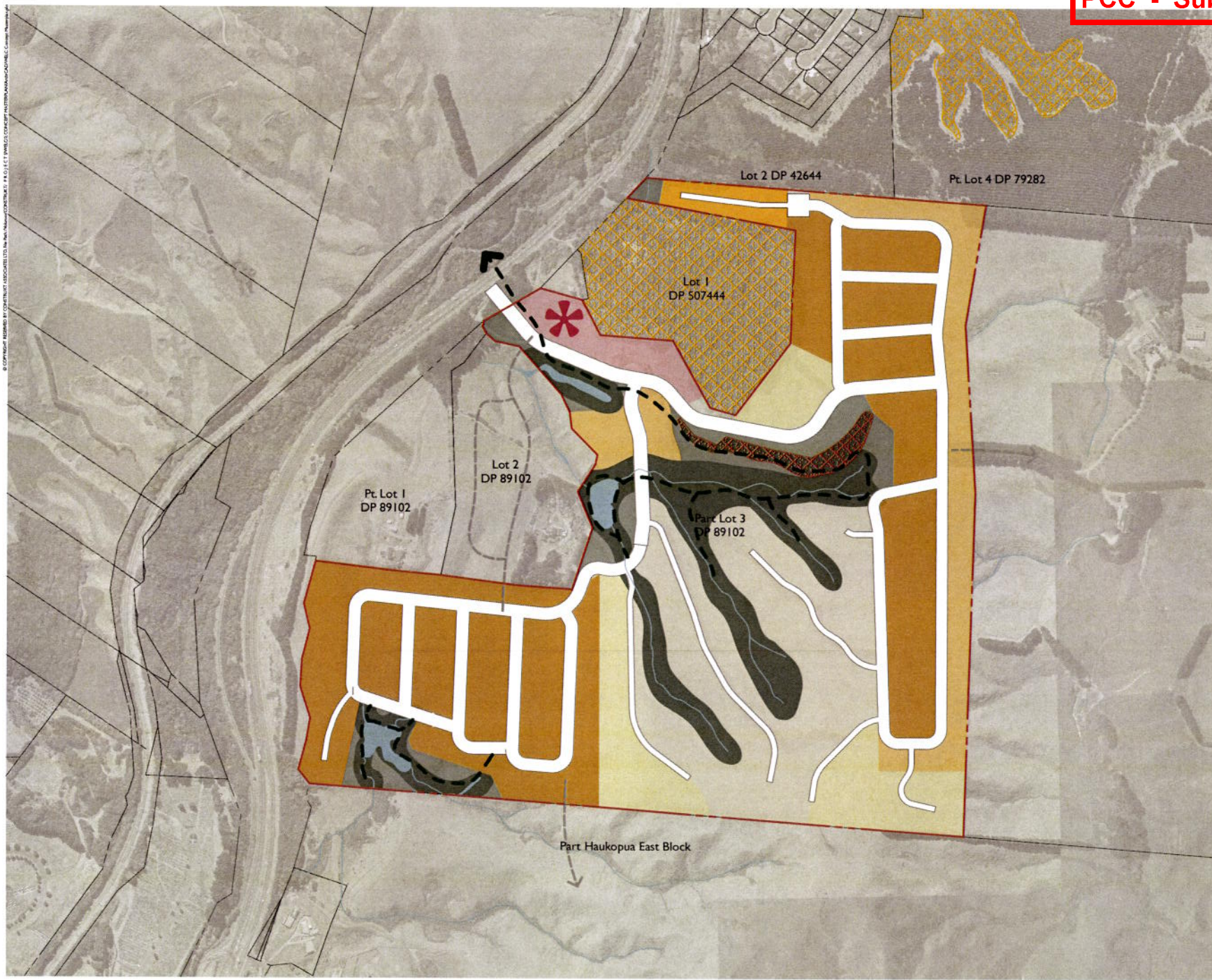


3 SITE LOCATION PLAN

SITE ASSESSMENT	
Legal description:	Part Lot 3 DP 89102
Address:	422 State Highway 1, Pukerua Bay Porirua
Site Area:	551,750m ²
Zone:	Current: Rural Zone Proposed: Residential Zone

DEVELOPMENT DESCRIPTION	
Medium Density Housing Development	
Large Lot Housing Development	





LEGEND

SITE ASSESSMENT

Legal description:	Part Lot 3 DP 89102
Address:	422 State Highway 1, Pukerua Bay Portua
Site Area:	551,750m ²
Zone:	Current: Rural Zone Proposed: Residential Zone

DEVELOPMENT DESCRIPTION

Medium Density Housing Development
Large Lot Housing Development

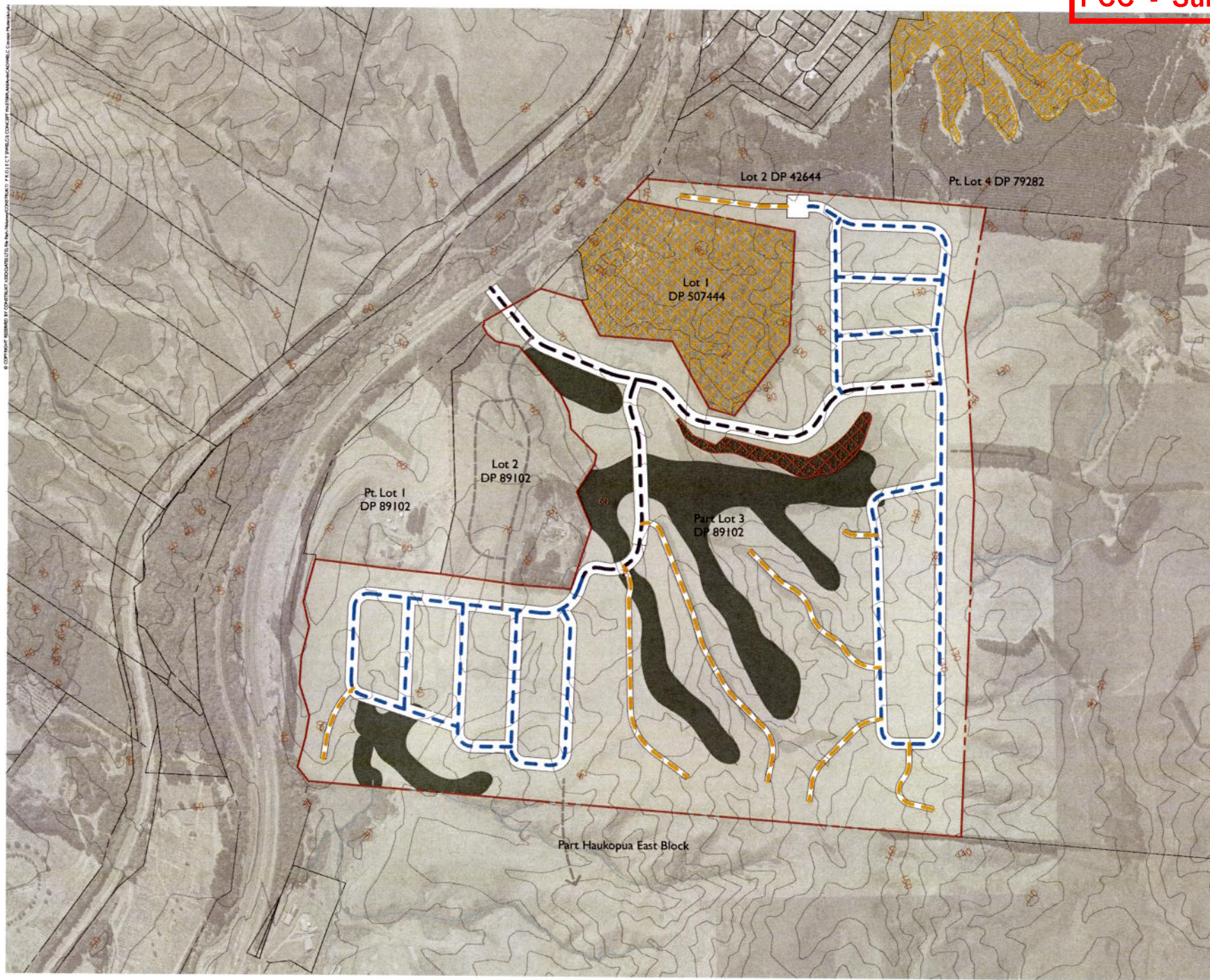
PUBLIC

- Extent of landholding
- Proposed roading location
- Proposed pedestrian link
- Reserve with Significant Natural Area SNA
- Farm drainage network
- Proposed additional reserve allocation
- QE2 Designation
- Proposed Local Centre / Retail Cluster

YIELD

Hillside Living - Large Block Residential			
~2000m ² + Sites	~ 30 sites	6%	
~1000m ² Sites	~ 30 sites	6%	
Suburban Living - Regular Block Residential			
~600-850m ² Sites	~ 50 sites	10%	
~450m ² Sites	~340 sites	68%	
~325m ² Sites	~ 20 sites	4%	
Community Node - Mixed use area (~>50% Residential)			
~300m ² Sites	~ 30 sites	6%	
Total	~500 Sites		

- NOTES**
- Refer to Civil Engineer's documents for:
 - all earthworks details
 - details of additional public infrastructure
 - Refer to the Urban Design Report for precinct zone details



SITE ASSESSMENT

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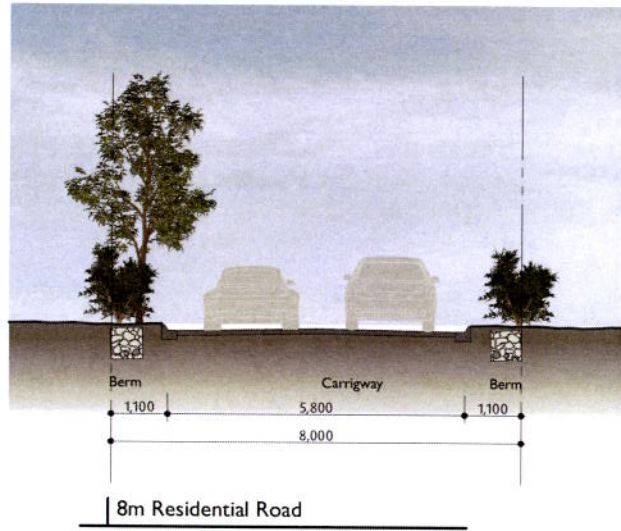
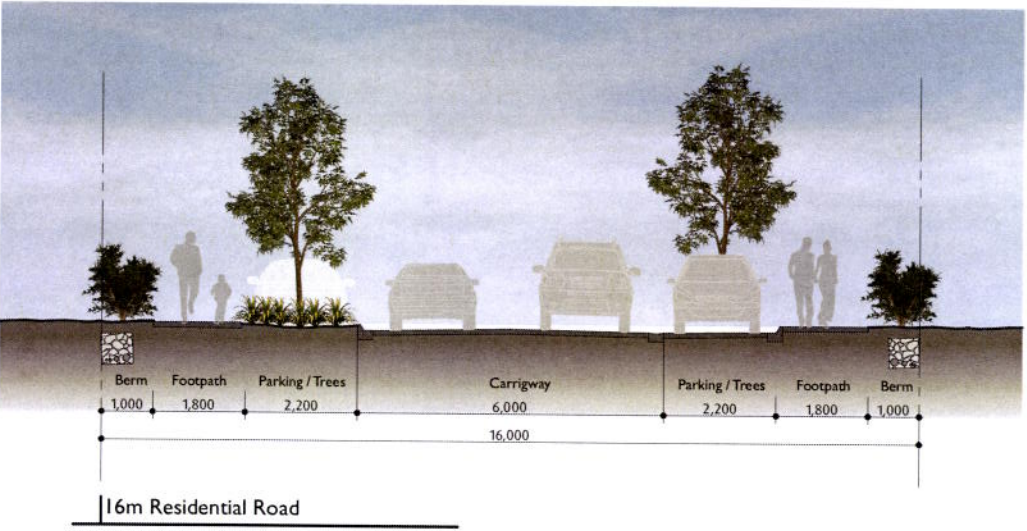
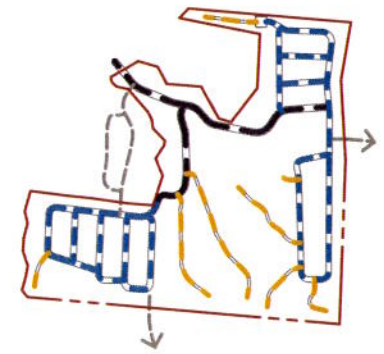
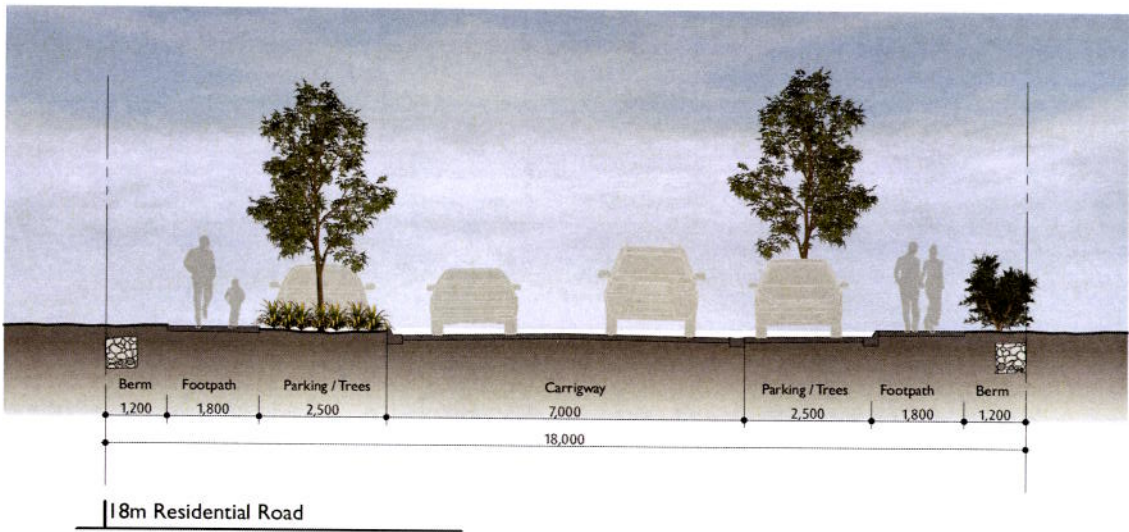
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Large Lot Housing Development

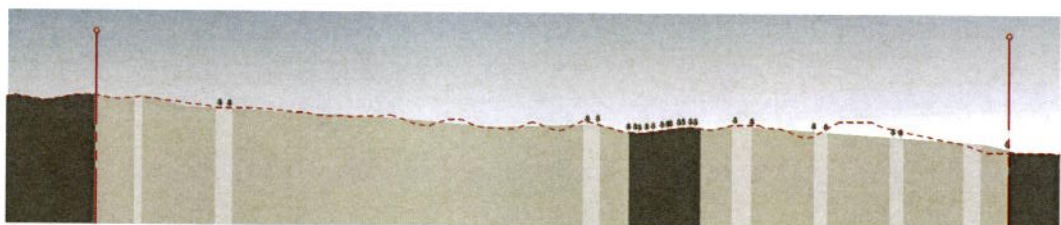
- PUBLIC**
- Extent of landholding
 - Proposed roading location
 - Proposed pedestrian link
 - Reserve with Significant Natural Area SNA
 - Farm drainage network
 - Proposed additional reserve allocation
 - QE2 Designation
 - Proposed Local Centre / Retail Cluster

- ROADING TYPE LEGEND**
- 18m wide primary road
 - 16m wide residential street
 - 8m wide narrow road

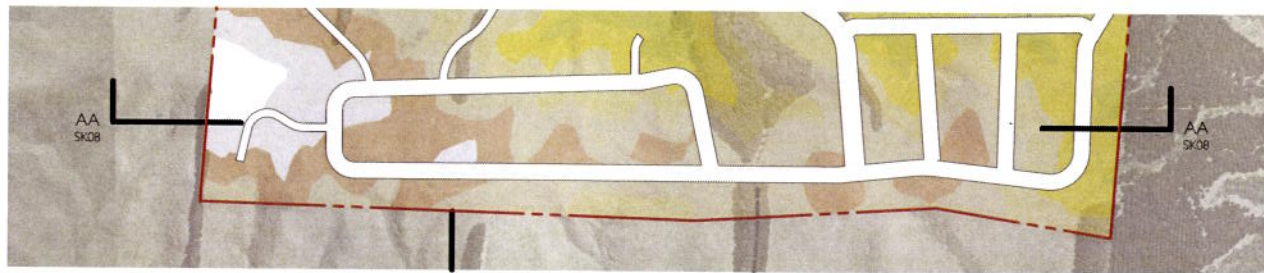
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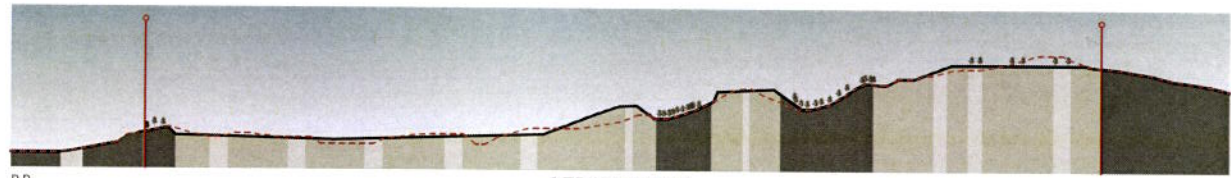


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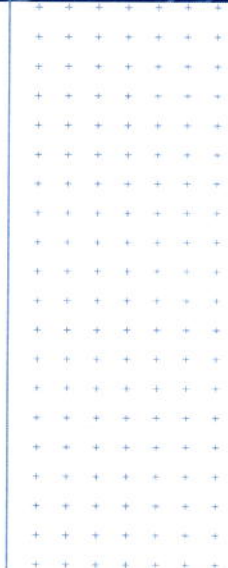
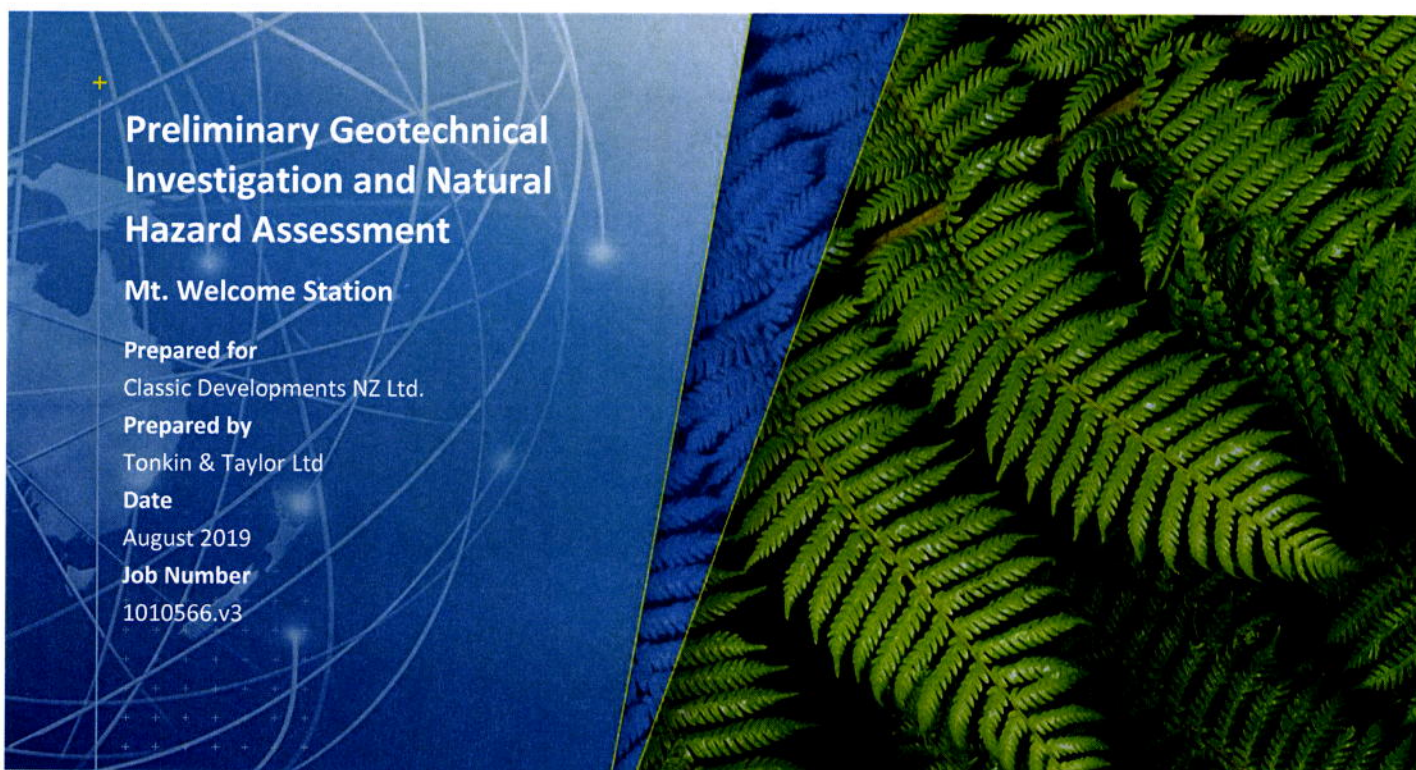
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SITE GRADIENT ANALYSIS KEY



APPENDIX 2



Exceptional thinking together

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Document Control

Title: Preliminary Geotechnical Investigation and Natural Hazard Assessment					
Date	Version	Description	Prepared by:	Reviewed by:	Authorised by:
7/6/2019	1	Draft report	TH	NCP	CJHH
30/7/2019	2	Draft report v2	TH	NCP	CJHH
22/8/2019	3	Final report v3	TH	NCP	CJHH

Distribution:

Classic Developments NZ Ltd.	1
Tonkin & Taylor Ltd (FILE)	1

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Appendix C :	Natural hazard assessment	
Appendix D :	Definition of fill types	

1 Introduction

Tonkin & Taylor Ltd (T+T) was engaged by Classic Developments NZ Ltd. to conduct a preliminary geotechnical investigation and a natural hazard assessment at the Mt. Welcome Station, Porirua.

The investigation and hazard assessment was undertaken to support plan changes application (from rural to residential) that Porirua City Council (PCC) intends to make to its District Plan.

Geotechnical services were provided in accordance with Phase 1 of our proposal¹.

2 Scope of work

The following scope of work has been completed:

- Desktop assessment to identify potential geotechnical constraints to the development, inform potential risks and to identify areas to target field investigations. The assessment included review of historic and recent aerial photographs, topographic data, NZ Geotechnical Database and published geological information;
- Preliminary field mapping of geological, geomorphic and hydrological features to gather information of the ground conditions and specific natural hazards;
- Subsurface investigation including test pits at strategic locations across the site, in-situ strength testing using dynamic cone penetrometers and shear vane;
- Laboratory testing to provide a general understanding of the soil properties encountered;
- Natural hazard assessment to address the Resource Management Act framework for potential hazard identification;
- Commentary on the material types across the site, including:
 - Assessment of suitability for use as fill for residential development; and
 - Preliminary assessment for cut slopes for residential development.

This report details the results of the geotechnical investigation, natural hazard assessment and geotechnical considerations.

¹ Tonkin & Taylor Ltd (April 2019), Proposal for Geotechnical Investigations and Natural Hazard Assessment.
Job Ref: 1010566.

2

3 Site summary

Mt. Welcome Station (422 State Highway 1, Pukerua Bay) is located south of Pukerua Bay, Porirua and immediately east of State Highway 1.

The proposed area for development is approximately 55 ha (0.55 km²) and located on elevated, west-facing slopes. The land is moderately steep to steep (20° to 45°), undulating hillside topography. A north-south orientated main ridge marks the eastern extent of the site, and is the highest area of the development (between 120 and 150 m RL). The south west corner of the site is the lowest area (between 30 and 40 m RL). A number of west trending gullies form both narrow and broad ridge features. Some gullies are deep with up to 50 m vertical relief, and saturated ground is typically found at the base of these gullies and in low lying areas.

Access to the site is from State Highway 1 along a farm track cut into the slope and climbs up to the main ridge and the eastern extent. Several small dwellings and sheds are located within the site adjacent to the main entrance. The site is currently used for deer grazing with localised cover of established pine trees functioning as a shelter belt along some ridges.



Figure 3.1: Aerial view looking north across Mt. Welcome Station toward Pukerua Bay.

4 Proposed development

According to the Indicative Land Use Plan (included in Appendix A), the proposed residential development can be divided into the following groups:

Development ID	Lots	Lot size	Additional notes
1	40	2000 m ²	Primary access and high value
2	35	1000 m ²	Large Block Residential
3	80	600-850 m ²	Regular Block Residential
4	345	450 m ²	Regular Block Residential
5	20	325 m ²	Regular Block Residential
6	30	300 m ²	Mixed use
Reserve	-	-	Reserve

Approximately 5.0 km of carriageways connect the proposed land areas. **No earthworks plan detailing the proposed cut and fill levels is available at the time of writing this report.** T+T understands the layout is indicative. The final layout will be determined at the next phase of investigation (subdivision and land use consent).

5 Geotechnical investigations

Geotechnical investigations were carried out at the project site on 9, 16 and 17 May 2019. The investigations comprised:

- Preliminary field mapping;
- 25 test pits up to 5.6 m depth;
- 9 dynamic cone penetrometer (DCP) tests; and
- Laboratory testing of select samples.

5.1 Preliminary field mapping

The mapping of geological, geomorphic and hydrological features was conducted to gain an understanding of site geology, natural hazards, topographic variation, geotechnical constraints and considerations relevant to the proposed development. This was completed by a Senior and Intermediate T+T Engineering Geologists on 8 May 2019.

The results of the observations and measurements are presented on Figure B1 and Table B1 in Appendix B.

5.2 Test pits and dynamic cone penetrometer tests

The excavation of test pits and dynamic cone penetrometer tests (DCP) were conducted to gain an understanding of the subsurface conditions and in particular, the thickness of the cover deposits at strategic locations across the site.

The excavation of twenty five (TP01 – TP25) test pits was undertaken by Goodman Contractors Ltd. on 16 and 17 May 2019, under the supervision of a T+T engineering geologist. In all cases, the test pits were taken to either a maximum depth achievable or 'refusal' which occurred due to encountering rock. The ability to excavate the overburden soils was noted by the engineering geologist and the test pits were logged to NZGS 'Field Description of Soil and Rock' guidelines.

Nine DCP (SC01 – SC04, TP01 – TP06, TP09, TP11 and TP12) tests were undertaken by an engineering geologist on 16 and 17 May 2019. Some DCP tests were conducted at the test pit excavation location. In all cases the Scala penetrometer tests were taken to 'refusal' which occurred due to the cone terminating on or within a hard, impenetrable strata.

Actual investigation locations were selected by T+T with consideration of value and accessibility.

The locations of the investigations were surveyed by hand held GPS and are presented on Figure 1 attached in Appendix B. A summary of results is presented on Table B2 in Appendix B. Test pit and DCP logs are presented in Appendix B.

5.3 Laboratory Testing

Small soil samples were collected from test pit excavations. The samples were tested at the Geotechnics Ltd. laboratory for determination of the moisture content, Atterberg limits (soil behaviour relating to moisture content) and particle size distribution. The tests were undertaken in

4

accordance with NZ4402 to gain a general understanding of the engineering properties for suitability for use as fill during construction. Further laboratory testing is expected during detailed design.

Results of the laboratory testing are summarised in Table 5.1 below, and a full laboratory report is presented in Appendix B.

Table 5.1: Geotechnical testing summary

Borehole No.	Sample Depth (m)	Moisture Content (%)	Atterberg Limits			Particle Size Distribution (%)		
			LL	PL	PI	Gravel	Sand	Fines
TP01	1.0					0	62	38
TP13	3.0					0	58	42
TP14	0.75	23	30	16	14			
TP15	1.0	22	28	20	8			
TP15	3.0					17	47	36
TP18	1.0					0	83	17
TP22	0.8	20	38	20	18			

Note: LL=Liquid Limit, PL=Plastic Limit, PI=Plasticity Index

6 Subsurface conditions

6.1 Published geology

The published geological map of the area² indicates that the site is underlain by alternating, indurated sandstone and mudstone and poorly bedded sandstone of the Rakaia Terrane. The map indicates that the northwest extent of the site (nearest State Highway 1) is underlain by Middle Pleistocene alluvial fan deposits however these were not encountered during investigations. The location of the site in the context of the regional geology is presented on Figure 6.1 below.

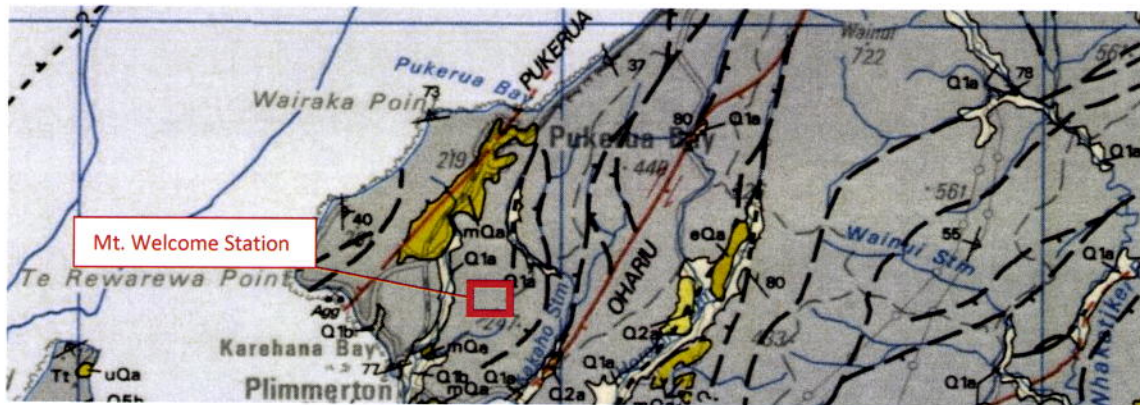


Figure 6.1: Geological setting. Note that this map only describes the general geology of the area and does not provide site specific detail.

² Begg, J.G., Johnston, M.R. (compilers) 2000: Geology of the Wellington area. Institute of Geological & Nuclear Sciences 1:250,000 geological map 10. 1 sheet + 64 p. Lower Hutt, New Zealand. Institute of Geological & Nuclear Sciences Limited.

6.2 Investigation results

A summary of ground conditions is included below.

6.2.1 Topsoil

Topsoil and grass cover is widely distributed at the site and varies between 0.1 and 0.3 m in thickness. The soil is typically described as a soft, sandy organic silt.

6.2.2 Surface soils

The site is overlain by a mixture of dune sand, loess, colluvium and alluvium.

Dune sand is described as a poorly graded, brown and fine grained sand. The distribution is widespread and varies from 0.2 to greater than 5.6 m in thickness (at the south east corner of the site). This deposit forms a hummocky topography seen along the main north-south orientated ridge. The material strength generally increases with depth but can be described generally as Loose to Medium dense (DCP 2 to 7 blows per 50 mm).

Loess is a fine grained, silt dominant and wind-blown deposit, typically described at the site as a sandy, silt. The distribution is also widespread but less prevalent than the dune sand described above. Loess is observed to mantle some slopes, inter-bedded in the dune sand and up to 3 m in thickness.

Colluvium (i.e. slope wash) is observed only on slopes or in gullies. These are generally localised deposits, derived from dune sand, loess or rock and less than 3 m in thickness. Colluvium is typically composed of silt, sand and gravel mixtures.

Alluvial deposits consisting of saturated gravels, silt, and peat were identified in the south west corner of the site and at the base of some gullies. These deposits are very soft to soft (DCP <1 blow per 50 mm) and are not likely to be wide spread, but confined to low lying areas and at the base of gullies where the ground is saturated.

6.2.3 Rock

Rock was observed in outcrop at numerous locations across the site and encountered in all test pits except TP08, TP11, TP13, TP14, TP18 and TP25. This is due to the thickness of surface soil being greater than the maximum excavator reach.

The rock type is predominantly a siltstone with some fine sandstone and mudstone. The siltstone ranges from moderately weathered to completely weathered corresponding with elevation (i.e. completely weathered at higher elevations). Rock strength corresponds to weathering grade and ranges from strong (UCS 50 – 100 MPa) to very weak (UCS 1 – 5 MPa).

Some localised outcrops of slightly weathered fine sandstone were encountered and are strong to very strong (UCS 50 – 250 MPa). These outcrops form narrow ridges and exposed in the base of some narrow gullies.

All rock is cross cut with at least three sets of defects at different orientations and spacing. Joint spacing varies from extremely closely spaced to closely spaced (<20 mm – 200 mm).

6.2.4 Groundwater observations

Numerous groundwater seepages were identified in the gullies and in some test pits (TP06, TP13, TP14, TP20 and TP23) located in low lying areas adjacent soft and saturated ground. Groundwater observations are presented on Figure C1 in Appendix C.

No groundwater seepages were observed on the hilltops or ridges.

6

7 Natural hazard assessment

The identified natural hazards that should be considered in further work are discussed in the following sections. Summary maps are presented on Figures C1 to C4 in Appendix C.

A description of the natural hazards applicable to the site are presented in Appendix C.

Table 7.1: Summary of natural hazard maps

Figure	Map	Description of map
Figure C1	Hydrology	Presents the observed seepages and overland flow paths
Figure C2	Soft ground	Presents all observed areas of soft ground
Figure C3	Slope instability	Presents all observed slope instability
Figure C4	Slope angle	Presents an overview of the slope angle to be considered as part of the earthworks design development

7.1 Slope stability

The slope stability assessment is based on the geotechnical investigation and review of the historic aerial photographs taken in 1942, 1969 and 1986.

A summary of the stability assessment locations is presented on Table B1 in Appendix B.

7.1.1 Shallow (surface soil) instability

Based on field mapping, slopes steeper than approximately 15° exhibit extensive shallow soil creep. Terracettes (small, step-like features which form on hill slopes due to surficial soil creep) are common on these slopes. The thickness of this sort of instability is in the order of 0.3 m. For reference, 3H: 1V slope are 18°.

Slopes steeper than 25° with a surface soil cover were observed to be susceptible to shallow translational sliding particularly in gullies where groundwater seepages can induce failure. The thickness of this sort of instability is in the order of 3 m. For reference, a 2H: 1V slope is 27°. Loose surface soil cover is susceptible to erosion and strength loss during heavy rainfall events. This is likely to be the primary driver for this type of instability. These landslides occur in the soil cover and typically slide over rock to the base of the slope as saturated debris flows. Rock is undisturbed by these slope failures.

7.1.2 Deep (rock mass) instability

Based on preliminary field mapping and review of historic aerial photographs, there are no discernible surface features that would suggest any large-scale historic or recent land instability within the underlying rock mass. This indicates that the land, in its current form is unlikely to suffer this type of instability under normal climatic and seismic conditions. This should be assessed further during design of the development.

7.2 Erosion

The site has an established cover of grass and vegetation, and limited evidence of erosion was identified during field mapping.

Loess soil is exposed in some of the translational landslides detailed above and is extensively rilled and rutted. However, no evidence of tunnelling of this material was observed (Loess soil typically has a low resistance to erosion and can be subject to erosion tunnels forming).

7.3 Settlement

The structures observed on the site were insufficient to make meaningful observations regarding settlements. However, inferred areas of soft ground susceptible to settlement when additional loads are applied (e.g. fill placement or building foundation) are presented on Figure C2 in Appendix C.

7.4 Seismicity

7.4.1 Active faults

Active faults are capable of producing earthquakes that trigger instability of slopes and liquefaction of saturated and soft soils within the vicinity of the earthquake epicentre. Two active faults have been identified within 2.5 km from the site³.

Both faults are characterised by lateral displacement of drainage features (of up to 250 m). Gullies offset by the Pukerua Fault can be seen on the hills to the northwest of the Mt. Welcome Station.

The Ohariu Fault in particular is one of the major active faults in the Wellington region extending north of the Porirua harbour and to the south east of Mt. Welcome Station. A single event lateral displacement of the Ohariu Fault is understood to be 2.9 m with a horizontal slip rate of 0.6 - 1.9 mm/yr.⁴.

Fault name	Fault sense	Location to site	Recurrence interval	Last event
Pukerua Fault	Dextral strike-slip	0.5 km northwest	3,500 – 5000 years	Unknown
Ohariu Fault	Dextral strike-slip	2.5 km southeast	2000 – 3,500 years	1000 – 2300 cal. BP.

7.4.2 Liquefaction

Subsurface investigation within elevated ground (on ridges and upper slopes) did not reveal any loose, saturated soils prone to liquefaction. We therefore consider that liquefaction damage in these areas is unlikely.

However, some localised areas of loose, saturated ground has been encountered (as identified in Figure C2). In these areas, liquefaction damage is considered to be possible.

³ Institute of Geological & Nuclear Sciences Limited GNS New Zealand Active Fault Database:
<http://data.gns.cri.nz/af/index.html>

⁴ David Heron, Russ van Dissen & Masumi Sawa (1998) Late Quaternary movement on the Ohariu Fault, Tongue Point to MacKays Crossing, North Island, New Zealand, New Zealand Journal of Geology and Geophysics, 41:4, 419-439, DOI: 10.1080/00288306.1998.9514820

8

8 Geotechnical considerations

The following considerations are relating to the geotechnical aspects of the proposed development described in Section 3 of this report. Note that this report does not address environmental, ecological, or the consenting requirements.

8.1 Material use as fill

All earthworks should be carried out in accordance with NZS 4431 and comply with the requirements of PCC Code of Land Development and Subdivision Engineering (February 2010).

For reference, a simplified definition of fill types is provided in Appendix D.

8.1.1 Topsoil and organics

Topsoil and organic material will be unsuitable for use as Structural fill, but may be suitable for re-spreading as a surface soil layer for establishing vegetation growth at the completion of the works.

8.1.2 Surface soils

The laboratory testing detailed in Section 5.3 above indicates that the surface soils encountered, in general are suitable for use as Structural and Landscape fill provided all earthworks performed complies with the general requirements of NZS 4431 and PCC Code of Land Development and Subdivision Engineering (February 2010).

Surface soils may become difficult to earthwork due to their sensitivity and general low resistance to erosion. Earthworks should therefore be carried out in fully drained conditions with no free water. We suggest mixing with sandstone and siltstone rock where possible to improve workability.

Surface soils may require conditioning to an appropriate water content by drying or wetting, and/or blending and mixing with 'wet' or 'dry' materials.

Further laboratory testing and compaction trials on this material should be undertaken to understand the compaction requirements.

8.1.3 Sandstone and siltstone rock

Based on the material encountered in this investigation, and previous experience, the rock is likely to provide good quality Structural fill for the proposed earthworks provided the construction work performed complies with the general requirements of NZS 4431 and PCC Code of Land Development and Subdivision Engineering (February 2010).

During excavation, handling and compaction, the highly to moderately weathered rock is expected to break down to a silty sandy gravel. Crush resistance testing will be required to determine the expected breakdown during earthworks.

Excavatability of rock material is dependent on weathering grade and the joint spacing. In test pits where rock was highly to completely weathered the diggers could excavate to the full extent of their reach. However, where rock graded to moderately weathered (moderately strong or greater) material, excavating with the 12 T excavator became difficult.

In general, the upper parts of the ridges are likely to be dry of optimum moisture content and may require some wetting. Soil excavated from the lower sections of the gullies and at depth is likely to be near or wet of optimum and may require some moisture conditioning.

8.2 Cut slopes

8.2.1 Permanent cut slopes

8.2.1.1 Rock slopes

For design purposes it may be assumed at this stage that the restrictions for cut slope angles in highly weathered (or better) rock shall comply with the requirements of PCC Code of Land Development and Subdivision Engineering (February 2010) for permanent cut batters. Therefore, for preliminary design the following slope batters could be assumed:

- 1V to 1H for cuts up to 10 m height in highly weathered (or better) rock;
- 1V to 1.5H for cuts greater than 10 m height in highly weathered (or better) rock.

Note that the slope batters described above are generic and the stability of rock slopes are controlled by weathering grade and the orientation of defects in the rock mass. Cuts could therefore be shallowed or steepened subject to specific geotechnical investigation and assessment by an Engineering Geologist.

Slopes with adverse defect orientations, or saturated rock slopes must be specifically designed and may require drainage measures. Additional stabilisation could include individual rock bolting or anchor and mesh stabilisation.

8.2.1.2 Soil slopes

Due to the potential for instability, all permanent cut slopes in colluvium, sand or completely weathered rock should be specifically assessed by an Engineering Geologist. The following grades are provided for preliminary design purposes and are based on prior experience in similar soil slopes:

- 2.5H to 1V for sand;
- 2H to 1V for colluvium and completely weathered rock.

Retaining will likely be required for slopes greater than those described above, subject to specific geotechnical investigation and assessment by an Engineering Geologist.

8.2.2 Temporary cut slopes

Temporary cut slopes are those unsupported for short periods during construction works. The following grades are provided for preliminary design (these need to be confirmed prior to detailed design by an Engineering Geologist):

- 3H to 1V for sand slopes up to 3m high;
- 1H to 1V for colluvium and completely weathered rock;
- 1H to 2V for moderately weathered to highly weathered rock up to 8m high;
- 1H to 3V for slightly weathered rock up to 8m high.

9 Geotechnical risks

Table 9.1 below presents geotechnical risks relating to the proposed works that should be considered in further work.

Table 9.1: Geotechnical hazards

Rank	Geotechnical Hazard / Constraint	Consequence	Mitigation
1	Instability of fill slopes	Large fill slope failures	Groundwater control including subsoil and surface drainage Geotechnical design for larger fills e.g. shear key and benching
2	Settlement of fills	Deformation of building foundations	Construct to acceptable standards
3	Stability of cut slopes	Landslides affecting finished lots and roads	Temporary and permanent cut slopes should be monitored during excavation and verified as stable by Engineering Geologist All slopes will require an offset from the top of slope for development to be determined by an Engineering Geologist
4	Settlement of soft ground	Deformation of building foundation and/or fills	Excavate all soft soils where viable Geotechnical design Avoid building on soft ground where possible
5	Erosion and sediment control during earthworks	Increased sediment load into streams Unable to meet consent requirements due to high erosion susceptibility of loess soil	Careful sediment control and stormwater retention consistent with Porirua City Council and Great Regional Wellington Council requirements Prepare Erosion and Sediment Control Plan
6	Quality of cut material for use as engineered fill	Cut material becomes unsuitable for use as engineered fill Cut material becomes difficult to work and delays construction	Quality control testing and monitoring of fill placement by Geotechnical Engineer
7	Stability of existing natural slopes	Landslides affecting finished lots	Site specific assessment of natural slopes below finished lots Appropriate setbacks from the crest of natural slopes
8	Seismicity	Liquefaction induced building damage Amplified ground shaking causing damage to building	Earthworks design in accordance with the current NZ engineering standards and guidelines Excavate all soft soils where viable Geotechnical design Avoid building on soft ground where possible
9	Surface erosion	Scour damage and blockages of drainage network	Adequate control and disposal of stormwater runoff

10 Conclusion

The results of the site inspection and limited field work indicate that ground stability and natural hazards are unlikely to present a practical constraint to residential development of the site provided proper precautions are taken (as summarised in this report).

We note that further geotechnical assessment will be required when an earthworks design becomes available.

11 Applicability

This report has been prepared for the exclusive use of our client Classic Developments NZ Ltd., with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

Recommendations and opinions in this report are based on desktop review and from subsurface investigations as described above. The nature and continuity of subsoil conditions away from these investigation locations are inferred but it must be appreciated that actual conditions could vary from the assumed model.

Tonkin & Taylor Ltd

Report prepared by:



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Tim Haxell

Engineering Geologist

Authorised for Tonkin & Taylor Ltd by:



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Chris Hillman

Project Director

T.HAXELL

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Appendix A: Indicative land use

- Indicative Land Use Plan



LEGEND

SITE ASSESSMENT
 Part Lot 3 DP 89102
 Legal description:
 422 State Highway 1, Pukerua Bay, Porirua
 Address:
 Site Area: 351,750m²
 Current Zone: Rural Zone
 Proposed Zone: Residential Zone

DEVELOPMENT DESCRIPTION
 Medium Density Housing Development
 Large Lot Housing Development

PUBLIC

- Extent of landholding
- Proposed road layout location
- Proposed pedestrian link
- Reserve with Significant Natural Area SNA
- Farm storage network
- Proposed additional reserve allocation
- Seismic hazard zone
- Q12 Designation

FIELD

Development ID	Area	Site Count	Percentage	
1	Large Block Residential	~ 200m ² Sites	~ 40 sites	7%
2	Large Block Residential	~ 1000m ² Sites	~ 35 sites	6%
3	Regular Block Residential	~ 600-850m ² Sites	~ 80 sites	13%
4	Regular Block Residential	~ 150m ² Sites	~ 345 sites	61%
5	Mixed Use Area (~ >50% Residential)	~ 232m ² Sites	~ 20 sites	4%
6	Mixed Use Area (~ >50% Residential)	~ 300m ² Sites	~ 30 sites	4%
Total				~550 Sites

NOTES

1. Refer to Civil Engineer's documents for:
 - all earthworks details
 - details of additional public infrastructure
2. Refer to landscape architect's documents for all planning layouts, schedules and specifications.
3. Refer to the Urban Design Report for precinct zone details



Appendix B: Geotechnical Investigation

- Figure B1: Field investigation
- Table B1: Summary of mapping results
- Table B2: Summary of test pit and DCP results
- Test pit logs
- DCP results
- Geotechnics Laboratory Test Report, 6 June 2019

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PROJECT No: 1010566		CLIENT	CLASSIC DEVELOPMENTS NZ LTD.	
DESIGNED	TH	PROJECT	MT WELCOME STATION	
DRAWN	JC	TITLE	FIELD INVESTIGATION	
CHECKED		SCALE (A3)	1:4000	FIG No
APPROVED	DATE			FIGURE B1
				REV 1


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ID	Outcrop location description	Cover deposit			Rock			Defect orientation (d/d)			Landslide details							
		Thickness (m)	Geological description	Geotechnical description	Rock type	Weathering	Strength	Defect spacing	J1	J2	J3	Additional	Inferred slope angle prior to landslide	Head scarp height	Head scarp width	Length of evacuated area	Estimated volume (m3)	Aspect
1	Base of gully		Colluvium	Fine SAND with min. silt, grey														
2	Ridge				SANDSTONE	MW	MS	Extremely closely spaced										
3	Farm track cutting				SILTSTONE	HW	W	Extremely closely spaced	43/164	59/268								
4	Farm track cutting	0.5	Colluvium Dune	Silty GRAVEL														
5	Base of slope			Fine SAND, poorly graded	SANDSTONE	HW	W											
6	Base of slope	<0.5	Dune		SANDSTONE	MW-HW	W-MS											
7	Translational landslide			Fine SAND (1.5m) over Silty, fine SAND, grey mottled brown. Wet, dilatant.	SILTSTONE													
8	Farm track cutting	3 Dune		Fine SAND	SANDSTONE	HW-CW	W											413 SW
9	Ridge	0.5	Dune		SILTSTONE	MW	MS		82/073	39/301	50/080	SM,UN and PL						
10	Translational landslide	1	Colluvium	Silty GRAVEL	SILTSTONE	HW	W											30 NE
11	Translational landslide	1.5	Colluvium	Sandy GRAVEL	SILTSTONE	HW	W											150 SW
12	Translational landslide	1	loess		SILTSTONE	HW	W											20 SW
13	Base of gully	0.3	Colluvium	Silty GRAVEL	SANDSTONE	MW	MS-S											
14	Base of gully				SANDSTONE	SW	VS	Grey										
15	Translational landslide	0.3	Colluvium		SANDSTONE	MW	MS											18 NE
16	Translational landslide	1	Colluvium		SILTSTONE	HW	W											49 NE
17	Farm track cutting				SILTSTONE	HW	W											
18	Base of slope				SANDSTONE	MW	S											
19	Ridge				SILTSTONE	MW	MS		16/016	74/110								
20	Translational landslide	1	Colluvium	Gravelly SILT	SILTSTONE	MW	MS	Extremely closely spaced										24 W
21	Ridge				SILTSTONE	MW	MS		21/036	80/309	21/233							
22	Farm track cutting	>0.6	Dune	Fine SAND with min. silt, grey mottled brown.														
23	Base of slope	0.5	Dune	Fine SAND	SILTSTONE	HW	W	Extremely closely spaced	35/090	61/283		FeSt, Mn						
24	Top of slope				SANDSTONE			Extremely closely spaced to closely spaced										
25	Base of slope				E	MW	S-VS		64/241 (B)	21/537	58/178	Subvertical						
26	Translational landslide	0.5	Dune	Fine SAND	SANDSTONE			Extremely closely spaced to very closely spaced										
27	Translational landslide	1	Colluvium	Sandy GRAVEL	MUDSTONE	MW	S-VS		73/325	18/358		FeSt						60 SW
28	Base of slope				SANDSTONE	HW	W	Extremely closely spaced										25 SW
29					SILTSTONE	HW	W	Extremely closely spaced to very closely spaced										
30	Base of slope				SANDSTONE	MW	S-VS		43/272	71/036								
31	Ridge				SANDSTONE	MW	VS	Very closely spaced	13/261	86/102	73/129							
					SANDSTONE	MW	VS	Very closely spaced	16/283									

FOR ROCK WEATHERING: UN=Unweathered, SW=Slightly weathered, MW=Moderately weathered, HW=Highly weathered, CW= Completely weathered

32 Ridge				SANDSTONE MW	VS	Very closely spaced	19/311	52/176 89/287	
33 Ridge				SILTSTONE MW	MS	Extremely closely spaced			Subvertical
34 Ridge				SILTSTONE HW	W	Extremely closely spaced			
35 Farm track cutting		0.5 Colluvium		SILTSTONE HW	W	Extremely closely spaced			
36 Farm track cutting		0.5 Colluvium		SILTSTONE HW	W	Extremely closely spaced			
37 Transitional landslide		1 Loess 2 Colluvium		SILTSTONE HW	W				FeSt
38 Transitional landslide		1.5 Colluvium		SILTSTONE HW	W				2 6 20 120 W
39 Transitional landslide		2 Colluvium		SILTSTONE HW	W	Extremely closely spaced	65/266		1.5 10 12 90 SW
40 Base of slope				SILTSTONE MW	S	Extremely closely spaced to very closely spaced	82/199	34/233 83/085 SM, UN and PL	2 7 12 84 SW
41 Waterfall in gully		Colluvium/Alluvium 2 m		SILTSTONE MW	MS				
42 Base of slope				SILTSTONE MW	MS	Extremely closely spaced			
43 Base of slope				SILTSTONE MW	MS	Extremely closely spaced			
44 Ridge		>1		SILTSTONE MW	MS				
45 Ridge				SILTSTONE HW	W	Extremely closely spaced			
46 Ridge				SILTSTONE HW	W	Extremely closely spaced	83/040	70/190 30/135 FeSt	FeSt
47 Ridge				SILTSTONE MW	MS	Extremely closely spaced	41/294	80/053 61/110 FeSt	
48 Ridge				SILTSTONE MW	MS	Extremely closely spaced	71/111	69/217 53/347 FeSt	
49 Base of slope				SILTSTONE MW	S-VS	Extremely closely spaced			FeSt
50 Base of gully				SILTSTONE HW	MS	Extremely closely spaced			
51 Slope				SANDSTONE SW	VS	Very closely spaced	63/117	66/170 34/285	
52 Base of slope				SILTSTONE MW	S-VS	Extremely closely spaced			FeSt

FOR ROCK WEATHERING: UN=Unweathered, SW=Slightly weathered, MW=Moderately weathered, HW=Highly weathered, CW= Completely weathered

Table B2: Summary of test pit and DCP results

Test Pit ID	Location (NZTM)		Ground Surface Elevation RL (m)	Depth (m)	Reason for termination
	Easting (m)	Northing (m)			
TP01	1758691	5454196	127.7	2.9	Refusal
TP02	1758681	5454281	127.4	2.5	Refusal
TP03	1758718	5454327	134	0.3	Refusal
TP04	1758720	5454282	128.2	4.6	Refusal
TP05	1758771	5454396	122.5	2.1	Refusal
TP06	1758629	5454482	101.8	3.65	Refusal
TP07	1758687	5454088	131.2	3.2	Refusal
TP08	1758686	5454060	136.2	4.7	Maximum depth
TP09	1758743	5453870	127.2	2.1	Refusal
TP10	1758685	5453855	139.1	4.2	Refusal
TP11	1758600	5453651	157.1	5.6	Maximum depth
TP12	1758604	5453778	142.3	0.5	Refusal
TP13	1758344	5454170	76.1	5.4	Maximum depth
TP14	1758233	5454089	60.5	4.9	Maximum depth
TP15	1758238	5453969	64.3	3.5	Refusal
TP16	1758281	5453832	87.9	1.1	Refusal
TP17	1758195	5453840	70.9	1.6	Refusal
TP18	1758078	5453897	62.4	5.2	Maximum depth
TP19	1757984	5453827	52.9	1.3	Refusal
TP20	1757967	5453765	36.4	3.2	Refusal
TP21	1757866	5453775	49.5	0.2	Refusal
TP22	1757894	5454327	64.4	2.2	Refusal
TP23	1757883	5453703	33.1	4.3	Refusal
TP24	1758131	5453762	74.1	2.9	Refusal
TP25	1757826	5453869	68.2	4.4	Maximum depth
SC01	1758629	5454432	112.0	1.8	Refusal
SC02	1758580	5453938	103.5	1.7	Refusal
SC03	1758045	5453839	41.0	1.65	Refusal
SC04	1758016	5453849	40.5	2.45	Refusal



Engineering log terminology

General

Soil and rock descriptions follow the "Guidelines for the field classification and description of soil and rock for engineering purposes" by the New Zealand Geotechnical Society (2005). Refer to this document for methods of field determination.

Water

Water level on date shown

Water inflow

Water outflow

Core recovery

Expressed as percentage of the length of the core run recovered.

Drilling method/casing

Common types:

- OB Open barrel
- W Wash
- HQ3 HQ triple tube
- PQ3 PQ triple tube
- HSA Hollow Stem Auger
- WS Window Sampler
- HA Hand Auger
- HFS High Frequency Sonic Drilling
- LFS Low Frequency Sonic Drilling

Graphic logs

The graphic log shows soil and rock types. The defect log indicates the location, orientation and abundance of defects of all types.

Typical material symbols:

Organic material	Igneous rock
Clay	Mudstone
Silt	Siltstone
Sand	Sandstone
Gravel or Conglomerate	Metamorphic Rock

Tests

- N=22: SPT uncorrected blow count for 300 mm
- 75/12: Undrained shear strength (peak/residual as measured by field vane).

Laboratory test(s) carried out:

- PMT Pressuremeter test
- LT Lugeon test
- LV Laboratory vane
- AL Atterburg limits
- UU Undrained triaxial
- PSD Particle size distribution
- c' Ø' Effective stress
- CONS Consolidation
- DS Direct shear
- COMP Compaction
- UCS Unconfined compression
- IS₅₀ Point load

Installation type

Standpipe	Slotted screen
VWP	Bentonite seal
Filter pack	

Sample type

SPT	Core
Thin-wall tube	Other
Bulk sample	Core or Sample loss

Soil description

Moisture content

D	Dry, looks and feels dry
M	Moist, no free water on hand when remoulding
W	Wet, free water on hand when remoulding
S	Saturated, free water present on sample

Consistency/undrained shear strength

		S _u (kPa)
VS	Very soft	< 12
S	Soft	12 to 25
F	Firm	25 to 50
St	Stiff	50 to 100
VSt	Very stiff	100 to 200
H	Hard	> 200

Density index

		SPT(N) - uncorrected
VL	Very loose	0 to 4
L	Loose	4 to 10
MD	Medium dense	10 to 30
D	Dense	30 to 50
VD	Very dense	> 50

Proportional terms definition (Coarse soils)

Fraction	Term	% of soil mass	Example
Major	(UPPER CASE)	Major constituent	GRAVEL
Subordinate	(lower case)	> 20	Sandy
Minor	with some...	12 - 20	with some sand
	with minor...	5 - 12	with minor sand
	with trace of... (or slightly)...	< 5	with trace of sand (slightly sandy)

Grain size criteria

Type	Coarse				Fine	
	Boulders	Cobbles	Gravel	Sand	Silt	Clay
			Coarse Medium Fine	Coarse Medium Fine		
Size range (mm)	200	60	20 6	2 0.6 0.2	0.06	0.002



Engineering log terminology

Rock description

Significant defects	
B	Bedding
J	Joint
Sc	Schistosity
Cl	Cleavage
BZ	Broken zone/crushed zone
F	Fault
Fg	Fault with gouge
SZ	Shear zone
Iz	Infilled seam
XD	Extremely weathered seam
DD	Drilling - induced defect



Weathering	
UW	Unweathered
SW	Slightly weathered
MW	Moderately weathered
HW	Highly weathered
CW	Completely weathered
RS	Residual soil

Defect shape	
ST	Stepped
UN	Undulating
PL	Planar

Roughness of defect surface	
R	Rough
SM	Smooth
SL	Slickensided

Field strength			
		UCS (MPa)	I _{s(50)} (MPa)
EW	Extremely weak	< 1	N/A
VW	Very weak	1 - 5	N/A
W	Weak	5 - 20	N/A
MS	Moderately strong	20 - 50	1 - 2
S	Strong	50 - 100	2 - 5
VS	Very strong	100 - 250	5 - 10
ES	Extremely strong	> 250	> 10

Defect coding

Type
 Angle (perpendicular to core axis)
J 60°, PL, SL, T, CV, STIFF GREEN CLAY
 Infilling description (as per soil description)
 Infilling/coating type
 Aperture
 Roughness
 Shape

Defect Orientation: for vertical unoriented boreholes defect orientation is measured normal to core axis e.g horizontal = 0°(see diagram). For angled boreholes defect orientation is measured relative to core axis e.g parallel to core axis = 0°.

Aperture		
		Aperture (mm)
T	Tight	nil
VN	Very narrow	0 - 2
N	Narrow	2 - 6
MN	Moderately narrow	6 - 20
MW	Moderately wide	20 - 60
W	Wide	60 - 200
VW	Very wide	> 200

Infillings and coatings		
CG	Clay gouge	Joints have openings between opposing faces of intact rock substance in excess of 1 mm filled with clay gouge. Clay is generally described in terms of soil properties.
CV	Clay veneers	Joints contain clay coating whose maximum thickness does not exceed 1 mm. Note: Describe clay in terms of soil properties.
PL	Penetrative limonite	Joint traces are marked in terms of well defined zones of slightly to moderately weathered ferruginised rock-substance within the adjacent rock.
FeSt	Limonite stained	Joint surfaces are stained or coated with limonite, although the rock substance immediately adjacent to the joints is fresh.
CT, SC	Coated	Joints exhibit coatings other than clay or limonite, e.g. Carbonate (CT) or Silica (SC).
CL, CS, CC	Cemented	Joints are cemented with limonite (CL), Silica (CS), or Carbonates (CC).
CN	Clean	Joint surface show no trace of clay, limonite, or other coatings.

Spacing	
Term	Spacing
Very wide	> 2 m
Wide	0.6 - 2 m
Moderately wide	200 - 600 mm
Close	60 - 200 mm
Very close	20 - 60 mm
Extremely close	> 20 mm

Excavator penetration	
Easy	1
Moderate	2
Difficult	3

RQD: Rock Quality Designation - percentage of core run consisting of sound rock longer than 10 cm.



EXCAVATION LOG

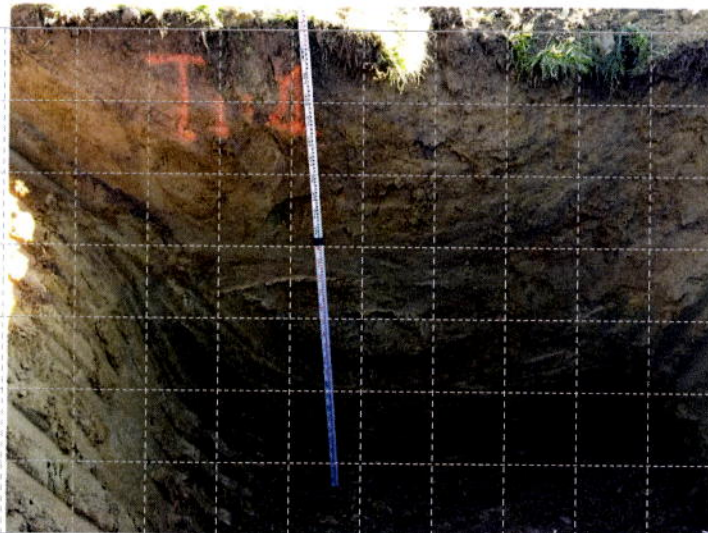
EXCAVATION No.: TP01

SHEET: 1 OF 1

PROJECT: Mt Welcome Development		LOCATION: Mt Welcome, Wellington		JOB No.: 1010566.0000	
CO-ORDINATES: 5454196.00 mN (NZTM2000) 1758691.00 mE		EXPOSURE METHOD: TP		EXCAV. STARTED: 16/05/2019	
R.L.: 127.70m		EQUIPMENT: CAT 312D		EXCAV. FINISHED: 16/05/2019	
DATUM: NZVD2016		OPERATOR: Goodmans		LOGGED BY: ADTH	
		DIMENSIONS: 4m by 3.2m		CHECKED BY: TH	

EXCAVATION TESTS				ENGINEERING DESCRIPTION				GEOLOGICAL					
PENETRATION	SUPPORT	WATER	SCALA PENETROMETER (Blows/50mm)	SAMPLES, TESTS	RL (m)	DEPTH (m)	GRAPHIC LOG	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE WEATHERING CONDITION	STRENGTH/DENSITY CLASSIFICATION	ESTIMATED UNIFORM STRENGTH (kPa)	ORIGIN TYPE, MINERAL COMPOSITION, DEFECTS, STRUCTURE	UNIT
1-3			2 4 6 8 10 12 14 16 18					Topsoil: Sandy SILT; yellow brown. Soft, moist, low plasticity. Sand: fine.	M	S	12		TSoil
						0.5		Sandy SILT with some clay; yellow brown. Firm, moist, low plasticity. Sand: fine.		F	12		Loess
						1.0							
						1.5							Residual Soil
						2.0		Clayey SILT with some sand, minor gravel; yellow brown. Firm, moist, high plasticity.	M/RS				
						2.5		Highly weathered yellow brown SANDSTONE. Extremely to very weak, very closely spaced joints, Mn staining on joint surfaces. Excavating to coarse gravel.	HW				Torlesse
						2.9m		2.9m: Effective refusal					

SKETCH / PHOTO:



COMMENTS: Termination in HW Rock.

Hole Depth 2.9m

Scale 1:25

Excavation+HA - 22/08/2019 10:46:11 AM - Produced with Core-GS by GeRec

Rev.: A



EXCAVATION LOG

EXCAVATION No.: TP03

SHEET: 1 OF 1

PROJECT: Mt Welcome Development	LOCATION: Mt Welcome, Wellington	JOB No.: 1010566.0000
CO-ORDINATES: 5454327.00 mN (NZTM2000) 1758718.00 mE	EXPOSURE METHOD: TP	EXCAV. STARTED: 16/05/2019
R.L.: 134.00m	EQUIPMENT: Hand excavation	EXCAV. FINISHED: 16/05/2019
DATUM: NZVD2016	OPERATOR: Tonkin+Taylor	LOGGED BY: ADTH
	DIMENSIONS: 0.3m by 0.3m	CHECKED BY: TH

EXCAVATION TESTS				ENGINEERING DESCRIPTION				GEOLOGICAL						
PENETRATION	SUPPORT	WATER	SCALA PENETROMETER (Blows/50mm)	SAMPLES, TESTS	RL (m)	DEPTH (m)	GRAPHIC LOG	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION	WEATHERING	STRENGTH/DENSITY CLASSIFICATION	ESTIMATED SHEAR STRENGTH (kPa)	ORIGIN TYPE, MINERAL COMPOSITION, DEFECTS, STRUCTURE	UNIT
1-3			2-18									0-200		
			1					TOPSOIL (as described previously)	M		S			TSoil
			2					Highly weathered yellow grey SILTSTONE. Very weak to weak, very closely spaced defects.						Torlesse Terrane
			3											
			5											
			15					0.35m: Effective refusal						
						0.5								
						1.0								
						1.33								

SKETCH / PHOTO:



COMMENTS: Termination in HW Rock.

Hole Depth
0.35m

Scale 1:13



EXCAVATION LOG

EXCAVATION No.: TP04

SHEET: 1 OF 1

PROJECT: Mt Welcome Development	LOCATION: Mt Welcome, Wellington	JOB No.: 1010566.0000
CO-ORDINATES: 5454282.00 mN (NZTM2000) 1758720.00 mE	EXPOSURE METHOD: TP	EXCAV. STARTED: 16/05/2019
R.L.: 128.20m	EQUIPMENT: CAT 312D	EXCAV. FINISHED: 16/05/2019
DATUM: NZVD2016	OPERATOR: Goodmans	LOGGED BY: ADTH
	DIMENSIONS: 4m by 3.2m	CHECKED BY: TH

EXCAVATION TESTS				ENGINEERING DESCRIPTION				GEOLOGICAL					
PENETRATION	SUPPORT	WATER	SCALA PENETROMETER (Blows/50mm)	SAMPLES, TESTS	RL (m)	DEPTH (m)	GRAPHIC LOG	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE WEATHERING CONDITION	STRENGTH/DENSITY CLASSIFICATION	ESTIMATED SHEAR STRENGTH (kPa)	ORIGIN TYPE, MINERAL COMPOSITION, DEFECTS, STRUCTURE	UNIT
1 2 3			2 4 6 8 10 12 14 16 18										
					128	0	TS	Topsoil: Sandy SILT; brown. Soft, moist, low plasticity.	M	S			Top
					127	1		Silty fine SAND with rare organics; yellow brown. Loose, dry-moist, poorly graded.	D-M	L			Dune Deposits
					126	2		Silty fine SAND; grey yellow. Loose, moist-wet, poorly graded. Increasing silt content with depth.	M-W				Dune Deposits
					125	3		Sandy SILT with some clay; yellow brown. Firm, moist-wet, low plasticity, rapid dilatancy.		F			Loess
					124	4		Fine to medium SAND with some silt; yellow brown. Loose, moist, poorly graded.	M	L			Dune Deposits
					124	4		Fine to medium SAND with some silt; grey. Loose, saturated, poorly graded.		S			Dune Deposits
					124	4.6		Highly weathered yellow grey fine SANDSTONE. Very weak to weak, closely spaced joints, Mn staining on joint surfaces					Tit
								4.6m Effective refusal					

SKETCH / PHOTO:



COMMENTS: Termination in HW Rock.

Hole Depth
4.6m

Scale 1:43

Excavation+HA - 22/08/2019 12:05:32 PM - Produced with Core-CIS by GeiRoc

Rev. A



EXCAVATION LOG

EXCAVATION No.: TP05

SHEET: 1 OF 1

PROJECT: Mt Welcome Development	LOCATION: Mt Welcome, Wellington	JOB No.: 1010566.0000
CO-ORDINATES: 5454396.00 mN (NZTM2000) 1758771.00 mE	EXPOSURE METHOD: TP	EXCAV. STARTED: 16/05/2019
R.L.: 122.50m	EQUIPMENT: CAT 312D	EXCAV. FINISHED: 16/05/2019
DATUM: NZVD2016	OPERATOR: Goodmans	LOGGED BY: ADTH
	DIMENSIONS: 4.2m by 3m	CHECKED BY: TH

EXCAVATION TESTS				ENGINEERING DESCRIPTION				GEOLOGICAL					
PENETRATION	SUPPORT	WATER	SCALE PENETROMETER (Blows/50mm)	SAMPLES, TESTS	RL (m)	DEPTH (m)	GRAPHIC LOG	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION WEATHERING	STRENGTH/DENSITY CLASSIFICATION	ESTIMATED SHEAR STRENGTH (kPa)	ORIGIN TYPE, MINERAL COMPOSITION, DEFECTS, STRUCTURE	UNIT
1-2			1-18		122.5	0.5	TS	Topsoil: (as described previously)	M	S	10-20		TSoil
								Sandy SILT; orange brown. Soft to firm, moist, non plastic.		S-F	20-30		Loess
								Sandy SILT with some clay, minor gravel. Soft, moist, low plasticity. Sand: fine.		F	30-40		
								Completely weathered yellow brown SILTSTONE. Extremely weak, very closely spaced joints, <5 mm zeolite coatings on joint surfaces.	CW		40-50		Torlesse Terrane
								Highly weathered yellow brown SILTSTONE. Very weak to weak, very closely spaced joints, zeolite seams and clay veneers on joint surfaces. Excavating to coarse gravel- small cobble.	HW		50-60		
								2.1m: Effective refusal					

SKETCH / PHOTO:



COMMENTS: Termination in HW Rock.

Hole Depth 2.1m

Scale 1:25

Excavation:HA - 22/08/2019 12:06:42 PM - Produced with Core-GS by GeRoc

Rev.: A



EXCAVATION LOG

EXCAVATION No.: TP06

SHEET: 1 OF 1

PROJECT: Mt Welcome Development LOCATION: Mt Welcome, Wellington JOB No.: 1010566.0000

CO-ORDINATES: 5454482.00 mN (NZTM2000) 1758629.00 mE EXPOSURE METHOD: TP EXCAV. STARTED: 16/05/2019

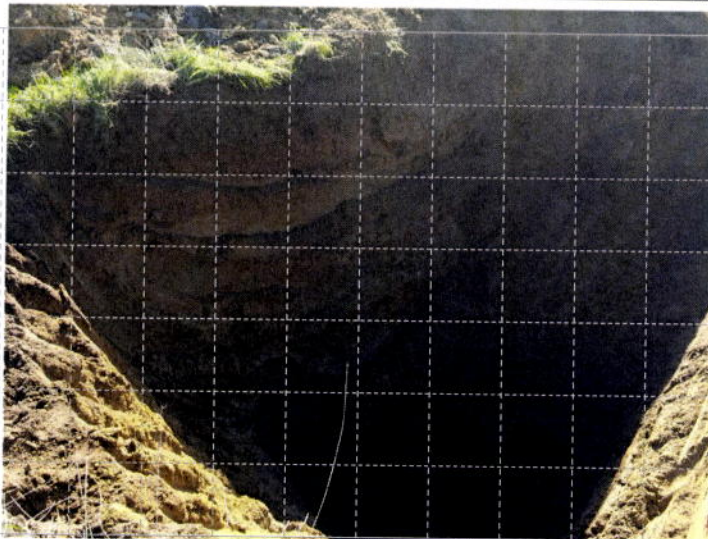
R.L.: 101.80m EQUIPMENT: CAT 312D EXCAV. FINISHED: 16/05/2019

DATUM: NZVD2016 OPERATOR: Goodmans LOGGED BY: ADTH

DIMENSIONS: 4m by 3.2m CHECKED BY: TH

EXCAVATION TESTS				ENGINEERING DESCRIPTION				GEOLOGICAL		
PENETRATION	SUPPORT	WATER	SAMPLES, TESTS	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION	WEATHERING	STRENGTH/DENSITY CLASSIFICATION	ESTIMATED SHEAR STRENGTH (kPa)	ORIGIN TYPE, MINERAL COMPOSITION, DEFECTS, STRUCTURE	UNIT
1-3				Topsoil (as described previously)	M		S			Top
				Silty fine SAND with minor organics; yellow brown. Loose, moist, poorly graded.			L			Dune Deposits
				Silty fine to medium SAND with minor organics, grey brown. Loose to medium dense, wet-saturated, poorly graded, dilatant.	W-S		L-MD			
				Silty fine SAND; grey. Loose to medium dense, saturated, poorly graded, sulphurous odour.	S					
				Sandy fibrous PEAT with some silt; brown. Wet, high compressibility.	W					Alluvium
				Gravelly SILT with some clay; grey. Soft, wet, moderate plasticity.			S			TH
				Highly weathered yellow brown SILTSTONE. Very weak to weak, very closely spaced joints, fracturing to fine to coarse gravel.						
				3.8m: Effective refusal						

SKETCH / PHOTO:



COMMENTS: Termination in HW Rock.

Hole Depth 3.8m

Scale 1:42

Excavation-HA - 22/08/2019 12:08:14 PM - Produced with Core-GS by GeRec

Rev.: A



EXCAVATION LOG

Excavation Id.: TP07

SHEET: 1 OF 1

PROJECT: Mt Welcome Development	LOCATION: Mt Welcome, Wellington	JOB No.: 1010566.0000
CO-ORDINATES: 5454088.00 mN (NZTM2000) 1758687.00 mE	EXPOSURE METHOD: TP	EXCAV. STARTED: 16/05/2019
R.L.: 131.20m	EQUIPMENT: CAT 312D	EXCAV. FINISHED: 16/05/2019
DATUM: NZVD2016	OPERATOR: Goodmans	LOGGED BY: ADTH
	DIMENSIONS: 4m by 3.2m	CHECKED BY: TH

EXCAVATION TESTS		ENGINEERING DESCRIPTION			GEOLOGICAL								
PENETRATION	SUPPORT WATER	SAMPLES, TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION	WEATHERING	STRENGTH/ DENSITY CLASSIFICATION	ESTIMATED SHEAR STRENGTH (kPa)	DEFECTS, STRUCTURE, COMMENTS	UNIT
1-3				131	0.5	TS	Topsoil: Silty SAND with some rootlets; brown. Soft, moist, low plasticity.	M		S			Dune Deposits
					1.0		Silty fine SAND; mottled yellow brown. Loosely packed, moist, poorly graded.			L			
				130	1.5		Silty fine SAND with minor organics; grey brown. Loosely packed, moist-wet, poorly graded.	M-W					Residual Soil
		● 78/21 kPa		129	2.0		Clayey SILT with minor gravel; yellow brown. Stiff, moist, high plasticity. Gravel: fine, angular HW greywacke.	M					
				128	3.5		Highly weathered yellow brown SILTSTONE. Very weak to weak, very closely spaced defects, Mn staining on defect surfaces.		HW				Torlesse Terrane
3.8m: Effective refusal													

SKETCH / PHOTO:



COMMENTS: Termination in HW Rock

Hole Depth 3.8m

Excavation - 22/08/2019 12:17:24 PM - Produced with Core-GS by GeRoc

Scale 1:33

Rev.: A



EXCAVATION LOG

Excavation Id.: TP08

SHEET: 1 OF 1

PROJECT: Mt Welcome Development	LOCATION: Mt Welcome, Wellington	JOB No.: 1010566.0000
CO-ORDINATES: 5454060.00 mN (NZTM2000) 1758686.00 mE	EXPOSURE METHOD: TP	EXCAV. STARTED: 16/05/2019
R.L.: 136.20m	EQUIPMENT: CAT 312D	EXCAV. FINISHED: 16/05/2019
DATUM: NZVD2016	OPERATOR: Goodmans	LOGGED BY: ADTH
	DIMENSIONS: 4m by 3.2m	CHECKED BY: TH

EXCAVATION TESTS			ENGINEERING DESCRIPTION				GEOLOGICAL							
PENETRATION 1 2 3	SUPPORT	WATER	SAMPLES, TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION	WEATHERING CLASSIFICATION	STRENGTH/DENSITY CLASSIFICATION	ESTIMATED SUMP STRENGTH (kPa)	DEFECTS, STRUCTURE, COMMENTS	UNIT
					136	0.5	TS	Topsoil (as described previously)	D	L				Top
					135	1.0		Fine SAND with minor silt; yellow brown. Loosely packed, dry, poorly graded.						Dune Deposits
					134	1.5								
					133	2.0								
					132	2.5								
					133	3.0		Silty fine SAND with some clay and minor organics; yellow brown. Loosely packed, moist, poorly graded.	M					
					134	3.5								
					135	4.0								
					136	4.5								
4.7m: Machine limit														

SKETCH / PHOTO:



COMMENTS: Termination due to machine limit

Hole Depth
4.7m

Excavation - 22/08/2019 12:22:49 PM - Produced with Core-GS by GeRoc

Scale 1:41

Rev. A



Tonkin+Taylor

EXCAVATION LOG

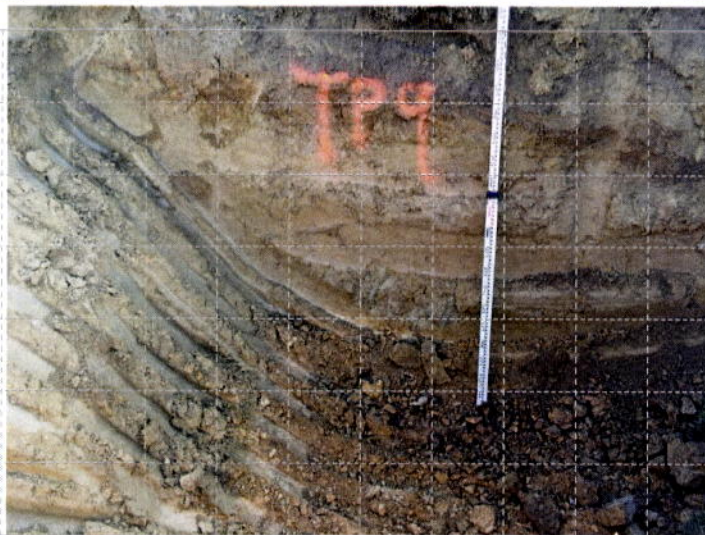
EXCAVATION No.: TP09

SHEET: 1 OF 1

PROJECT: Mt Welcome Development	LOCATION: Mt Welcome, Wellington	JOB No.: 1010566.0000
CO-ORDINATES: 5453870.00 mN (NZTM2000) 1758743.00 mE	EXPOSURE METHOD: TP	EXCAV. STARTED: 16/05/2019
R.L.: 127.20m	EQUIPMENT: CAT 312D	EXCAV. FINISHED: 16/05/2019
DATUM: NZVD2016	OPERATOR: Goodmans	LOGGED BY: ADTH
	DIMENSIONS: 4m by 3.2m	CHECKED BY: TH

EXCAVATION TESTS				ENGINEERING DESCRIPTION				GEOLOGICAL			
PENETRATION	SUPPORT	WATER	SCALE PENETROMETER (80mm x 50mm)	SAMPLES, TESTS	DEPTH (m)	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE WEATHERING CONDITION	STRENGTH/DENSITY CLASSIFICATION	ESTIMATED SHEAR STRENGTH (kPa)	ORIGIN TYPE, MINERAL COMPOSITION, DEFECTS, STRUCTURE	UNIT
1 2 3			2 4 6 8 10 12 14 16 18		127	Topsoil (as described previously)	M	S			T Soil
					0.5	Silty fine SAND; mottled orange brown. Very loose, moist, poorly graded.		VL			Dune Deposits
					1.0	Fine SAND with some silt; mottled grey brown. Loose, moist, poorly graded.		L			
					1.25	Highly to completely weathered yellow brown SILTSTONE. Very weak to weak, very closely spaced defects, excavating to fine gravel.	HW-CW				Torlesse Terrane
					2.55	2.55m: Effective refusal					

SKETCH / PHOTO:



COMMENTS: Termination in HW Rock

Hole Depth 2.55m



EXCAVATION LOG

Excavation Id.: TP10

SHEET: 1 OF 1

PROJECT: Mt Welcome Development	LOCATION: Mt Welcome, Wellington	JOB No.: 1010566.0000
CO-ORDINATES: 5453855.00 mN (NZTM2000) 1758685.00 mE	EXPOSURE METHOD: TP	EXCAV. STARTED: 16/05/2019
R.L.: 139.10m	EQUIPMENT: CAT 312D	EXCAV. FINISHED: 16/05/2019
DATUM: NZVD2016	OPERATOR: Goodmans	LOGGED BY: ADTH
	DIMENSIONS: 3.9m by 3m	CHECKED BY: TH

EXCAVATION TESTS			ENGINEERING DESCRIPTION			GEOLOGICAL								
PENETRATION	SUPPORT	WATER	SAMPLES, TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION	WEATHERING	STRENGTH/DENSITY CLASSIFICATION	ESTIMATED SHEAR STRENGTH (kPa)	DEFECTS, STRUCTURE, COMMENTS	UNIT
1 2 3					139	0.0	TS	Topsoil (as described previously)	M	S	S	0-100		Top
			● 209/66 kPa ● 179/75 kPa		137	0.5		Sandy SILT with some clay; yellow brown. Very stiff, moist, moderate plasticity.			VSI	0-100		Loess
					136	3.5		Completely weathered grey yellow SILTSTONE. Extremely weak, very closely spaced defects, excavating to silty fine gravel.			CW	0-100		Torlesse Terrane
					135	4.0		Highly weathered grey brown, locally red-brown SILTSTONE. Very weak to weak, very closely spaced defects, excavating to coarse gravel.			HW	0-100		
						4.5		4.2m: Effective refusal						

SKETCH / PHOTO:



COMMENTS: Termination in HW Rock

Hole Depth
4.2m

Scale 1:42

Excavation - 22/08/2019 12:49:59 PM - Produced with Core-GS by GeRec

Rev: A



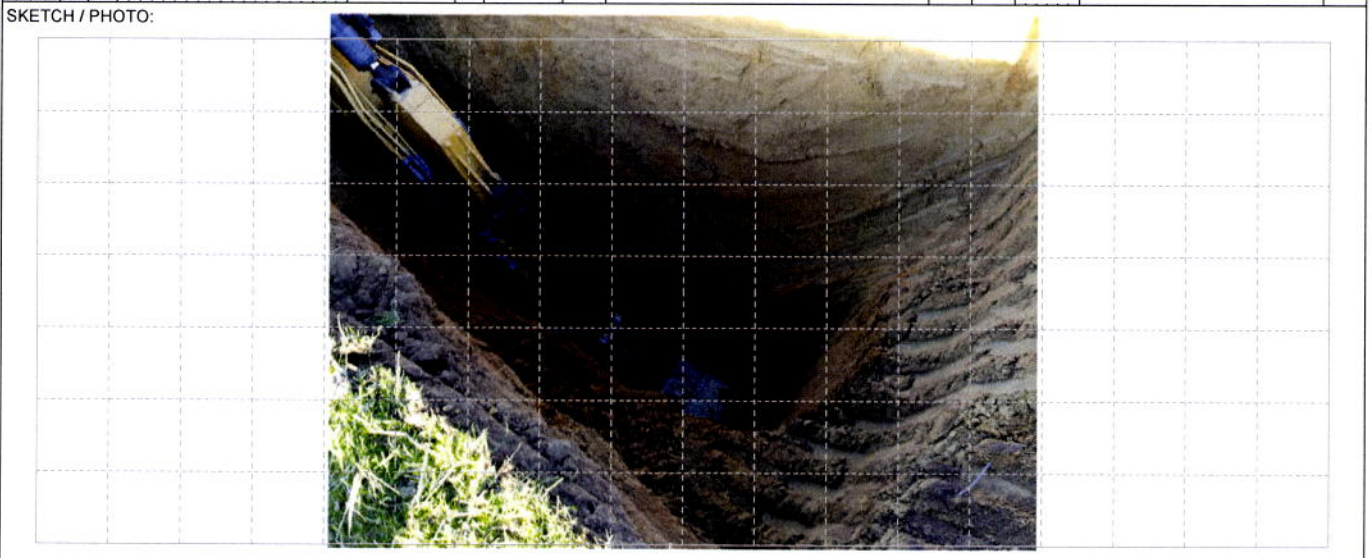
EXCAVATION LOG

EXCAVATION No.: TP11

SHEET: 1 OF 1

PROJECT: Mt Welcome Development	LOCATION: Mt Welcome, Wellington	JOB No.: 1010566.0000
CO-ORDINATES: 5453651.00 mN (NZTM2000) 1758600.00 mE	EXPOSURE METHOD: TP	EXCAV. STARTED: 16/05/2019
R.L.: 157.10m	EQUIPMENT: CAT 312D	EXCAV. FINISHED: 16/05/2019
DATUM: NZVD2016	OPERATOR: Goodmans	LOGGED BY: ADTH
	DIMENSIONS: 4.5m by 3m	CHECKED BY: TH

EXCAVATION TESTS				ENGINEERING DESCRIPTION				GEOLOGICAL						
PENETRATION	SUPPORT	WATER	SCALA PENETROMETER (Blows/50mm)	SAMPLES, TESTS	RI (m)	DEPTH (m)	GRAPHIC LOG	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION	WEATHERING	STRENGTH/DENSITY CLASSIFICATION	ESTIMATED SHEAR STRENGTH (kPa)	ORIGIN TYPE, MINERAL COMPOSITION, DEFECTS, STRUCTURE	UNIT
1-3			2-18		157.10	0	Topsoil (as described previously)		M		S			Top
					156	1	Fine SAND with some silt; mottled orange brown. Loose to medium dense, moist, poorly graded.				L-MD			Dune Deposits
					155	2	Sandy SILT with some clay; grey brown. Stiff, moist, low plasticity. Sand: fine.				St			Loess
					154	3	Silty fine to medium SAND with some gravel; yellow brown. Medium dense, moist, poorly graded. Gravel: fine angular highly weathered greywacke.				MD			Colluvium Deposits
					153	4								
					152	5								
5.6m: Machine limit														



COMMENTS: Termination due to machine limit

Hole Depth: 5.6m

Excavation-HA - 22/08/2019 12:53:38 PM - Produced with Core-GS by GeRoc

Scale 1:48

Rev.: A



Tonkin+Taylor

EXCAVATION LOG

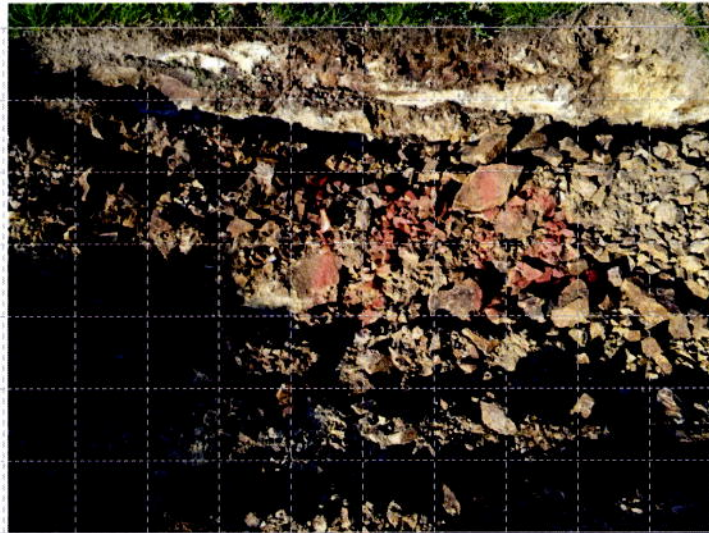
EXCAVATION No.: TP12

SHEET: 1 OF 1

PROJECT: Mt Welcome Development	LOCATION: Mt Welcome, Wellington	JOB No.: 1010566.0000
CO-ORDINATES: 5453778.00 mN (NZTM2000) 1758604.00 mE	EXPOSURE METHOD: TP EQUIPMENT: CAT 312D	EXCAV. STARTED: 16/05/2019 EXCAV. FINISHED: 16/05/2019
R.L.: 142.30m	OPERATOR: Goodmans	LOGGED BY: ADTH
DATUM: NZVD2016	DIMENSIONS: 3m by 1.2m	CHECKED BY: TH

EXCAVATION TESTS				ENGINEERING DESCRIPTION				GEOLOGICAL					
PENETRATION	SUPPORT	WATER	SCALA PENETROMETER (Blow/50mm)	SAMPLES, TESTS	RL (m)	DEPTH (m)	GRAPHIC LOG	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	ESTIMATED STRENGTH (kPa)	ORIGIN TYPE, MINERAL COMPOSITION, DEFECTS, STRUCTURE	UNIT
1 2 3			1 2 4 6 8 10 12 14 16 18					Topsoil (as described previously)	M	S			TS
			3 7 15			142		Highly weathered grey brown SILTSTONE. Very weak to weak, very closely spaced defects, excavating to coarse gravel.	HW				Torlesse Terrane
						0.5		0.5m: Effective refusal				0.50m: B, 79° dip, 20° 0.50m: J, 47° dip, 126° 0.50m: J, 60° dip, 275°	
						1.0							
						141							

SKETCH / PHOTO:



COMMENTS: Termination in HW Rock

Hole Depth
0.5m

Excavation-HA - 22/08/2019 1:28:04 PM - Produced with Core-GIS by GeRoc

Scale 1:13

Rev: A



EXCAVATION LOG

Excavation Id.: TP13

SHEET: 1 OF 1

PROJECT: Mt Welcome Development	LOCATION: Mt Welcome, Wellington	JOB No.: 1010566.0000
CO-ORDINATES: 5454170.00 mN (NZTM2000) 1758344.00 mE	EXPOSURE METHOD: TP	EXCAV. STARTED: 17/05/2019
R.L.: 76.10m	EQUIPMENT: CAT 312D	EXCAV. FINISHED: 17/05/2019
DATUM: NZVD2016	OPERATOR: Goodmans	LOGGED BY: ADTH
	DIMENSIONS: 4m by 3.2m	CHECKED BY: TH

EXCAVATION TESTS			ENGINEERING DESCRIPTION			GEOLOGICAL					
PENETRATION	SUPPORT	WATER	SAMPLES, TESTS	DEPTH (m)	GRAPHIC LOG	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE WEATHERING CONDITION	STRENGTH/DENSITY CLASSIFICATION	ESTIMATED SHEAR STRENGTH (kPa)	DEFECTS, STRUCTURE, COMMENTS	UNIT
1 2 3				76	TS	Topsoil: Sandy SILT with some rootlets; brown. Soft, moist, non-plastic.	M	S			Top
			TP13 0.6 m @ 0.6m			Silty fine SAND; mottled yellow brown. Loosely packed, moist, poorly graded.		L			
				75		Silty fine SAND with trace organics; grey brown. Loosely packed, moist, poorly graded.					
				74		Silty fine SAND with minor organics; reddish brown. Tightly packed, moist, poorly graded.		D			
			TP13 2.5 m @ 2.5m			Fine to medium SAND with some silt; grey brown. Loosely packed, saturated, poorly graded.					
			TP 13 3.0 m @ 3.0m							3.5m: Sand becoming tightly packed	Dune Deposits
				72							
				71							
5.4m: Machine limit											

SKETCH / PHOTO:



COMMENTS: Termination due to machine limit

Hole Depth
5.4m



EXCAVATION LOG

Excavation Id.: TP14

SHEET: 1 OF 1

PROJECT: Mt Welcome Development		LOCATION: Mt Welcome, Wellington		JOB No.: 1010566.0000	
CO-ORDINATES: (NZTM2000)	5454089.00 mN 1758233.00 mE	EXPOSURE METHOD:	TP	EXCAV. STARTED:	17/05/2019
R.L.:	60.50m	EQUIPMENT:	CAT 312D	EXCAV. FINISHED:	17/05/2019
DATUM:	NZVD2016	OPERATOR:	Goodmans	LOGGED BY:	ADTH
		DIMENSIONS:	4m by 3m	CHECKED BY:	TH

EXCAVATION TESTS		ENGINEERING DESCRIPTION				GEOLOGICAL	
PENETRATION	SUPPORT WATER	SAMPLES, TESTS	DEPTH (m)	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION WEATHERING	STRENGTH/DENSITY CLASSIFICATION	DEFECTS, STRUCTURE, COMMENTS
1 2 3			60	TS Topsoil (as described previously). Moist-wet	M-W		
			60	Sandy SILT with some clay and organics; grey brown. Soft, moist, low plasticity.	M	S	
			60	Clayey SILT with some sand and organics; grey brown. Firm, moist, moderate plasticity.		F	
			59	Fine SAND with some silt and organics; grey brown. Loosely packed, moist-wet, poorly graded.	M-W	L	
			59	Sandy fine to coarse GRAVEL with some organics and silt; grey brown. Loosely packed, moist, well graded. Gravel: sub-rounded SW greywacke.	M		
			59	Lenses of soft, compressible PEAT with small stumps and logs, fine to coarse GRAVEL, and organic SILT.	W	S	
			58	Silty fine SAND with minor organics; grey. Loosely packed, moist, poorly graded.	M	L	
			57				
			56				
			55				
			54				
			53				
			52				
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			5				
			4				
			3				
			2				
			1				
			0				
			5	4.9m: Machine limit			

17/05/2019
Inflow between 1.6-2.3 m
● 98/30 kPa
● 102/36 kPa
TP14 0.9 m @ 0.9m
TP14 1.6 m @ 1.6m

4.5m: Silty fine SAND becoming tightly packed

SKETCH / PHOTO:



COMMENTS: Termination due to machine limit

Hole Depth
4.9m

Excavation - 22/08/2019 2:24:40 PM - Produced with Core-GS by GeRoc

Scale 1:43

Rev. A



EXCAVATION LOG

Excavation Id.: TP15

SHEET: 1 OF 1

PROJECT: Mt Welcome Development	LOCATION: Mt Welcome, Wellington	JOB No.: 1010566.0000
CO-ORDINATES: 5453969.00 mN (NZTM2000) 1758238.00 mE	EXPOSURE METHOD: TP	EXCAV. STARTED: 17/05/2019
R.L.: 64.30m	EQUIPMENT: CAT 312D	EXCAV. FINISHED: 17/05/2019
DATUM: NZVD2016	OPERATOR: Goodmans	LOGGED BY: ADTH
	DIMENSIONS: 3.8m by 2.8m	CHECKED BY: TH

EXCAVATION TESTS		ENGINEERING DESCRIPTION			GEOLOGICAL			
PENETRATION	SUPPORT WATER	SAMPLES, TESTS	GRAPHIC LOG	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION	WEATHERING CLASSIFICATION	DEFECTS, STRUCTURE, COMMENTS	UNIT
1 2 3			RL (m) DEPTH (m)	Topsoil (as described previously)	M	S		Top
		TP15 1.0 m @ 0.8m	64 0.5	Silty fine SAND; yellow brown. Loosely packed, moist, poorly graded.		L		Dune Deposits
			63 1.0	Silty fine SAND; grey brown. Loosely packed, moist, poorly graded.				
		TP15 3.0 @ 2.8m	62 1.5 2.0 2.5	Fine-medium SAND with some gravel; yellow brown. Loosely packed, dry-moist, poorly graded.	D-M			Torfesse
			61 3.0 3.5	Highly weathered yellow brown SILTSTONE. Very weak to weak, very closely spaced defects, zeolite coating on fracture surfaces, excavating to sandy fine gravel.	HW			
				3.8m: Effective refusal				

SKETCH / PHOTO:



COMMENTS: Termination in HW Rock

Hole Depth
3.8m

Excavation - 22/05/2019 2:25:28 PM - Produced with Core-GS by GeRoc

Scale 1:33

Rev: A



EXCAVATION LOG

Excavation Id.: TP16

SHEET: 1 OF 1

PROJECT: Mt Welcome Development		LOCATION: Mt Welcome, Wellington		JOB No.: 1010566.0000	
CO-ORDINATES: 5453832.00 mN (NZTM2000) 1758281.00 mE		EXPOSURE METHOD: TP		EXCAV. STARTED: 17/05/2019	
R.L.: 87.90m		EQUIPMENT: CAT 312D		EXCAV. FINISHED: 17/05/2019	
DATUM: NZVD2016		OPERATOR: Goodmans		LOGGED BY: ADTH	
		DIMENSIONS: 3.5m by 2m		CHECKED BY: TH	

EXCAVATION TESTS			ENGINEERING DESCRIPTION				GEOLOGICAL							
1 PENETRATION	2 SUPPORT	3 WATER	SAMPLES TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION	WEATHERING	STRENGTH/DENSITY CLASSIFICATION	ESTIMATED SHEAR STRENGTH (kPa)	DEFECTS, STRUCTURE, COMMENTS	UNIT
							TS	Topsoil (as described previously)	M		S			Topsoil
							TS	Sandy fine to coarse GRAVEL with minor silt; yellow brown. Loosely packed, moist, well graded. Gravel: angular, highly weathered greywacke.			L			Colluvium Deposits
						0.5		Highly weathered yellow brown fine SANDSTONE. Very weak, closely spaced defects, orthogonally jointed, excavating to coarse gravel.						Torlesse Terrane
					87	1.0		1.1m: Effective refusal					1.10 - 1.10m: J, 63° dip, 101° 1.10 - 1.10m: J, 74° dip, 214° 1.10 - 1.10m: J, 65° dip, 257°	

SKETCH / PHOTO:



COMMENTS: Termination in HW Rock

Hole Depth
1.1m

Scale 1:13

Rev.: A



EXCAVATION LOG

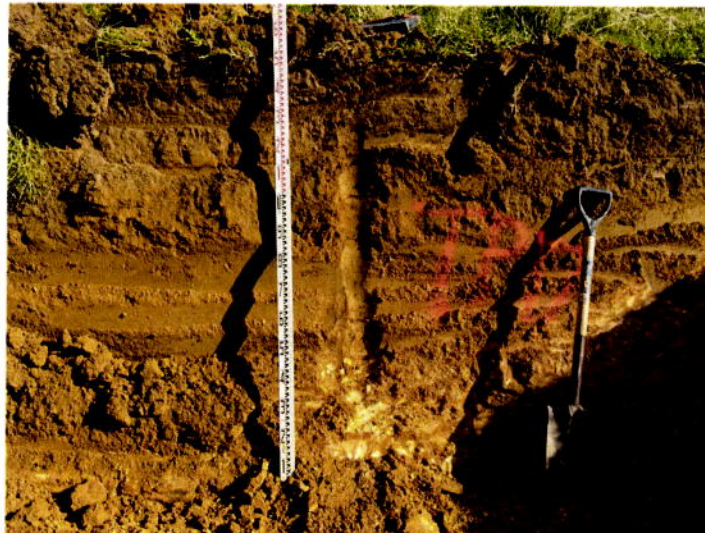
Excavation Id.: TP17

SHEET: 1 OF 1

PROJECT: Mt Welcome Development	LOCATION: Mt Welcome, Wellington	JOB No.: 1010566.0000
CO-ORDINATES: 5453840.00 mN (NZTM2000) 1758195.00 mE	EXPOSURE METHOD: TP	EXCAV. STARTED: 17/05/2019
R.L.: 70.90m	EQUIPMENT: CAT 312D	EXCAV. FINISHED: 17/05/2019
DATUM: NZVD2016	OPERATOR: Goodmans	LOGGED BY: ADTH
	DIMENSIONS: 3.5m by 2m	CHECKED BY: TH

EXCAVATION TESTS			ENGINEERING DESCRIPTION				GEOLOGICAL				
PENETRATION 1 2 3	SUPPORT WATER	SAMPLES, TESTS	RL (m)	DEPTH (m)	GRAPHIC LOG	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE / WEATHERING CONDITION	STRENGTH/DENSITY CLASSIFICATION	ESTIMATED SHEAR STRENGTH (kPa)	DEFECTS, STRUCTURE, COMMENTS	UNIT
			70	0.0	TS	Topsoil (as described previously)	M	S			TSoil
			70	0.5		Silty fine SAND with some clay; yellow brown. Loosely packed, moist, poorly graded.		L			Dune Deposits
		TP17 0.8 m @ 0.8m	70	1.0		Sandy fine to coarse GRAVEL with some silt; yellow brown. Tightly packed, moist, well graded. Gravel: angular highly weathered greywacke.					Colluvium Deposits
			69	1.5		Highly weathered grey white SILTSTONE. Very weak to weak, very closely spaced defects, excavating to fine gravel.	HW				Torlesse Terrane
				1.6		1.6m: Effective refusal					

SKETCH / PHOTO:



COMMENTS: Termination in HW Rock

Hole Depth
1.6m

Excavation - 22/08/2019 3:02:13 PM - Produced with Core-GS by GeRoc

Scale 1:17

Rev.: A



EXCAVATION LOG

Excavation Id.: TP18

SHEET: 1 OF 1

PROJECT: Mt Welcome Development		LOCATION: Mt Welcome, Wellington		JOB No.: 1010566.0000	
CO-ORDINATES: 5453897.00 mN (NZTM2000) 1758078.00 mE		EXPOSURE METHOD: TP		EXCAV. STARTED: 17/05/2019	
R.L.: 62.40m		EQUIPMENT: CAT 312D		EXCAV. FINISHED: 17/05/2019	
DATUM: NZVD2016		OPERATOR: Goodmans		LOGGED BY: ADTH	
		DIMENSIONS: 4m by 3.2m		CHECKED BY: TH	

EXCAVATION TESTS			ENGINEERING DESCRIPTION				GEOLOGICAL							
1 PENETRATION	2 SUPPORT	3 WATER	SAMPLES, TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION	WEATHERING	STRENGTH/DENSITY CLASSIFICATION	ESTIMATED UNSATURATED STRENGTH (kPa)	DEFECTS, STRUCTURE, COMMENTS	UNIT
			TP18 1 m @ 1.0m		62.40	0	TS	Topsoil (as described previously)	M	St				Top
					61.40	1		Fine to medium SAND with some silt; yellow brown. Loosely packed, dry-moist, poorly graded.	D-M		L			Dune Deposits
					60.40	2								
					59.40	3								
					58.40	4		Silty fine SAND with trace organics; grey brown. Loosely packed, moist, poorly graded.	M					
					57.40	5								
5.2m: Machine limit														

SKETCH / PHOTO:



COMMENTS: Termination due to machine limit

Hole Depth
5.2m

Scale 1:45

Excavation - 22/08/2019 3:04:08 PM - Produced with Core-GS by GeRoc

Rev.: A



EXCAVATION LOG

Excavation Id.: TP19

SHEET: 1 OF 1

PROJECT: Mt Welcome Development	LOCATION: Mt Welcome, Wellington	JOB No.: 1010566.0000
CO-ORDINATES: 5453827.00 mN (NZTM2000) 1757984.00 mE	EXPOSURE METHOD: TP	EXCAV. STARTED: 17/05/2019
R.L.: 52.90m	EQUIPMENT: CAT 312D	EXCAV. FINISHED: 17/05/2019
DATUM: NZVD2016	OPERATOR: Goodmans	LOGGED BY: ADTH
	DIMENSIONS: 4.2m by 1.3m	CHECKED BY: TH

EXCAVATION TESTS			ENGINEERING DESCRIPTION				GEOLOGICAL							
PENETRATION	SUPPORT	WATER	SAMPLES, TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION	WEATHERING	STRENGTH/DENSITY CLASSIFICATION	ESTIMATED SHEAR STRENGTH (kPa)	DEFECTS, STRUCTURE, COMMENTS	UNIT
1 2 3														
							TS	Topsoil (as described previously)	M		S			
						0.5		Sandy fine to coarse GRAVEL; yellow brown. Loose, moist, well graded, angular.			L			Colluvium Deposits
					52	1.0		Highly weathered grey brown SILTSTONE. Very weak, very closely spaced defects, excavating to coarse gravel.	HW					Torlesse Terrane
								1.3m: Effective refusal					1.30m: J, 74° dip, 305° 1.30m: B, 63° dip, 293° 1.30m: J, 73° dip, 44° 1.30m: J, 59° dip, 234°	

SKETCH / PHOTO:



COMMENTS: Termination in HW Rock

Hole Depth
1.3m

Scale 1:13

Rev. A



EXCAVATION LOG

Excavation Id.: TP20

SHEET: 1 OF 1

PROJECT: Mt Welcome Development	LOCATION: Mt Welcome, Wellington	JOB No.: 1010566.0000
CO-ORDINATES: 5453765.00 mN (NZTM2000) 1757967.00 mE	EXPOSURE METHOD: TP	EXCAV. STARTED: 17/05/2019
R.L.: 36.40m	EQUIPMENT: CAT 312D	EXCAV. FINISHED: 17/05/2019
DATUM: NZVD2016	OPERATOR: Goodmans	LOGGED BY: ADTH
	DIMENSIONS: 4.1m by 3m	CHECKED BY: TH

EXCAVATION TESTS		ENGINEERING DESCRIPTION				GEOLOGICAL								
PENETRATION	SUPPORT	WATER	SAMPLES, TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION	WEATHERING	STRENGTH/DENSITY CLASSIFICATION	ESTIMATED UNIT STRENGTH (kPa)	DEFECTS, STRUCTURE, COMMENTS	UNIT
1 2 3								Topsoil (as described previously)	M		S			TS
					36	0.5		Sandy SILT with some clay; yellow brown. Soft, moist, low plasticity.						Loess
		17/05/2019			35	1.0		Sandy fine to medium GRAVEL with some organics, grey brown. Loosely packed, moist, well graded. Gravel: angular MW greywacke.	M-W		L			Cvd
					35	1.5		Silty fine SAND; grey brown. Loose, moist-wet, poorly graded.						Alluvial Deposits
					34	2.0		Silty fine to coarse GRAVEL with some sand and organics; blue grey. Loosely packed, wet, well graded. Gravel: sub-rounded slightly weathered greywacke.	W				2.5m: Gravel becoming tightly packed	
					33	3.0		Moderately to highly weathered grey brown fine SANDSTONE. Weak to moderately strong, closely spaced defects, Mn staining on defect planes. Excavating to small cobbles.	MW	HW				Tonisse
					33	3.5		3.2m: Effective refusal						

SKETCH / PHOTO:



COMMENTS: Termination in MW Rock

Hole Depth
3.2m

Scale 1:33



Tonkin+Taylor

EXCAVATION LOG

Excavation Id.: TP21

SHEET: 1 OF 1

PROJECT: Mt Welcome Development	LOCATION: Mt Welcome, Wellington	JOB No.: 1010566.0000
CO-ORDINATES: 5453775.00 mN (NZTM2000) 1757866.00 mE	EXPOSURE METHOD: TP	EXCAV. STARTED: 17/05/2019
R.L.: 49.50m	EQUIPMENT: CAT 312D	EXCAV. FINISHED: 17/05/2019
DATUM: NZVD2016	OPERATOR: Goodmans	LOGGED BY: ADTH
	DIMENSIONS: 3m by 1.2m	CHECKED BY: TH

EXCAVATION TESTS			ENGINEERING DESCRIPTION				GEOLOGICAL							
PENETRATION	SUPPORT	WATER	SAMPLES, TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION	WEATHERING	STRENGTH/DENSITY CLASSIFICATION	ESTIMATED SHEAR STRENGTH (kPa)	DEFECTS, STRUCTURE, COMMENTS	UNIT
1 2 3								Topsoil (as described previously) Highly weathered grey brown SILTSTONE. Very weak, very closely spaced defects, zeolite and clay veneers on joint surfaces. Excavates to fine gravel.	M	S				Topsoil
					49	0.5			HW					Torlesse Terrane
						1.0		1m: Effective refusal					1.00m: J, 42° dip, 202° 1.00m: J, 68° dip, 50° 1.00m: B, 78° dip, 138°	

SKETCH / PHOTO:



COMMENTS: Termination in HW Rock

Hole Depth
1m

Excavation - 22/08/2019 3:15:17 PM - Produced with Core-GS by GeRec

Scale 1:13

Rev: A



EXCAVATION LOG

Excavation Id.: TP22

SHEET: 1 OF 1

PROJECT: Mt Welcome Development		LOCATION: Mt Welcome, Wellington		JOB No.: 1010566.0000	
CO-ORDINATES: (NZTM2000)	5454327.00 mN 1757894.00 mE	EXPOSURE METHOD:	TP	EXCAV. STARTED:	17/05/2019
R.L.:	64.40m	EQUIPMENT:	CAT 312D	EXCAV. FINISHED:	17/05/2019
DATUM:	NZVD2016	OPERATOR:	Goodmans	LOGGED BY:	ADTH
		DIMENSIONS:	4m by 2.8m	CHECKED BY:	TH

EXCAVATION TESTS			ENGINEERING DESCRIPTION			GEOLOGICAL							
PENETRATION	SUPPORT	WATER	SAMPLES, TESTS	RL (m)	DEPTH (m)	GRAPHIC LOG	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION	WEATHERING	STRENGTH/DENSITY CLASSIFICATION	ESTIMATED SHEAR STRENGTH (kPa)	DEFECTS, STRUCTURE, COMMENTS	UNIT
1-3							Topsoil (as described previously)	M		S			TSoil
				64	0.5		Clayey SILT with some sand; yellow brown. Firm-stiff, moist, high plasticity.			F-St			
			TP22 0.9 m @ 0.9m	63	1.0		Clayey SILT with some gravel; yellow brown. Stiff, moist, moderate plasticity. Gravel: fine, angular highly weathered Siltstone.			St			Loess
					2.0		Highly weathered grey brown SILTSTONE. Weak, very closely spaced defects, zeolite coating on joint surfaces. Excavating to fine gravel.			HW			Torlesse
							2.2m: Effective refusal						

SKETCH / PHOTO:



COMMENTS: Termination in HW Rock

Hole Depth
2.2m

Scale 1:19

Excavation - 22/05/2019 4:03:56 PM - Produced with Core-GS by GeiRoc

Rev. A



EXCAVATION LOG

Excavation Id.: TP23

SHEET: 1 OF 1

PROJECT: Mt Welcome Development		LOCATION: Mt Welcome, Wellington		JOB No.: 1010566.0000	
CO-ORDINATES: (NZTM2000)	5453703.00 mN 1757883.00 mE	EXPOSURE METHOD:	TP	EXCAV. STARTED:	17/05/2019
R.L.:	33.10m	EQUIPMENT:	CAT 312D	EXCAV. FINISHED:	17/05/2019
DATUM:	NZVD2016	OPERATOR:	Goodmans	LOGGED BY:	ADTH
		DIMENSIONS:	4m by 2.5m	CHECKED BY:	TH

EXCAVATION TESTS		ENGINEERING DESCRIPTION				GEOLOGICAL							
PENETRATION	SUPPORT	WATER	SAMPLES, TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE WEATHERING CONDITION	STRENGTH-DENSITY CLASSIFICATION	ESTIMATED SHEAR STRENGTH (kPa)	DEFECTS, STRUCTURE, COMMENTS	UNIT
1 2 3					33		TS	Topsoil (as described previously)	M	S			Top
						1		Silty fine SAND with some gravel; grey brown. Loosely packed, moist, poorly graded.		L			Alluvial Deposits
					32	2		Sandy fine to medium GRAVEL with some silt; grey brown. Loosely packed, moist, well graded. Gravel: subrounded highly weathered greywacke.					
					31								Alluvial Deposits
					30	3		Sandy SILT with some organics; blue grey. Soft, moist-wet, low plasticity.	M-W	S			
					29			Silty fine SAND with some organics; blue grey. Loosely packed, moist-wet, poorly graded.		L			Alluvial Deposits
					28	4		Sandy fine to coarse GRAVEL with small cobbles; yellow brown. Tightly packed, moist, well graded. Gravel: sub-rounded to rounded moderately weathered greywacke.	M				
						5		Moderately weathered to highly weathered yellow brown fine SANDSTONE. Weak to moderately strong, very closely spaced defects. Excavates to fine gravel.					Tit
								4.3m: Effective refusal					

SKETCH / PHOTO:



COMMENTS: Termination in MW Rock

Hole Depth
4.3m

Scale 1:46

Excavation - 22/08/2019 4:09:42 PM - Produced with Core-GS by GeiRoc

Rev: A



EXCAVATION LOG

Excavation Id.: TP24

SHEET: 1 OF 1

PROJECT: Mt Welcome Development	LOCATION: Mt Welcome, Wellington	JOB No.: 1010566.0000
CO-ORDINATES: 5453762.00 mN (NZTM2000) 1758131.00 mE	EXPOSURE METHOD: TP	EXCAV. STARTED: 17/05/2019
R.L.: 74.10m	EQUIPMENT: CAT 312D	EXCAV. FINISHED: 17/06/2019
DATUM: NZVD2016	OPERATOR: Goodmans	LOGGED BY: ADTH
	DIMENSIONS: 3.2m by 2m	CHECKED BY: TH

EXCAVATION TESTS		ENGINEERING DESCRIPTION				GEOLOGICAL			
PENETRATION -1 -2 -3	SUPPORT WATER	SAMPLES, TESTS	SAMPLES	RL (m) DEPTH (m) GRAPHIC LOG	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION WEATHERING	STRENGTH/DENSITY CLASSIFICATION ESTIMATED UNIT WEIGHT (kPa)	DEFECTS, STRUCTURE, COMMENTS	UNIT
				74	Topsoil (as described previously)	D			T Soil
				0.5	Silty fine SAND with minor organics; yellow brown. Loosely packed, dry, poorly graded.		L		Dune Deposits
				73	Clayey SILT with minor organics; yellow grey. Stiff, moist, high plasticity.	D-M	St		
				1.5	Sandy SILT with some clay; yellow brown. Stiff, dry, poorly graded.	D			Loess
				72					
				2.5	Highly weathered yellow brown SILTSTONE. Very weak, very closely spaced defects, Mn staining and clay veneers on defect faces. Excavating to medium gravel.	HW			Torlesse
					2.9m: Effective refusal				

SKETCH / PHOTO:



COMMENTS: Termination in HW Rock

Hole Depth
2.9m

Scale 1:25

Excavation - 22/08/2019 4:17:24 PM - Produced with Core-GS by GeRoc

Rev.: A



EXCAVATION LOG

Excavation Id.: TP25

SHEET: 1 OF 1

PROJECT: Mt Welcome Development	LOCATION: Mt Welcome, Wellington	JOB No.: 1010566.0000
CO-ORDINATES: 5453869.00 mN (NZTM2000) 1757826.00 mE	EXPOSURE METHOD: TP	EXCAV. STARTED: 17/06/2019
R.L.: 68.10m	EQUIPMENT: CAT 312D	EXCAV. FINISHED: 17/06/2019
DATUM: NZVD2016	OPERATOR: Goodmans	LOGGED BY: ADTH
	DIMENSIONS: 4m by 1.8m	CHECKED BY: TH

EXCAVATION TESTS		ENGINEERING DESCRIPTION				GEOLOGICAL								
PENETRATION	SUPPORT	WATER	SAMPLES, TESTS	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	SOIL NAME, PLASTICITY OR PARTICLE SIZE CHARACTERISTICS, COLOUR, SECONDARY AND MINOR COMPONENTS	MOISTURE CONDITION	WEATHERING	STRENGTH DENSITY CLASSIFICATION	ESTIMATED SHEAR STRENGTH (kPa)	DEFECTS, STRUCTURE, COMMENTS	UNIT
1 2 3					68	0.0		Topsoil (as described previously)	D	S				Top
					67	0.5		Silty fine SAND with minor clay; brown. Loosely packed, moist, well graded.	M	L				Dune Deposits
					65	2.5		Silty fine SAND with some clay; grey brown. Loosely packed, dry, poorly graded.	D					
					64	4.4		4.4m: Machine limit						

SKETCH / PHOTO:



COMMENTS: Termination due to machine limit

Hole Depth
4.4m



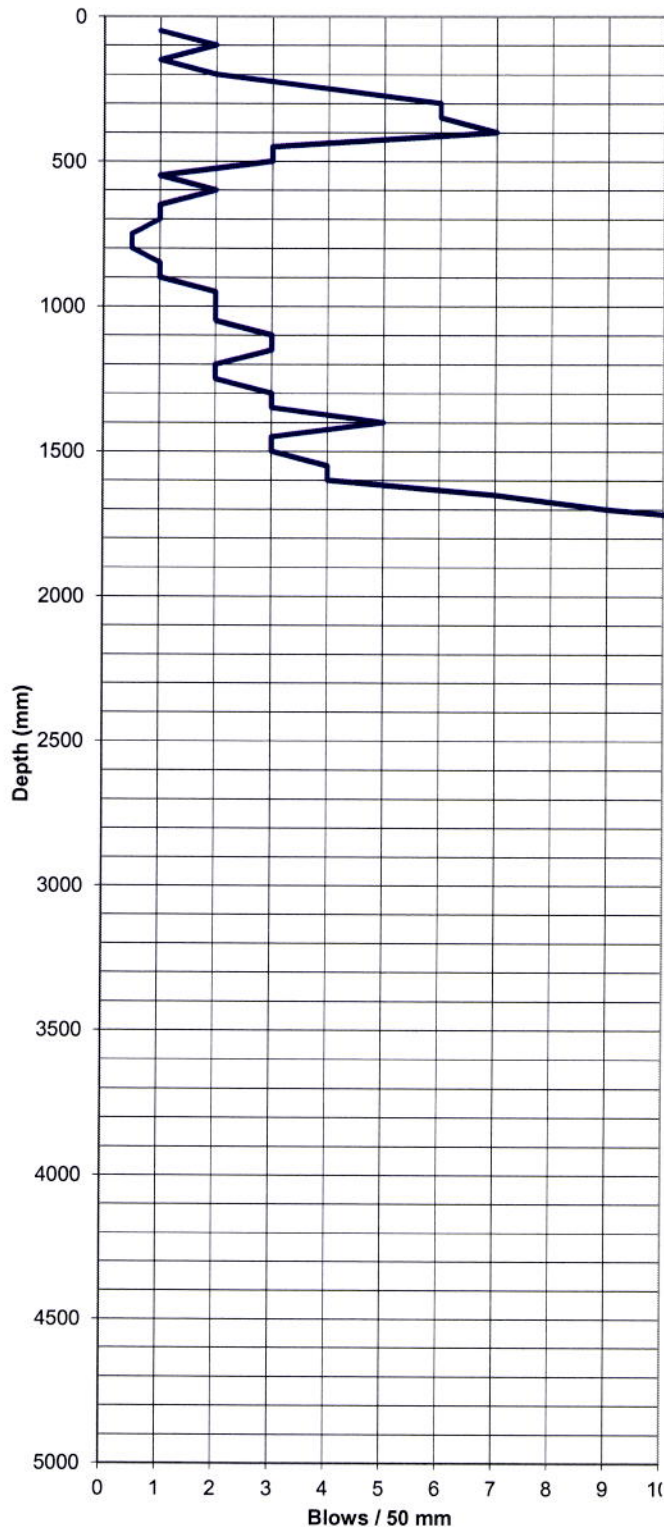
TONKIN & TAYLOR
SCALA PENETROMETER LOG

Job No: 1010566.000
Project: Mt Welcome Development
Location: 5454432, 1758629
RL: 112 m

Date: 16/05/2019
Operated by: TH
Logged by: ADTH
Checked by: NCP

Test No.	SC1
Sheet of	1 / 1

mm Driven	No. of Blows	mm Driven	No. of Blows
50	1	2550	
100	2	2600	
150	1	2650	
200	2	2700	
250	4	2750	
300	6	2800	
350	6	2850	
400	7	2900	
450	3	2950	
500	3	3000	
550	1	3050	
600	2	3100	
650	1	3150	
700	1	3200	
750	0.5	3250	
800	0.5	3300	
850	1	3350	
900	1	3400	
950	2	3450	
1000	2	3500	
1050	2	3550	
1100	3	3600	
1150	3	3650	
1200	2	3700	
1250	2	3750	
1300	3	3800	
1350	3	3850	
1400	5	3900	
1450	3	3950	
1500	3.0	4000	
1550	4.0	4050	
1600	4	4100	
1650	7	4150	
1700	9	4200	
1750	12	4250	
1800	12	4300	
1850		4350	
1900		4400	
1950		4450	
2000		4500	
2050		4550	
2100		4600	
2150		4650	
2200		4700	
2250		4750	
2300		4800	
2350		4850	
2400		4900	
2450		4950	
2500		5000	



Test Method Used: NZS 4402:1988 Test 6.5.2 Dynamic Cone Penetrometer



Mt Welcome Development
T&T job No.: 1010566.0

5/06/2019



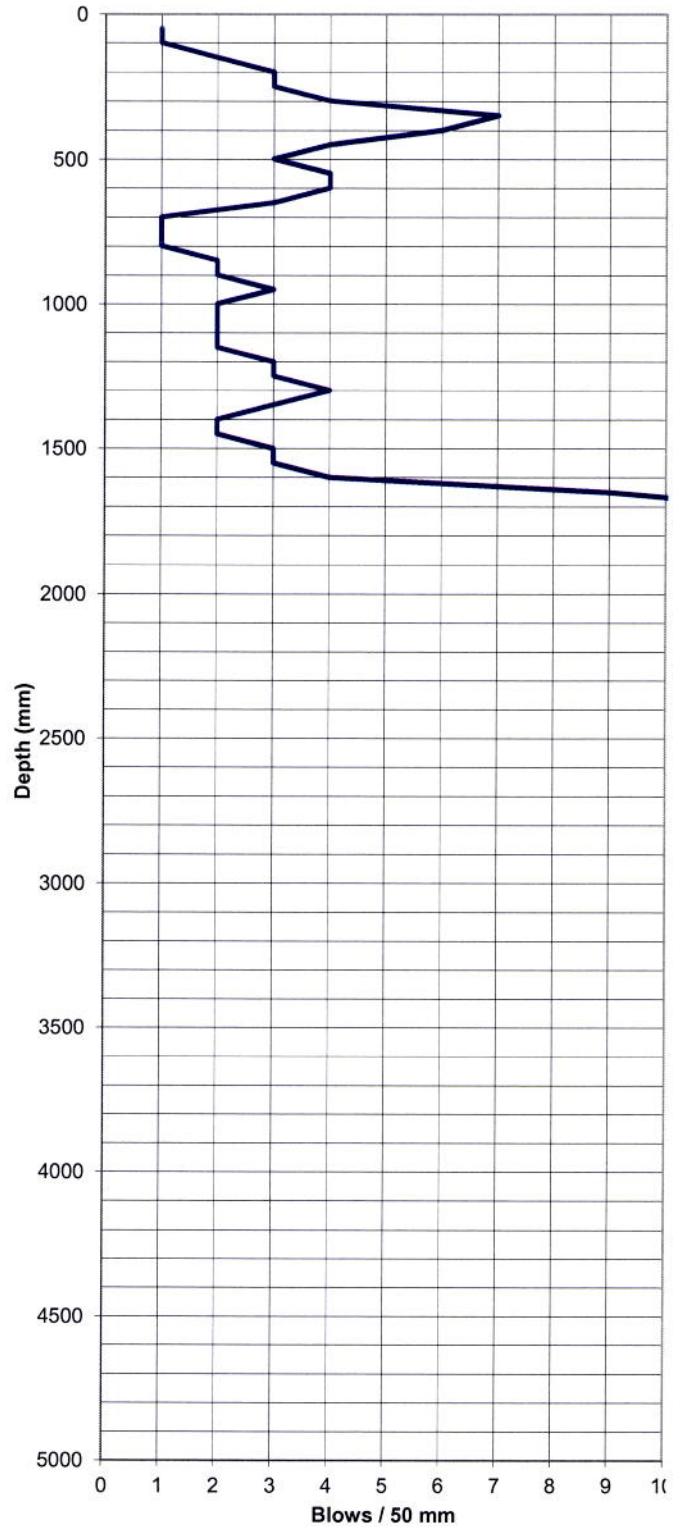
TONKIN & TAYLOR
SCALA PENETROMETER LOG

Job No: 1010566
Project: Mt Welcome Development
Location: 5453938, 1758580
RL: 103.5 m

Date: 16/05/2019
Operated by: TH
Logged by: ADTH
Checked by: NCP

Test No.	SC2
Sheet of	1 / 1

mm Driven	No. of Blows	mm Driven	No. of Blows
50	1	2550	
100	1	2600	
150	2	2650	
200	3	2700	
250	3	2750	
300	4	2800	
350	7	2850	
400	6	2900	
450	4	2950	
500	3	3000	
550	4	3050	
600	4	3100	
650	3	3150	
700	1	3200	
750	1	3250	
800	1	3300	
850	2	3350	
900	2	3400	
950	3	3450	
1000	2	3500	
1050	2	3550	
1100	2	3600	
1150	2	3650	
1200	3	3700	
1250	3	3750	
1300	4	3800	
1350	3	3850	
1400	2	3900	
1450	2	3950	
1500	3	4000	
1550	3	4050	
1600	4	4100	
1650	9	4150	
1700	12	4200	
1750		4250	
1800		4300	
1850		4350	
1900		4400	
1950		4450	
2000		4500	
2050		4550	
2100		4600	
2150		4650	
2200		4700	
2250		4750	
2300		4800	
2350		4850	
2400		4900	
2450		4950	
2500		5000	



Test Method Used: NZS 4402:1988 Test 6.5.2 Dynamic Cone Penetrometer



Mt Welcome Development
T&T job No.: 1010566

5/06/2019



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TONKIN & TAYLOR

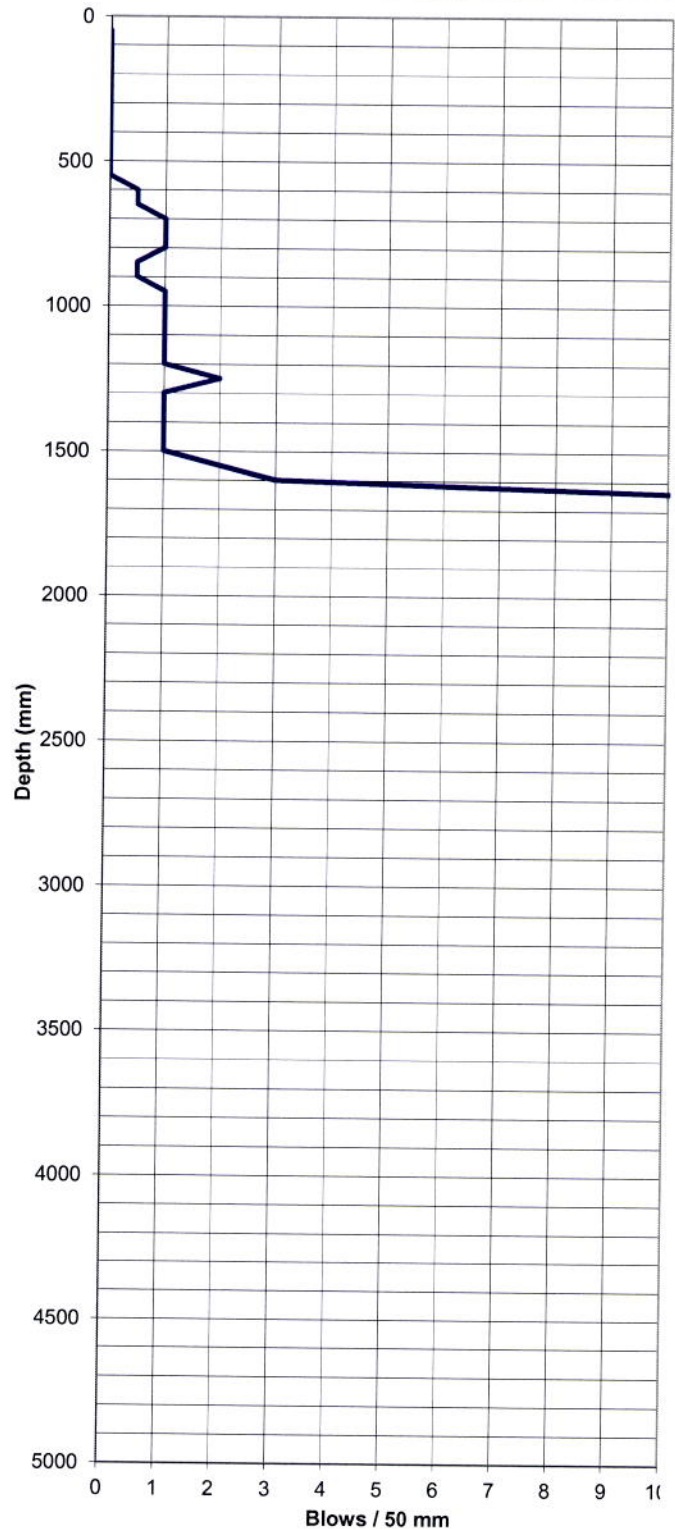
SCALA PENETROMETER LOG

Job No: 1010566
 Project: Mt Welcome Development
 Location: 5453839, 1758045
 RL: 41.0 m

Date: 16/05/2019
 Operated by: TH
 Logged by: ADTH
 Checked by: NCP

Test No.	SC3
Sheet of	1 / 1

mm Driven	No. of 1	mm Driven	No. of Blows
50		2550	
100		2600	
150		2650	
200		2700	
250		2750	
300		2800	
350		2850	
400		2900	
450		2950	
500		3000	
550		3050	
600	0.5	3100	
650	0.5	3150	
700	1	3200	
750	1	3250	
800	1	3300	
850	0.5	3350	
900	0.5	3400	
950	1	3450	
1000	1	3500	
1050	1	3550	
1100	1	3600	
1150	1	3650	
1200	1	3700	
1250	2	3750	
1300	1	3800	
1350	1	3850	
1400	1	3900	
1450	1	3950	
1500	1	4000	
1550	2	4050	
1600	3	4100	
1650	12	4150	
1700		4200	
1750		4250	
1800		4300	
1850		4350	
1900		4400	
1950		4450	
2000		4500	
2050		4550	
2100		4600	
2150		4650	
2200		4700	
2250		4750	
2300		4800	
2350		4850	
2400		4900	
2450		4950	
2500		5000	



Test Method Used: NZS 4402:1988 Test 6.5.2 Dynamic Cone Penetrometer



Mt Welcome Development
 T&T job No.: 1010566

5/06/2019



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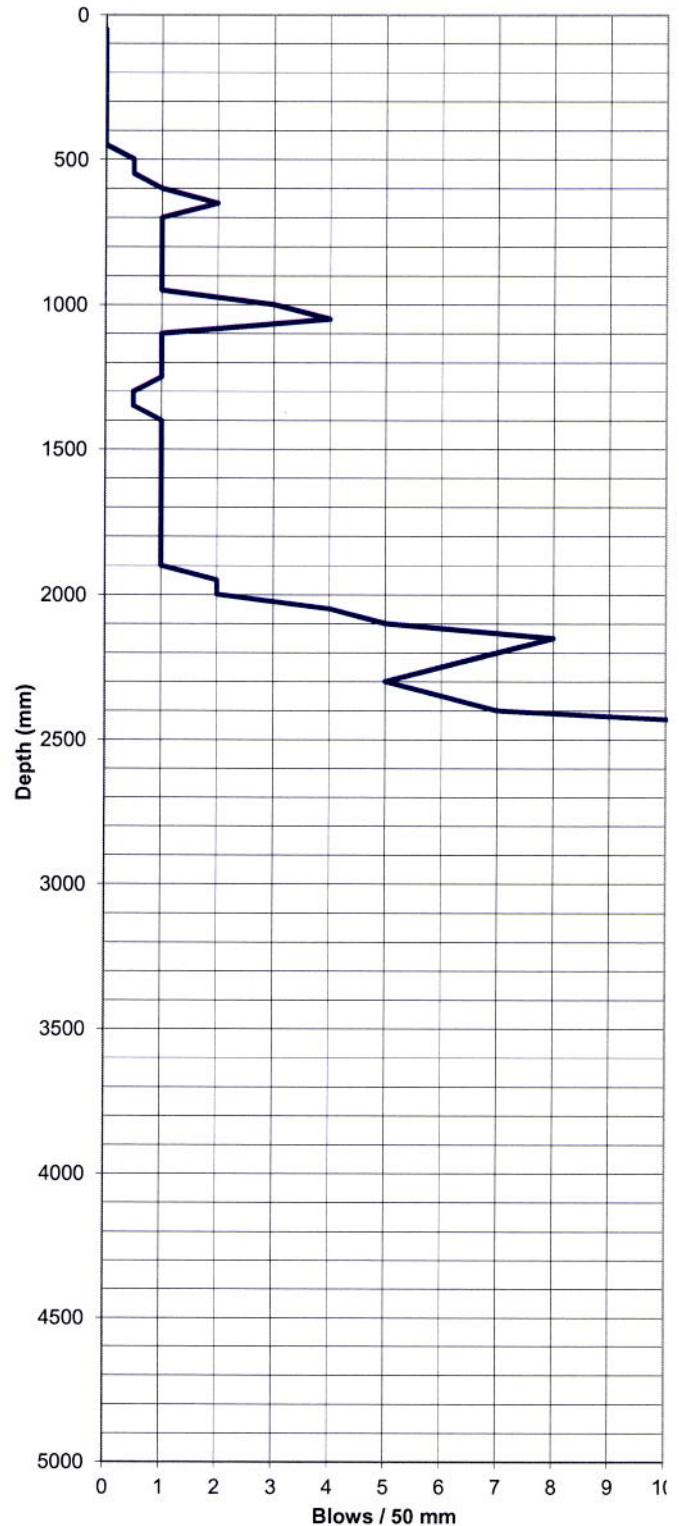
**TONKIN & TAYLOR
SCALA PENETROMETER LOG**

Job No: 1010566
Project: Mt Welcome Development
Location: 5453849, 1758015
RL: 40.5

Date: 16/05/2019
Operated by: TH
Logged by: ADTH
Checked by: NCP

Test No.	SC4
Sheet of	1 / 1

mm Driven	No. of Blows	mm Driven	No. of Blows
50		2550	
100		2600	
150		2650	
200		2700	
250		2750	
300		2800	
350		2850	
400		2900	
450		2950	
500	0.5	3000	
550	0.5	3050	
600	1	3100	
650	2	3150	
700	1	3200	
750	1	3250	
800	1	3300	
850	1	3350	
900	1	3400	
950	1	3450	
1000	3	3500	
1050	4	3550	
1100	1	3600	
1150	1	3650	
1200	1	3700	
1250	1	3750	
1300	0.5	3800	
1350	0.5	3850	
1400	1	3900	
1450	1	3950	
1500	1	4000	
1550	1	4050	
1600	1	4100	
1650	1	4150	
1700	1	4200	
1750	1	4250	
1800	1	4300	
1850	1	4350	
1900	1	4400	
1950	2	4450	
2000	2	4500	
2050	4	4550	
2100	5	4600	
2150	8	4650	
2200	7	4700	
2250	6	4750	
2300	5	4800	
2350	6	4850	
2400	7	4900	
2450	12	4950	
2500		5000	



Test Method Used: NZS 4402:1988 Test 6.5.2 Dynamic Cone Penetrometer



Mt Welcome Development
T&T job No.: 1010566

5/06/2019



Our Ref: 1100053.0.0.0/REP1
Customer Ref: 1010566
6 June 2019

Tonkin & Taylor Limited
PO Box 5271
Auckland
1141

Attention: Tim Haxell

Mount Welcome Laboratory Test Report

Samples from the above mentioned site have been tested as received according to your instructions and the results are included in this report.


If we can be of any further assistance, feel free to get in touch. Contact details are provided at the bottom of this page.

GEOTECHNICS LTD

Report prepared by:



.....
James Green
Construction Materials Technician

Authorised for Geotechnics by:


.....
Paul Burton
Project Director

Paul Burton
I have reviewed this
document
2019.06.06 12:13:44 +12'00'

Report checked by:


.....
Alan Benton
Wellington Manager

6-Jun-19

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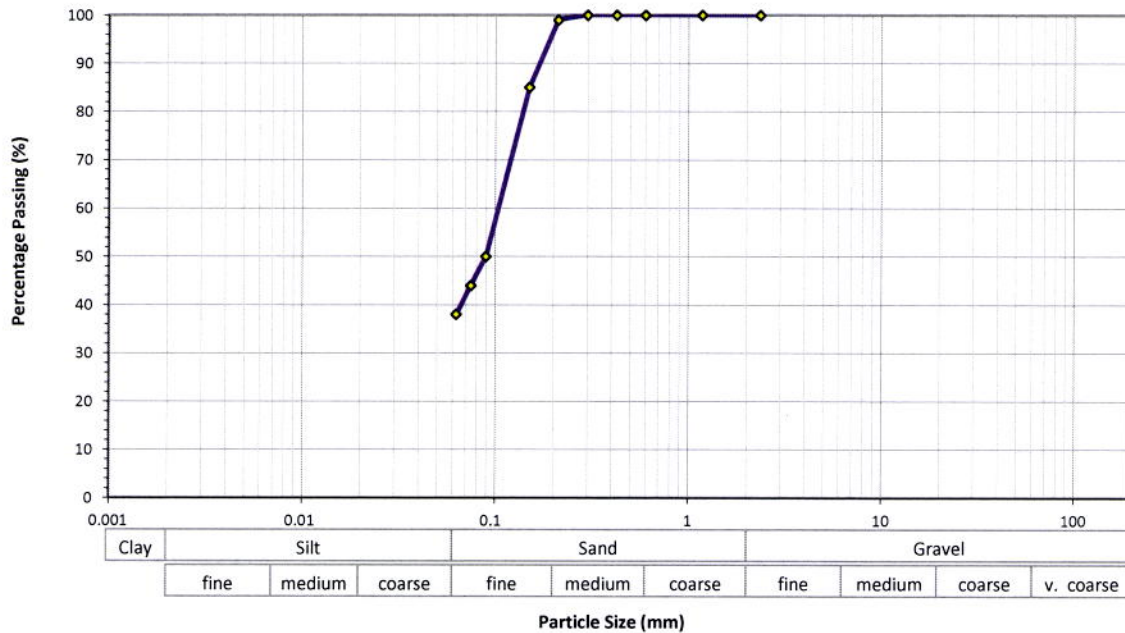
Geotechnics Project Number 1100053.0.0.0
QESTLab Work Order ID W19WN-0027
Customer Project ID 1010566

Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve)

TEST DETAILS

LOCATION	Description	Mount Welcome		
	Data	N/A		
SAMPLE	Geotechnics ID	S19WN000092		
	Reference	TP01_1.0m	Top Depth	1.0
	Sampled By	Others, Tested As Received	Bottom Depth	N/A
	Description	Silty fine to medium SAND; brown. Moist; poorly graded.		
SPECIMEN	Reference			
	Description	Depth		

TEST RESULTS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150	-	26.5	-	4.75	-	0.300	100
100	-	19.0	-	3.35	-	0.212	99
75.0	-	16.0	-	2.36	100	0.150	85
63.0	-	13.2	-	1.18	100	0.090	50
53.0	-	9.50	-	0.600	100	0.075	44
37.5	-	6.70	-	0.425	100	0.063	38

TEST REMARKS

• The material used for testing was natural, whole soil. • The sampling is not covered under our scope of IANZ accreditation. • The percentage passing the <0.063mm was obtained by difference. • Results apply only to sample tested. • This report may be reproduced only in full.

Approved By Alan Benton
Date 5/06/2019



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.



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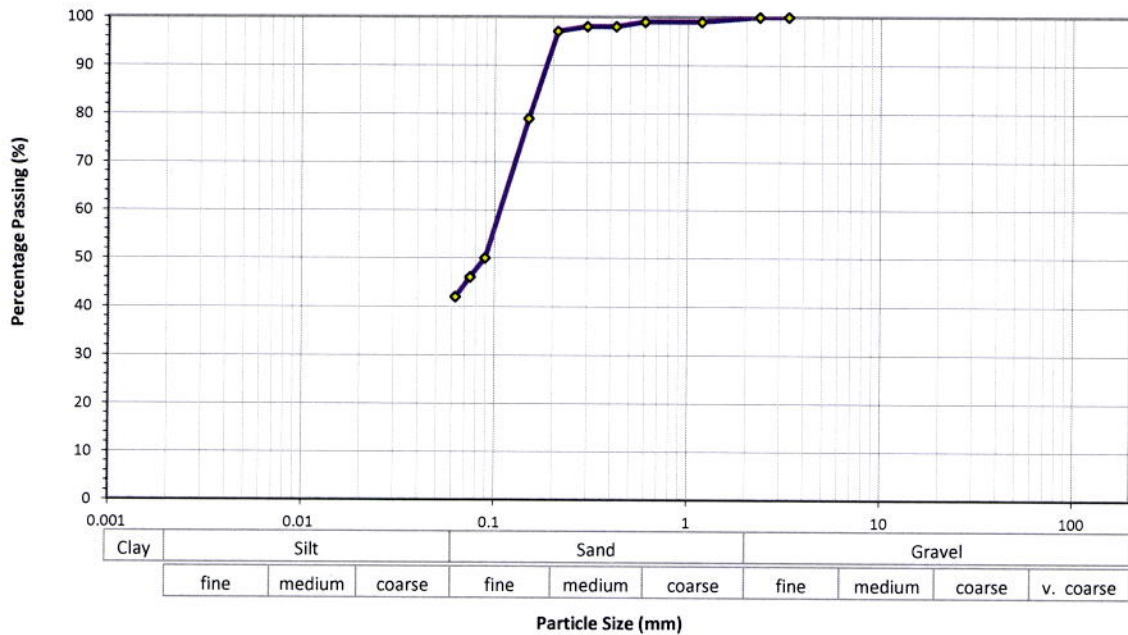
Geotechnics Project Number 1100053.0.0.0
QESTLab Work Order ID W19WN-0027
Customer Project ID 1010566

Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve)

TEST DETAILS

LOCATION	Description	Mount Welcome		
	Data	N/A		
SAMPLE	Geotechnics ID	S19WN000093		
	Reference	TP13_3.0m	Top Depth	3.0
	Sampled By	Others, Tested As Received	Bottom Depth	N/A
	Description	Silty fine to coarse SAND; grey. Moist; well graded.		
SPECIMEN	Reference Description	Depth		

TEST RESULTS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150	-	26.5	-	4.75	-	0.300	98
100	-	19.0	-	3.35	100	0.212	97
75.0	-	16.0	-	2.36	100	0.150	79
63.0	-	13.2	-	1.18	99	0.090	50
53.0	-	9.50	-	0.600	99	0.075	46
37.5	-	6.70	-	0.425	98	0.063	42

TEST REMARKS

• The material used for testing was natural, whole soil. • The sampling is not covered under our scope of IANZ accreditation. • The percentage passing the <0.063mm was obtained by difference. • Results apply only to sample tested. • This report may be reproduced only in full.

Approved By Alan Benton
Date 5/06/2019

IANZ
 ACCREDITED LABORATORY

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.



GEOTECHNICS

Wellington
 Level 4,
 2 Hunter Street
 Wellington 6011
 New Zealand


p: +64 4 381 8584

Report No: MAT:S19WN000094

Issue No: 1

Material Test Report

Customer: Tonkin & Taylor Limited
Address: Level 2, 105 Carlton Gore Rd
 Newmarket Auckland 1023
Project: GWN MT WELCOME LAB T&T
Project No.: 1100053.0.0.0
Customer Reference No.: 1010566
Report Authorised By : James Green



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.

Approved By:
 Alan Benton
 (Wellington Manager)
 Date of Issue: 5/06/2019

Please reproduce this report in full when transmitting to others or including in internal reports.

Sample Details

Location Mount Welcome
Geotechnics ID S19WN000094
Sample Reference TP14_0.75m
Sample Description Sandy SILT; brown mottled light grey. Moist; low plasticity. Sand, fine.
Sample Depth 0.75
Bottom Depth N/A

Test Results

Description	Method	Result	Limits
Moisture Content (%)	NZS 4402:1986 Test 2.1	23.0	
Date Tested		27/05/2019	

Comments

N/A

If samples have been taken, and were not destroyed during testing, they will be retained for one month from the date of this report before being discarded.



Level 4,
2 Hunter Street
Wellington 6011
New Zealand
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Geotechnics Project Number 1100053.0.0.0
QESTLab Work Order ID W19WN-0027
Customer Project ID 1010566

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

TEST DETAILS

LOCATION	Description	Mount Welcome		
	Data	N/A		
SAMPLE	Geotechnics ID	S19WN000094		
	Reference	TP14_0.75m	Top Depth	0.75
	Sampled By	Others, Tested As Received	Bottom Depth	N/A
	Description	Sandy SILT; brown mottled light grey. Moist; low plasticity. Sand, fine.		
SPECIMEN	Reference	N/A	Depth	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	30
Plastic Limit	16
Plasticity Index	14

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • Results apply only to sample tested. • This report may be reproduced only in full.

Approved By Alan Benton
Date 5/06/2019



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.



GEOTECHNICS

Wellington
Level 4,
2 Hunter Street
Wellington 6011
New Zealand

p: +64 4 381 8584

Report No: MAT:S19WN000095

Issue No: 1

Material Test Report

Customer: Tonkin & Taylor Limited
Address: Level 2, 105 Carlton Gore Rd
Newmarket Auckland 1023
Project: GWN MT WELCOME LAB T&T
Project No.: 1100053.0.0.0
Customer Reference No.: 1010566
Report Authorised By : Alan Benton

IANZ ACCREDITED LABORATORY

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.

Approved By:
Alan Benton
(Wellington Manager)
Date of Issue: 5/06/2019

Please reproduce this report in full when transmitting to others or including in internal reports.

Sample Details

Location Mount Welcome
Geotechnics ID S19WN000095
Sample Reference TP15_1.0m
Sample Description Sandy SILT; light brown. Moist; low plasticity. Sand, fine.
Sample Depth 1.0
Bottom Depth N/A

Test Results

Description	Method	Result	Limits
Moisture Content (%)	NZS 4402:1986 Test 2.1	21.8	
Date Tested		30/05/2019	

Comments

N/A

If samples have been taken, and were not destroyed during testing, they will be retained for one month from the date of this report before being discarded.



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Geotechnics Project Number 1100053.0.0.0
QESTLab Work Order ID W19WN-0027
Customer Project ID 1010566

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

TEST DETAILS

LOCATION	Description	Mount Welcome		
	Data	N/A		
SAMPLE	Geotechnics ID	S19WN000095		
	Reference	TP15_1.0m	Top Depth	1.0
	Sampled By	Others, Tested As Received	Bottom Depth	N/A
	Description	Sandy SILT; light brown. Moist; low plasticity. Sand, fine.		
SPECIMEN	Reference	N/A	Depth	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	28
Plastic Limit	20
Plasticity Index	8

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • Results apply only to sample tested. • This report may be reproduced only in full.

Approved By Alan Benton
Date 5/06/2019





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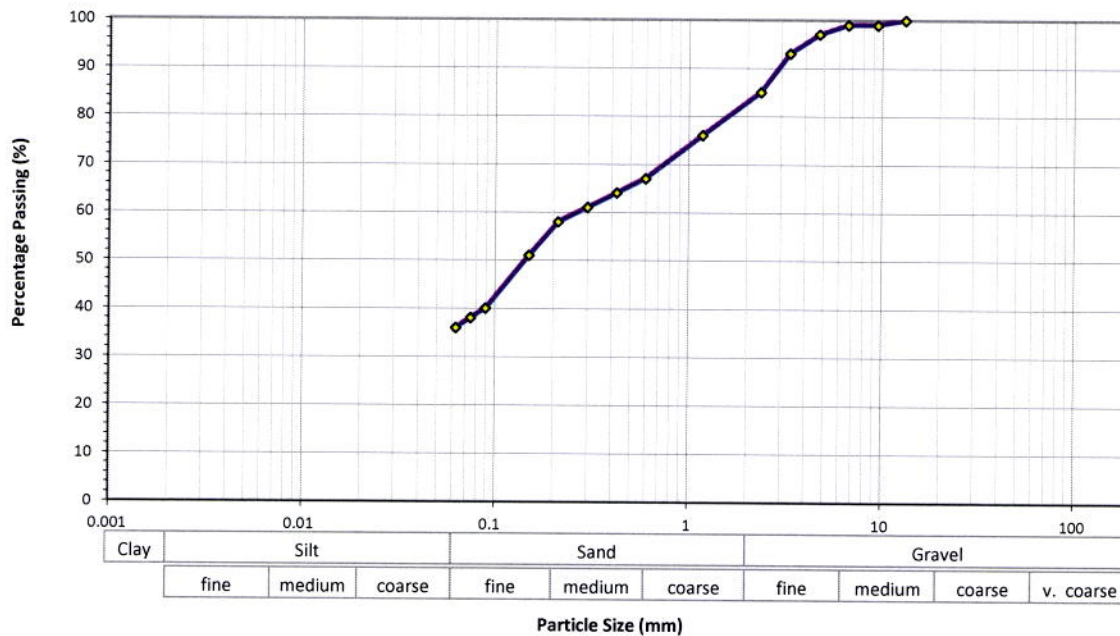
Geotechnics Project Number 1100053.0.0.0
QESTLab Work Order ID W19WN-0027
Customer Project ID 1010566

Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve)

TEST DETAILS

LOCATION	Description	Mount Welcome		
	Data	N/A		
SAMPLE	Geotechnics ID	S19WN000096		
	Reference	TP15_3.0m	Top Depth	3.0
	Sampled By	Others, Tested As Received	Bottom Depth	N/A
	Description	Silty fine to coarse SAND, with some gravel; light orange brown mottled dark orange. Moist; well graded. Gravel, fine to medium.		
SPECIMEN	Reference	Depth		
	Description			

TEST RESULTS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150	-	26.5	-	4.75	97	0.300	61
100	-	19.0	-	3.35	93	0.212	58
75.0	-	16.0	-	2.36	85	0.150	51
63.0	-	13.2	100	1.18	76	0.090	40
53.0	-	9.50	99	0.600	67	0.075	38
37.5	-	6.70	99	0.425	64	0.063	36

TEST REMARKS

• The material used for testing was natural, whole soil. • The sampling is not covered under our scope of IANZ accreditation. • The percentage passing the <0.063mm was obtained by difference. • Results apply only to sample tested. • This report may be reproduced only in full.

Approved By Alan Benton
Date 5/06/2019





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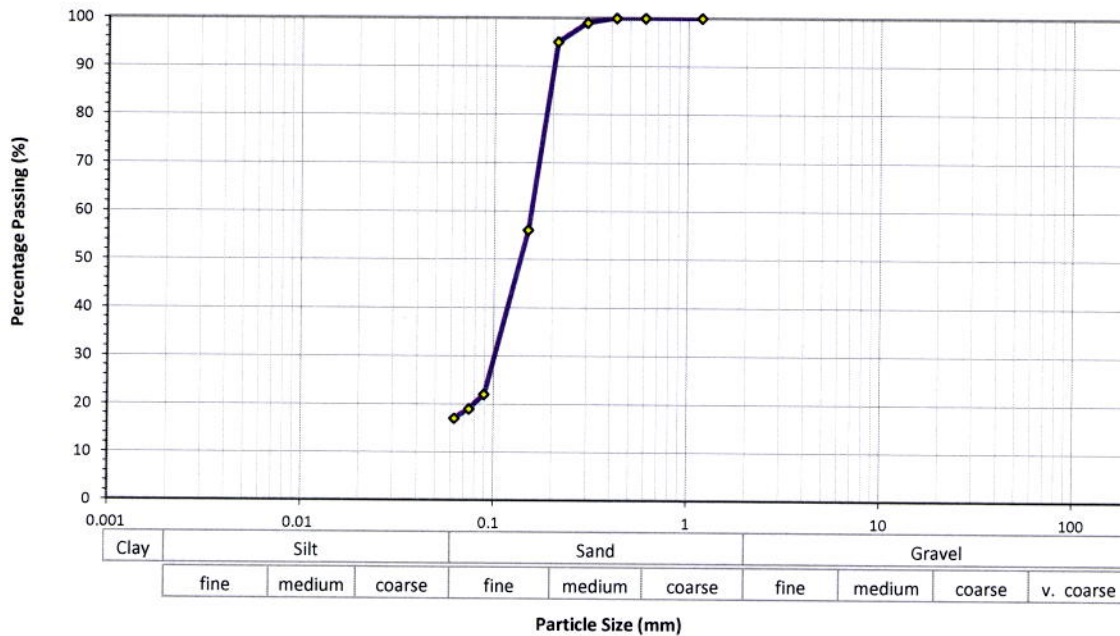
Geotechnics Project Number 1100053.0.0.0
QESTLab Work Order ID W19WN-0027
Customer Project ID 1010566

Determination of the Particle Size Distribution - NZS 4402:1986 Test 2.8.1 (Wet Sieve)

TEST DETAILS

LOCATION	Description	Mount Welcome		
	Data	N/A		
SAMPLE	Geotechnics ID	S19WN000097		
	Reference	TP18_1.0m	Top Depth	1.0
	Sampled By	Others, Tested As Received	Bottom Depth	N/A
	Description	Fine to medium SAND, with some silt; greyish brown. Moist; poorly graded.		
SPECIMEN	Reference	Depth		
	Description			

TEST RESULTS



Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)	Sieve Size (mm)	Percentage Passing (%)
150	-	26.5	-	4.75	-	0.300	99
100	-	19.0	-	3.35	-	0.212	95
75.0	-	16.0	-	2.36	-	0.150	56
63.0	-	13.2	-	1.18	100	0.090	22
53.0	-	9.50	-	0.600	100	0.075	19
37.5	-	6.70	-	0.425	100	0.063	17

TEST REMARKS

• The material used for testing was natural, whole soil. • The sampling is not covered under our scope of IANZ accreditation. • The percentage passing the <0.063mm was obtained by difference. • Results apply only to sample tested. • This report may be reproduced only in full.

Approved By Alan Benton
Date 5/06/2019





GEOTECHNICS

Wellington
 Level 4,
 2 Hunter Street
 Wellington 6011
 New Zealand

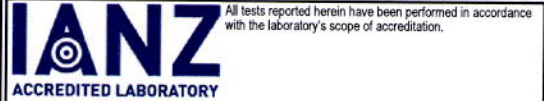
p: +64 4 381 8584

Report No: MAT:S19WN000098

Issue No: 1

Material Test Report

Customer: Tonkin & Taylor Limited
Address: Level 2, 105 Carlton Gore Rd
 Newmarket Auckland 1023
Project: GWN MT WELCOME LAB T&T
Project No.: 1100053.0.0.0
Customer Reference No.: 1010566
Report Authorised By : James Green



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.

Approved By:
 Alan Benton
 (Wellington Manager)
 Date of Issue: 5/06/2019

Please reproduce this report in full when transmitting to others or including in internal reports.

Sample Details

Location Mount Welcome
Geotechnics ID S19WN000098
Sample Reference TP22_0.8m
Sample Description SILT, with minor sand; orange brown. Moist; low plasticity. Sand, fine to coarse. Trace rootlets.
Sample Depth 0.8
Bottom Depth N/A

Test Results

Description	Method	Result	Limits
Moisture Content (%)	NZS 4402:1986 Test 2.1	20.3	
Date Tested		29/05/2019	

Comments

N/A

If samples have been taken, and were not destroyed during testing, they will be retained for one month from the date of this report before being discarded.



Level 4,
2 Hunter Street
Wellington 6011
New Zealand
p: +64 4 381 8584

Geotechnics Project Number 1100053.0.0.0
QESTLab Work Order ID W19WN-0027
Customer Project ID 1010566

Determination of Liquid & Plastic Limit, Plasticity Index - NZS 4402: 1986 Tests 2.2 (4 Point), 2.3 & 2.4

TEST DETAILS

LOCATION	Description	Mount Welcome		
	Data	N/A		
SAMPLE	Geotechnics ID	S19WN000098		
	Reference	TP22_0.8m	Top Depth	0.8
	Sampled By	Others, Tested As Received	Bottom Depth	N/A
	Description	SILT, with minor sand; orange brown. Moist; low plasticity. Sand, fine to coarse. Trace rootlets.		
SPECIMEN	Reference	N/A	Depth	N/A
	Description	N/A		

TEST RESULTS

Liquid Limit	38
Plastic Limit	20
Plasticity Index	18

TEST REMARKS

• The material used for testing was natural, fraction passing a 425um sieve. • Results apply only to sample tested. • This report may be reproduced only in full.

Approved By Alan Benton
Date 5/06/2019



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.

Appendix C: Natural hazard assessment

- Description of applicable natural hazards
- Figure C1: Hydrology
- Figure C2: Soft ground
- Figure C3: Slope instability
- Figure C4: Slope angle

C1 Description of applicable natural hazards

C1.1 Slope stability

Slope failures are major natural hazards. They are referred to as the downslope movement of rock debris and soil in response to gravitational stresses. Slope failures are generally classified according to the type of downslope movement e.g. falls, slides, and creep. Common causes of slope failure include:

- Slope steepness / gradients;
- Excessive water in slopes adding weight, erosion, and reducing strength;
- Modifications (excavations and removal of the slope's base, loading of the slope or crest, surface or groundwater manipulation, and irrigation);
- Seismic loading.

C1.2 Erosion

Erosion is the loss or displacement of land along a watercourse, through runoff or surface overland flow water or ground water seepage. Gullies are permanent erosional form. The gullies function as sediment sources, stores, and conveyors that link hillslopes to downstream water channels and flow paths.

Tunnel erosion is a process involving the removal of subsurface soil layers by water. The water moves down through the soil profile until it reaches a less permeable layer where it concentrates to form a downslope channel (tunnels). As the tunnel widens the risk of ground surface collapse increases, which can then often continue as gully erosion and increase the risk of losing larger areas of pasture and productive land.

Changes in land use, may accelerate gully expansion by head cutting, sidewall collapse, tunnelling, and other processes, which lead to widespread land degradation and potential damage to structures and infrastructure.

C1.3 Settlement

Soft and compressible sediments can produce large total and differential settlements when additional loads are applied (e.g. by fill placement or building construction). This has the potential to damage buildings and other infrastructure founded on these materials.

Soft and compressible sediments are usually formed when fine grained materials are deposited in a low energy environment (e.g. settle out of suspension in a standing water body such as a lake or swamp).

C1.4 Seismicity

C1.4.1 Ground acceleration

During an earthquake, ground acceleration will apply additional loadings on structures. The additional loading is directly related to the intensity of the ground acceleration and the duration of the shaking.

C1.4.2 Liquefaction

Liquefaction is the rearrangement of soil particles due to an increase in pore water pressure during strong earthquakes, resulting in a reduction in soil strength and stiffness. Three key elements are required for liquefaction to occur:

- 1 Loose, non-plastic soil (typically sands and silts);
- 2 Saturated soil (below ground water level);
- 3 Sufficient ground shaking (a combinations of intensity and duration of shaking).

Soil types that are susceptible to liquefaction are those that are geologically young and deposited in low energy environments forming loose and soft layers.

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L:\1010566\WorkingMaterial\CAD\FIG\1010566-FC1.dwg 2019-Jul-08 9:47:55 AM Plotted by JONALD CASTRO



LEGEND

- EXISTING CONTOUR (2m INTERVAL)
- SALE AND PURCHASE AGREEMENT AREA
- PROPOSED DISPOSAL AREA
- OVERLAND FLOW PATH
- SEEPAGE
- SATURATED GROUND

NOTES:

1. THE INFORMATION SHOWN ON THIS PLAN WAS COLLECTED DURING PRELIMINARY MAPPING ONLY WITHIN THE EXTENT OF THE SITE.
2. THE SEEPAGES SHOWN ON THIS PLAN ARE THOSE THAT WERE IDENTIFIED DURING PRELIMINARY MAPPING. THERE MAY BE OTHERS THAT ARE NOT SHOWN ON THIS PLAN.

PROJECT No. 1010566			CLIENT	CLASSIC DEVELOPMENTS NZ LTD.
DESIGNED	TH	Jul.19	PROJECT	MT WELCOME STATION
DRAWN	JC	Jul.19	TITLE	HYDROLOGY
CHECKED				
APPROVED			SCALE (A3)	1:4000
DATE			FIG No.	FIGURE C1
			REV	1

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L:\1010566\WorkingMaterial\CAD\Fig\1010566-Fig2.dwg 2019-Jul-08 9:48:05 AM Plotted By: JONALD CASTRO



LEGEND	
	EXISTING CONTOUR (2m INTERVAL)
	SALE AND PURCHASE AGREEMENT AREA
	PROPOSED DISPOSAL AREA
	INFERRED SOFT GROUND

NOTES:

1. THE AREAS OF SOFT GROUND SHOWN ON THIS PLAN ARE ESTIMATED AND BASED ON DESK STUDY, PRELIMINARY MAPPING OBSERVATIONS AND DCP TESTING, ONLY WITHIN THE EXTENT OF THE SITE. SOFT GROUND MAY BE FOUND BEYOND THE AREAS SHOWN ON THIS PLAN.

PROJECT No. 1010566		
DESIGNED	TH	Jul.19
DRAWN	JC	Jul.19
CHECKED		
APPROVED _____ DATE _____		

CLIENT	CLASSIC DEVELOPMENTS NZ LTD.
PROJECT	MT WELCOME STATION
TITLE	INFERRED SOFT GROUND
SCALE (A3)	1:4000
FIG No.	FIGURE C2
REV	1

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L:\1010566\WorkingMaterial\CAD\FIG\1010566-FC3.dwg 2019-Jul-08 9:48:14 AM Plotted By: JONALD CASTRO

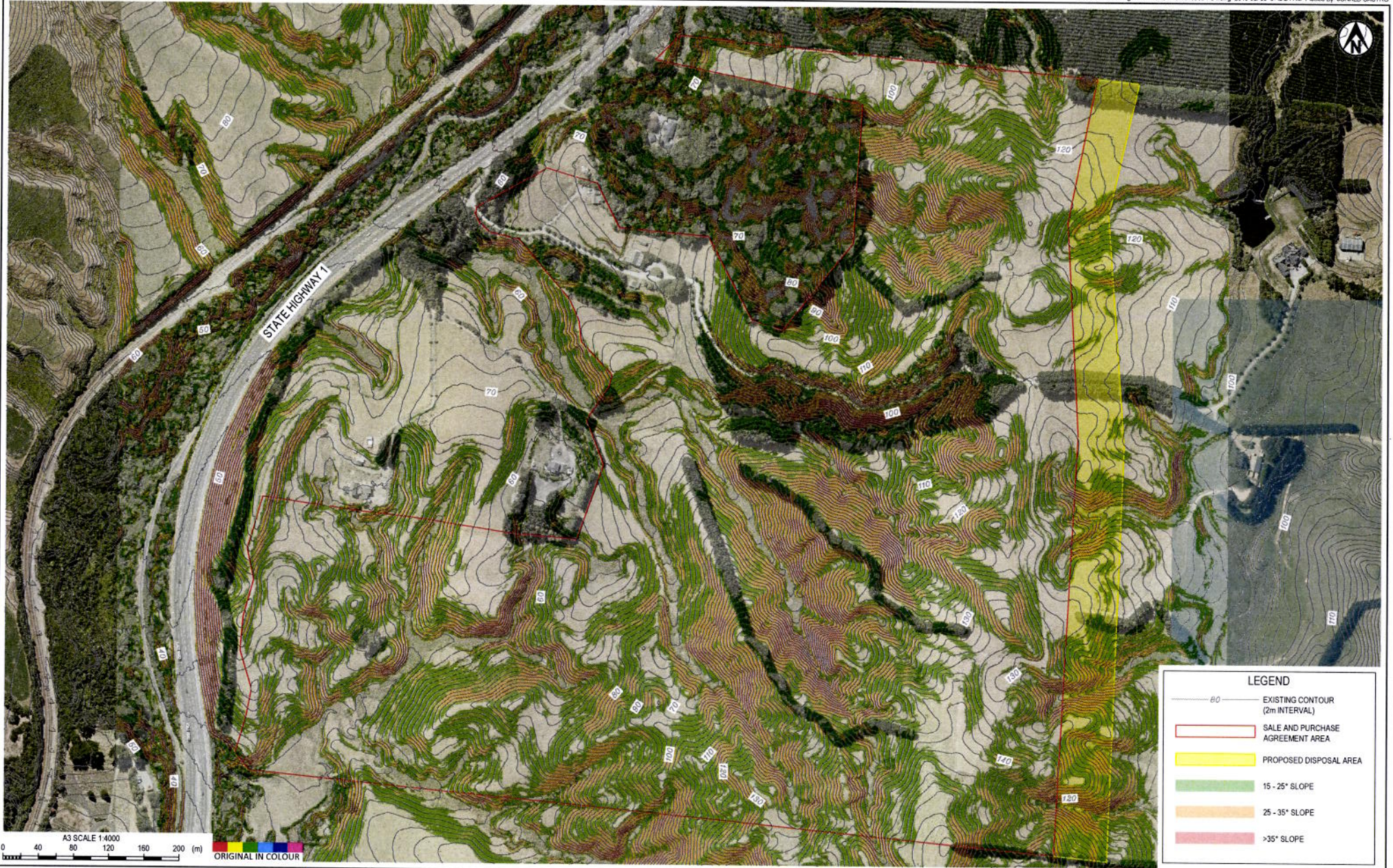


NOTES:
 1. THE AREAS OF INSTABILITY SHOWN ON THIS PLAN WERE IDENTIFIED DURING DESK STUDY AND PRELIMINARY MAPPING OBSERVATIONS.

PROJECT No. 1010566			CLIENT CLASSIC DEVELOPMENTS NZ LTD.		
DESIGNED TH Jul 19	DRAWN JC Jul 19	CHECKED	PROJECT MT WELCOME STATION		
APPROVED _____ DATE _____			TITLE SLOPE INSTABILITY		
SCALE (A3) 1:4000			FIG No. FIGURE C3		REV 1

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LEGEND	
	EXISTING CONTOUR (2m INTERVAL)
	SALE AND PURCHASE AGREEMENT AREA
	PROPOSED DISPOSAL AREA
	15 - 25° SLOPE
	25 - 35° SLOPE
	>35° SLOPE

NOTES:

- THE SLOPE ANGLES SHOWN ON THIS PLAN WERE GENERATED FROM THE WELLINGTON LIDAR 1m DEM (2013).

PROJECT No. 1010566			CLIENT CLASSIC DEVELOPMENTS NZ LTD.	
DESIGNED TH JC	JUL 19	JUL 19	PROJECT MT WELCOME STATION	
DRAWN			TITLE SLOPE ANGLE	
CHECKED			SCALE (A3) 1:4000	
APPROVED			FIG No. FIGURE C4	
DATE			REV 1	

Appendix D: Definition of fill types

D1 Definition of fill types**D1.1 Landscape fill (non-structural)**

Defines material placed to form bunds and landscaping areas but not associated with access roads or foundations of structures. Typically, landscape fill should not be placed at steeper than 1V : 4H unless instructed otherwise by the Engineer.

D1.2 Structural fill

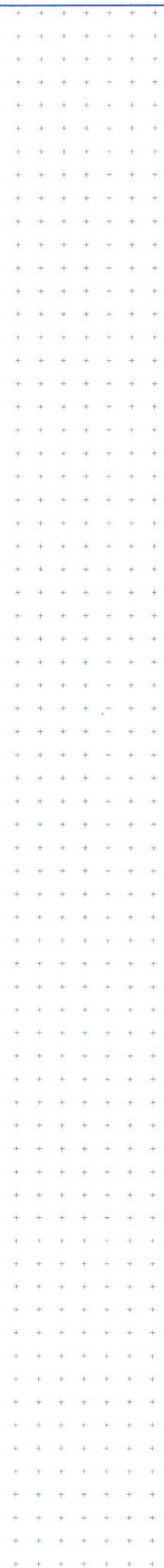
Defines all general fill placed to form earth fills, embankments, reinforced earth slopes to the required levels, and to provide founding for the structures, access roads, services and similar. It shall contain no unsuitable material, rubbish or topsoil.

D1.3 Other fills**D1.3.1 Topsoil**

Topsoil is defined as the layer of organic material immediately below the ground level that is unsuitable for use as Structural, Bulk or Landscape fill, but which is considered by the Engineer to be suitable for re-spreading as a surface soil layer for establishing vegetation growth at the completion of the works.

D1.3.2 Unsuitable material

Defines material that is either organic material, other than topsoil, within cuts or fill areas, or material which by its inherent nature cannot be satisfactorily reconditioned by wetting and drying for use as Structural, Bulk or Landscape fill. Unsuitable materials shall be placed in areas designated as instructed by the Engineer, placed in on-site stockpiles or sent to an off-site disposal.



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APPENDIX 3

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027-284-0332
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tim kelly transportation planning limited

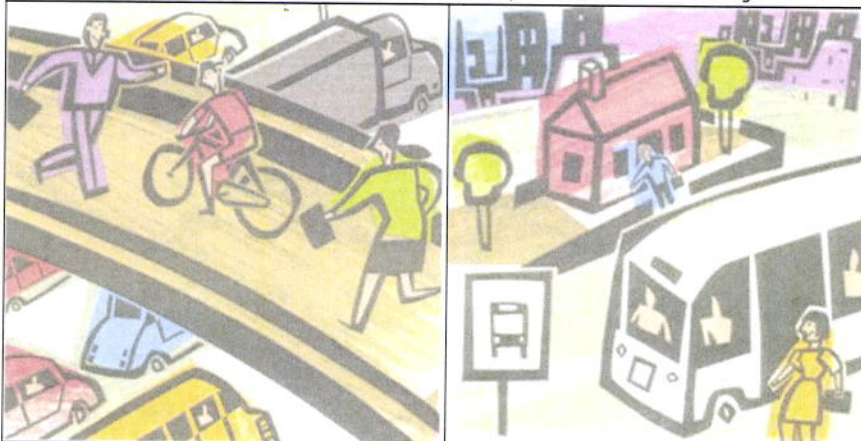
Mt Welcome Station Residential Development Vehicular Access Assessment

prepared by: **Tim Kelly Transportation Planning Ltd**

for: **Quest Projects Ltd / Classic Development Ltd**

August 2019

Reference: *mt welcome porirua access v2 aug19.docx*



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1 Background & Scope

1.1 Background

The Porirua City Council (PCC) has identified land in its Growth Strategy for potential future residential development. This includes part of the Mt Welcome Station located to the east side of State Highway 1 (SH1), south of Pukerua Bay.

Accessibility to residential development in this area will be an important consideration in the potential re-zoning of the land and the development of a masterplan to guide development. While the opening of the Transmission Gully (TG) project in 2020 will provide significant traffic relief to the existing SH1 route, the provision of safe and efficient vehicular access to/from the former SH1 route will be essential to service the land.

1.2 Scope

This document presents an assessment of the issues associated with the provision of vehicular access to this property, taking account of the likely traffic environment when TG is open to traffic and the volume/pattern of additional vehicle movements associated with residential development.

2 Existing Road & Traffic Environment

2.1 Location

The location of the Mt Welcome Station property is shown by **Figure 2.1**.

The site covers around 55 hectares (with a possibility of a further 6.7 hectares) and is located to the eastern side of SH1, south of the Pukerua Bay township. Current vehicular access is from a point located 820m south of the Grey Street intersection in Pukerua Bay, and 1.08kms north of the Airlie Road intersection.

2.2 Road Environment

In the vicinity of the existing property access, SH1 has a legal width of around 113m, extending to the rail boundary to the north-west and including a large area of trees to the south-east. The seal-width is 15-16m, providing for a single traffic lane in each direction, shoulders and a flush median. Double-yellow lines prohibit over-taking.

Further to the south, SH1 provides two lanes in each direction, extending north from the Plimmerton roundabout. Northbound, the merge point is located 109m to the south of the property access. In the southbound direction, the single carriageway divides into two lanes 180m to the south.

The existing access is uncontrolled, and no ancillary lane is provided for right-turn entry movements from the south. The available sight-lines for traffic exiting to SH1 are approximately 310m in both directions.

The applicable speed limit in this area is 100km/hr (which commences at the end of the Pukerua Bay 50km/hr zone, 670m to the north-east). Street lighting is provided.

As a rural area, there are no footpaths or on-road cycle facilities in this area. The off-road Ara Harakeke Way provides for pedestrian and cycle movements between Plimmerton and Pukerua Bay and is located between the railway and SH1.

Photos at **Annexure A** show the road environment in this area.

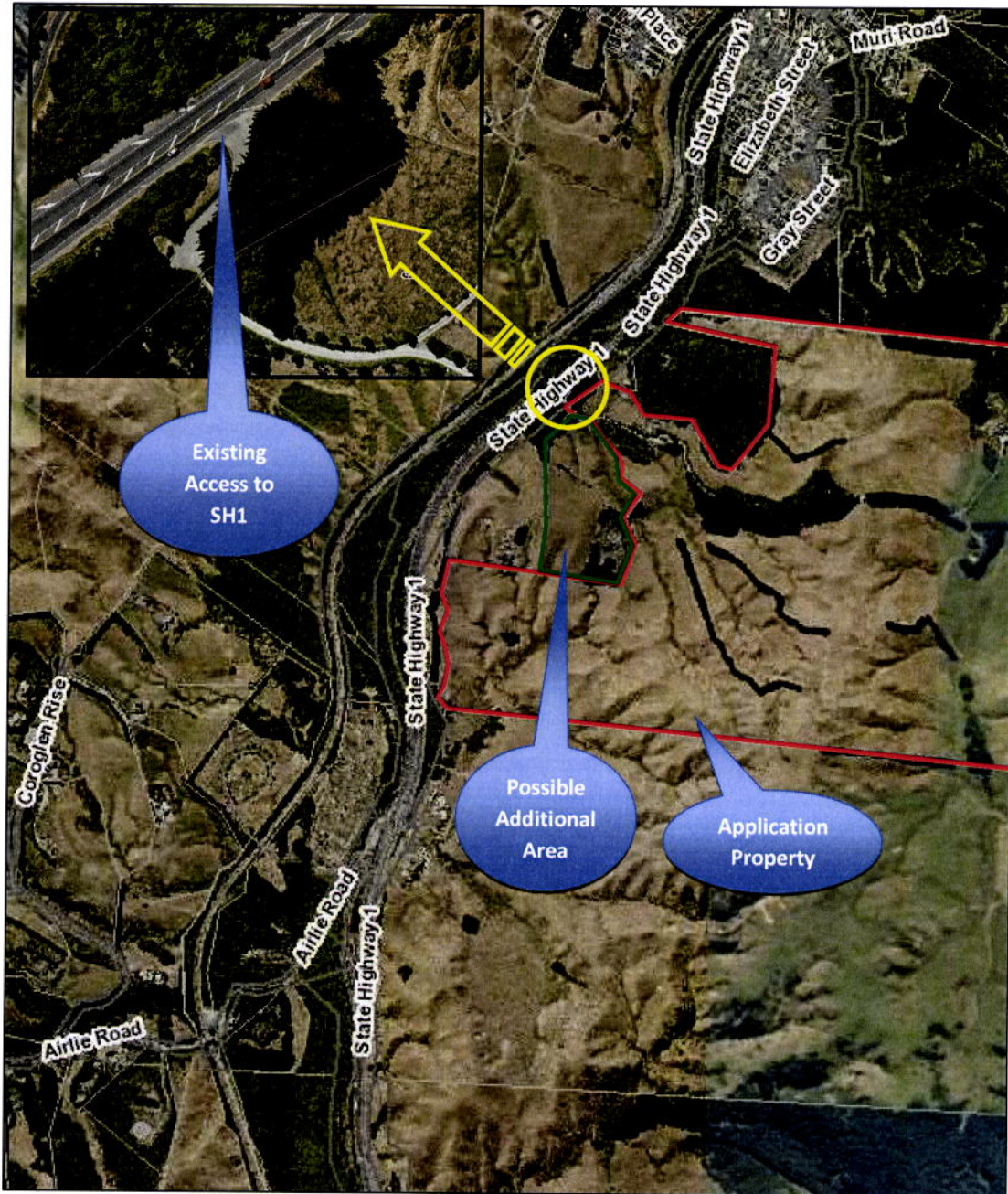


Figure 2.1: Location Plan (Base plan source: Porirua CC)

2.3 Traffic Volumes

Detailed count information for a SH1 recording station to the north of Pukerua Bay has been obtained from the NZ Transport Agency (NZTA). This information relates to a typical week in March 2019.

Typical daily two-way traffic volumes are 27,200 vehicles/day (5 weekday average) and 26,900 vehicles/day (7-day average). Peak volumes are 1,800 – 2,400 vehicles/hour, with the highest volumes occurring during a Friday mid-afternoon period.

Heavy vehicles form around 9% of the average daily flows.

A comparison of combined two-way traffic profiles over an average weekday, Saturday and Sunday is shown by **Figure B1, Annexure B**. Weekdays exhibit morning and afternoon peaks associated with commuter activity, while weekends sustain high volumes during the late morning to mid-afternoon period.

A directional profile of this count for a full one-week period is shown by **Figure B2, Annexure B**. This shows the uniformity of traffic patterns Monday – Thursday. Travel associated with the weekend is evident in higher northbound peak volumes on Friday afternoon, and southbound peak volumes on a Sunday afternoon.

2.4 Crash History

The crash history for the section of SH1 adjacent to the property for the period since January 2014 has been obtained from the database maintained by the NZTA and is summarised at **Annexure C**.

The causes of the seven incidents recorded in this area have been:

- lane-changing in the northbound passing lane to the south of the access (3);
- loss of control in the northbound passing lane to avoid stationary traffic (1);
- failure to merge at the end of the northbound passing lane (1);
- southbound truck losing control as a result of sudden illness, to north of access (1); and
- lane-changing in the southbound passing lane to the south of the access (1).

This record of recent crashes does not indicate any systemic safety problems with the road network in this area and no problems have been associated with the use of the existing property access. The significant reductions in traffic densities on this route arising from the opening of the TG project (described in **Section 3**) can be expected to result in large reductions in crash frequencies in this area.

By law, only those crashes involving personal injuries are required to be reported. Accordingly, it is possible that a number of other non-injury crashes may have occurred which have not been included in these records.

3 Future Traffic Environment

3.1 Transmission Gully

The Transmission Gully (TG) motorway project is currently programmed to open to traffic in mid-2020. This will connect MacKays Crossing to the north with Linden to the south, providing a 27kms four-laned route which will bypass Paekakariki, Pukerua Bay, Plimmerton, Paremata and Mana.

The possibility of tolls being applied to the TG route is understood to be under active consideration, both as a means of funding the project and also as a potential means of controlling levels of private vehicle use.

3.2 SH1 Revocation

The new route will become SH1 with the existing state-highway status being revoked from the current route. This route would then become the responsibility of PCC as a local road, though this is currently understood to be the subject of negotiations between PCC and the NZTA, linked to the possibility of tolls being applied to the TG route.

Logically, the standard of the road would be modified to reflect its change in status and reduced traffic volumes. Again, this would be affected by any decision regarding tolls.

For assessment purposes, traffic modelling of the TG project in 2011 assumed that a package of measures would be applied to the existing SH1. This package, which was agreed with PCC and the NZTA at the time, included:

- a lowering of the speed limit to 80km/hr (Plimmerton – Pukerua Bay);
- retention of two lanes in each direction (Plimmerton – Pukerua Bay); and
- traffic signals to control side road intersections in Pukerua Bay (incorporating pedestrian crossing phases).

The objectives of such measures were to achieve improvements in accessibility and safety with reductions in severance. Together, this was expected to provide a further incentive for through traffic to use TG, thereby 'locking-in' the benefits of the TG project.

3.3 Forecast Traffic Volumes

Traffic modelling of the TG project was undertaken in 2011 as part of the Assessment of Environmental Effects (AEE) in support of applications for the Notice of Requirement (NoR) and consents for the project.

This modelling¹ reported forecast traffic volumes in 2026 for scenarios without TG (the 'Do-Nothing') and with TG, for representative AM (7-8am), Inter (11am-1pm average) and PM (5-6pm) peak periods for a typical weekday, in addition to Annual Average Daily Traffic (AADT) volumes. The assessments assumed no tolls were to be applied to the TG route.

¹ *Transmission Gully Project: Assessment of Traffic & Transportation Effects. Technical Report 4 of AEE. SKM. June 2011.*

Forecasts for the section of SH1 to the south of Pukerua Bay are summarised by **Table 3.1**. Reductions in traffic volumes of 69 – 81% were forecast, depending upon the time period and direction of travel.

The rate of traffic growth in this corridor has been higher than expected when these forecasts were made in 2011. As a result, the existing daily volume (27,200 vehicles/day for March 2019, as reported in **Section 2.3**) is higher than the forecast daily volume for 2026 without the TG project in place (24,100 vehicles/day). Although the forecast percentage reductions in traffic volumes can be expected to remain valid, the absolute reductions will be larger than those forecast in 2011.

Scenario	Period	Northbound	Southbound	2-Way
2026 Do-Nothing	AM	570	1,280	1,850
	IP	670	660	1,330
	PM	1,210	720	1,930
	AADT	11,900	12,200	24,100
2026 TG	AM	140	400	540
	IP	150	170	320
	PM	310	140	450
	AADT	2,790	3,140	5,930
2026 Effect of TG	AM	-75%	-69%	-71%
	IP	-78%	-74%	-76%
	PM	-74%	-81%	-77%
	AADT	-77%	-74%	-75%

TABLE 3.1: Forecast Traffic Volumes, 2026

(AM/IP/PM are vehicles/hour, AADT is vehicles/day)

4 Potential Development

4.1 Concept

At this stage, no specific development proposal has been prepared. The general concept is for a residential development comprising around 570 dwellings (inclusive of the possible additional area shown by **Figure 2.1**).

4.2 Vehicular Access

The provisional proposal is for the development to be serviced by a single vehicular access point in the vicinity of the existing access location shown by **Figure 2.1**.

The purpose of this assessment is to determine the ability of a single access point to accommodate the traffic movements which are anticipated to be associated with the development, and the appropriateness of this location.

5 Assessment of Proposed Access

5.1 Vehicular Activity

Assessments have been undertaken of the ability of a single access to accommodate forecast traffic movements.

Assessment Periods

The information described in **Section 2** identified the periods of peak vehicular activity on SH1 as being:

- weekday AM peak (8 - 9am); and
- weekday PM peak (4 - 5pm).

These periods form the basis of the assessment. Conditions have been assessed for the year 2025.

Background Traffic Volumes

The forecast percentage traffic reductions resulting from the TG project described in **Table 3.1** have been applied to the existing (March 2019) traffic volumes. These have then been factored to 2025 at an assumed growth rate of 1% per annum.

Traffic Generation & Distribution

For the purposes of estimating the generated vehicle movements associated with the residential development, it has been assumed that:

- each dwelling generates an average of 8 vehicle movements/day;
- 10% of these vehicle movements occur in each of the weekday AM and PM peak periods;
- during the weekday AM peak period, two-thirds of these vehicle movements are outbound and one-third inbound, with the opposite for the weekday PM peak period; and
- 15% of the vehicle movements are to/from the north, with 85% to/from the south².

Total forecast vehicle movements for the assessed scenarios in 2025 are shown at **Annexure D**.

Development of this area includes the possibility of a small commercial area for the purposes of servicing the development only. With details not yet developed, no traffic generation estimates have been prepared. While any commercial activities may generate some associated vehicular activity (deliveries, etc), they can also be expected to suppress the need for residents to make external trips. Accordingly, the net effect of any such commercial activity is expected to be reasonably neutral.

² Based upon the observed directional distribution of side road movements at the Teihana Road (west) intersection in Pukerua Bay.

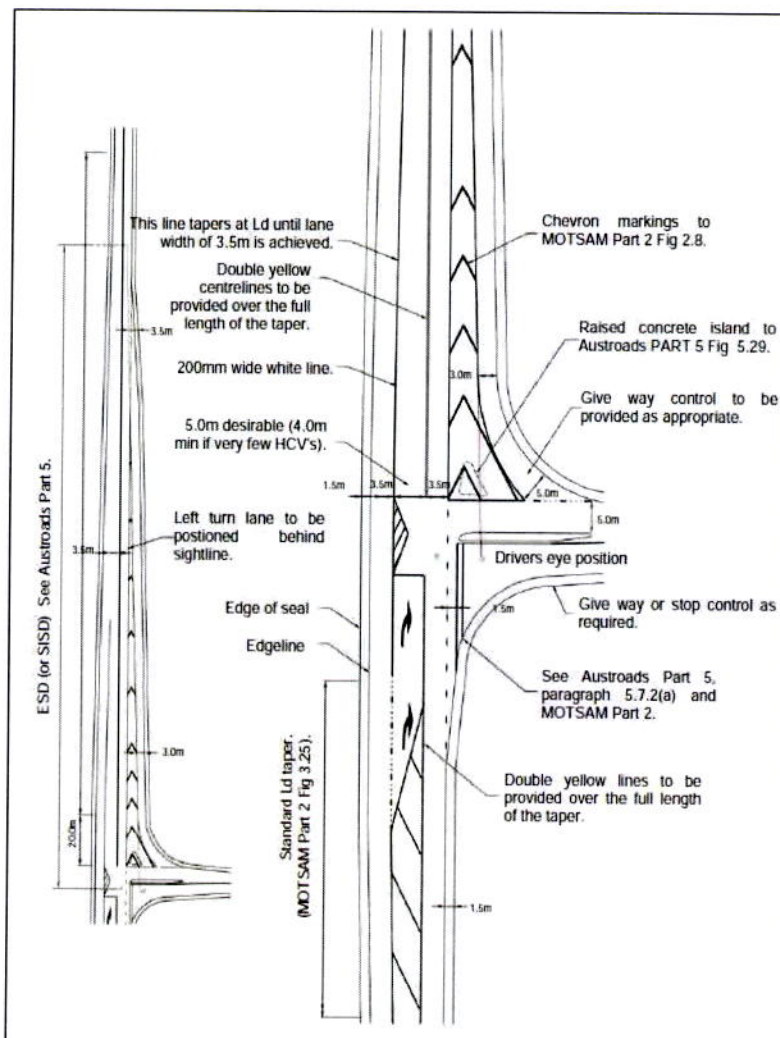
5.2 Form of Intersection

At this early stage, no specific intersection design has been prepared.

At this location, the primary alternative intersection forms would be a priority intersection or an at-grade roundabout. The focus of this assessment is upon a priority intersection but where relevant, comment is provided on the potential comparative performance of a roundabout solution.

For assessment purposes, it has been assumed that the side road approach would comprise a single lane which flares over a short distance to provide separate lanes for left and right-turning movements. These movements would be subject to 'stop' controls. An ancillary right-turn bay 50m in length has been assumed for movements approaching from the south, with a full and recessed deceleration lane for entering movements from the north. Right-turn exit movements would be able to make the manoeuvre in two stages, with an acceleration lane enabling a merge with northbound traffic.

An indication of this generic intersection form is shown by **Figure 5.1**.



**Figure 5.1:
Example of
Intersection
Form**
*(Source: Manual
of Traffic Signs &
Markings, Section
3, Figure 3.25a.
March 2011)*

5.3 Intersection Performance - Efficiency

The performance of the notional priority access intersection has been assessed using the computer program SIDRA³. The results of the assessments are summarised at **Annexure E**, for the weekday AM and PM peak periods in 2025. These results indicate that:

- in all cases, the through movements on SH1 would continue to operate at Level of Service (LOS⁴A), with negligible levels of delay;
- the right-turn movement into the access from the south would be subject to delays of 8 – 9 seconds with a queue length of up to 8m, well within the available length of the right-turn bay; and
- exiting movements would be subject to average delays of 10 - 12 seconds, with the highest delays (19 – 21 seconds) being experienced by the right-turn movement, which would operate at LOS C.

Sensitivity Testing

The original 2011 modelling for the TG project recognised that the split of future traffic volumes between the TG and existing SH1 route could be sensitive to assumptions made relating to the treatment applied to the existing route. A tested scenario which assumed no changes were made to the existing route indicated that the residual volumes would be 48% higher to the south of Pukerua Bay. This is because the higher speeds possible on the existing route would attract some trips which would otherwise use TG.

For this assessment, the following sensitivity tests have been undertaken:

- residual traffic volumes 50% higher than forecast; and
- residual traffic volumes 100% higher than forecast.

Results for these tests indicate that:

- the through movements on SH1 would operate at LOS A with negligible delays regardless of the assumed residual volumes;
- delays experienced by the right-turn entry movement would be at most 14 seconds (during the AM peak) with a queue length of 8m;
- the left-turn exit movement would operate at LOS C and D during the AM peak period with 50% and 100% higher residual volumes respectively, with corresponding delays of 16 and 30 seconds; and
- the right-turn exit movements would be most sensitive to the level of residual volumes, deteriorating to LOS E (delays 37 seconds) and LOS F (delay 90 - 122 seconds) for the 50% and 100% higher residual volumes respectively.

The results for the right-turn exit movement are considered to represent a 'worst-case', as the intersection form shown by **Figure 5.1** would permit these movements to make the

³ *Signalised and Un-signalised Intersection Design and Research Aid.*

⁴ *Level of Service is a six-point scale used to describe traffic conditions, in which LOS A represents free-flow conditions and LOS F represents heavily congested conditions.*

turn in two stages, giving way to the southbound and northbound through movements separately. A test in which this movement is not required to give-way to northbound through traffic indicates that this would operate with much lower levels of delay and LOS B.

Maximum Levels of Development

Assessments have been undertaken to broadly determine the maximum levels of development which could be supported by the intersection under the varying levels of SH1 residual traffic described above. The threshold for the acceptable performance of the intersection is the deterioration in any turning movement to LOS E (equivalent to an average delay per vehicle in excess of 35 seconds). The results of this assessment are summarised by **Table 5.1**.

Level of SH1 Residual Traffic	Number of Dwellings	
	One-Stage Right Turn Exit Manoeuvre Assumed	Two-Stage Right Turn Exit Manoeuvre Assumed
As forecast for TG Project	~ 1,000	~ 1,400
50% higher than forecast	~ 500	~ 1,000
100% higher than forecast	~ 50	~ 600

TABLE 5.1: Maximum Supportable Development Size

(assumes trip generation / distribution assumptions as above)

As described above, it is the delay experienced by the right turn exit manoeuvre which is most sensitive to both the assumed level of SH1 residual traffic and the ability for this turn to be made in two stages (giving way to each direction of movement on SH1 at a time).

With the SH1 residual levels as forecast, significantly higher levels of development could be supported before the delays experienced by the right-turn deteriorated to LOS E. But with residual volumes twice that forecast, the development would be reliant upon all right-turn exit movements being able to make the turn in two stages, otherwise the supportable level of development would be reduced to less than 10% of that proposed.

It is emphasised that this is a broad assessment only, intended to demonstrate the sensitivity of the supportable development size to the level of residual traffic activity on SH1.

Comparative Roundabout Performance

A roundabout would result in a re-distribution of the delays experienced at the intersection. Through movements on SH1 would be required to slow down to negotiate the roundabout and potentially to give-way to movements to/from the development area. At the same time, the delays experienced by turning movements would be reduced.

Based upon the results reported above, there would be no necessity for a roundabout from a capacity perspective, unless residual traffic volumes were higher than forecast. However, the introduction of delays to SH1 through movements may be regarded as beneficial as part of a wider strategy to deter through traffic from the route.

5.4 Safety of Vehicle Movements

As described in **Section 2**, the available sight-distances at the access location are in excess of 300m, enabling vehicle turning movements to be made safely.

Sufficient space appears to be available to provide for a deceleration lane for vehicle movements approaching from the north and turning left into the access, minimising the possibility of rear-end collisions. Recessing of this deceleration lane would ensure that the sight-line available to an exiting driver would not be obscured by an approaching vehicle turning left into the access.

The access location would be located approximately 109m to the north of the merge point for the northbound passing lane. This means that the development of a taper for the right-turn bay would be located within the 'run-out' area from the passing lane. This would create a situation which is at best ambiguous for northbound drivers and at worst could result in northbound drivers colliding with the rear of a right-turning vehicle which was slowing or stopped. To address this possibility, a greater physical separation would be required between the termination of the passing lane and the intersection – around 420m⁵ would be required based on the current speed environment (this could be reduced if the speed limit was lowered to 80km/hr). This could be achieved if the termination point of the northbound passing lane was moved south by around 310m. Such a measure is unlikely to result in any significant inconvenience for northbound movements in the context of the reduced post-TG traffic volumes.

Comparative Roundabout Performance

Roundabouts are usually associated with a greater number of crashes (because all traffic movements are required to give-way) but with lower severity (because of the lower speeds). More recently, the NZTA has been favouring roundabouts over priority intersection as part of the 'Safe Systems' approach which acknowledges that crashes will occur but then seeks to minimise the associated trauma.

Whether a roundabout would offer an overall safer solution for this intersection can only be determined from a detailed assessment of the through / turning traffic movements, the speed environment and the wider priorities of PCC for this section of SH1 once the revocation process is complete.

5.5 Construction Access

Earthworks and construction activity within the development area could (depending upon the cut/fill balance for the site as a whole) generate a significant number of heavy vehicle movements to and from the access. This would be likely to necessitate the formation of the full access intersection prior to the commencement of construction.

⁵ Based upon a 'run-out' length of 205m (Austroads Guide to Road Design Part3, Figure 9.2) and a right-turn bay 30m long, 3.5m wide with tapers, total length 212m (Manual of Traffic Signs and Markings, Section 3, Figure 3.25). Total would reduce to approx. 350m for an 80km/hr speed limit.

6 Compliance with District Plan & NZTA Requirements

6.1 Operative District Plan

Relevant Plan & Status

The relevant plan is the Porirua City District Plan (PCDP). The site lies within the 'Rural' zone.

Part H of the PCDP classifies this section (Plimmerton to Pukerua Bay) of SH1 as a 'Major Rural Arterial'. This status may eventually be reviewed as part of the revocation process.

The section which follows presents an assessment of the ability of a proposed access to comply with the relevant objectives, rules and standards for both the Rural zone and the district-wide Transport provisions.

6.2 Compliance with Rural Zone Requirements

Objectives & Policies

Objective C4.1: To identify a rural zone and continue its management so as to avoid, remedy or mitigate the effects of activities within it.

Policy C4.1.3: To ensure that activities within the Rural Zone do not detract from the character or quality of the rural environment.

Policy C4.1.6: To ensure that non-primary production activities do not make it necessary to upgrade rural roads beyond the level needed to service rural and recreational activities.

The explanation notes that *'the Council does not propose to upgrade rural roads beyond what is necessary to ensure the existing standard and carrying capacity of roading is maintained.'*

The PCDP notes that that *'applications for resource consent require an assessment of environmental effects to ensure that the proposed activity is able to be accommodated without adversely impacting on the character of the rural environment, and that all adverse environmental effects such as traffic and roading ... are mitigated.'*

This assessment confirms that, subject to the opening of the TG project and the diversion of significant volumes of through traffic from the existing SH1 corridor, a new access servicing residential development can operate which would not adversely impact upon the rural environment in this area and would not necessitate the upgrading of any existing road.

Rules & Standards

There are no rural zone standards of relevance to transportation matters.

6.3 Compliance with District-Wide Transportation Requirements

Objectives & Policies

Objective C7.1: To achieve a safe and efficient transportation network that enables the people of the city and the wider community to provide for their social and economic well-being without creating significant adverse environmental effects.

Policy C7.1.4: To protect the corridors of existing and proposed major transport routes in the City.

This assessment has demonstrated that a potential access point servicing residential development can be provided which would operate without adversely impacting upon the safe or efficient operation of the existing SH1 route.

Part H Rules & Standards

Standard (i): maximum gradients of 1 in 5 for driveways.

Able to comply.

Standards (iii, iv, v): parking is to comply with dimensional requirements and be clear of front yards.

Able to comply.

Standard (vi): minimum carriageway width to be accordance with Table 4, Part H. In addition, Figure 6 of Part H defines the minimum required standard for the formation of a private access onto State Highways.

The proposed access arrangements would be able to comply with the road width requirements. The proposed access intersection design can comply with the current NZTA standards which exceed the PCDP requirement.

6.4 Compliance with PCC Code of Land Development & Subdivision Engineering

The Code of Land Development and Subdivision Engineering (CoLD)⁶ postdates the PCDP. It is understood that PCC intends to update the PCDP to reflect the CoLD requirements, but because this would form part of the wider PCDP update process, this has been delayed.

Access Road Standard: Based upon the expected levels of traffic activity, the proposed access road would be defined by Table 3.2 of the CoLD as a 'primary or secondary arterial', requiring a 20m legal road width, two 3.5m traffic lanes and sealed shoulders. While this is yet to be designed, there appears to be no physical impediment to the achievement of an appropriate design standard.

Minimum Sight Lines: Figure 3.3 of the CoLD indicates that for a 'high volume' driveway connecting to a road with an operating speed of 110km/hr (100km/hr speed limit), minimum sight distances of 290m are required. This can be achieved.

⁶ Code of Land Development and Subdivision Engineering. Porirua City Council, February 2010.

6.5 NZTA Requirements

The NZTA One Network Road Classification (**ONRC**) system categorises this part of SH1 as a 'National / High Volume / Rural' road, as this currently carries more than 20,000 vehicles/day, with more than 1,200 heavy vehicles a day. Categorisation after the opening of TG will be governed by the level of residual traffic, which in turn will be determined by any tolling applied to TG. Without tolling, and based on the expected traffic reductions, it is likely that an 'Arterial' or 'Regional' categorisation would be appropriate.

This section of SH1 is a 'Limited Access' road, but this is likely to change in the post-TG environment.

Table 6.1 assesses the ability of an access intersection to comply with guidance on accessway standards at Appendix 5B of the (former) Transit New Zealand Planning Policy Manual (2007).

TABLE 6.1: Assessment of Ability to Comply with relevant NZTA Requirements	
NZTA Requirement	Assessment
Practicality of access to the site to be formed from the local road network rather than the state highway	<i>No practical alternative available in this case.</i>
Compliance with sight-distance requirements (282m for 100km/hr posted speed limit)	<i>Complies.</i>
Compliance with spacing requirement for other accessways and intersections.	<ul style="list-style-type: none"> • <i>the level of traffic activity associated with residential development means that the vehicle crossing would be classified as an 'intersection' rather than an 'access'</i> • <i>the PPM indicates that intersection spacing will be considered on a case-by-case basis, taking a range of criteria into account</i> • <i>this assessment indicates that an intersection at this location can operate without detrimental impacts upon the safe and efficient operation of the state highway in the context of lower traffic post-TG</i> • <i>separation distances from the Airlie Road and Gray Street intersections to the south and north means that there would be no interaction between these intersections and access to the development area</i>
Compliance with geometric design standards - accessways likely to generate at least 100 vehicle movements/day or 20 vehicle movements/hour are usually treated as intersections for design purposes.	<i>Accept that access should be treated as an 'intersection' for design purposes</i>
Type and volume of traffic using the access and the state highway.	<i>The assessment has taken account not only of the existing traffic composition by time of day but has also addressed conditions in 2025 with allowance for expected traffic growth.</i>
Whether any changes are proposed to the road or speed environment.	<p><i>The only change to the road environment as a result of the proposed intersection would be the termination of the northbound passing lane further to the south and the formation of a full intersection to service development.</i></p> <p><i>Changes unrelated to the proposal are the expected traffic reductions associated with the TG project and a possible reduction in speed limit reflecting the changed role of this road post-TG.</i></p>
The safety record in the vicinity of the site.	<i>The assessment has provided a detailed breakdown of crash locations and</i>

TABLE 6.1: Assessment of Ability to Comply with relevant NZTA Requirements	
NZTA Requirement	Assessment
	<i>types in this area.</i>
The optimum location of any accessway for that site, whether other accesses exist, any need to close other accessways.	<i>The proposed access location is optimal in terms of the available sight-lines for turning traffic movements.</i>
Provision for manoeuvring within the site and likelihood of any reverse manoeuvring to/from state highway.	<i>No requirement for any reverse manoeuvring to/from SH1.</i>
Adequacy of queuing and parking provision on site, likelihood of queuing over vehicle crossing and onto state highway.	<i>No possibility of vehicles queuing back onto SH1.</i>
Whether particular mitigation measures such as a deceleration or turning lane are required.	<i>The proposed intersection design takes account of measures required to control the safety of turning movements and will minimise impacts upon through traffic. While at this early stage no design has been prepared, the provision of a full intersection does not appear to be precluded by the physical space available.</i>
Any cumulative effects of the proposed accessway and other new accessways on the safety and function of the state highway.	<i>The traffic assessment takes account of likely future levels of traffic demand in this area post-TG. No other specific development proposals are planned for this area which could have any significant impact upon the assessments.</i>
Particular needs of cyclists and pedestrians.	<i>Pedestrian and cycle activity in this area is primarily recreational in nature and accommodated by the pathway adjacent to SH1. Connectivity between this pathway and the development will be addressed as part of the detailed design process.</i>

7 Conclusions

This document addresses matters associated with the provision of vehicular access to a potential residential development within the Mt Welcome Station, located to the south of Pukerua Bay.

This assessment concludes that:

- this section of SH1 will experience significant reductions in traffic demand as a result of the opening of the Transmission Gully (TG) project, currently scheduled for mid-2020;
- the level of post-TG traffic volumes will be governed by the package of measures applied to the existing SH1 route and the possibility of tolls on the TG route;
- access would be optimally provided by means of a single intersection located on the eastern side of SH1, between the Airlie Road intersection and the southern edge of Pukerua Bay – this would be preferable to the formation of multiple access points;
- capacity analyses indicate that a single priority intersection would be able to accommodate likely levels of through and turning traffic activity, though conditions could be sensitive to the higher levels of residual traffic activity on SH1;
- any commercial component of the development is expected to have a neutral overall impact upon external trip generation;
- although not yet the subject of a design process, sufficient physical space appears to be available within the SH1 corridor to provide for an intersection which would meet current criteria, ensuring its safety of use;
- the positioning of the intersection would require the termination point of the northbound passing lane to be moved further to the south, but there appears to be no reason why this could not be achieved;
- as part of the detailed design process, consideration will be required to the provision of connectivity across SH1 between the development and the existing pedestrian / cycle track on the western side of SH1;
- an intersection provided in the vicinity of the existing access would be able to comply with the relevant PCC and NZTA requirements; and
- overall, vehicular access is able to be formed in a manner which would avoid any significant adverse effects upon either the safety or the efficiency of the existing SH1 route in the post-TG operating environment.

ANNEXURE A: PHOTOS



Photo 1
View to S across SH1 to existing
Mt Welcome Station access
(November 2018)



Photo 2
View to SW showing sight-line
from existing Mt Welcome
Station access
(November 2018)



Photo 3
View to NE showing sight-line
from existing Mt Welcome
Station access
(November 2018)

ANNEXURE A: PHOTOS



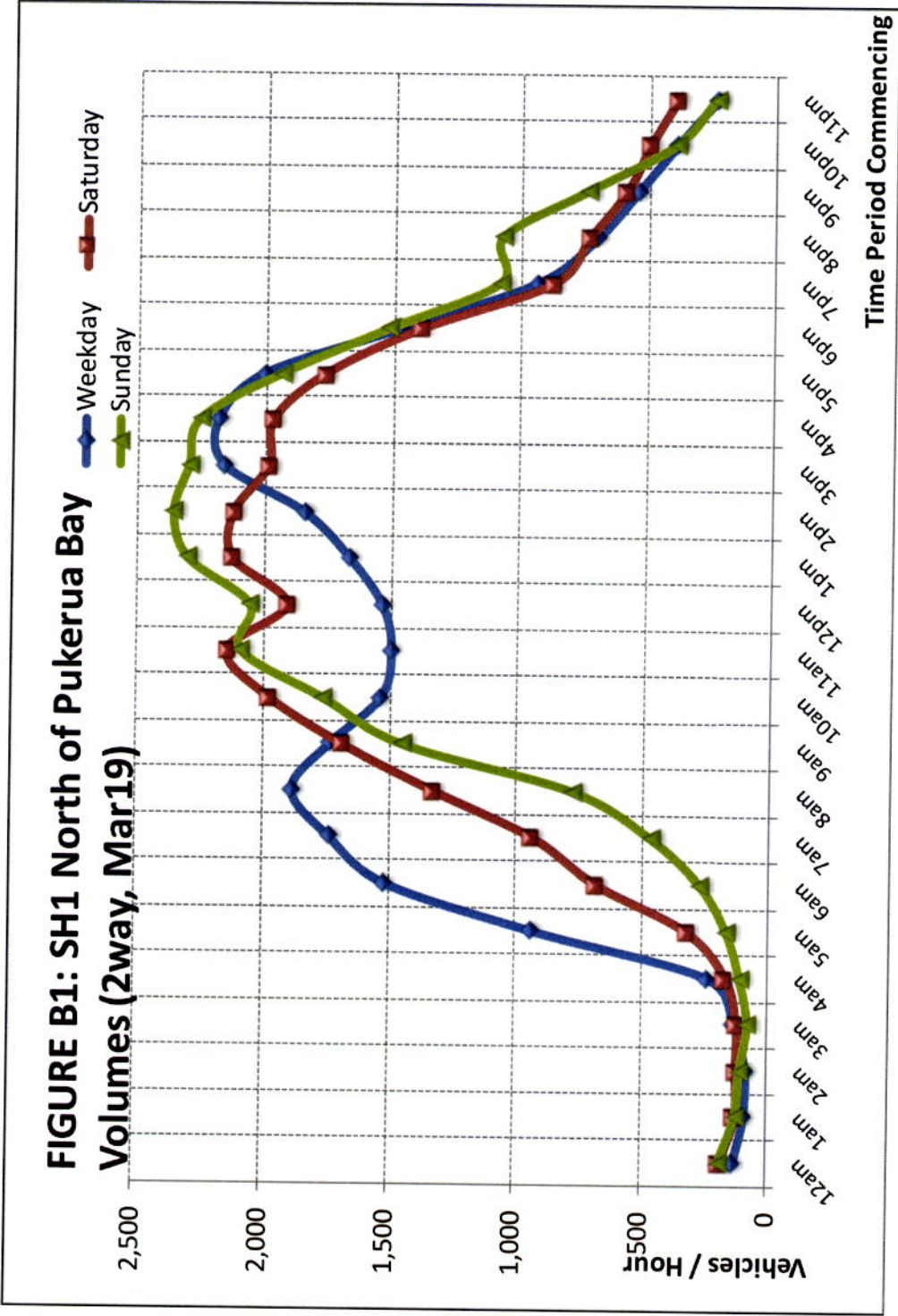
Photo 4
View to SW across Mt Welcome
Station access
(November 2018)

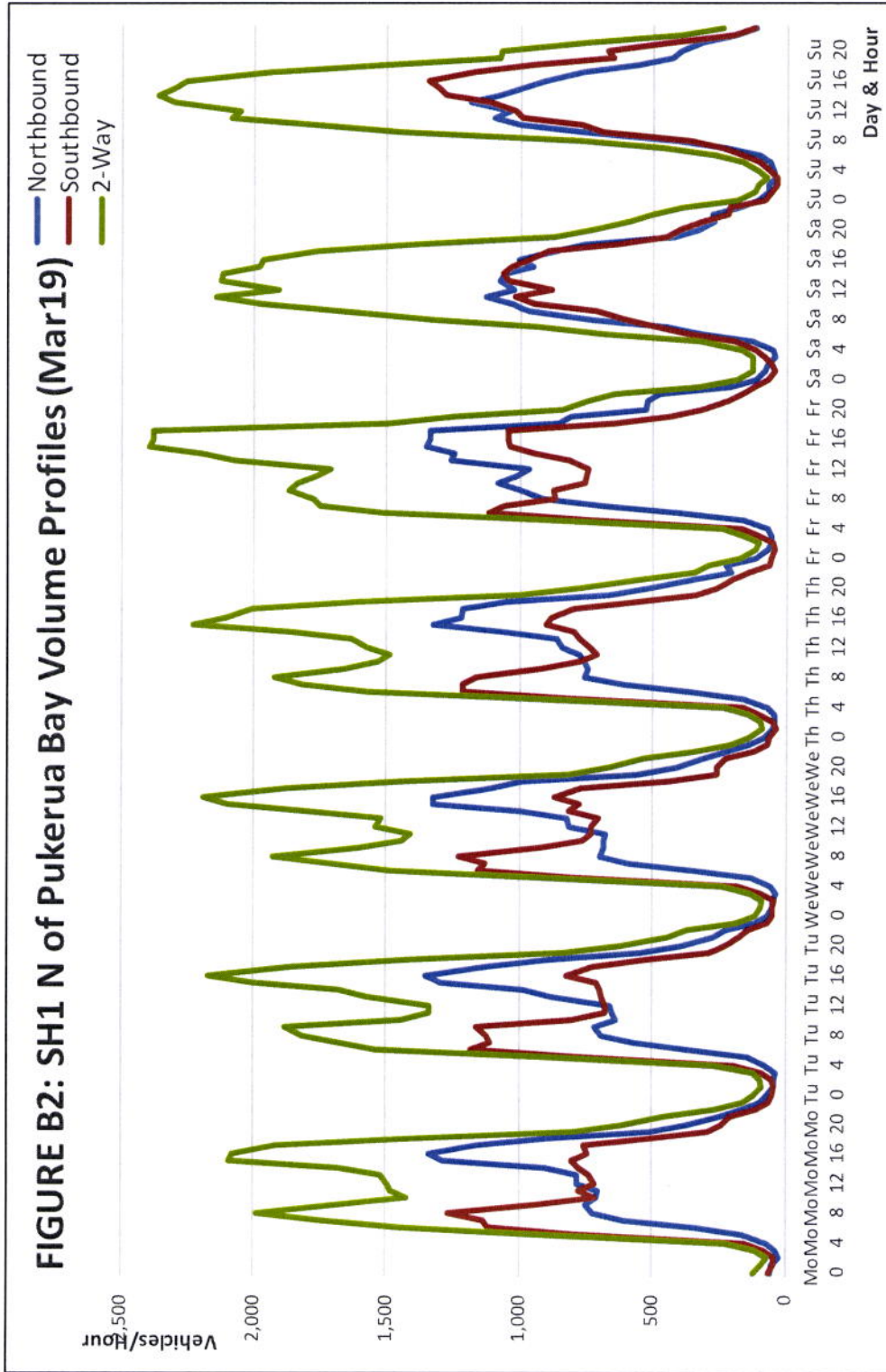


Photo 5
View to NE along western side
of SH1 opposite existing Mt
Welcome Station access
(November 2018)



Photo 6
View to SW along western side
of SH1 opposite existing Mt
Welcome Station access
(November 2018)





ANNEXURE C: CRASH HISTORY

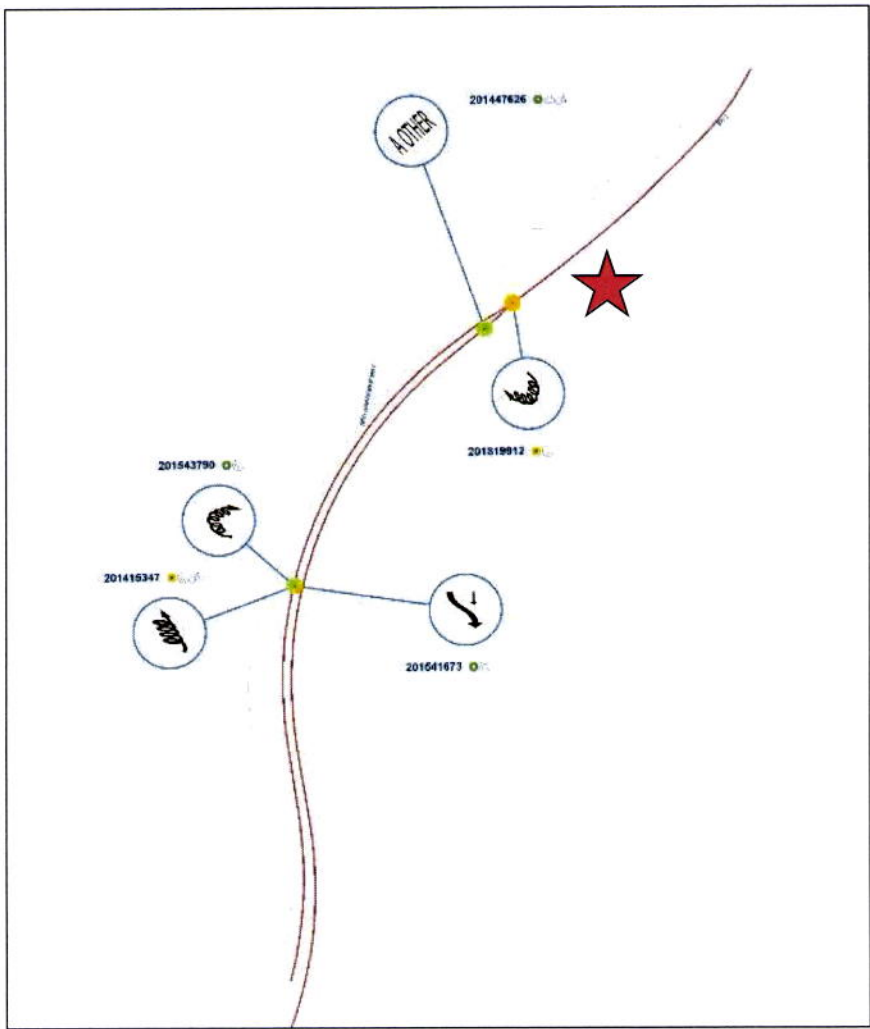


Figure C1: Crash Plot for Area Road Network (January 2014 on)
Star symbol indicates approximate position of existing property access.
(Source: NZTA Crash Analysis System)

ANNEXURE C: CRASH HISTORY

Date	Day	Time	Location	Description	Factors	Casualties
May 2014	Thu	5:50 PM	SH 1N 600 N AIRLIE ROAD	Car/Wagon1 NDB on SH 1N lost control; went off road to left, Car/Wagon1 hit guide/guard rails	CAR/WAGON1, lost control avoiding another party, swerved to avoid vehicle	2 Minor
Nov 2014	Tue	3:30 PM	SH 1N 1000 N AIRLIE ROAD	Truck1 EDB on SH 1N overtaking Car/Wagon2	CAR/WAGON2, incorrect merging/diverging manoeuvre TRUCK1, incorrect merging/diverging manoeuvre	None
Jul 2015	Sat	12:15 PM	SH 1N 500 N AIRLIE ROAD	Car/Wagon1 SDB on SH 1N changing lanes to left hit Car/Wagon2	CAR/WAGON2, did not check/notice another party behind	None
Jul 2015	Mon	7:03 AM	SH 1N 670 N AIRLIE ROAD	Car/Wagon1 NDB on SH 1N lost control turning right, Car/Wagon1 hit guide/guard rails	CAR/WAGON1, other fatigue	None
Jul 2016	Wed	1:05 PM	SH 1N 400 N AIRLIE ROAD	SUV1 NDB on State Highway 1 Pukerua Bay changing lanes/overtaking to right hit Car/Wagon2	CAR/WAGON2, lost control under braking, other inexperience SUV1, did not check/notice another party behind, incorrect merging/diverging manoeuvre	None
Sep 2017	Fri	5:45 PM	SH 1N 400 N AIRLIE ROAD	Car/Wagon1 NDB on State highway 1 changing lanes to left hit Van2	CAR/WAGON1, attention diverted by other traffic VAN2, did not check/notice another party from other dirn, emotionally upset/road rage	None
Oct 2018	Fri	3:45 AM	SH 1N 700 S GRAY ST	Truck1 SDB on SH 1, PUKERUA BAY, PORIRUA lost control turning right, Truck1 hit cliffs	TRUCK1, alcohol test below limit, lost control when turning, sudden illness	1 Minor

TABLE C1: Observed Crash History for Area, Period from January 2014 (Source: NZTA Crash Analysis System)

ANNEXURE D: FORECAST TURNING MOVEMENTS, 2025

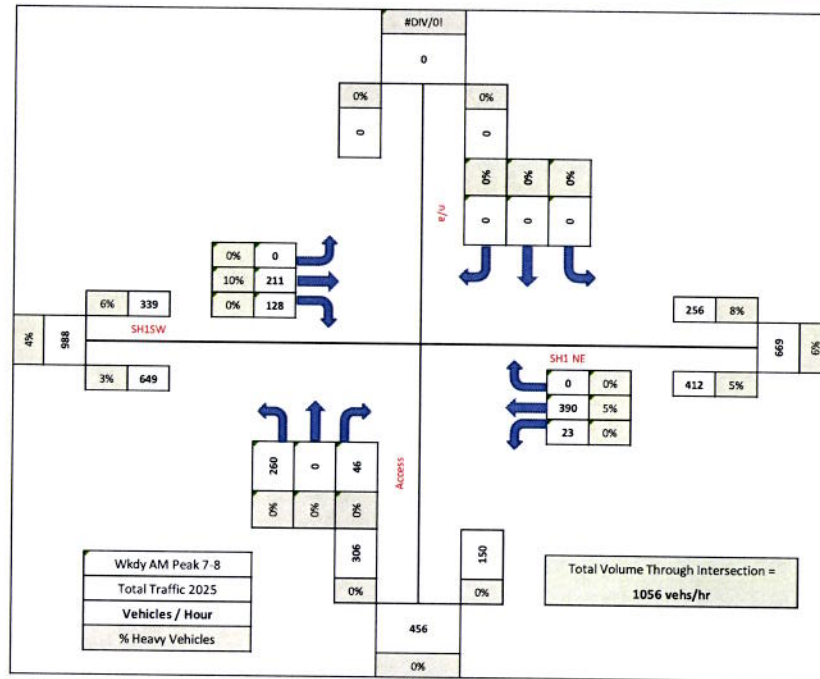


Figure D1: Forecast Intersection Turning Movements (AM Peak, 2025)

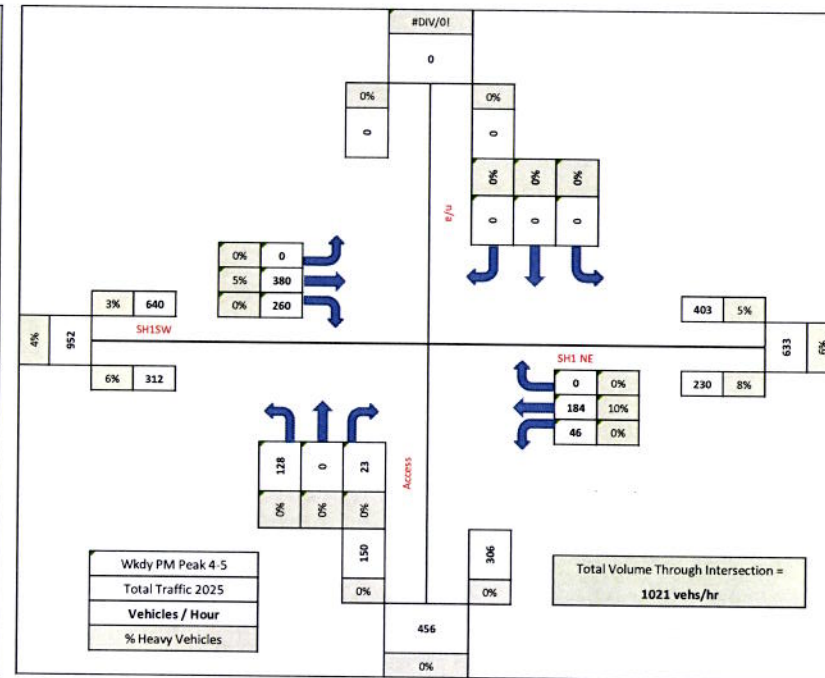


Figure D2: Forecast Intersection Turning Movements (PM Peak, 2025)

ANNEXURE E: INTERSECTION/ACCESS ASSESSMENTS

Period	Approach	Movement	Movement					Approach					Intersection									
			Veh/hr	Average Delay (secs)	RFC %	95% Queue (m)	LOS	Veh/hr	Average Delay (secs)	RFC %	95% Queue (m)	LOS	Veh/hr	Average Delay (secs)	RFC %	95% Queue (m)	LOS					
AM Peak Base Scenario, 2025	Access	Left	274	11.4	37%	13	LOS B	322	12.4	37%	13	LOS B	1,114	4.9	37%	13	LOS NA					
		Right	48	18.6	17%	4	LOS C															
	SH1 North	Left	24	6.9	1%	0	LOS A	435	0.4	22%	0	LOS NA										
		Through	411	0.0	22%	0	LOS A															
	SH1 South	Through	222	0.0	12%	0	LOS A	357	3.5	15%	4	LOS NA										
		Right	135	9.1	15%	4	LOS A															

Period	Approach	Movement	Movement					Approach					Intersection									
			Veh/hr	Average Delay (secs)	RFC %	95% Queue (m)	LOS	Veh/hr	Average Delay (secs)	RFC %	95% Queue (m)	LOS	Veh/hr	Average Delay (secs)	RFC %	95% Queue (m)	LOS					
PM Peak Base Scenario, 2025	Access	Left	135	8.6	14%	4	LOS A	159	10.4	14%	4	LOS B	1,075	3.9	24%	8	LOS NA					
		Right	24	21.0	10%	2	LOS C															
	SH1 North	Left	48	6.9	3%	0	LOS A	242	1.4	11%	0	LOS NA										
		Through	194	0.0	11%	0	LOS A															
	SH1 South	Through	400	0.0	21%	0	LOS A	674	3.3	24%	8	LOS NA										
		Right	274	8.1	24%	8	LOS A															

TABLE E1: SIDRA RESULTS FOR SH1/ACCESS INTERSECTION - BASE SCENARIO



APPENDIX 4

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27 August 2019

Stuart Dixon
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Dear Stuart

PRELIMINARY SITE INVESTIGATION, MT WELCOME STATION

1.0 Introduction

Classic Developments Limited has engaged Pattle Delamore Partners Limited (PDP) to undertake a preliminary site investigation (PSI) for a site comprised of one parcel of land legally described as Lot 3 Deposited Plan 89102 located at 422 State Highway 1, Pukerua Bay. This PSI has been undertaken to meet the objectives of Classic Developments' proposed development plans (Appendix A) for the site. Henceforth the property at 422 State Highway 1 is referred to as 'the site'.

This desktop review has been limited to a review of existing available information for the site including; council records, property title information, historical aerial photographs and Fire & Emergency New Zealand (FENZ) records. Following the desktop review, a walkover of the site was undertaken by PDP staff on 14th June 2019.

This report provides the results of the PSI review and has been prepared in general accordance with the requirements of the Ministry for the Environment (MfE) '*Contaminated Land Management Guideline No. 1: Reporting on Contaminated Sites in New Zealand*' (CLMG No. 1) (MfE, 2011a). It has been certified by a suitably qualified and experienced practitioner as required by the *Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011* (the NES).

2.0 Project Objectives

Classic Developments intend to redevelop the site for residential purposes. The size of the proposed residential properties range from 200 m² to 800 m². Classic Developments has been advised by Porirua City Council that in order to support its intent to change its planning document a PSI is required to:

- Determine whether any activities from the Hazardous Activities and Industries List ¹ (HAIL) are currently, have been, or are more likely than not to have been occurring at the site; and therefore, Whether the NES applies to the site development, and consents must be sought under the NES to permit development activities.

¹ The Hazardous Activities and Industries List is a compilation of activities and industries that are considered likely to be a source of land contamination from the use, storage or disposal of hazardous substances. The list was prepared and published by MfE (2011).

3.0 Scope

The scope of the PSI review work undertaken by PDP to fulfil the project objectives has included:

- ∴ A review of a selection of publicly available aerial photographs;
- ∴ A review of Certificates of Title (CT) for the site;
- ∴ A review of the Greater Wellington Regional Council (GWRC) Selected Land Use Register (SLUR) data available for the site;
- ∴ A review of Porirua City Council property information files for the site;
- ∴ A review of Fire & Emergency New Zealand information related to the property;
- ∴ An interview with the current site owner, and the neighbour occupying 434 State Highway 1, to determine the historical use of the site, with a specific focus on identifying potential contamination sources and/or land uses;
- ∴ A walkover of the property to visually inspect the site conditions including any historical infrastructure that can be identified;
- ∴ Consideration of the NES Regulations; and
- ∴ Preparation of this report that summarises the findings of the information review.

4.0 Site Description

The site covers an area of 55.17 ha and is legally described as Lot 3 Deposited Plan 89102. Under the jurisdiction of Porirua City Council, the site is zoned 'Rural Zone'. The site runs adjacent to State Highway 1, and wraps around the properties at 422A, 422B and 434 State Highway 1, Pukerua Bay (which are outside of the scope of this report) before rejoining State Highway 1 north of the property at 434 State Highway 1. The site extends inland to the east and is bounded by other rural properties to the north, south, and east. The site is largely pastoral farmland and residential rural land use. There are no major tributaries or streams that run through the site.

Currently the site is used for pastoral purposes, specifically for grazing sheep and deer. The grazing of deer has only begun within the last ten years. The structures on site include one woolshed, a stand-alone race/docking area and a residential property. The majority of these structures are located in the area 200 m east of State Highway 1. A lean to was added to the woolshed within the last ten years. Driveway access to the site from State Highway 1 is located at the north-western corner of the site. Further detail of the site buildings and land features is described in Section 6.0, as observed during the site walk over.

5.0 Geology and Hydrogeology

The site topography is gently rolling with shallow gully features that trend in a south to north direction. Based on the published geology of the Wellington area (Begg, 2001) there is a geological contact running through the property which runs from north east to south west. The western area of the site is underlain by Middle Quaternary alluvium and colluvium which consists of gravel, sand and mud, with rare non welded ignimbrite and tephra. The eastern area of the site is underlain by the Rakaia Terrane sediments which consists of interbedded sandstone and mudstone with minor conglomerate, basalt and chert.

Based on topography the inferred groundwater flow direction is in a north westerly direction (toward the coast).

6.0 Historical Site Information

6.1 Aerial Photographs

A review was undertaken of a selection of the available historical aerial photography for the site, and included photos from 1942, 1961, 1979, 1986, 1995, 2002, 2011 and 2018, sourced variously from the Alexander Turnbull Library and Google Earth Imagery. Copies of the historical aerial photographs from 1942, 1961, 1979, 1986, 1995, 2002, 2011 & 2018 are provided in Appendix B. The following key findings from the aerial photographs with respect to the history and use of the site are summarised in Table 1.

Table 1: Summary of Historical Aerial Photographs

Year	Description of Site Use
1942	The site and the surrounding land appears to be in use for pastoral purposes. The buildings/structures which are present on site include the present-day residential dwelling and woolshed, located in the western area of the site in proximity to Stage Highway 1. Driveway access to the structures is via State Highway 1 (as it remains to this day). There appears to be a small residential structure in the south west corner of the site. Use known.
1961	The site use remains unchanged from pastoral use. The dwelling to the north at 434 State Highway 1 has been constructed sometime between 1942 and 1961. There is also a small structure to the east of the woolshed on the site which has been constructed, which may have been associated with a sheep dip. Additionally, a woolshed farmtrack is visible, as is a greenbelt area south of the woolshed.
1979	The site use remains unchanged from pastoral use. The woolshed area has been further developed, and includes the present day dock/race structure, as well as an increase in the number of sheep holding pens to the north of the woolshed. Structures which may be associated with a sheep dip are visible, a pen has been added in this location. The structure in the south west of the property (as observed in the 1942 photograph) has been removed and no longer appears.
1986	The site uses remains unchanged from pastoral use. The bush area immediately to the south of the woolshed has been cleared. The structures appear unchanged from the 1979 photo.
1995	The site use remains unchanged from pastoral use. The structures appear unchanged from the 1986 photo.
2002	The site use remains unchanged from pastoral use. The structures appear unchanged from the 1995 photo.
2011	The site appears relatively unchanged from the 2002 photo, with the exception of the following; landscaping works and what appears to be the installation of a concrete driveway to the residential dwelling, and further planting in the area surrounding the woolshed. Buildings have been constructed on 422A and 422B State Highway 1 to the south of the site between 2006 and 2011.
2018	Both the site use and the structures present on the site appear unchanged from the 2011 photo.

6.2 Certificates of Title

The current and historical CTs for the site are summarised in Table 2 below with further information provided where relevant. Historical CTs were found dating back to 1887. The CTs are attached in Appendix C.

Table 2: Relevant Information from Certificates of Title

Legal Description	Certificate of Title
Lot 3 Deposited Plan 89102	WN56D/262 (issued in 2003) <ul style="list-style-type: none"> ∴ The current CT concerns 196.882 ha of land ∴ The current proprietorship is listed as The Mt Welcome Family Trust Limited
Lot 3 Deposited Plan 89102	16D/680 (issued in 1976) <ul style="list-style-type: none"> ∴ The current CT concerns 84.63 ha of land. ∴ The current site proprietorship is listed as James Andrew Gray of Plimmerton.
Lot 3 Deposited Plan 89102	WN44/252 (issued in 1887) <ul style="list-style-type: none"> ∴ The current CT concerns 80.94 ha of land. ∴ The original proprietorship is listed as Huntleigh Downs Limited.

6.3 Fire and Emergency New Zealand Records

FENZ records were obtained directly from Fire & Emergency New Zealand, and these are included in Appendix D. FENZ hold no record of fire incidents or the use of fire fighting foams on the site (Appendix D).

6.4 Greater Wellington Regional Council Records

A review of the SLUR database on the GWRC's Webmap showed no record of HAIL activities at 422 State Highway 1 (Appendix D).

6.5 Porirua City Council Records

A property information request and contaminated land enquiry was requested from Porirua City Council. The Council had no record of the site as a potential contaminated site (Appendix D). The property file did not contain any evidence of HAIL activities having been conducted on the site.

7.0 Site Reconnaissance and Interviews

A site walkover was undertaken by PDP staff on the 14th June 2019. An interview was completed with Mr Dave Riley, a representative of the current site owner (The Mt Welcome Family Trust Limited); and with the owner of the homestead located in the property at 434 State Highway 1, to the north of the site; Mr Peter Smith. Photographs are shown in Appendix E.

7.1 Site Observations

The following site observations were made during the site walkover:

- ∴ All of the site buildings and structures which included a residential dwelling, woolshed (with additional lean-to structure) and a dock/race structure with concrete pad were related to the historical and current land use for deer/sheep farming purposes. The location of the site buildings and structures was consistent with the 2018 aerial image of the site.
- ∴ There were bulk stores no chemicals or hazardous substances stored on site.
- ∴ There were no bulk fuel storage containers or tanks on site.
- ∴ There were no observed sheep dips or spray structures on the site.
- ∴ There was no spraying equipment observed on site.

7.2 Interviews

An interview was completed with David Riley, a representative of the current site owner, on 14th June 2019, and the following historical information was noted:

- ∴ The current owners have owned the property for approximately 10 years. In that time the site has continued to be sheep farming/pastoral land as per the survey of historic records.
- ∴ He noted no hazardous activities (such as fuel storage) as having occurred in his experience on the site.
- ∴ The lean-to structure was added to the woolshed structure approximately ten years ago
- ∴ The owner stated that no sheep dipping activities have occurred on the property. The dock/race had been used for drenching of sheep but this was carried out on the concrete foundation (as per the site walkover).

Following this discussion with the owner a second interview was conducted with the owner of the neighbouring property at 434 State Highway 1, Pukerua Bay. He related the following information:

- ∴ That the owner was a rural lifestyle block owner who ran approximately 200 ewes south of his property. He had lived in the property for 10 years.
- ∴ The owner noted that 422 State Highway 1, along with the properties at 422A & 422B State Highway 1 had been a part of a larger parcel of land, which had been subdivided (as per the aerial images).
- ∴ The owner confirmed, as per previous discussions that no hazardous activities had appeared to be carried out on site related to sheep dipping or fuel storage etc.

8.0 Information Summary

Based on the findings from this PSI for the site located at 422 State Highway 1, Pukeura Bay, Wellington, the following information on the current and historical land use at the site is summarised:

- ∴ The aerial photographs show that the site was utilized for pastoral purposes from the 1940s until the present day.
- ∴ Two aerial photographs from 1961 and 1979 show structures which may have been a sheep dip or spray race. This is not unexpected as sheep dips were historically very common, and treating sheep with an external chemical insecticide was historically a legal requirement (MfE, 2006).
- ∴ During the site walkover there was no evidence of any HAIL activities observed.

- ✧ Through anecdotal information from the site owner, no sheep dipping or spraying activities have been observed or carried out in the last 10 – 15 years.
- ✧ No use of fire fighting foams or fire emergency equipment has been recorded by Fire and Emergency New Zealand.
- ✧ No records related to HAIL activities have been recorded by Greater Wellington Regional Council; and none of the documentation on the Porirua City Council property information file indicated that HAIL activities have taken place on the property.

Based upon all of the available information, the only potential sources of soil contamination associated with the past and present land use activities within the site are related to the small scale farming activities. No evidence was found for the bulk storage of hydrocarbons, and there was no evidence found of a sheep dip or spray on site during the site visit. Nevertheless, given that sheep dipping was common practice historically, and the possibility of structures associated with sheep dips evident in the 1961 and 1979 aerial photographs, the presence of a historical sheep dip cannot be ruled out.

9.0 Consideration of the NES

The NES seeks to control activities on contaminated land so as to protect human health. Regulations apply to a 'piece of land' which is described as a site or the area of a site where an activity or industry described in the HAIL is currently, or has been, or is more likely than not to have been, undertaken on it.

With regards to the findings from this investigation, with the exception of the potential for a sheep dip, no other HAIL activities have been found to be occurring, or to have occurred in the past. Other than in the area of the site where the sheep dip may have been located, there are considered to be no significant potential sources of contamination associated with the past and present land use activities identified at the site.

10.0 References

- Begg, J. G. *Geology of the Wellington Area*. Institute of Geological and Nuclear Sciences 1:250,000 Geological Map 10. Map (1 sheet) and text (64 p.), Institute of Geological and Nuclear Sciences Limited.
- Bryce Holmes, 2018. *Summary of Intent. Pukerua Bay – Mt Welcome Station. December 2018*, Land Matters.
- MfE, 2011a. *Contaminated Land Management Guidelines No. 1 – Reporting on Contaminated Sites in New Zealand (Revised 2011)*. Ministry for the Environment.
- MfE, 2011b. *Hazardous Activities and Industries List (HAIL): October 2011*. Ministry for the Environment.
- MfE, 2006. *Identifying, investigating and managing risks associated with former sheep-dip sites: A guide for local authorities*. Ministry for the Environment.
- NES, 2011. *Resources Management (National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations*.

11.0 Limitations

This report has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided by Classic Developments Ltd and others (not directly contracted by PDP for the work), including LINZ, the Alexander Turnbull Library, Greater Wellington Regional Council, Fire & Emergency New Zealand, Mr Dave Riley and Mr Peter Smith. PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the report. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

This report has been prepared by PDP on the specific instructions of Classic Developments Ltd for the limited purposes described in the report. PDP accepts no liability if the report is used for a different purpose or if it is used or relied on by any other person. Any such use or reliance will be solely at their own risk.

Yours faithfully

PATTLE DELAMORE PARTNERS LIMITED

Prepared by



Joshua Hawkes

Environmental Geologist

Reviewed by



Nerena Rhodes

Environmental Science Service Leader

Approved by



Natalie Webster

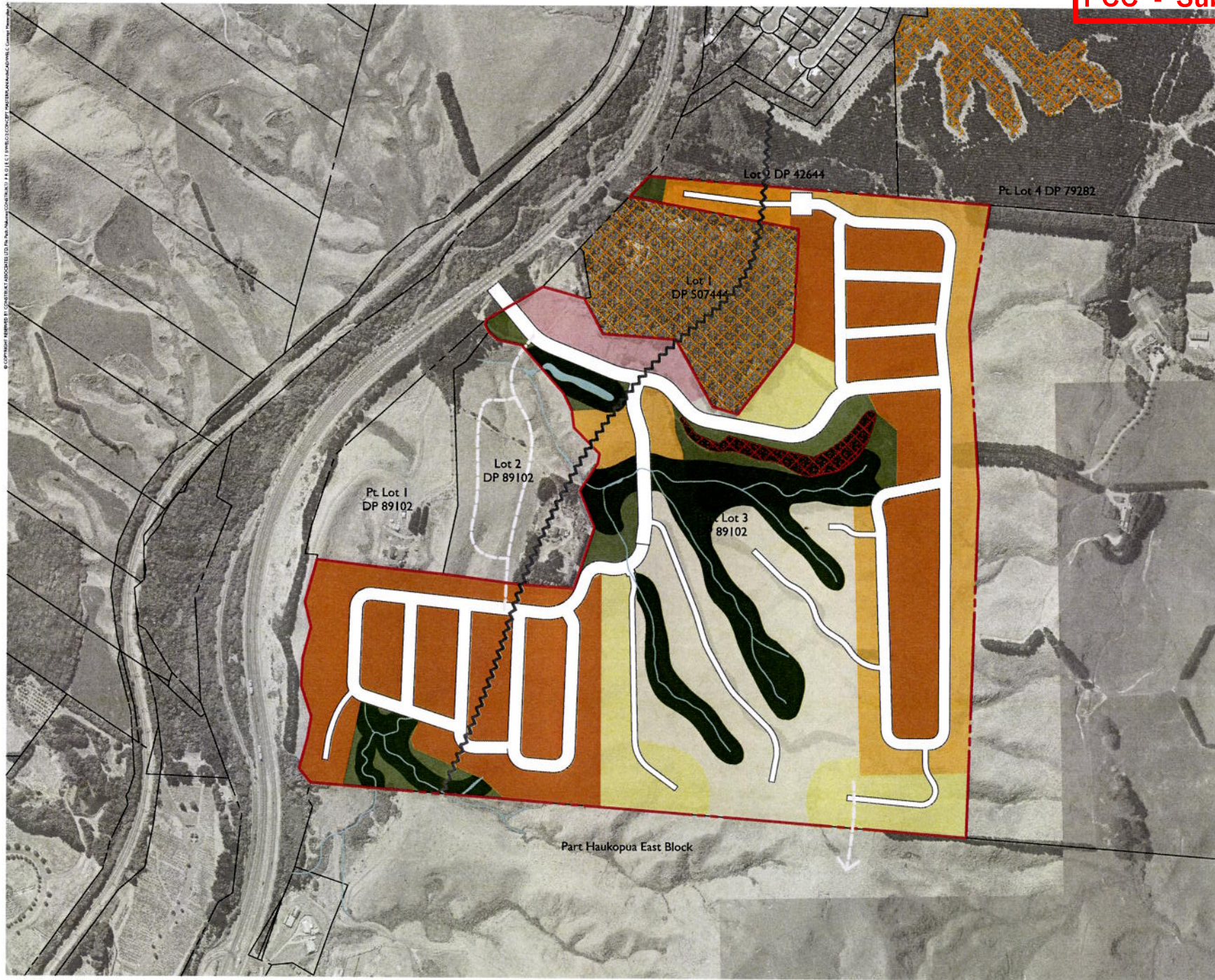
Technical Director – Contaminated Land



FIGURE 1 : SITE LAYOUT



Appendix A: Classic Developments Proposed Development Plan



LEGEND

SITE ASSESSMENT	
Legal description:	Part Lot 3 DP 89102
Address:	422 State Highway 1, Pukerua Bay Porirua
Site Area:	551,750m ²
Zone:	Current: Rural Zone Proposed: Residential Zone

DEVELOPMENT DESCRIPTION	
Medium Density Housing Development	
Large Lot Housing Development	

PUBLIC

	Extent of landholding
	Proposed roading location
	Proposed pedestrian link
	Reserve with Significant Natural Area SNA
	Farm orange network
	Proposed additional reserve allocation
	Seismic hazard zone
	QE2 Designation

YIELD

Large Block Residential		
	~2000m ² + Sites	~ 40 sites 7%
	~1000m ² Sites	~ 35 sites 6%
Regular Block Residential		
	~600-850m ² Sites	~ 80 sites 15%
	~450m ² Sites	~345 sites 64%
	~325m ² Sites	~ 20 sites 4%
Mixed use area (~>50% Residential)		
	~300m ² Sites	~ 30 sites 4%
Total		~550 Sites

- NOTES**
- Refer to Civil Engineer's documents for:
 - all earthworks details
 - details of additional public infrastructure
 - Refer to landscape architect's documents for all planting layouts, schedules and specifications.
 - Refer to the Urban Design Report for precinct zone details



Appendix B: Historical Aerial Photographs

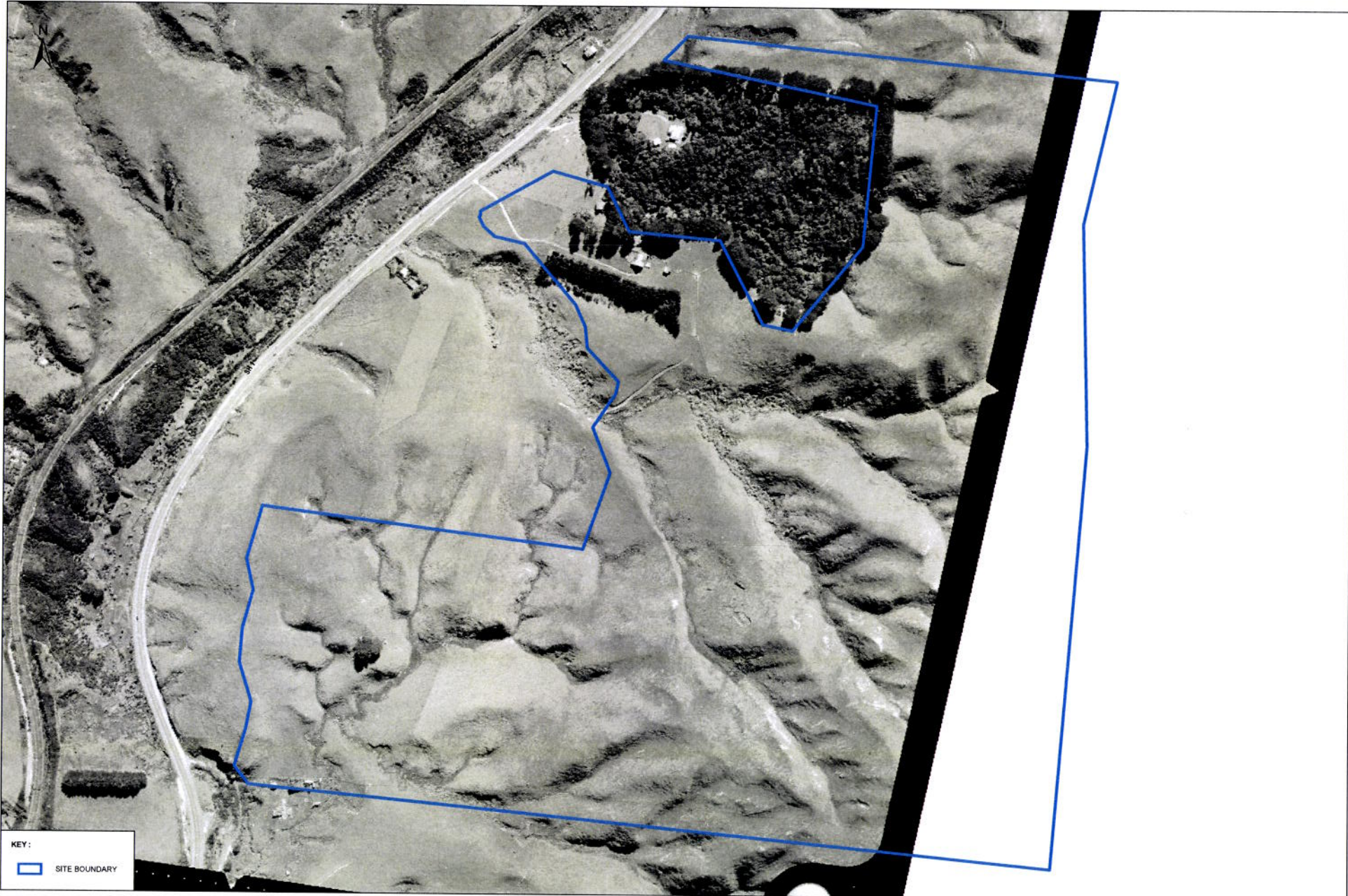


KEY:
[Blue outline] SITE BOUNDARY

SOURCE:
1. AERIAL IMAGERY DERIVED FROM HISTORICAL DATA (MAY NOT BE SPATIALLY ACCURATE).
2. CHARACTERISTIC TOPOGRAPHICAL INFORMATION AND SIZE 1 DERIVED FROM LIDAR DATA.

AERIAL PHOTOGRAPH : 1942

SCALE : 1:4,000 (A3)
0 25 50 100
METRES



KEY:
[Blue outline] SITE BOUNDARY

SOURCE:
1. AERIAL IMAGERY DERIVED FROM REMOTE SENSING MAY NOT BE SPATIALLY ACCURATE.
2. COORDINATE/TOPOGRAPHICAL INFORMATION MAY BE DERIVED FROM LIDAR DATA.

AERIAL PHOTOGRAPH : 1961

SCALE : 1:4,000 (A3)
0 25 50 100
METRES



KEY:
 SITE BOUNDARY

SOURCE
 1. AERIAL IMAGES DERIVED FROM AIRPHOTOS (MAY NOT BE SPATIALLY ACCURATE)
 2. COORDINATE/TOPOGRAPHICAL INFORMATION AND BEST DERIVED FROM LIDAR DATA

AERIAL PHOTOGRAPH : 1979

SCALE : 1:4,000 (A3)
 0 25 50 100
 METRES



KEY:
[Blue outline] SITE BOUNDARY

SOURCE:
1. AERIAL IMAGES DERIVED FROM GOOGLE EARTH MAY NOT BE SPATIALLY ACCURATE.
2. QUALITY OF TOPOGRAPHICAL INFORMATION AND HEIGHT DERIVED FROM LIDAR DATA.

AERIAL PHOTOGRAPH : 1986

SCALE : 1:4,000 (A3)
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METRES

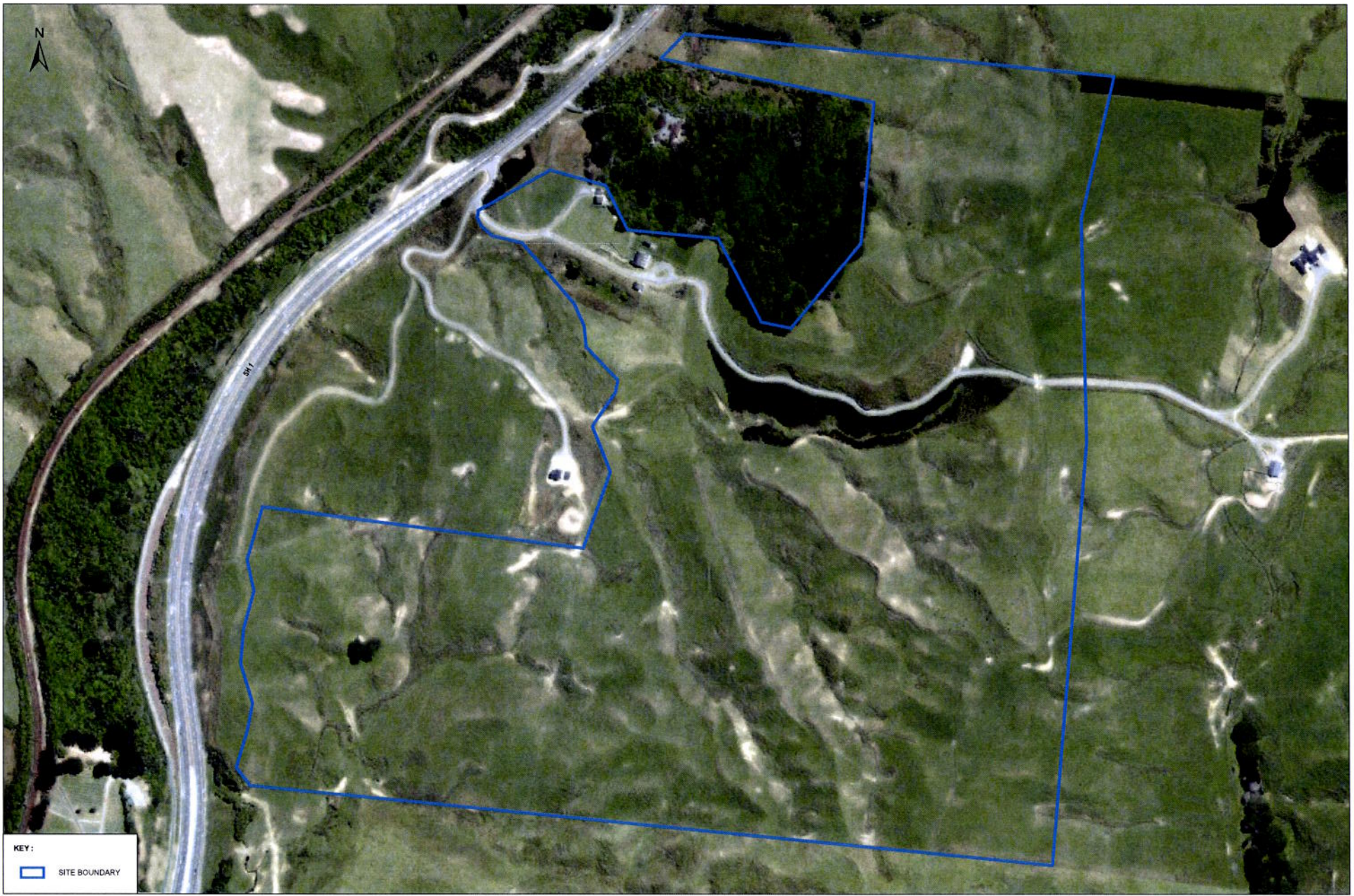


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SOURCE:
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2. CADASTRAL/TOPOGRAPHICAL INFORMATION AND INSET DERIVED FROM LIDAR DATA.

AERIAL PHOTOGRAPH : 1995

SCALE : 1:4,000 (A3)
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METRES

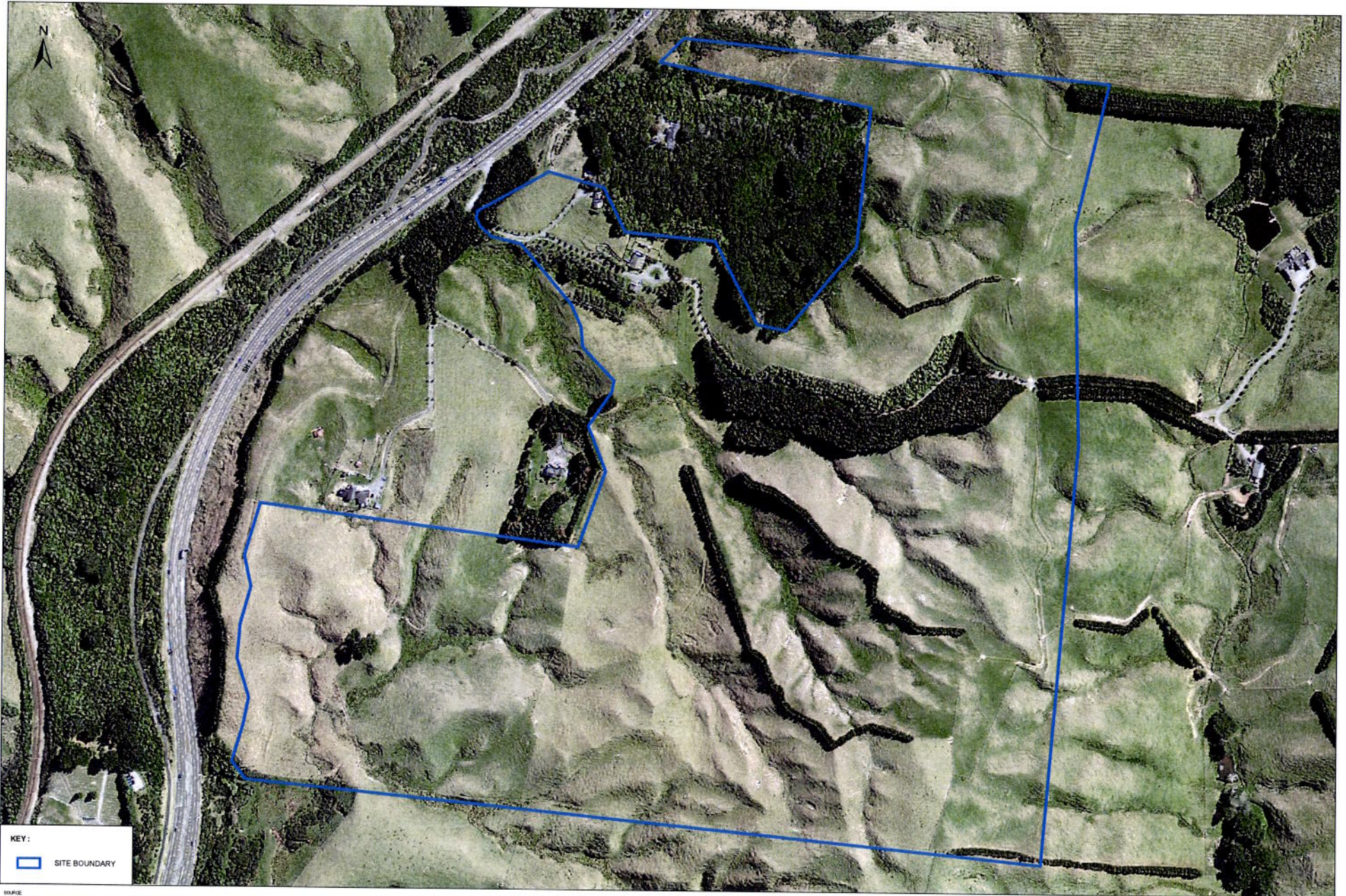


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SOURCE:
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 2. CADASTRAL/TOPOGRAPHICAL INFORMATION AND NOT DERIVED FROM LIDAR DATA

AERIAL PHOTOGRAPH : 2002

SCALE : 1:4,000 (A3)
 0 25 50 100
 METRES



KEY :
[Blue outline] SITE BOUNDARY

SOURCE:
1. AERIAL IMAGERY DERIVED FROM GOOGLE EARTH (MAY NOT BE SPATIALLY ACCURATE)
2. COORDINATE/PROJECTIONAL INFORMATION AND METRE DERIVED FROM LIDAR DATA

AERIAL PHOTOGRAPH : 2011

SCALE : 1:4,000 (A3)
0 25 50 100
METRES

A03437100.dwg MNY 1 ISSUE1

PATTLE DELAMORE PARTNERS LTD

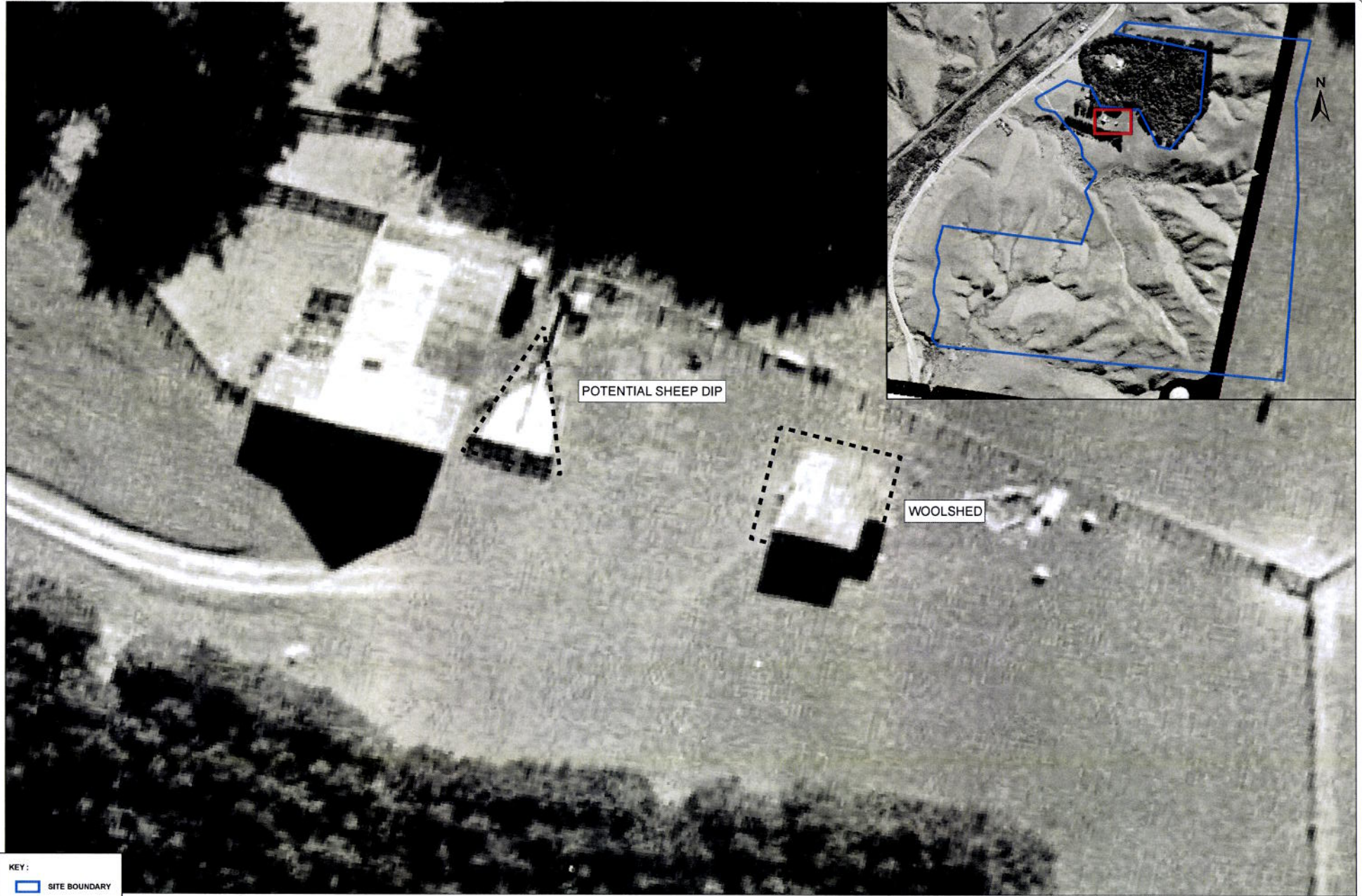


KEY :
 SITE BOUNDARY

SOURCE:
 1. VECTOR MANGERY DERIVED FROM PHOTO AIRPHOTO AND MAY NOT BE SPATIALLY ACCURATE;
 2. CADASTRAL/TOPOGRAPHICAL INFORMATION AND INDEED DERIVED FROM LIDAR DATA.

AERIAL PHOTOGRAPH : 2018

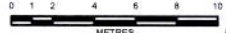
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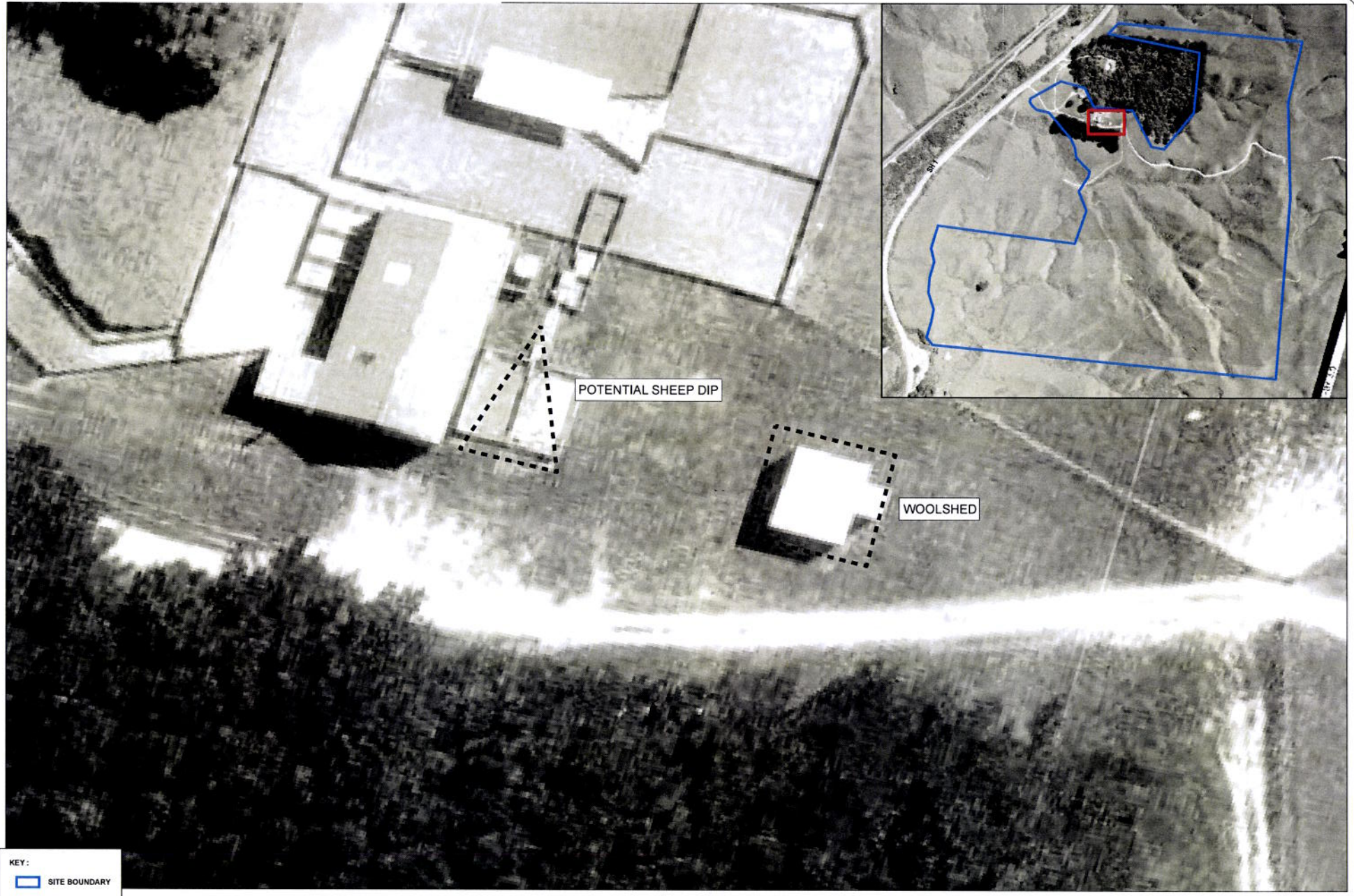


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SOURCE:
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 2. CADASTRAL/TOPOGRAPHICAL INFORMATION AND INSET DERIVED FROM LIDAR DATA.

AERIAL PHOTOGRAPH INSET : 1961

SCALE : 1:250 (A3)

 METRES



KEY:
 SITE BOUNDARY

SOURCE:
 1. AERIAL IMAGES DERIVED FROM AIRPHOTO MAY NOT BE SPATIALLY ACCURATE.
 2. CADASTRAL/TOPOGRAPHICAL INFORMATION AND INSET DERIVED FROM LIDAR DATA.

AERIAL PHOTOGRAPH INSET : 1979

SCALE : 1:250 (A3)
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 METRES



Appendix C: Certificates of Title

SCHEDULE 1.

NEW ZEALAND.



Register-book,
Vol. Lp Lp, folio 251.

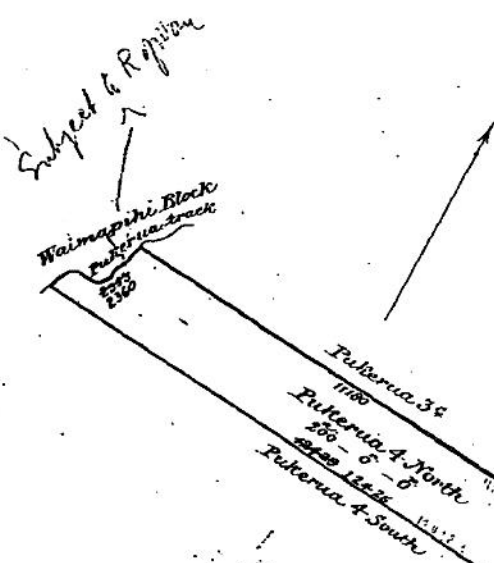
Reference: Warrant No. 110.
P.R. folio

CERTIFICATE OF TITLE UNDER LAND TRANSFER ACT.



This Certificate, dated the first day of June, one thousand eight hundred and eightythree, under the hand and seal of the District Land Registrar of the Land Registration District of Wellington, being a Certificate in lieu of Grant, under Warrant of His Excellency the Governor, in exercise of the powers enabling him in that behalf, Witnesseth that Manatu te Kairangi an aboriginal native of New Zealand

is seized of an estate in fee-simple (subject to such reservations, restrictions, encumbrances, liens, and interests as are notified by memorial underwritten or indorsed hereon; subject also to any existing right of the Crown to take and lay off roads under any Act of the General Assembly of New Zealand) in the land hereinafter described, as the same is delineated by the plan drawn hereon, bordered red, be the several admeasurements a little more or less, which said land is in the said Warrant expressed to have been originally acquired by the said Manatu Kairangi as from the fifteenth day of August, one thousand eight hundred and eightythree, under The Native Land Transfer Act 1882, that is to say: All that parcel of land containing two hundred acres situate in the Provincial District of Wellington being the Block known as 'Pukerua No. 4 North' on the public map of the 'Pukerua Survey District' deposited in the Office of the Chief Surveyor at Wellington



Transfer No. 2728 produced 3rd June 1882 at 10.15 am Manatu te Kairangi to Francis Henry Dillon Bell and Alexander John Rushforth as tenants in common

Transfer No. 1310 produced 8th October 1887 at 10.30 am Francis Henry Dillon Bell and Alexander John Rushforth to Anthony Hall of Pukerua

Transmission 5839 Probate of will of Anthony Hall who died on the 7th October 1901 granted to Charlotte Elizabeth Hall of Pukerua, widow, Reginald Stace Hall of Pukerua Farmer, and Frank Mills of Wellington Clerk produced 1st July 1902 at 2.45 pm

Transfer 42069 produced 1st July 1902 at 2.45 pm Charlotte Elizabeth Hall, Reginald Stace Hall and Frank Mills to the said Reginald Stace Hall

Mortgage 3694 produced 1st July 1902 at 2.45 pm Reginald Stace Hall to John Hammond and James Flochard

DISCHARGED CONTINUED

Scale, 20 Chs to 1 Inch.

over M. Wilson

44/251

Mortgage 35080 produced 13 October 1946 at 2.55 pm. Reginald Stanger to The Devon Investment Co. Ltd. **DISCHARGED**

Mortgage 98602 produced 17 November 1944 at 11 am Reginald Stanger to William H. Faulkner **DISCHARGED**

Mortgage 211186 Reginald Stanger to Fredrick George Russell Grace produced 30 October 1930 at 3.25 pm **DISCHARGED**

Transmission 28094 of mortgage 211186 to John Edwin Duncan and Susan Russell Grace as survivors on 27th June 1935 at 2.00 pm **DISCHARGED**

Mortgage 71022386 Reginald Stanger to Thomas H. Faulkner produced 17th November 1935 at 11.40 am **DISCHARGED**

Variation of Mortgage 227366 produced 14th November 1940 at 3 pm **DISCHARGED**

Transmission 51682 to Isabella Wall, Anthony Joseph Wall and Doran Dorothy Wall. Entered 24/7/1952 at 12.10 P.M. **DISCHARGED**

Transfer 357646 the registered proprietors to Reginald Faulkner Wall of Tuckers farm produced 24/7/1952 at 12.12 P.M. **DISCHARGED**

Mortgage 315876 Reginald Faulkner to Isabella Wall produced 27.10.52 at 10.15 am **DISCHARGED**

Transfer 396872 Reginald Faulkner Wall to James Andrew Gray of Hemmerton Farm produced 17-8-1956 at 11.25 am **DISCHARGED**

Mortgage 353827 James Andrew Gray to Australia Mutual Provident Society produced 27th August 1956 at 10.18 am **DISCHARGED**

Mortgage 353830 James Andrew Gray & Dorothy Gray produced 27th August 1956 at 10.30 am **DISCHARGED**

Variation of Mortgage 353829 produced at December 1956 at 9.50 am **DISCHARGED**

Variation of Mortgage 353829 - 9.8.1966 at 2.20 pm **DISCHARGED**

209672/1 **DISCHARGED** Mortgage 853758 to The State Advances Corporation & Law **DISCHARGED** 15-12-1970 at 9.55 am **DISCHARGED**

THIS REPRODUCTION (ON A REDUCED SCALE) CERTIFIED TO BE A TRUE COPY OF THE ORIGINAL REGISTER FOR THE PURPOSES OF SECTION 153A LAND TRANSFER ACT 1952 **DISCHARGED**

Mortgage 097082.1 to Rural Banking and Finance Corporation - 3.6.1976 at 2.07 p.m. **DISCHARGED**

DET 209673-1 CANCELLED AND THE FOLLOWING E.I.T. - 22-10-1976 ISSUED IN TERMS OF PLAN 44495. 47160/672 - LOT 1 (PART HEREIN) 47160/680 - LOT 3

DISTRICT LAND REGISTRAR
CANCELLED
WELLINGTON, N.Z.

DUPLICATE DESTROYED

CERTIFICATE OF TITLE, Vol. , folio





**COMPUTER FREEHOLD REGISTER
UNDER LAND TRANSFER ACT 1952**

Historical Search Copy



Identifier WN44/252
Land Registration District Wellington
Date Issued 01 June 1887

Cancelled

Prior References

WA 110

Estate	Fee Simple
Area	80.9371 hectares more or less
Legal Description	Pukerua 4 South Block

Original Proprietors

Huntleigh Downs Limited

Interests

2487 Proclamation defining the middle line of portion of the Plimmerton - Paekakariki road - 7.9.1936 at 10.00 am
Appurtenant hereto is a water supply right created by Transfer B787781.1 - 13.6.2000 at 9.22 am
819199.2 Mortgage to Westpac Banking Corporation - 25.1.2001 at 9.00 am
B830435.1 Mortgage to St Laurence Mortgages Limited - 12.4.2001 at 9.00 am
5063138.1 Department dealing correcting the memorials by deleting Proclamation 2487 and Mortgage 819199.2 and adding Mortgage B819199.2 - 24.7.2001 at 3:59 pm
B819199.2 Mortgage to Westpac Banking Corporation - 25.1.2001 at 9.00 am
5059353.1 Variation of Mortgage B819199.2 - Produced 16.7.2001 at 9.00 am and Entered 24.7.2001 at 4:00 pm
5238129.1 Variation of Mortgage B830435.1 - 31.5.2002 at 10:13 am
5347234.1 Variation of Mortgage B819199.2 - 18.9.2002 at 9:00 am
5757394.1 Notice pursuant to Section 93 Transit New Zealand Act 1989 (affects DP 89102) - 8.10.2003 at 9:00 am
5757394.2 Certificate pursuant to Section 321(3) (c) Local Government Act 1974 (DP 89102) - 8.10.2003 at 9:00 am
5757394.3 Certificate pursuant to Section 223 Resource Management Act 1991(affects DP 89102) - 8.10.2003 at 9:00 am
5757394.3 Certificate pursuant to Section 223 Resource Management Act 1991(affects DP 89102) - 8.10.2003 at 9:00 am
5757394.4 Consent Notice pursuant to Section 221 Resource Management Act 1991 - 8.10.2003 at 9:00 am
5757394.5 Consent Notice pursuant to Section 221 Resource Management Act 1991 - 8.10.2003 at 9:00 am
5757394.6 CTs issued - 8.10.2003 at 9:00 am

Legal Description	Title
part Lot 1 Deposited Plan 89102	WN56D/260
part Lot 2 Deposited Plan 89102	WN56D/261
part Lot 3 Deposited Plan 89102	WN56D/262

CANCELLED

SCHEDULE 1.

NEW ZEALAND.

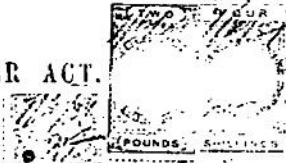


Register-book,

Vol. *L. L. L.*, folio *25*

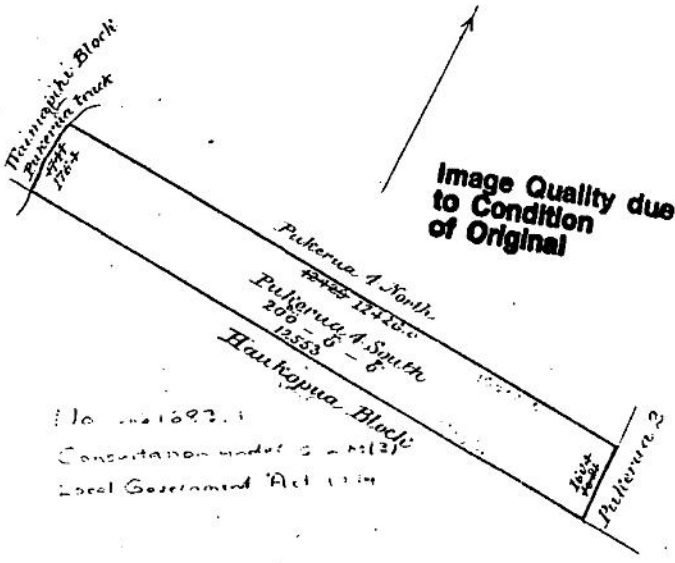
Reference: Warrant No. *110*
P.R. folio

CERTIFICATE OF TITLE UNDER LAND TRANSFER ACT.



This Certificate, dated the *first* day of *June*, one thousand eight hundred and eighty-~~three~~^{four}, under the hand and seal of the District Land Registrar of the Land Registration District of *Wellington*, being a Certificate in lieu of Grant, under Warrant of His Excellency the Governor, in exercise of the powers enabling him in that behalf, *Whitarseth* that *Aga haka Tawhia* an aboriginal native of New Zealand

is seized of an estate in fee-simple (subject to such reservations, restrictions, encumbrances, liens, and interests as are notified by memorial underwritten or indorsed hereon; subject also to any existing right of the Crown to take and lay off roads under any Act of the General Assembly of New Zealand) in the land hereinafter described, as the same is delineated by the plan drawn hereon, bordered *red*, to be the several admeasurement of a little more or less, which said land is in the said Warrant expressed to have been originally required by *the said Aga haka Tawhia* as from the *fifteenth* day of *August*, one thousand eight hundred and eighty-~~three~~^{four}, under *the Deeds Tawhia Tawhia Act, 1882*, that is to say: All that parcel of land containing *two hundred and one acres in the Provincial District of Wellington being the Block known as Block No. 24 South in the public Map of the Haukapa Survey District deposited in the Office of the Chief Surveyor at Wellington.*



Transfer *1812727* produced *30 June 1884* at *10.15 am* *Agatha Tawhia* to *Anthony Wall & Edward Lethers*

Transmission *3839* Probate of will of *Anthony Wall* who died on the *7th* October 1961 granted to *Charlotte Elizabeth Wall of Paramata Widow, Reginald Stace Wall of Paramata Farmer, and Frank Hills of Wellington Clerk* produced *1st July 1902* at *2.45 pm* *M. Wilson*

Transfer *42069* produced *1st July 1902* at *2.45 pm* *Charlotte Elizabeth Wall, Reginald Stace Wall and Frank Hills* to the said *Reginald Stace Wall* *M. Wilson*

Mortgage *5694* produced *1st July 1902* at *2.45 pm* *Reginald Stace Wall* to *John Hammond and James Floeckhart* *M. Wilson*

Scale, 20 Chs to 1 Inch.

CONTINUED

Over

EQUIVALENT METRIC AREA IS *80.9371* ha.

44/252

Mortgage 55080 produced 13 October 1966 at 11:10
from Reginald Wall to the Dixon
Investment Corporation Limited, Pauling
A.P.R.

Mortgage 253758 to The State
New Zealand Corporation of New
Zealand - 15-12-1970 at 9:55 am
A.L.R.

THIS REPRODUCTION (ON A REDUCED SCALE)
CERTIFIED TO BE A TRUE COPY OF THE
ORIGINAL REGISTER FOR THE PURPOSES OF
SECTION 213A LAND TRANSFER ACT 1952

Mortgage 98602 produced 11 November
1966 at 11 am Reginald Wall to
William Alfred Dickinson
A.P.R.

Mortgage 097082.1 to National Banking
and Finance Corporation Limited, 1976
at 2.07 p.m.
A.L.R.

Mortgage 211486 Reginald Wall
to John Leaver Duncan
Frederick George Daygill and
William Russell Trace produced 20
October 1930 at 2:20 pm
A.L.R.

Transmission 28494 of Mortgage 211486 to
John Gavin Duncan and William Russell Trace
as survivors entered 24 June 1935 at 11:45 am
A.L.R.

No. 218582.1 Variation of the terms
of Mortgage 553829 - 11.2.1977 at
2.29 p.m.
A.L.R.

Mortgage 455521.3 to National Banking and
Finance Corporation Limited, 1976 at 12 p.m.
A.L.R.

Mortgage 455521.3 to National Banking and
Finance Corporation Limited, 1976 at 12 p.m.
A.L.R.

DISCHARGE
Transmission 2187 defining the middle line of
the Pimmerton-Mahurangi Road
entered 9 September 1928 at 10 am
A.L.R.

503247.1 Mortgage to Australian Mutual
Provident Society, 1976 at 2.16 o'clock
A.L.R.

DISCHARGE
Transmission 51682 to Isabella Wall, Anthony
Lyndell Wall and Ronald Victor Wall
entered 24/7/1952 at 12.10 P.M. (Pimmerton)
A.L.R.

Transfer 352646 the registered proprietors
to Reginald Wall and John Leaver
Duncan, produced 24/7/1952 at 12.12 P.M.
A.L.R.

CERTIFICATE OF TITLE,
Vol. , folio
B.179766.1 Transfer to Scott Superannuation
Services Limited at Wellington - 1.7.1991
at 2.36 pm.

Mortgage 315876 (Encumbered) Reginald Wall
to Isabella Wall, produced 22.10.52 at 10.15 am
A.L.R.

B.179766.2 Mortgage to The Rural Bank
Limited - 1991 at 2.36 pm.
A.L.R.

Transfer 396872 Reginald Wall to
James Andrew Gray of Pimmerton
entered 17-8-1956 at 11.25 am
A.L.R.

Mortgage 353829 James Andrew Gray to Australian
Mutual Provident Society produced 27 August 1956
A.L.R.

B.298588.1 Transfer to Kenneth Francis Gray
of Pimmerton, Farmer, Joy Constance Gray,
of Pimmerton, Married Woman and Robert
William Newcombe of Feilding, Farmer
(jointly inter se) as to a 55/110th share,
John Anthony Carrad of Pimmerton, Farmer
and Christina May Carrad his wife (jointly
inter se) as to a 28/110th share and
Christina May Carrad, Married Woman and
John Anthony Carrad, Farmer, both of
Wellington (jointly inter se) as to a
27/110th share as tenants in common in the
said shares - 6.7.1993 at 11.37 am.

Mortgage 353829 James Andrew Gray & Family
Guendoline Gray produced 29 August 1956 at
10.30 am
A.L.R.

Variation of Mortgage 353829 produced 4
December 1956 at 9.52 am
A.L.R.

Variation of Mortgage 353829 - 9.8.1966
at 2.20 pm
A.L.R.

A.L.R.

B.346074.4 Transmission of the share of Kenneth Francis Gray, Joy Constance and Robert William Newcombe to Joy Constance Gray and Robert William Newcombe as Survivors - 3.3.1994 at 10.55 a.m.

3

~~WITHDRAWN~~
B654878.1 CAVEAT BY HUNTLEIGH DOWNS LIMITED
10.3.1998 AT 2.50.22 / 3 / 1999
for DLR

~~WITHDRAWN~~
B658440.1 CAVEAT BY ANZ BANKING GROUP (NEW ZEALAND) LIMITED
2.4.1998 AT 11.37.22 / 3 / 1999
for DLR

B758612.5 Correction of name of Christina May Carrad to Christina Mary Carrad

B758612.8 Transfer to Huntleigh Downs Limited

B758612.9 Mortgage to ANZ Banking Group (New Zealand) Limited
All 06.12.1999 at 3.25.11 / 1001
for RGL

Appurtenant hereto is a water supply easement over part Lot 1 Plan A/831 marked A DP 86711 CT 22B/279 created by Transfer B787781.1
13.6.2000 at 9.22.

for RGL

819199.2 Mortgage to Westpac Banking Corporation
25.1.2001 at 9.00.

for RGL

B830435.1 Mortgage to ST Laurence Mortgages Limited - 12.4.2001 at 9.00

for RGL

REGISTER

NEW ZEALAND.



Register-book, Vol. 97, folio 159.

Reference: Warrant No. P.R. folio 3-193.

CERTIFICATE OF TITLE UNDER LAND TRANSFER ACT.

This Certificate, dated the thirteenth day of January, one thousand eight hundred and ninety-two, under the hand and seal of the District Land Registrar of the Land Registration District of Wellington, being a Certificate in lieu of Grant, under Warrant of His Excellency the Governor, in exercise of the powers enabling him in that behalf, Witnesseth that

Malinga Te Kiko of Porirua

is seized of an estate in fee-simple (subject to such reservations, restrictions, encumbrances, liens, and interests as are notified by memorial underwritten or indorsed hereon; subject also to any existing right of the Crown to take and lay off roads under any Act of the General Assembly of New Zealand) in the land hereinafter described, as the same is delineated by the plan hereon, bordered yet, be the several admeasurements a little more or less, which said land is in the said Warrant expressed to have been originally acquired by was originally acquired as from the fourteenth day of June, one thousand eight hundred and ninety-two, that is to say: All that

parcel of land containing by admeasurement one hundred and twenty two being the whole number Pukerua No. 2 C No. 2 B on the public maps of Block V Paikakariki Survey District depicted in the Office of the Chief Surveyor at Wellington.

H. Smart

Subject to right of way

Waimapihi Block

Discharged
Carial 1872
and another

X

X

Carial 1879
28th January 1879

555080
DM 98602
27-11-19

Transfer 36433 produced 6th August 1900 at
3pm to Malinga Te Kiko to Robert William
Sinclair and John Walker shepherds of
sheepfarmers.

Transfer 36716 produced 5th September 1900 at 2.50
pm to Robert William Sinclair and John
Walker Sinclair to Reginald Stace Wall of
Parimata shepherds.

Discharged
1st July 1902
James Blackwood, Robert and
John Hammond

Discharged
13 October 1901
at 2.30 pm Reginald Stace Wall to the
Bank of New Zealand Limited

Discharged
17th November
1901 to William

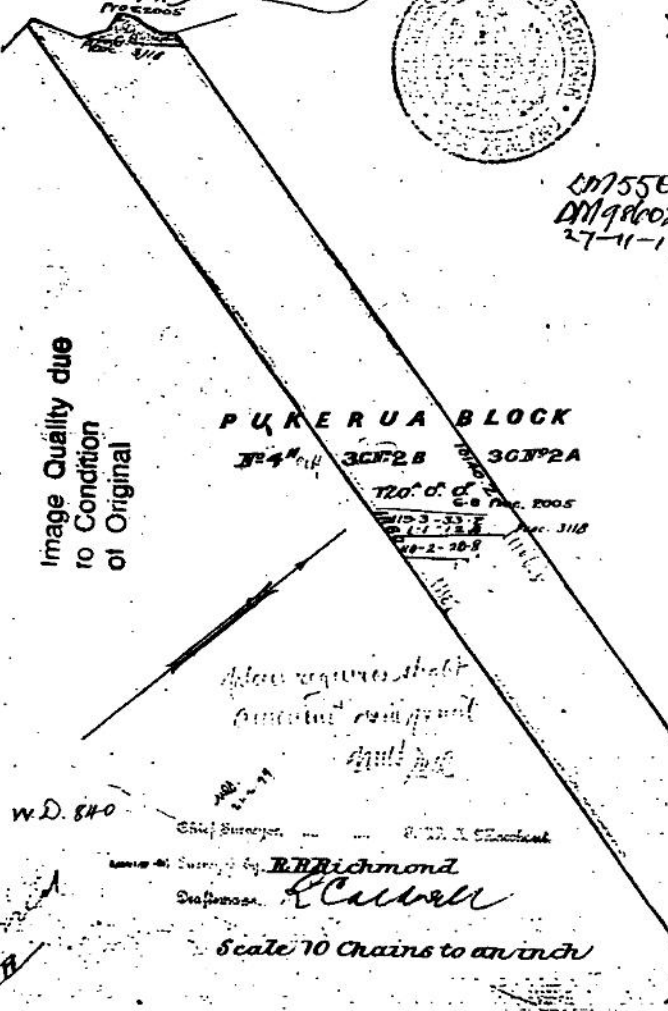


Image Quality due to Condition of Original

97/159

Proclamation N° 2005 proclaiming a road the land coloured red on the plan hereon produced 2nd April 1970 at 3.47 pm

ABST. 209672.1
MORTGAGE 853758 to the state for incorporation of New York 15-12-1970 at 9.55 am
A.C.R.

DISCHARGED

Mortgage 211186 Reginald Faulkner to John Cairns & Frederick George Selby produced 30th October 1970 at 2.35 pm

DISCHARGED

Transmission 28204 of mortgage 211186 to John Cairns and Frederick George Selby entered 17th June 1975 at 2.20 pm

THIS REPRODUCTION (ON A REDUCED SCALE) CERTIFIED TO BE A TRUE COPY OF THE ORIGINAL REGISTER FOR THE PURPOSES OF SECTION 215A LAND TRANSFER ACT 1972
D.L.R.

DISCHARGED

Mortgage No 227366 Reginald Storr to the Trustees of the State Highway produced 5th November 1973 at 9.10 am

No. 989190 Gazette Notice declaring portion of State Highway to be a limited access road - 28/11/73 at 9.10 am

DISCHARGED

Variation of mortgage 227366 produced 1st November 1970 at 3 pm

No. 133881.1 Gazette Notice partially revoking Gazette Notice No. 989190 declaring portion of No. 1 State Highway to be a limited access road - 13.11.1975 at 9.41 a.m.

DISCHARGED

Proclamation 3118 taking part of suburban lots for road and order in honour of presenting the same produced 17th November 1970

O.E.T. 209673.1 (CANCELLED AND THE FOLLOWING CEST - 22-10-1976) ISSUED IN TERMS OF PLAN 44495
ET 16D/678 - LOT 1 (PART HERON)
ET 16D/679 - LOT 2
ET 16D/680 - LOT 3 (H. L. L. L.)
CERTIFICATE OF TITLE

Transmission 51682 to Isabella Wall of Anthony Turner Wall and Roman Hester of Wall entered 24/4/1952 at 12.10 P.M.

Transfer 352466 the registered proprietor to Reginald Faulkner Wall of Lukerua farmers produced 24/4/1952 at 12.12 P.M.

DISCHARGED

Mortgage 355716 (Tranbance) Reginald Faulkner Wall to Isabella Wall entered 22.10.1952 at 10.52 am

Transfer 396872 Reginald Faulkner Wall to James Andrew Gray of Minimoston farmer produced 17-8-1956 at 11.25 am

Mortgage 353829 James Andrew Gray to Australia Mutual Provident Society produced 19th August 1956 at 10:18 am

Mortgage 353830 James Andrew Gray to Dorothy Geraldine Gray produced 28th August 1956 at 11:30 am

Variation of Mortgage 353829 produced 1st December 1956 at 9.52 am

Variation of Mortgage 353829 - 9.8.1966 at 2.20 pm

DISTRICT LAND REGISTRAR
CANCELLED
WILLIAMSON HENDERSON

DUPLICATE DESTROYED

[Land and Deeds—1.
Form B.

NEW ZEALAND.



Vol. 415, Folio 189
Transfer No. 216367
Application No.
Order for N/C No.

Register-book,
Vol. 433 folio 251

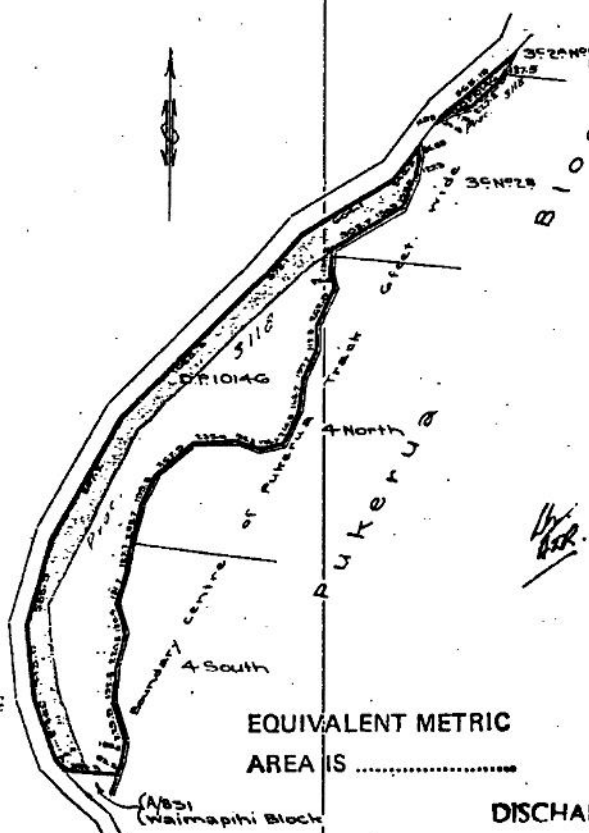
CERTIFICATE OF TITLE UNDER LAND TRANSFER ACT.

This Certificate, dated the ninth day of August one thousand nine hundred and thirty-two
under the hand and seal of the District Land Registrar of the Land Registration District of WELLINGTON Witnesseth that
REGINALD STACE WALL of Pukerua Farmer

is seized of an estate in fee-simple (subject to such reservations, restrictions, encumbrances, liens, and interests as are notified by memorial under written or endorsed hereon, subject also to any existing right of the Crown to take and lay off roads under the provisions of any Act of the General Assembly of New Zealand) in the land hereinafter described, as the same is delineated by the plan hereon bordered green, be the several admeasurements a little more or less, that is to say: All that parcel of land containing EIGHTEEN ACRES TWO ROODS TWELVE AND EIGHTY FIVE ONE HUNDREDTHS PERCHES more or less situate in Block V of the Paekakariki Survey District being part of the Waimapiri Block and being also all the land bordered green as shown on Deposited Plan No. 10146



W. N. Haine
Assistant District Land Registrar.



*Harvest 1960 against part by the
Minister of Employment produced
15th Sept 1960 at 11.34 a.m.*

*Proclamation 2687 defining the middle line
of the Penmorton-Paekakariki
Road produced 7th September 1952 at 10 a.m.*

*Proclamation 3118 taking part of within land of
road and Order in Council consenting thereto
produced 7 July 1952 at 10 a.m.*

*Transmission 51682 to Isabella Wall
Anthony Hunter Wall, Roman Gordon Wall
as executors. Entered 24/7/1952 at 12.10 P.M.*

*Transfer 352646 the registered proprietors
to Reginald Faulkner Wall of Pukerua
Farmer. Produced 24/7/1952 at 12.12 P.M.*

*Notice 515876 (Encumbrance) Reginald Faulkner
Wall to Isabella Wall dated 25.10.52 at 10.15 a.m.
PRODUCED 27.5.1956*

DISCHARGED

Total Area: 18 2/3
Scale: 6 Chains to an inch.
M.L.

CONTINUED

433/251

Transfer 396872 of balance Rimald
Fairbairn Hill to James Andrew Gray
of Plumpton Farmer produced 17-8-1956
at 11.25 p.m. Kivcocker
A.L.R.

Mortgage 353829 of balance James Andrew
Gray to Australian Mutual Provident Society
produced 29 August 1956 at 10.18 am
Kivcocker A.L.R.

Mortgage 353830 of balance James Andrew Gray
to British Guerdine Gray produced 29
August 1956 at 10.30 am Kivcocker
A.L.R.

Variation of Mortgage 353829 produced
4 December 1956 at 9.520 m (J. H. H.)
A.L.R.

Variation of Mortgage 353829 - 1.8.1966
at 2.20 p.m. as book
A.L.R.

THIS REPRODUCTION (ON A REDUCED SCALE)
CERTIFIED TO BE A TRUE COPY OF THE
ORIGINAL RECORD BY THE PURPOSES OF
SECTION 215A LAND TRANSFER ACT 1952.
J. G. Shields A.L.R.

ABST. 209672.1
Mortgage 853758 to The State
Finance Corporation - 15.12.1970
at 10.10 a.m.
J. H. H. A.L.R.

No. 989190 Gazette Notice declaring
portion of No. 1 State Highway
to be a limited access road.
- 2.8.1975 at 9.10 am
J. H. H. A.L.R.

No. 133881.1 Gazette Notice partially
revoking Gazette Notice No. 989190
declaring portion of No. 1 State
Highway to be a limited access road
- 13.11.1975 at 9.41 a.m.
A.L.R.

Mortgage 097082.1 to Rural Banking
and Finance Corporation -
3.6.1976 at 2.07 p.m.
A.L.R.

O.E.T. 209673.1 CANCELLED AND THE FOLLOWING IN
- 22-10-1976 ISSUED IN TERMS OF PLAN 44445.
ET16 0/680 - LOT 3 (PART HEREIN)
A.L.R.

DISTRICT LAND REGISTRAR
CANCELLED
WELLINGTON, NEW ZEALAND

DUPLICATE DESTROYED



Appendix D: Council and Fire & Emergency New Zealand Records

Nerena Rhodes

From: Records Management <Records.Management@porirua.govt.nz>
Sent: Thursday, 23 May 2019 4:37 PM
To: Kate Walker
Subject: RE: Attention Records Property File - 422 State Highway 1, Pukerua Bay [#17987C]

Hi Kate,

Just to update you I've spoken to a Environmental Health Officer who mentioned "Our GIS does not have it recorded as a potential contaminated site"

Regards

Liam Maher
Information Support Officer
Kaiārahi Karapa



Tel: 04 237 1419
porirua.govt.nz

From: Records Management
Sent: Wednesday, 22 May 2019 9:38 a.m.
To: 'Kate.Walker@pdp.co.nz'
Subject: RE: Attention Records Property File - 422 State Highway 1, Pukerua Bay [#17987C]

Hi Kate,

I've included below the acknowledgement letter for this property request, and will have the building file sent to you as soon as possible. Also, if you had contaminated land and/or resource consent enquiries I will forward your email to the appropriate teams.

Thank you

Regards

Liam Maher
Information Support Officer
Kaiārahi Karapa



Tel: 04 237 1419
porirua.govt.nz

Dear Sir/Madam

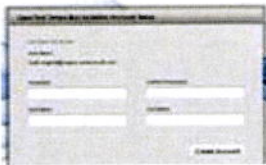
Thank you for your request received on 20th May relating to 422 State Highway 1

Your request has been assigned to the appropriate officer and you can expect a reply within 20 working days from the date the request was received by council.

Process for accessing files:

1. In your inbox, open the email from tempo@pcc.govt.nz (please check your junk mail if you haven't received an email in your inbox).
2. Click on the link in the email. If you are not an existing customer you will be asked to create an account

When creating an account the password must have at least one number, one uppercase letter, one lower case letter and one special character and be at least 6 characters in length. E.g. Pass66@Karen



3. You will receive a second email welcoming you to tempo box – use your email address and the password will be the one created in the account setup



4. When you are in the Tempo Box screen, you will see a little red box in the top right hand corner of the screen by your name. Click on the red box to retrieve your file.
5. Once you have retrieved your file from Tempo Box, please save it to your PC, USB or Device

Yours sincerely

Liam Maher
Information Support Officer
Kaiārahi Karapa

poriruacity

Tel: 04 237 1419
porirua.govt.nz

From: Enquiries [mailto:ENQUIRIES@PORIRUACITY.GOVT.NZ]
Sent: Tuesday, 21 May 2019 8:46 a.m.
To: Records Management
Subject: FW: Attention Records Property File - 422 State Highway 1, Pukerua Bay [#17987C]

Hi Team,

A below email for you.

Kind regards,
Sandy Betham

-----Original Message-----

From: Kate.Walker@pdp.co.nz
Sent: Monday, 20 May 2019 3:42:54 p.m.
To: enquiries@porirucity.govt.nz
Subject: Attention Records Property File - 422 State Highway 1, Pukerua Bay

Hi there,

Can you please provide council property files and contaminated land enquiry pertaining to the site above (422 State Highway 1, Pukerua Bay).

The site is known as Mt Welcome Station and is 55.1700 ha.

Thanks,
Kate

Kate Walker – BSc, PGDipSci | Environmental Scientist
Pattle Delamore Partners Ltd
Level 5, PDP House, 235 Broadway, Newmarket, Auckland
PO Box 9528, Newmarket, Auckland 1149
NEW ZEALAND

DDI - +64 9 529 5875 | Mobile - + 64 21 670 978
Fax - +64 9 523 6901
Map - [Auckland Office](#) | Web - www.pdp.co.nz

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National Headquarters

Level 12
80 The Terrace
PO Box 2133
Wellington
New Zealand

Phone +64 4 496 3600

5 June 2019

Kate Walker
Environmental Scientist
Pattle Delamore Partners Ltd
Newmarket

By email: Kate.Walker@pdp.co.nz

Dear Kate

Information Request – Fire Incidents and use of firefighting foams at 422 State Highway 1, Pukerua Bay.

I refer to your official information request dated 21 May 2019 asking for any information relating to fire incidents and the use of firefighting foams at 422 State Highway 1, Pukerua Bay.

Fire and Emergency New Zealand holds no record of fire incidents or use of firefighting foams at the address you have provided. We hope this is helpful to you.

You have the right to seek an investigation and review by the Ombudsman of this decision. Information about how to make a complaint is available at www.ombudsman.parliament.nz or freephone 0800 802 602.

Yours sincerely

A handwritten signature in blue ink, appearing to read 'Jenny Stevens'.

Jenny Stevens
Manager, Executive & Ministerial Services

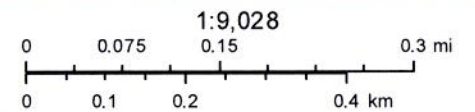
GWRC SLUR Webmap



August 26, 2019

- Selected Land Use Register
- Placenames - Towns
- Placenames - Suburbs

- Placenames - Localities
- Placenames - Bays
- State Highways Labels
- Rail Stations



GWRC
 GWRC/LINZ/Terralink International
 GWRC, WAGGIS, LINZ, NZAM

GWRC Mapping Services
 GWRC



Appendix E: Field Photos



Photograph 1: View toward the southeast of Woolshed



Photograph 2: View looking east of Woolshed and Dock/Race Structure showing sheep yards and concrete pad



APPENDIX 5

**MT WELCOME STATION, 422 STATE HIGHWAY 1,
PUKERUA BAY, PORIRUA:
ARCHAEOLOGICAL APPRAISAL FOR PLAN CHANGES
TO THE PORIRUA DISTRICT PLAN**

Prepared for Classic Developments Ltd



June 2019

By
Helen Heath (MA)
Rod Clough (PhD)

Clough
& ASSOCIATES LTD

321 Forest Hill Rd,
Waiatarua, Auckland 0612
Telephone: (09) 8141946
Mobile 0274 850 059
www.clough.co.nz

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INTRODUCTION

Project Background

Classic Developments Ltd intends to assist Porirua City Council in changes to its District Plan to allow the development of Mt Welcome Station at 422 State Highway 1, Pukerua Bay in Porirua (Figure 1). The land area is 55.1700ha. An indicative land use plan, shown in Figure 2, envisages a central open space (reserve) for lifestyle multiple use including recreation, catchment management, stormwater management, and pedestrian links; recognition and enhancement of an area of bush on a neighbouring property through proposed planting and catchment control; roading linkages; an area of affordable housing; and potential residential development areas including a village area (Land Matters Dec 2018),

An archaeological appraisal was commissioned by Classic Developments Ltd to establish whether future development resulting from the proposed Plan Change is likely to impact on archaeological values. This report has been prepared in support of the Plan Change process under the Resource Management Act 1991 (RMA) and to identify any requirements under the Heritage New Zealand Pouhere Taonga Act 2014 (HNZPTA). Recommendations are made in accordance with statutory requirements.

Methodology

The New Zealand Archaeological Association's (NZAA) site record database (ArchSite), Porirua City Council website, District Plan schedules and the Heritage New Zealand Pouhere Taonga (Heritage NZ) New Zealand Heritage List/Rārangi Kōrero were searched to determine whether any archaeological sites had been recorded on or in the immediate vicinity of the property. Literature and archaeological reports relevant to the area were consulted (see Bibliography). Early plans held at Land Information New Zealand (LINZ) and aerial photographs were checked for information relating to past land use.

A visual inspection of the property was conducted on 14 June 2019. 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. Particular attention was paid to the spur and ridge lines and creek banks (topographical features where archaeological sites are often found to be located). Photographs were taken to record the topography and features of interest and GPS readings were taken to record the latter where appropriate. Subsurface testing was not carried out by the archaeologist; however, the results of the geotechnical test pitting undertaken by Tonkin & Taylor Ltd were reviewed.

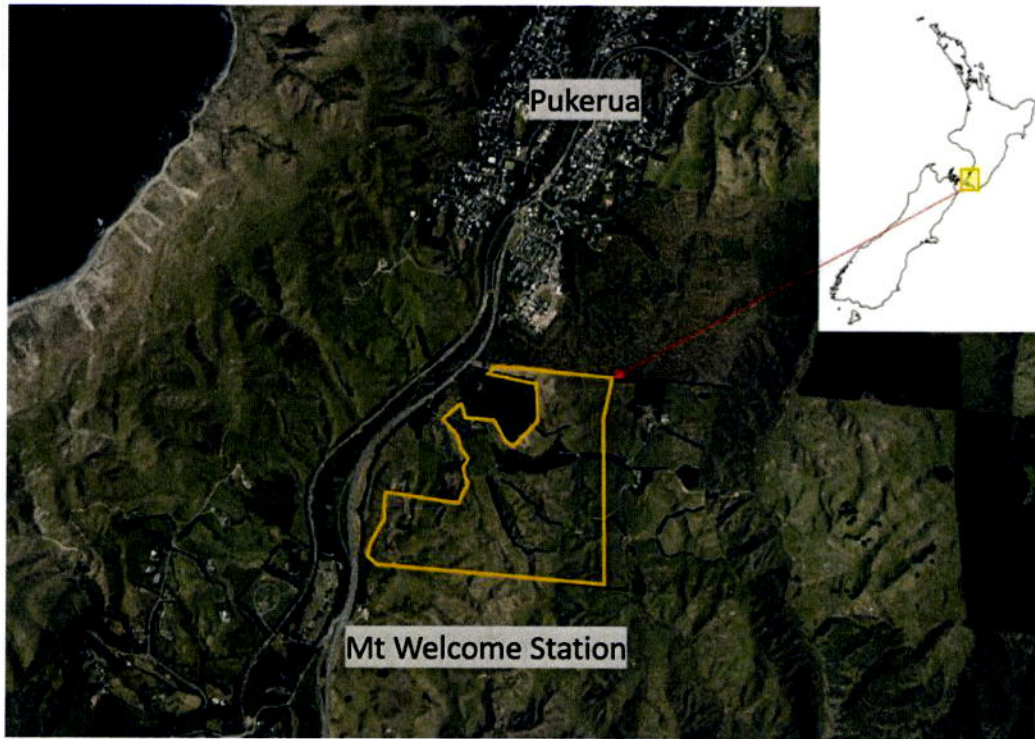


Figure 1. Location of Mt Welcome Station, 422 State Highway 1, Pukerua Bay in Porirua

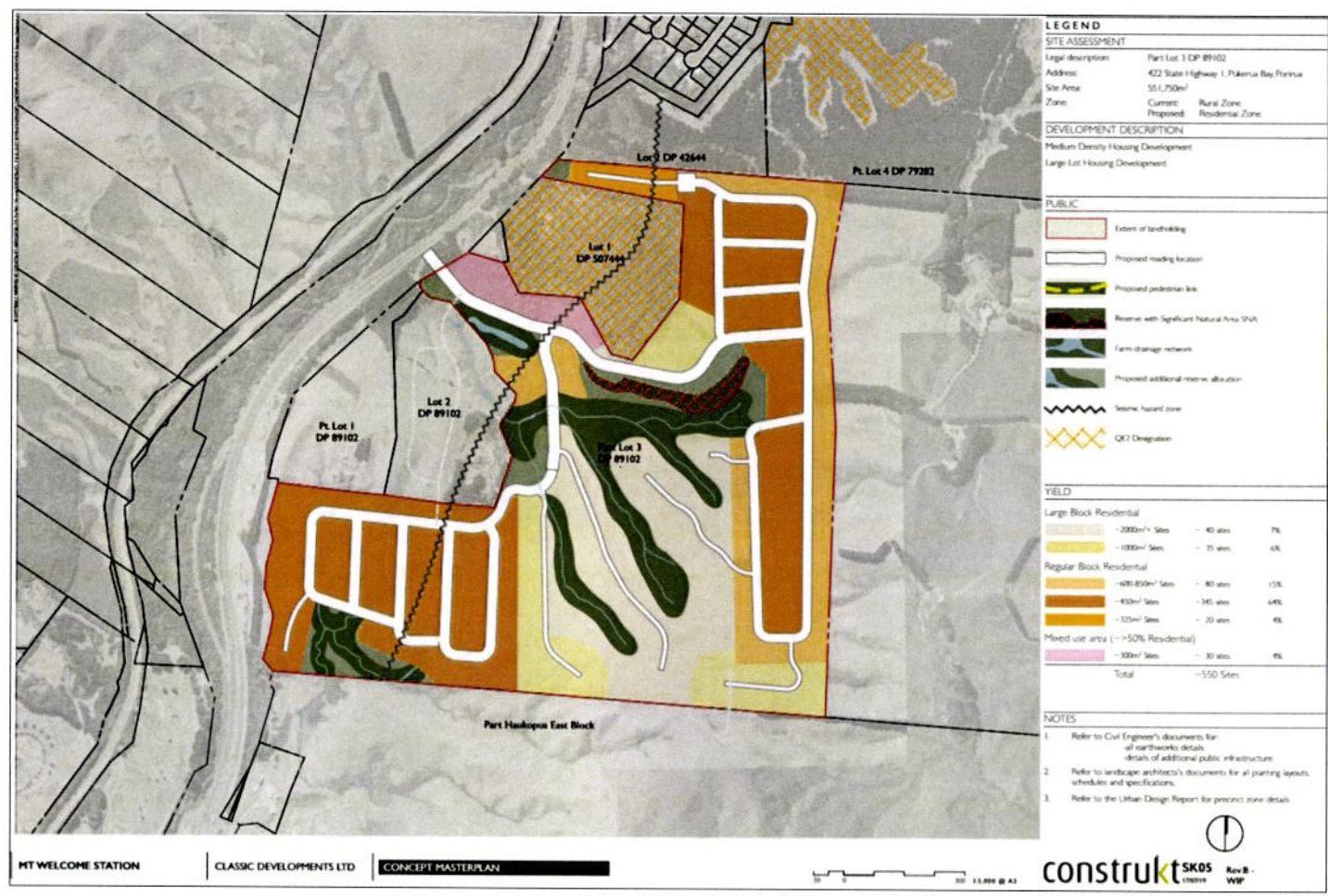


Figure 2. Indicative land use plan for Mt Welcome Station

HISTORICAL BACKGROUND

Only a brief historical summary is provided for the purpose of this appraisal.

According to tradition, the first settlers in the area arrived with Kupe, the Polynesia voyager, who left an anchor stone at Porirua. Following Kupe, brothers Tara and Tautoki explored the Wellington district and settled the area. Their descendants Ngati Tara lived there for several generations before the arrival of Ngati Kahungunu. By the 17th century Ngati Ira had spread westward into Porirua, intermarried with Ngati Kahungunu and Ngati Tara, and built the Waimapihi Pa in Pukerua Bay (Best 1914; 1917).

Waimapihi Pa was seized by Ngati Toa around 1819-20 from defending Ngati Ira and Muaupoko warriors and Ngati Ira were pushed out of the Porirua region. Ngati Toa still held the area in 1845, as described by Bevan (1907). Bevan describes the accommodation he stayed at while journeying from Wellington to Waikawa. Such stopovers included European barracks, local houses, kainga and pa. Bevan stayed at Waimapihi Pa, held by Ngati Toa, and described it as a fortified village containing hundreds of inhabitants with an outer stockade, two lines of palisades with deep ditches and underground retreats (Bevan 1907: 5). Ngati Toa also had many pa and small kainga within the Porirua Harbour, an area which is an important part of Ngati Toa's history.¹

Following European contact, the Wellington district became a desirable place for British settlers. From the 1830s, the cultivation of gardening and flax production increased in the area to provide for whalers and traders, which in turn contributed to the increase and placement of European settlement (Stodart 2015). There was fighting over land between Maori and Pakeha (Keith 1990). Porirua was a prime location for farming and control over land access to the Wellington district, while Pukerua was also a stopping point for those travelling south. By the early 1840s the Porirua district was purchased, surveyed and then settled by the New Zealand Company.

¹ The information presented in this historical summary should not be viewed as complete or without other context as there are many other histories known to tangata whenua.

ARCHAEOLOGICAL BACKGROUND

No archaeological sites recorded in NZAA ArchSite fall within the boundaries of Mt Welcome Station, the majority of the recorded sites being located closer to the coast (Figure 3). However, the nearest sites are only c.1km away. Features of these sites include food storage pits and terraces for whare or food storage, and an artefact find (R26/148,149 and 120) (see Table 1).

Further to the northwest along the coast are three recorded sites (R26/226, R26/147 and R26/209), including pits, a kainga/village and a burial with flaked stone artefacts. Another burial (R26/227) was found in the north of Pukerua Bay. Heading east along the coast are World War II concrete machine gun pill boxes built as precaution for a perceived Japanese threat and brickworks related to the construction of the railway around the 1880s.

In addition, there are sites listed in the Porirua Heritage Management Strategy 2010 that are not recorded archaeological sites, but are recommended for archaeological management (see pages C-27 to C-34). Figure 4 shows two Pa (Waimapihi and Pukerua) that are not listed on NZAA ArchSite but are referred to in the historical literature (see Historical Background). Best (1917) describes Waimapihi pa as ‘stockades of large posts of tree trunks bound by long saplings where palisading was lashed’ (p. 148). Waimapihi Pa is at the end of Pa Road in Pukerua Bay. Pukerua Pa is at 153 Rawhiti Road, according to the Porirua Heritage Management Strategy, but Stodart (2015) notes that the location is problematic (p. 10). The Heritage Management Strategy also lists pits and terraces, a whaling station and two urupa at 153 Rawhiti Road. This could be a general location for all these sites; they are also listed as being in Wairaka, which could be anywhere east of State Highway 1.

While these sites are not within the Mt Welcome Station, they demonstrate the archaeological potential in the wider area. Archaeological sites reflect the settlement patterns of the area and, paired with historical literature, demonstrate human settlement from an early period, with Maori establishing kainga and pa, and burying their dead along the coast in urupa. Pukerua was a stopping point for people traveling to the lower Wellington region.

There are no historic places listed on the NZ Heritage List within the boundaries of the proposed development area (<http://www.heritage.org.nz/the-list> checked 21/6/19), or any historic heritage sites scheduled in the Porirua City District Plan

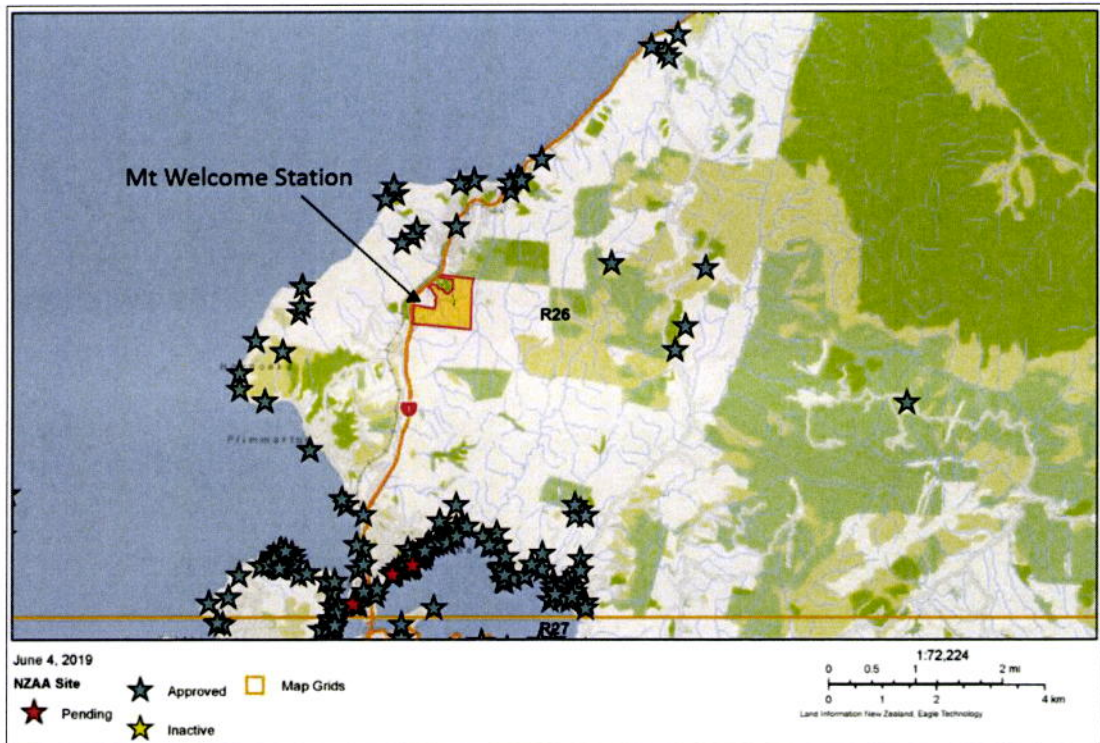


Figure 3. Archaeological sites in Pukerua Bay and Porirua to the south

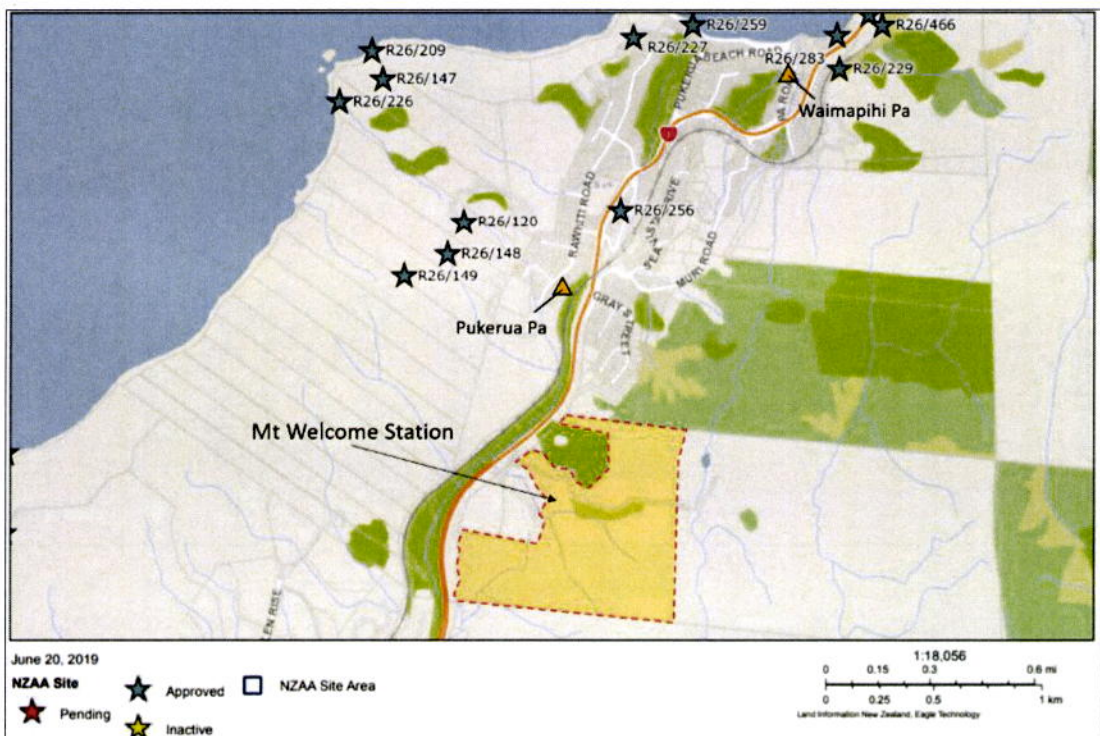


Figure 4. Recorded archaeological sites from NZAA Archsite and Pa sites from Porirua Heritage Management Strategy 2010 within c.2km of the project area

Table 1. Recorded sites within c.2km from the project area (source: NZAA ArchSite and Porirua Heritage Management Strategy 2010)

NZAA ID	NZTM E	NZTM N	Short Description	Site Type	Site Feature	Distance from Mt Welcome Station
R26/120	1757857	5455432	Pits on spurs	Pit/Terrace	Terrace, Hut floor/ site, Pit	1km
R26/147	1757481	5456086	Two square pits. Flat floor surface with the rear of the excavation backed by a scarp.	Pit/Terrace	Pit	1.8km
R26/148	1757781	5455286	Pits on large spurs	Pit/Terrace	Pit	1km
R26/149	1757581	5455186	Five pits with rounded ends and raised rims. Two have external drains.	Pit/Terrace	Pit – raised rim	1km
R26/209	1757431	5456216	Burial	Burial/cemetery	Burial and artefacts – stone flakes	1.9km
R26/226	1757281	5455986	Eight pits. Known local knowledge as a Kainga	Pit/Terrace	Pit, Terrace	1.8km
R26/227	1758641	5456276	Crouch burial in sand	Burial/cemetery	Burial	1.8km
R26/229	1759591	5456132	Brickworks. Used in the construction of railway tunnels between Pukerua Bay and Paekakariki	Industrial	Borrow pit, Brickworks, Platform, Scarp, Shaft, Kiln - brick, Ruins - building or structure, Unclassified	2km
R26/256	1758581	5455486	Adze find	Artefact find	Artefact - Adze	1km
R26/259	1758914	5456333	Concrete pill box built during World War II	Military (non-Maori)	Pill box	1.9km
R26/283	1759581	5456286	WW2 concrete machine gun pillbox. Two steel reinforced wooden blast doors lying inside the structure.	Military (non-Maori)	Pill box	2km
-			Waimapihi Pa	Pa	Pa	1.9km
-			Pukerua Pa	Pa	Pa	0.6km

Information from Early Maps and Plans

Information obtained from early survey maps between 1886 and 1998 showed that plans were mainly concerned with the placement of the railway and land divisions. No pre-1900 buildings were identified on the maps examined (listed in the Bibliography), and there was no indication as to whether the cottage and woolshed at Mt Welcome Station were built before 1900. The earliest survey plan located showing the cottage is from 1940, while a 1942 aerial photograph shows both structures (see Figure 6, below). An 1896 survey plan (WN ML 1429 I) states that the landscape was at that date covered in bush, so the major forest clearance and farm development occurred after 1896.

PHYSICAL ENVIRONMENT

Topography, Vegetation, Geology and Current Land use

Mt Welcome Station is a block of farmland with an undulating hillside and steep ridges (Figure 5). The steepest ridges are in the northeast, while the land is lower closer to the highway. Farm drainage networks run in the gullies between the ridges and are also found in the lower-lying areas. The vegetation is predominantly grassland with some pine trees along the ridges. Small rock outcrops are dotted across the landscape and erosion from the steeper slopes shows crumbling sandstone. The land is currently used as grazing for livestock, mainly sheep and deer.



Figure 5. General view over Mt Welcome Station

Historical Modification

Aerials from 1942 up to the present day show consistent use of the farmland as grazing areas for livestock. Modification of the landscape over time includes grading of slopes, farm tracks, fencing, the planting of pine and additional houses. As noted above, major forest clearance occurred after 1896.

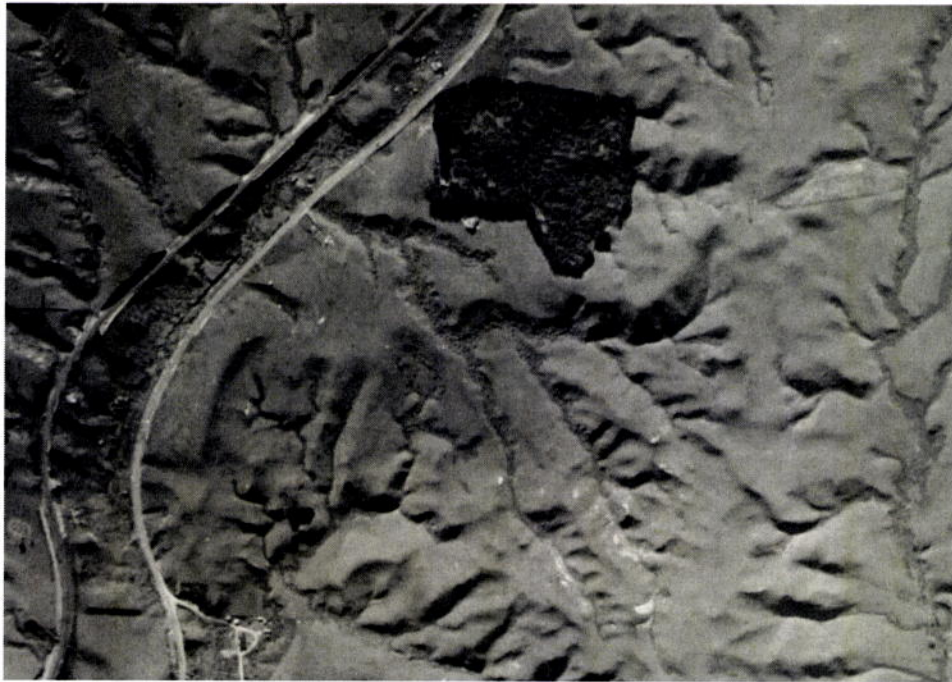


Figure 6. Aerial from 1942 (source: Retrolens)



Figure 7. Aerial from 2019 (source: LINZ)

FIELD ASSESSMENT

Field Survey Results

An archaeological survey of the property was carried out on 14 June 2019 by Helen Heath, accompanied by Dave Riley from Classic Developments Ltd. Weather conditions and visibility were good and the survey of the 55ha property was undertaken on foot.

There are three buildings on the site located along the driveway in the area proposed for mixed use residential development in Figure 2 (shaded pink). They include a cottage (proposed for removal) and a woolshed (Figure 8). As previously noted, the structures do not appear on any pre-1900 maps, but the cottage is shown in a 1940 survey plan, while the cottage and the wool shed both appear on the 1942 aerial (Figure 6). The current landowner, Rick Lucas, does not know when they were built. As bush clearance and farm development appear to have occurred sometime after 1896, they are considered likely to be of 20th century date. The third building, south of the wool shed, was a later addition to the property.

Figure 9–Figure 13 show views over the property, with locations identified in relation to the indicative land use plan in Figure 2.

The landscape within the property mainly comprises high ridges that slope down to the west, separated by gullies that drain into the lower farm drainage network in the lower-lying land. Ridges are suitable locations for food storage pits, as they drain naturally, while flat and wide gullies or plains that are sheltered are suitable for crop gardens. However, generally the gullies and lower areas seen at Mt Welcome Station would not have provided ideal conditions for crop cultivation. Some depressions were noted in the southeastern part of the property which could potentially be archaeological features (Figure 14 and Figure 15). However, holes/depressions resulting from deer rooting were witnessed all over the property and these depressions also have the potential to have been made by farm stock.

No probing or test pitting was carried out during the survey. However, Tonkin & Taylor Ltd have carried out a geotechnical investigation across the property. On 9, 16 and 17 May 2019 25 tests pits up to 5.6m in depth and 9 dynamic cone penetrometer (DCP) tests were carried out (Tonkin & Taylor Ltd 2019). The sections recorded by Tonkin & Taylor Ltd showed a topsoil overlying silty fine sand across most of the site, bar the wetter mash areas. No potential archaeological features or fills were seen in the test pits and in many places the topsoil was thin, suggesting recent modification that could have obscured or destroyed archaeological features, if any had once have been present.

Parts of the northern and western areas of proposed regular block residential development were not surveyed on foot due to the presence of farm stock, as shown in Figure 15.

No confirmed archaeological sites were identified during the field survey.



Figure 8. The Wool Shed



Figure 9. View west over Part Lot 3 from eastern area of site in Figure 2



Figure 10. View west over Part Lot 3 and proposed additional reserve allocation in Figure 2



Figure 11. Farm drainage network in northwest of Part Lot 3 in Figure 2



Figure 12. View west over the western area of Part Lot 3 shaded dark orange in Figure 2



Figure 13. View southwest over northern part of Part Lot 3 shaded dark orange in Figure 2



Figure 14. Locations of depressions on ridges (determined by GPS), recorded as yellow dots

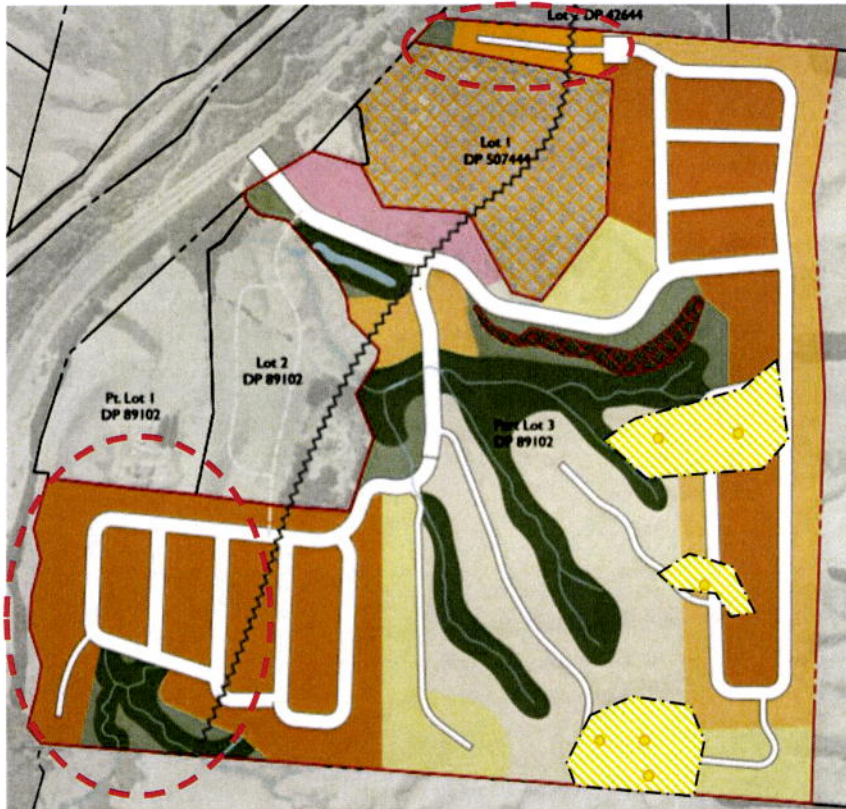


Figure 15. Location of depressions on ridges (determined by GPS), recorded as yellow dots, overlaid on indicative land use plan. Red dotted lines indicate areas not accessible for survey

DISCUSSION AND CONCLUSIONS

Summary of Results

No archaeological sites had previously been recorded within the Mt Welcome Station property at 422 State Highway 1, Pukerua Bay, and no confirmed archaeological sites were identified during the field survey. In the southeastern part of the property depressions were identified that have some potential to be archaeological features, but these could equally have been caused by farm stock. The results of geotechnical testing by Tonkin & Taylor Ltd were reviewed, but there were no indications of archaeological deposits in the locations tested and a thin topsoil indicated some degree of modification.

Maori Cultural Values

This is an assessment of 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.

Survey Limitations

It should be noted that archaeological survey techniques (based on visual inspection) 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.

Parts of the northern and western areas of proposed regular block residential development were not surveyed on foot due to the presence of farm stock, as shown in Figure 15.

Archaeological Value and Significance

The project area has no known archaeological value as no archaeological sites were identified as a result of background research or confirmed through field survey. While possible archaeological pit depressions were identified in some areas, these could equally have been made by livestock. In addition, the property is some distance from the known locations of archaeological sites in the area. The potential for subsurface archaeological features or deposits is therefore considered to be low.

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.

Effects of Future Development

Future development within the proposed Plan Change area at Mt Welcome Station will have no known effects on archaeological values as no archaeological sites were positively identified within the boundaries of the area. The closest recorded sites are around 1km away and while the landscape has a rich history and recorded sites reflect much activity in the area, the development area in question is further away from the coast and more desirable areas of settlement (Figure 3). In addition, bush clearance and the creation of farmland that occurred sometime after 1896 have modified the landscape, potentially affecting any archaeological evidence that may once have been present.

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 location, based on the location of the property and the results of the field survey, the possibility can be provided for by putting procedures in place ensuring that Heritage NZ are contacted should this occur during future development of the property.

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 Porirua City District Plan is relevant to the proposed activity.

There are no scheduled historic heritage sites located on the property. This assessment has established that future development of the proposed Mt Welcome Station Private Plan Change area will have no effect on any known archaeological sites, and has little potential to affect unrecorded subsurface remains. However, a more detailed assessment that

includes subsurface testing to determine the origin of the depressions noted in in the southeastern part of the property is recommended at the detailed planning stage.

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)'

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 future development of Mt Welcome Station as no known sites will be affected, and it is unlikely that any undetected sites are present. However, should any sites be identified during more detailed survey, or exposed during future development, the provisions of the HNZPTA must be complied with.

Conclusions

No archaeological sites have previously been recorded on Mt Welcome Station and none were identified during the field survey. The land has been modified by bush clearance and farm activity. The only potential archaeological features identified consisted of indistinct depressions that are likely to be the result of livestock activity. Overall the archaeological potential of the property is considered to be low, and the effects of future development on archaeological values in the proposed Plan Change area are likely to be minor or less than minor. Any adverse effects on archaeological values could be appropriately mitigated by recording and information recovery under the archaeological provisions of the HNZPTA.

RECOMMENDATIONS

- There should be no constraints on the proposed Plan Change on archaeological grounds, since no archaeological sites are known to be present and it is considered unlikely that any are present on the property.
- A more detailed archaeological assessment that includes subsurface testing to determine the origin of the depressions noted in the southeastern area should be carried out at the detailed planning stage.
- Any adverse effects on archaeology identified at the detailed planning stage should be appropriately mitigated by recording and information recovery under the archaeological provisions of the HNZPTA.
- 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 on the property.

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Maps and Plans Examined:

- WN A 831 I 1
- WN DP 9457 I 1
- WN DP 9663 I 1
- WN DP 10469 I 1
- WN DP 44495 S 1
- WN DP 44495 S 2
- WN ML 1429 I 1
- WN ML 1953 I 1
- WN ML 3088 I 1 - to the east
- WN ML 4984 I 2
- WN ML 4984 I 3
- WN ML 4984 I 4
- WN SO 24910 I 1
- WN SO 32889 S 1
- WNC B 461 I 1
- WNC B 461 I 2
- WNC B 461 I 8
- WNC B 461 I 10
- WNC DP 9096 I 1
- WNC DP 10146 I 1



WNC ML 759 I 1 - just to the south
WNC ML 759 I 1- just to the south
WNC ML 775 I 1
WNC ML 4984 I 1
WNC SO 12357 I 1
WNC SO 18802 I 1
WNC SO 20580 I 1



APPENDIX 6

**MT WELCOME:
PRELIMINARY LAND DEVELOPMENT AND
INFRASTRUCTURE REPORT**

PORIRUA CITY



WWW.ROGEN.NZ



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1	September 2019	Council Consultation	D. Brittliff

18004 - Mt Welcome preliminary development and infrastructure report

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1. INTRODUCTION

Orogen Limited (Orogen) was engaged by Quest Projects Limited and Classic Developments Limited to conduct preliminary civil engineering investigations for the land locally referred to as Mt Welcome which is south of the Pukerua Bay residential settlement.

The investigations were undertaken to support the client's submissions on Porirua City Council's (PCC's) Growth Strategy 2048, feasibility analysis of the infrastructure needs, and to support potential plan changes to PCC's District Plan.

Civil engineering services have been provided to the project team throughout the formulation of an indicative master plan for Mt Welcome that we summarise in this report.

2. SCOPE OF WORK

The following scope of work has been completed to provide our recommendations on the land:

- Desktop assessment to identify potential infrastructure constraints for the development;
- Site visits and investigations for consideration of geotechnical, ecological, earthworks, access, servicing, and planning constraints for the land;
- Mapping using Lidar, aerial photography and Porirua City Council/Wellington Water Limited infrastructure databases;
- Various iterations of earthworks, roading and infrastructure concepts as the project team developed detailed information for the land;
- Prepare indicative infrastructure analysis and feasibility for the land with the objective of meeting the needs of the indicative master plan but without having significant impacts on Council's existing assets.

This report describes the results of the civil engineering assessment for the land. It does not include detailed design as those will be more appropriate at the time of resource consenting and preparation of construction plans/specifications post plan change.

3. SITE SUMMARY

Mt Welcome (422 State Highway 1, Pukerua Bay) is located south of the existing Pukerua Bay residential settlement.

The area proposed for development is approximately 55 hectare in area with the prospect of adding a further 10 hectare to the development area (2 lifestyle blocks at 422A and 422B State Highway 1).

The land has undulating topography and with a north and north west aspect. The proposed development areas are generally separated by gully systems that drain in a westly direction. A preliminary geotechnical report has been completed for the land which describes a range of soil types for the property including dune sand, loess, colluvium and alluvium. There is also rock at depth throughout the site and shallower on weathered ridgelines.

4. CONCEPTUAL ROAD NETWORK AND EARTHWORKS

A balanced approach to earthworks is required on the land to enable suitable and Council compliant access to residential development areas that aligns to the concept for stormwater management that is an overall economic development.

The indicative alignments for the access roads on the site follow topography that can provide for access roads that would align to the current design standards for residential development. The master plan shows a main road extending along and parallel to the alignment of the existing farm track. It then branches off to the south before the pine clad valley. That road will cross a gully using either a bridge or culvert. Near the top of the main ridge at the eastern extent of the project, the road will extend to the north and south to open up residential development from elevated upper terraces.

Access points from the current State Highway 1 are feasible as are access to neighbouring blocks.

Walking paths are feasible throughout the site which would integrate with the concept for management of stormwater and also the potential vegetation areas. These paths or tracks could integrate into wider walking or cycling networks which connect to Pukerua Bay and also the Plimmerton network if desired by Council through the access design process.

The earthworks within the site will most likely occur in 4 stages. The key considerations will be cut/fill balancing to achieve an economic earth moving programme. The geotechnical report notes that some of the material (mixed sand/loess) is likely to be moisture sensitive and therefore spring/summer programming will be important. Our three dimensional civil engineering software has run at four iterations of conceptual landform modelling over the land and the last (which has informed the master plan) achieves a good cut to fill balance that is not dissimilar in scale terms to earthworks across the northern Wellington region.

In our experience there will need to be an effective management of erosion and sediment control on site to mitigate issues on freshwater resources. Orogen have considered these aspects and customisation of its construction management plan to the site will be effective in addressing potential adverse effects from erosion and silt control. We expect these matters will be regulated through the resource consents phase in accordance with best practice and Greater Wellington Regional Council (GWRC) consent conditions.

5. STORMWATER

Low impact stormwater design is contemplated on this site that involves various concepts for the streetscape to integrate hard and soft engineering solutions for runoff collection, conveyance, and treatment. The concept will be to provide peak flow discharges to flow rates acceptable to the receiving environment in controlled and engineered discharge points as shown on the master plan. The potential earthworked landform shape enables the two main gully systems on the site to be utilised for stormwater attenuation and treatment with integrated landscape, stormwater, and ecological benefits. The preliminary concept indicates that the available space on the land for stormwater management is sufficient to support the potential level of development contemplated on the master plan.

Our preliminary analysis shows that the site may consist of 4 controlled stormwater catchments – North (7ha), east (30ha), central (7ha) and south (16ha). Those catchments have the ability to attenuate approximately 6,000m³ of stormwater which will allow treatment and controlled flows to predeveloped levels. The attenuation areas will be constructed as wetland environments for biodiversity improvements.

6. SEWER

The intention of the development is to provide a reticulated sewer system that connects to the current Council network in the eastern side of the current State Highway 1 by the site. The current Council system gravitates to Paremata but is known to have peak flow capacity issues that are being addressed by Wellington Water Limited.

Therefore the master plan indicates utility areas on the south western corner and central to the site where peak attenuation storage is proposed to manage the discharge of wastewater from the site at times when the downstream reticulation can receive the wastewater. In time the attenuation storage system can be decommissioned (if no longer needed) once Wellington Water Limited improve the receiving catchments capacity during peak flow periods.

Our initial calculations indicate that storage may be in the order of 110m³ for each catchment from where waste water will then be pumped into the existing network during off peak periods.

7. WATER SUPPLY

The intention of development of the land is to provide a reticulated water supply in the new development. A new water reservoir can be located on the land that can supply the site. The reservoir site should be at the elevation to enable it to be considered as a standalone reservoir or one that can provide wider network resilience if desired by Council as it has the ability to supply Pukerua Bay and land to the south in the wider Northern Growth area.

The preliminary analysis shows that a reservoir can be placed on site at an elevation of 155mRL with a capacity of 1000m³. Internal reticulation can comply with PCC's engineering requirements and developed along the internal roading network.

The regional water distribution main is located on the eastern site of the current State Highway 1 and this main currently supplies Pukerua Bay. The anticipated reservoir site is at the same height as the Pukerua Bay reservoir and therefore the new reservoir can be filled by gravity from the current regional water distribution main in the same way the Pukerua Bay is supplied. This new reservoir can then potentially provide secondary storage to Pukerua Bay or to any development to the south.

Similarly, if Council determined that the reservoir to support development of the site is better located beside their current Pukerua Bay reservoir then this would equally provide sufficient supply to the land.

8. ELECTRICITY AND TELECOMMUNICATIONS

The site would be connected to the power and telecommunications via the current infrastructure located in the State Highway 1.

9. CONCLUSIONS

This report summarises the civil engineering aspects of developing the land at Mt Welcome south of Pukerua Bay. Based on our field inspections, preliminary engineering assessment of the three waters/roading/earthworks, and high level engineering cost analysis of the infrastructure that is likely required for the development of the land, we consider the land can be converted from rural to residential in general accordance with the master plan (or other layout) for the property.



Orogen consider that most of the infrastructure can be self sufficient within the block. Early engagement with PCC and Wellington Water will be important to enable integration of existing infrastructure to Mt Welcome.

Environmental effects can be managed through normal regional and district consenting processes where detailed management plans can be established that provide important design and site management expectations.



APPENDIX 7

Memo

To:	Bryce Holmes, Landmatters	Job No:	1906
From:	Tony Payne & Graham Ussher	Date:	9 May 2019
cc:			
Subject:	Mt Welcome Station – Preliminary Ecology Survey		

Dear Bryce,

This memorandum details the preliminary ecological survey results undertaken on 13th March 2019, by Senior Ecologist Tony Payne. We understand that the project team for the Mt Welcome Station development intends to use this memorandum for internal project planning purposes.

1 Areas of Ecological Importance

The site survey involved a broad scale assessment of the ecological values on site, with a particular focus on identifying the ecological constraints and opportunities for the proposed development.

We have identified the streams on site based on the definition of an 'Active Bed' and in conjunction with the definition of an ephemeral watercourse, both of which are included in the Wellington Region Proposed Natural Resources Plan (PNRP). We have differentiated the streams between ones with an average active bed width >1 m wide, and <1 m wide in case there is planning significance to relies upon active bed width.

We have also mapped areas of terrestrial vegetation that likely meet the ecological significance criteria listed in the Wellington Regional Policy Statement (RPS) - Policy 23.

1. Representativeness
2. Rarity
3. Diversity
4. Ecological Context

All streams and notable areas considered to be of ecological relevance and/or significance are provided in a dwg. file. A figure depicting the relevant ecological features is attached below.

2 Streams

There are two stream catchments on site. Both have been extensively modified and degraded, through a loss of canopy cover, increased sedimentation, stock damage and the installation of perched culverts. The 'Active Bed' of the streams are generally <1 m wide, with the exception of isolated pools and sections of scouring at culvert inlet/outlets. There is a significant opportunity for restoration and enhancement of the streams through the correction of the perched culverts, exclusion of stock and by providing for appropriate riparian planting.



Figure 1: (upper) The lower reach of the stream at the southwestern boundary of the site (lower) a perched culvert beneath a farm track in the same stream.

3 Wetlands

The historic agricultural activities have likely resulted in significant modification of the upper catchments onsite, such that there has likely been a shift from small forested streams, to induced grassland wetlands - most likely through increased sedimentation into watercourses during land clearance and subsequent farming, over time.

The areas that are identified as 'wetlands' include areas that are either permanently or intermittently wet that are dominated by plant species that are adapted (obligate or facilitative plant species) to wet conditions. These are novel systems (i.e. not natural) and thus it is unclear whether they should meet the definition of a 'Natural wetland' in the Proposed Natural Resources Plan. This should be a future point of

discussion with Council; for now, we have taken a conservative approach and mapped areas that may meet this criterion, instead of omitting them in this planning and design stage.

For clarification, we have not included areas that are permanently or intermittently wet and which are dominated by pasture grass, as they clearly meet one the exceptions listed in the RPS of a natural wetland, that wetlands do not include *“damp gully heads, or wetted pasture, or pasture with patches of rushes”*.

Where we consider that induced grassland wetlands would have naturally supported an intermittent stream, we have mapped a stream, as well as mapping the wetland around it. This is because, even if an induced wetland is not considered a ‘wetland’ under the PNRP, the underlying hydrological feature is a stream, and should be recognised as such for the purposes of an effects assessment or prediction of potential future state if restored through riparian planting.

The wetlands onsite are highly degraded through stock damage, and their biodiversity values are low (botanically and in terms of wildlife). However, they all retain some function in terms of regulating water flow and quality, and offer an opportunity for enhancement. Despite their degraded state, due to a regional scarcity of wetlands, all wetlands onsite meet the ‘Rarity’ criteria under the RPS, and are therefore considered ecologically significant.

Where areas of the site are determined to be wetlands and streams, and where Council determines that removal of them is able to take place, it is likely that Council will require some form of ecological offsetting. That is most likely to involve protection, stock exclusion, revegetation and enhancement in general of wetlands and/or streams elsewhere.

The balance areas of Mt Welcome Station that are not subject to this development proposal offer a range of opportunities in this regard. The identification of specific opportunities and the likely quantum needed will be dependent on the scale and nature of the streams and wetlands removed from within the project area.



Figure 2: A representation of the lower gully slopes throughout the site which are dominated by a mix of wetland obligate and facilitative plant species.

4 Terrestrial Vegetation

Due to the agricultural context, the site is largely devoid of areas that qualify as ecologically significant vegetation under the RPS. There is an isolated stand on the site of seral (young regenerating) forest that meets the 'Representativeness' criteria under the RPS. We understand that the current scheme plan avoids this area.

There are some relatively small areas of rank grass, and debris that provide suitable habitat for native skinks. All New Zealand lizards are absolutely protected under the Wildlife Act 1953 and consequently a Wildlife Act Authority from Department of Conservation is required to undertake activities within New Zealand herpetofauna habitat that may result in a significant impact on a species or habitat.

Given the possible presence of native lizards, a lizard survey to assess the importance of the site for native lizards in general should be conducted as part of any future assessment of ecological effects.



Figure 3: A rocky outcrop with rank grass - habitat for native grassland skinks.

5 Priorities for protection

There are four broad categories of ecological values at the site. These are:

- Natural wetlands
- Streams
- Induced wetlands
- Habitat for protected and/or rare lizards

Natural wetlands should be accorded the greatest priority for protection, as they are a nationally threatened environment and are accorded a high level of protection in the Wellington PNRP. Our preliminary assessment considers that all wetlands on this site are induced – and are not natural. However, if Council disagrees and considers these to be natural, avoidance of effects should be prioritised in the development design.

Watercourses that meet the definition of an intermittent or permanent stream are the next highest priority for protection. This includes streams that are shown through induced wetlands, as, even if the wetlands are not considered to be 'natural', the underlying watercourse is likely to be a stream. Effects on

streams are encouraged to be avoided in the PNRP, although if effects are unavoidable, consideration of enhancement to balance unavoidable effects (e.g. from infilling or piping) is usually required and may be acceptable to Council. The process for assessing loss of stream values and the means for determining an appropriate quantum of offset enhancement elsewhere to balance that loss, follows a standard process that Council is familiar with. The costs of providing offsets to balance loss of stream values should be taken into account when considering cost:benefits of impacts on streams.

Adverse effects on induced wetlands are a moderate priority for protection as they are not natural and at this site have low botanical and fauna values. However, they do have ecosystem service (water regulation etc) values, and could serve as an important part of a site-based ecological mitigation or offset package, if the loss of other ecologically significant values is unavoidable.

Also of moderate importance is the preservation of lizard habitat. The species of lizards that are likely to be present at the site are not Threatened, and are likely to be distributed widely in the local area. There is an established process for salvaging and relocating native lizards from development sites. Stream restoration sites (if any) can potentially provide habitat replacement for lizards as well.

Of least importance to preserve are the extensive exotic sites – pasture, shelterbelts, buildings, amenity garden areas and existing tracks. These are not considered to have ecological importance for indigenous species or environments and, in our opinion, removal of these would constitute no or a negligible ecological effect.

We trust that this information provides the initial basis for further strategic planning to ensure the proposed development appropriately avoids, minimises or mitigates any significant ecological effects.

Yours sincerely,



Graham Ussher
Principle Ecologist¹
RMA Ecology Ltd



Tony Payne
Senior Ecologist
Nelmac Ltd

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¹ This report has been prepared for the benefit of our Client with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement. Any use or reliance by a third party is at that party's own risk. Where information has been supplied by the Client or obtained from other external sources, it has been assumed that it is accurate, without independent verification, unless otherwise indicated. No liability or responsibility is accepted by RMA Ecology Limited for any errors or omissions to the extent that they arise from inaccurate information provided by the Client or any external source.

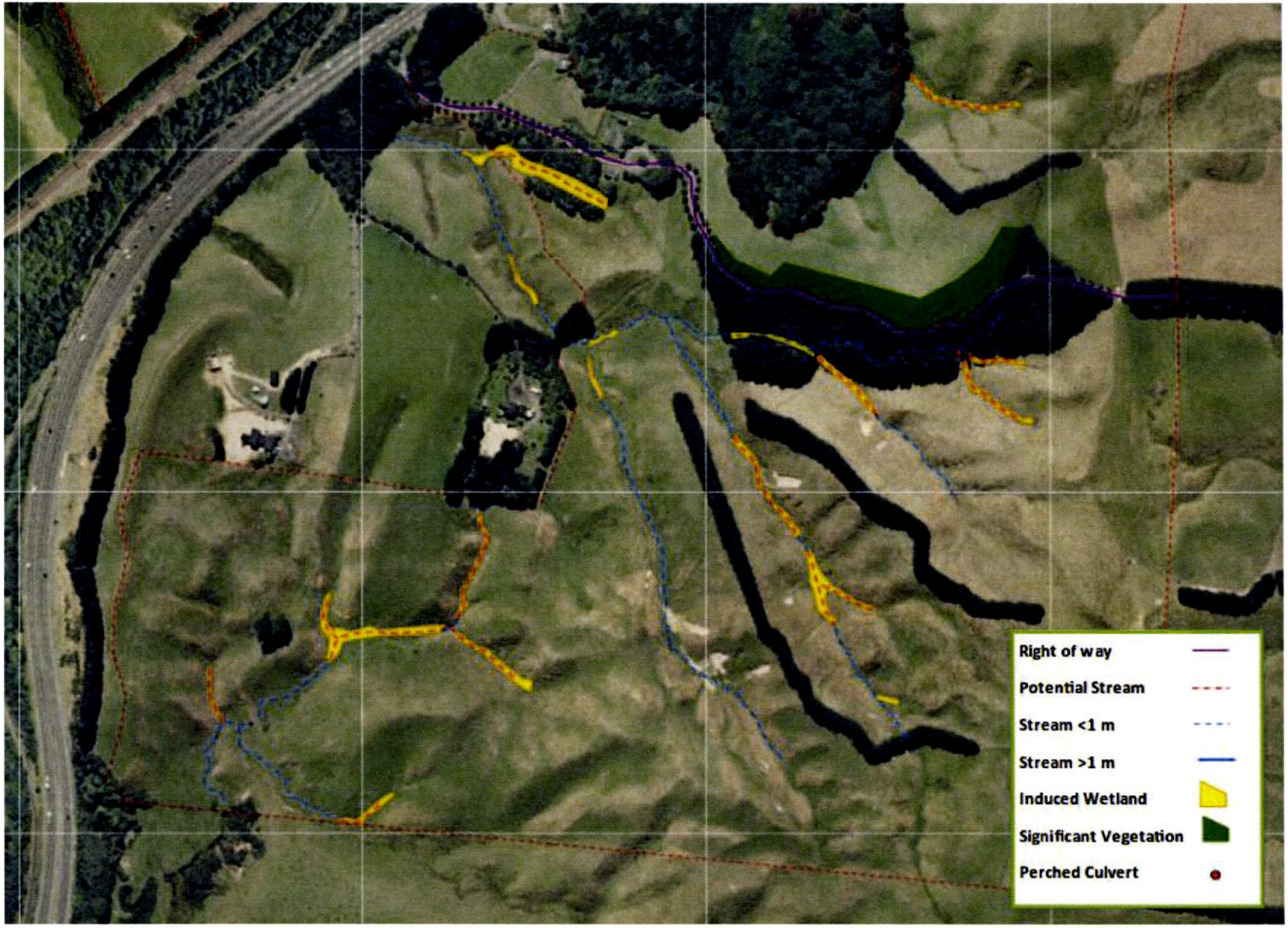


Figure 4: Mt Welcome Station, ecological features map
Mt Welcome Station, Pukerua Bay: Ecological values assessment