

Stormwater and Wastewater Report for Proposed
Accommodation Development at

1695 Pohuehue Road, Warkworth

For Pohuehue Community Housing Ltd.

Haigh Workman Reference: 25 050-CIV

June 2025



Revision History

Revision N ^o	Issued By	Description	Date
A	Ben Richardson	First Issue	30 th May 2025
B	Ben Richardson	For Resource Consent	24 th June 2025
C	Ben Richardson	Updated Septic System	18 th December 2025

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Executive Summary

Haigh Workman Limited were engaged to undertake stormwater and wastewater assessment to construct 12 units for emergency housing, serviced by a proposed driveway located at 1695 Pohuehue Road, Warkworth.

This report addresses stormwater and wastewater including preliminary design of stormwater and wastewater disposal for the proposed development.

Site plans identifying the location of the proposed buildings, driveways, parking areas, and stormwater and wastewater infrastructure are provided in Appendix A. Geotechnical and soil contamination recommendations have been reported on separately by Haigh Workman Ltd. Traffic and planning assessment is being reported on by others.

Providing the recommendations set out within this report are adhered to, we consider the site to be suitable for the development at the designated areas. Should the Client choose to change building platform locations, further investigative work may be required to confirm suitability.

The site is not connected to public reticulation for water, stormwater, or wastewater; therefore, it must be accounted for on-site.

Water for the buildings is to be supplied by roof water runoff collection and supplemented by bore water supply. The new water bore will be pumped to a header tank for storage and distribution to the proposed buildings, each with its own dedicated water detention tank.

Stormwater runoff from the site drains into an ornamental pond within a gulley that bisects the lot and then through a weir into a Mahurangi river tributary stream where it eventually drains into the Mahurangi River. As there are downstream buildings that would be affected by flooding in a 1% AEP event, stormwater neutrality is required for both the 10% and 1% AEP event. Gutters are to be sized for a 1% AEP event. Stormwater neutrality can be achieved by providing attenuation within the top portion of the proposed water tanks. The discharge of these tanks is to be directed towards the pond.

Wastewater is to be treated onsite to a secondary level. A sub-surface dripper line effluent field is proposed for final treatment and effluent dispersal. TP58 compliance requires the new disposal field to have an area of 5,500m².

Firefighting supply is to be from the large pond in consultation with the NZFS.

There is an existing metal driveway to an existing dwelling and sheds with large parking and manoeuvring areas. A new vehicle accessway is proposed to service all existing and proposed buildings. The proposed metal driveway includes parking for the proposed buildings. Vegetation near the accessway shall be cleared to provide minimum site distances.

1 Introduction

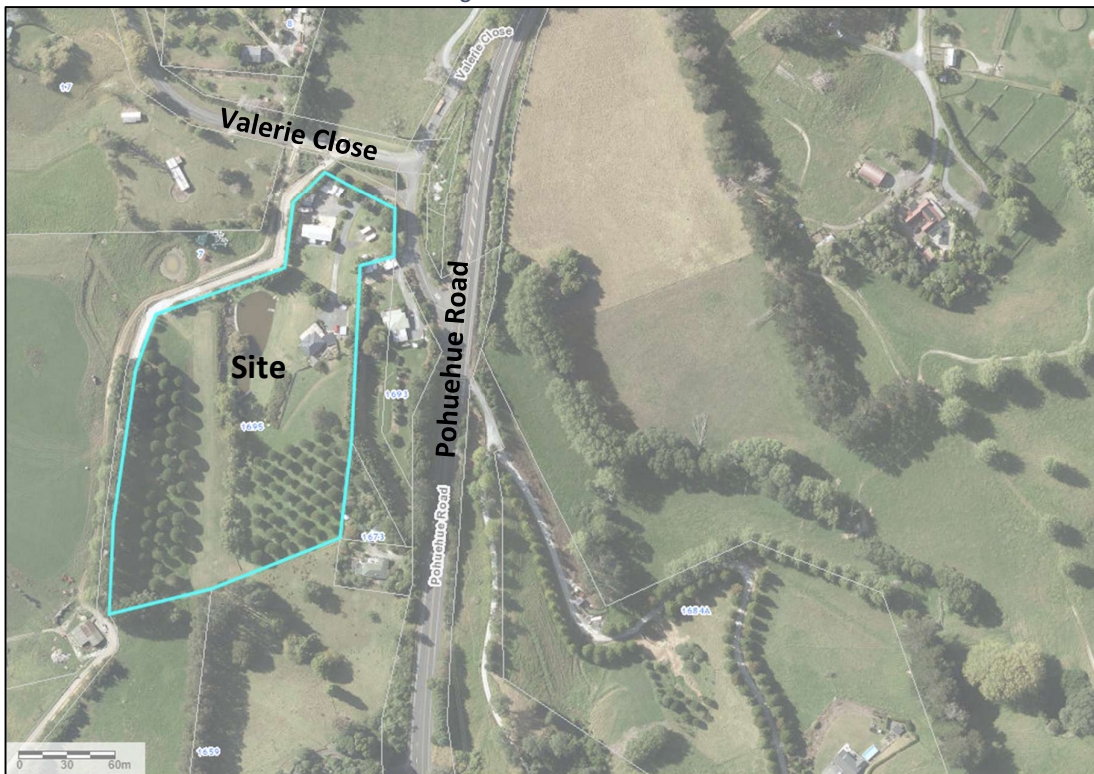
1.1 Project Brief and Scope

Haigh Workman Ltd (Haigh Workman) was engaged by Pohuehue Community Housing Ltd to undertake an Engineering Assessment for the proposed development at 1695 Pohuehue Road, Warkworth (Lot 1 DP 100471) (the site). This report is intended to provide sufficient details to support resource consent applications for the proposed development.

The objectives of this investigation are to:

- Undertake a stormwater assessment and preliminary design of stormwater attenuation and disposal for the proposed development;
- Undertake an on-site wastewater treatment and discharge assessment to service the proposed development.
- Apply the recommendations given in the geotechnical assessment for the property;
- Provide the concept design for vehicle access and movement;
- Estimate the earthworks volumes;

Figure 1 - Site Location



2 Site Description

The site is legally described as Lot 1, DP 100471 with an area of 28,714 m² (2.8 ha) and is within the current rural production zone to the south of Warkworth. The site is within the Future Urban zone designation. The site has one existing dwelling and 2 farm sheds. The site is currently accessed from Valerie Close via a gravel driveway that approaches the site through the northern end of site and leads to the farm sheds and existing dwelling (within the north-eastern portion of the site).

There is an overland flow path (OLFP) leading to a man-made pond that bisects the site in a south to north orientation as shown in the drawings in appendix A. Approximately half of the site is located in established pine nut trees with half being towards the southeast of the OLFP and half to the southwest.

To the west of the pond, the site has undergone historic earthworks with minor cutting into the area where pine nut trees have been planted and substantial non-engineered filling to construct a large flat area. The fill batter slopes down towards the ornamental pond area.

2.1 Proposed Development

The site plans within Appendix A show the extents and locations of the proposed development. The existing dwelling is to be removed. The development includes the construction of 13 new emergency housing buildings, and the manager's office. It is proposed to carry out earthworks consisting of cut and fill to create the driveway and parking areas. The proposed buildings are to be constructed on timber piles. Proposed building platform areas are on gentle slopes of less 14°. Should the development locations be subject to change, further investigation will be required. Refer to Appendix A for the site plans which assign the proposed buildings numbers 1 to 13.

3 Water Supply

3.1 Potable Water Supply

The subject site is located within an area zoned as Future Urban under the Auckland Unitary Plan and is currently not serviced by Auckland Council's municipal reticulated water supply network. As such, the proposed developments are to be entirely self-sufficient with respect to potable water supply.

Each of the proposed accommodation units will be equipped with an independent rainwater harvesting system. These systems will capture roof runoff and convey it to a dedicated on-site water tank associated with each unit. The primary function of these tanks is to store rainwater for domestic use; however, they are also designed to provide stormwater attenuation capacity within the upper portion of the tank volume. This dual-purpose design ensures compliance with Auckland Council requirements for managing runoff from the 10-year and 100-year Average Recurrence Interval (ARI) storm events.

Notwithstanding the efficiency of rainwater harvesting systems, the available roof catchment area for each unit is constrained, and thus the volume of water that can be harvested is insufficient to consistently meet water supply demand throughout the year.

To ensure a reliable and resilient water supply, a supplementary source will be provided in the form of a groundwater bore. The bore will be equipped with a pump system that delivers water to a centralised header

tank (Refer to drawing W-01). From this tank, water will be gravity-fed or pumped to each of the individual unit tanks as required, thereby maintaining adequate storage levels and ensuring continuity of supply even during periods of limited rainfall. The integration of bore water as a supplementary source reduces the risk of water shortages, enhances system reliability, and supports the long-term sustainability of the development.

The combined approach of rainwater harvesting with on-demand bore water supplementation represents a practical and environmentally responsible solution for meeting the potable water needs of the development in the absence of a municipal supply.

Any take from water bores will need to comply with Rule E7.4.1(A15) for up to 20m³/Day, when averaged over any consecutive 5 day period, and no more than 5000m³/Year. Prior to any new bore being installed, consent will need to be sought under Rule E7.4.1 (A41).

3.2 Fire Fighting

Council Engineering Standards require a water supply that is adequate for firefighting purposes, where there is currently no reticulated water supply. In accordance with the New Zealand Fire Service Firefighting Water Supplies Code of Practice SNZ PAS 4509:2008, provisions must be made to ensure that sufficient and accessible firefighting water is available at all times to protect the proposed development.

To meet this requirement, it is proposed that the existing on-site pond be utilised as the primary source of firefighting water. The pond maintains a minimum static storage volume suitable for firefighting purposes, in accordance with the requirements set out in SNZ PAS 4509:2008. Specifically, Clause 5.3.3 of the Code permits the use of static water sources such as ponds, provided that the following conditions are met:

- **Minimum Storage Volume:** The pond must have a minimum available volume of 45,000 litres (45 m³) of water, which must be dedicated solely to firefighting and maintained year-round.
- **Access Requirements:** From a desktop assessment, it is apparent that the pond is located within 90 metres of all buildings measured as the hose lay distance. Alternatively, fire hydrant connections or drafting points must be provided in accessible and compliant locations. The accessway must accommodate firefighting appliances, with turning circles and clearances designed to comply with NZFS Appliance Access Way requirements (refer to Table 5 of SNZ PAS 4509:2008).
- **Drafting Point:** A suitable drafting point at each end of the pond must be constructed, typically in the form of a hardstand area adjacent to the pond, with a 100 mm female Camlock coupling (or other approved connection) accessible to fire service personnel. This must comply with Clause 5.4 of the Code.

Where practical, signage indicating the availability and location of the firefighting water source will be installed in accordance with Clause 7.1 of the Code. Regular maintenance will be required to ensure the drafting point remains clear, accessible, and functional, and that the storage volume of the pond is not compromised by sedimentation or seasonal fluctuations.

A detailed firefighting water supply plan, including access layouts, pond capacity calculations, and drafting point design details, will be provided at the Building Consent or Engineering Approval stage to confirm compliance with SNZ PAS 4509:2008 and any additional requirements specified by Fire and Emergency New Zealand (FENZ).

or Auckland Council. The pond has adequate capacity and the proposed driveway is suitable for fire truck use, if required.

3.3 Alternative to Fire Fighting Supply

The Code (SNZ PAS 4509:2008) specifically allows for alternative methods to be used in meeting the Code requirements, as long as there is approval from an appropriate person nominated by the NZFS National Commander. Clause 4.4 of the Code states that:

- Fire engineers or similar competent persons may use alternative methods, such as those detailed in Appendix H and Appendix J to determine firefighting water supplies. To comply with this code of practice, such alternatives must be submitted for approval to the person(s) nominated by the National Commander. The person(s) so nominated will approve these cases on confirmation that the method and calculations used are correctly applied.
- Alternative methods will need to show that the calculated firefighting water supply makes allowances for tactical flow rates (that is, the amount needed above a theoretical amount to absorb the released heat for operational effectiveness).

NZFS considers that a 'one size fits all' volume is not appropriate in all circumstances. There are alternatives to firefighting couplings, but firefighters are not expected to lift pumps or hoses onto the top of water tanks.

4 Stormwater Management

4.1 General

Stormwater runoff from the site drains into a pond within a gully that bisects the lot and then through a weir into a Mahurangi river tributary stream where it eventually drains into the Mahurangi River. As there are downstream properties that would be affected by flooding in a 1% AEP event, stormwater neutrality is required for both the 10% and 1% AEP event. Stormwater neutrality can be achieved by providing attenuation within the top portion of the proposed water tanks. The discharge of these tanks is to be directed towards the pond. With attenuation being allowed for, the proposed units will not increase flooding risk downstream in a 1% AEP event.

Stormwater neutrality is required to meet the runoff of the proposed roof areas. No allowance has been made for any increase in runoff from the proposed metalled driveway area in accordance with AUP-Op Section E8.6.2.4.

It is proposed that managers unit is attenuated by the tanks for the emergency housing. For simplicity, the average roof area has been used to keep all tanks the same. The runoff calculations herein demonstrate that attenuation can be achieved within the top 6,400l portion of the proposed water tanks.

The water tanks are proposed to be Baileys 30,000l tanks (Some relocated from the previous site, and some new).

4.2 Regulatory Framework

4.2.1 Auckland Unitary Plan

Rule E8.4.1. (A7) permits a diversion and discharge of stormwater runoff from impervious areas up to 5,000m². The proposed development is within this constraint.

Rule E8.6.1.(3)(a) states that any development must not increase the flooding risk to other properties in up to a 10% AEP event. It must also not lead to the inundation of buildings in up to a 1% AEP event.

4.2.2 GD01

GD01 updates, and is a replacement for TP10 which provided technical guidance on stormwater devices but did not set out attenuation objectives.

Section C6.0 gives detail on the prevention of scour and erosion in overland flow paths. Guidelines for energy dissipation where necessary are given.

4.2.3 The Countryside Living Toolbox

The predecessors of the Auckland Council developed the Countryside Living Toolbox as a technical guideline for stormwater management device details (published April 2010). While not regulatory, the majority of the design details remain compliant with the Auckland Unitary Plan and Engineering Standards.

4.3 Flood Hazard

Several buildings and houses downstream from the site are shown to be inundated in a 1% AEP event on Auckland Council Geomaps. In order to not exacerbate the downstream flood risk it is necessary to attenuate the 1% AEP flood event with allowance for climate change. With attenuation being allowed for, the proposed units will not increase flooding risk downstream in a 1% AEP event.

The proposed units and driveways are outside the Auckland council mapping for flood zones in a 1% AEP event.

4.4 Stormwater Quantity Control

4.4.1 Effects on Run off

Runoff from the Site has been calculated using the rational method as per building code compliance document E1/VM4.

The total additional impervious surface area of the site is expected to be 2,870 or 10.0% of the total lot area. The proposed development is considered a Permitted Activity regarding Rule E8.6.2.4 of the Unitary Plan.

Peak stormwater runoff in the 1% and 10% AEP events (RCP 6.0 for 2081-2100 to account for climate change) is calculated as follows:

Design Additional Impermeable Area

Component	Units	Area (m ²)	Total Area (m ²)
6 bedroom roof	8	116.0	928.0
3 bedroom roof	4	64.0	256.0
Managers unit	1	45.0	45.0
		Total	1,229.0

Proposed Future Condition

	Area m ²	C	I ₁₀ mm/hr	Q ₁₀ L/s	I ₁₀₀ mm/hr	Q ₁₀₀ L/s
Roof Area	1,229	0.9	123.6	37.98	186	57.1
Average per tank (12 tanks)	102	0.9	123.6	3.2	186	4.8

Pre-Development Runoff

	Area m ²	C	I ₁₀ mm/hr	Q ₁₀ L/s	I ₁₀₀ mm/hr	Q ₁₀₀ L/s
Heavy Clay pasture/bush cover	1,229	0.35	123.6	14.7	186	22.2
Excess run-off (total)				23.2		34.9
Excess run-off (Per tank)				2.1		3.2

A runoff coefficient of 0.35 was selected for the pasture with bush cover as recommended by E1/VM1 2.1.1 for grass cover over heavy CLAY.

For conservatism, no allowance has been allowed for landscaped terraces, flower beds, etc – as can be expected with a residential property. The emergency housing buildings may only have sporadic or no landscaping.

For stormwater neutrality in 10% AEP and 1% AEP events the attenuation required in is 2.1 L/s and 3.2 L/s respectively. The hydrographs shown in Appendix B demonstrate how the outlet flow rate is reduced for both storm events.

4.4.2 Preliminary Detention Tanks Sizing

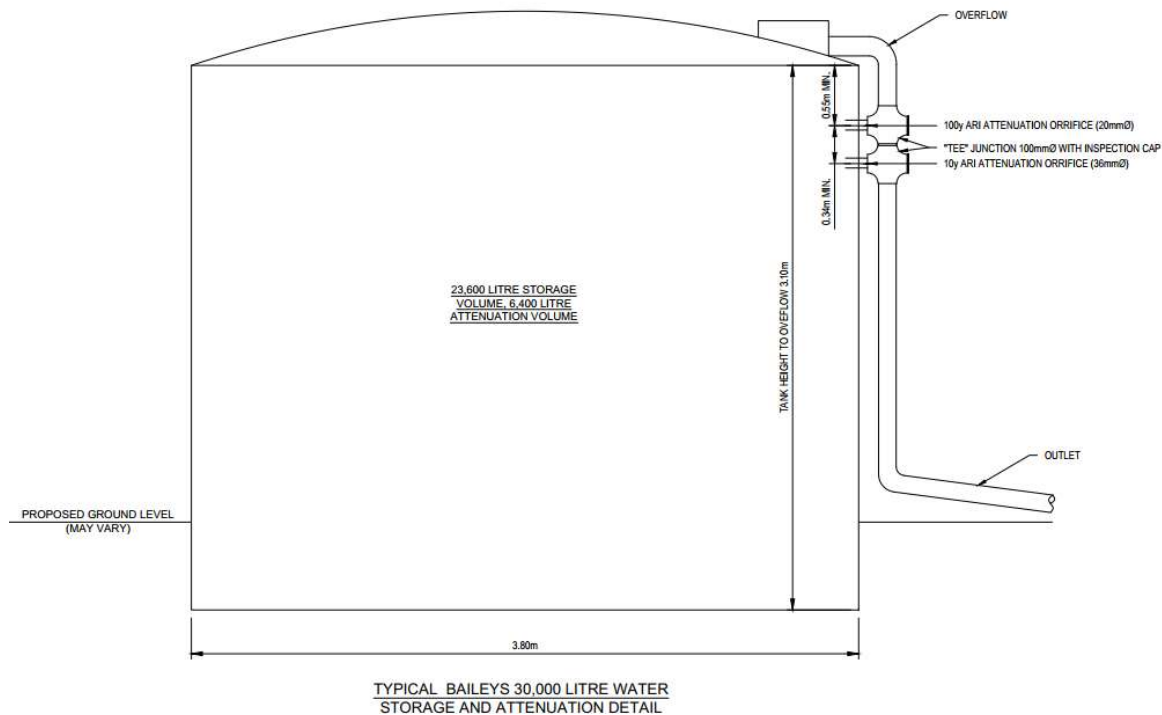
Runoff from the roofs of the emergency housing buildings is to be collected in a combined 30,000L water storage and attenuation tank with a 3.8m diameter.

An 18mm diameter outlet orifice is to be positioned 395mm below the overflow at the top of the tank. An additional 32mm diameter orifice is to be positioned 248mm below the top orifice. A 100mm overflow pipe is to be positioned at the head of the tank. The outlet is to have an access hatch and rodding eye installed to allow inspection and debris clearance.

The tank inlets are to be installed with a debris screen on the downpipes from the gutter.

With the above detention tank arrangement 2.1 L/s and 3.2 L/s will be attenuated in a 10% and 1% AEP rain event respectively. This will bring peak flowrates in the two design storms below their predevelopment flowrates. The maximum detained volume experienced in a 1% AEP event is 7.3m³.

Figure 2 - Attenuation Tank Elevation (Extract from Drawing W-02)



If the client elects to bury the attenuation tank, an access manhole will need to be installed to inspect and clean the attenuation orifice. Only personnel suitably trained in confined spaces are permitted to enter.

4.5 Outlet Dispersal

The stormwater is to be conveyed by 100mm diameter uPVC line that can be buried beneath the topsoil (600mm general and 900mm below driveway). The lines are to convey water to the ornamental pond or the man-made ephemeral stream leading to it.

The stormwater lines are to daylight at its terminal (i.e. above the water level), either through the rip rap lined pond and concreted in place or through the concrete panels lining the ephemeral stream.

5 Wastewater Treatment and Effluent Disposal

5.1 Summary of Existing Regulatory Framework

Auckland Council technical publication TP58 is accepted as a means of compliance for effluent disposal design in Auckland according to the AUP-Op. TP58 provides set-back distances and recommends that wastewater treatment plants and disposal fields be located no closer than 3.0m from a dwelling. Furthermore, a setback of 15m for secondary treated effluent from surface water systems is required.

The effluent disposal systems need to be sited to avoid surface runoff and natural seepage from higher ground, or protected by using interception drains.

The following analysis ensures that on-site wastewater disposal for the proposed development can comply with both the regional and district plan wastewater discharge rules and appropriate engineering guidelines. The analysis has assumed secondary treatment to pressure compensating drippers.

5.2 Design Population and System Flow Volumes

5.2.1 Design Occupancy

The units are proposed to be emergency housing and have a relatively small area per bedroom. The emergency housings are assumed to have a design occupancy of one person per bedroom as per previous discharge consented (Ref: DIS60313232-A) design on the donor site where some of the units are coming from. The managers office also allows an occupancy of one person.

Source of Water Supply

Water supply is to be sourced from individual roof supply tank and on-site bore water. Flow reduction fittings shall be used.

Design Flows

The proposed dwellings will be designed to at least meet category 'C' according to TP58 Section 6.3.1, 'Households with 11/5.5 or 6/3 Flush Toilet(s) and Standard Fixtures, low water use dishwasher and NO garbage grinder [Note 6]'. A category C property allows for 180 litres/person/day of wastewater generation for on-site water supply with bore water supplement.

Facility	Units	Design Occupancy	Flow Allowance (L/Person/Day)	Total Flow (L/Person/Day)
6 bed Workers accom.	8	6	180	8,640
3 bed Workers accom.	4	3	180	2,160
Managers unit (office)	1	1	180	180
			Total	10,980

The design wastewater flow is = 10,980 litres per day.

The design occupancy is based on previous reporting from the donor site and accounts for the small bedrooms and building sizes.

5.3 Design for Land Application System

We recommend installing a Pressure Compensating (PCDI) dripper line system.

Effluent Field Design Area

Soil deposits encountered in the hand auger investigations found stiff CLAY with 100mm topsoil – see geotechnical report for borehole logs. Groundwater was not encountered in 1.5m of depth. The soil is indicative of Category 6 slowly drained clay in accordance with TP58. This soil type can be expected to sustain a land loading rate of 2 mm/day. This is the most conservative areal loading rate recommended for the soil type in TP58 9.2.5.

On this basis, the new wastewater system discharging 10,980 litres/day would require $10,980/2 = 5400\text{m}^2$ of disposal area. An area of $5,500\text{m}^2$ has been allowed for.

Effluent Field Location

The area shown on the appended site plan has been selected for the proposed effluent field. The site is suitable for a sub-surface PCDI irrigation system and is to be buried 100mm into the topsoil.

The design of wastewater disposal fields will need to comply with rules for set-back distances and slopes that are operative at the time of building. The slope of the wastewater fields will not exceed 15%.

Access to the disposal area should be minimised by effective bordering with either hedgerows or fencing.

The recommended $5,500\text{m}^2$ effluent disposal field is shown on Drawing W-01 in Appendix A. The field complies with the following conditions:

- A 1.5m setback from the property boundaries.
- A 3.0m setback from dwellings and areas where people congregate like decks.
- A 15m + 2m Buffer setback from surface water flow paths.
- No crossover with stormwater lines.

5.3.1 Effluent Field Details

It is assumed the system will have the following characteristics:

- a Lowara Scuba SC411 Pump or Similar approved

- a required residential 10m pressure head
- a 5m head loss from blocked filters (GD06)
- a 5m elevation difference between the highest and lowest dripper

It is recommended that the field shape should be quadrilateral with a 63mm SN10 diameter delivery line running from the secondary treatment system to the field as per drawing W-01 in Appendix A. The dripper line is to be laid in a series of laterals along the contour for a length of 25-30m at 1m centres. The dripperline is to be laid with four connections to the delivery line with four flush valves at the terminals. The laterals must run parallel with the contours.

Tubing is to be 2.3 l/hr drippers at 0.6 m spacing (UniBioline or similar).

With the above arrangement the flow rate to the dripper field will be 87.8 L/min and a flush velocity of 1.3m/s is maintained. Refer to pump and line calculations in Appendix C.

Reserve Area

A reserve area of 79% of the design area for dripper line effluent fields is allocated. The reserve field is required to cope with wastewater in the event of a system failure, or from underestimation of daily wastewater production. There is adequate compliant space within the site for the required reserve area.

5.4 Design for Treatment System

Treatment Plant Design Sizing

Treatment plants must meet the requirements of AS/NZS 1546.3:2001.

The system is to meet the quality output of AS/NZS 1546.3:2003, producing effluent of less than 20 g/m³ of 5-day biochemical oxygen demand (BOD₅) and no greater than 30 g/m³ total suspended solids (TSS), capable of consistently treating 10,800 litres/day

The influent raw wastewater is expected to have 300g/m³ of BOD5 and 200g/m³ of suspended solids.

5.4.2 Siting Requirements

Restrictions on siting of secondary treatment plants are:

- Invert level at inlet not less than 0.5 m below floor level;
- Greater than 3.0 m from any house;
- Greater than 1.5 m from any boundary;
- Easily accessible for routine maintenance.
- Outside the 1% AEP flood inundation zone.

Installation Requirements

Treatment plants must be installed by the plant provider to the manufacturers published specifications. The trickle irrigation tubing must also be installed by the treatment plant installer.

Commissioning Requirements

The treatment and PCDI irrigation must be tested and commissioned by the plant provider.

Reflection Wastewater Treatment Solutions have provided a system specification that meets the above criteria. The specification is included in Appendix C.

5.5 Management Procedures

Operation Maintenance Requirements

A maintenance agreement is to be entered into with the provider. Once commissioned, the plant will operate automatically with audible and visual alarms fitted to advise the house occupants in the event of emergency failure.

Monitoring and Inspection

As part of the maintenance agreement with the plant provider, there should be at least annual inspections with written reports provided to the owner.

Likelihood of Failure/ Accidental Discharge

The likelihood of a discharge from a household secondary (aeration) treatment plant is less than minor. The pipe work to and within the plant when correctly installed is robust with sealed connections and buried below ground reducing the risk of accidental damage. Only the puncture of a distribution pipe would allow treated effluent to escape in a concentrated manner.

Consequence of Failure/ Accidental Discharge

In the unlikely event of some form of failure/ accidental discharge, the material would have to travel in excess of 15 m over ground to reach any surface water. Most, if not all, of the accidental discharge is likely to be lost to soakage over this distance and the failure should quickly become apparent.

Vegetation Planting

Trickle irrigation disposal systems rely on evapo-transpiration from sub-surface irrigated lawns. The proposed effluent disposal field is located within an area of mature pine nut trees which aids evapotranspiration.

6 Earthworks

6.1.1 Building Platforms

We recommend no filling within the building footprints should be carried out, without specific settlement design at the building consent stage. We consider earthworks batters shall be limited to a maximum (1V:3H) gradient for building platforms. Cut batter height shall be limited to 1.0 m unless it is retained with specific engineering design.

6.1.2 Driveway

Cuts and fills for the driveway will be required for construction. Refer to the Civil report reference 25 050-CIV for further details. Earthworks fill batters shall be limited to a maximum grade of 1V:3H. Cut batters shall be limited to a maximum grade of 1V:2H and 2.0m in height.

We recommend that any earthworks be carried out in accordance with NZS4404¹ and NZS4431². It may not be practical to carry out earthworks in winter months or periods of prolonged rainfall, therefore we recommend site formation works are undertaken in weather conditions favourable for earthworks activities.

¹ New Zealand Standard NZS 4404, *Land Development and Subdivision Infrastructure*, 2010.

² New Zealand Standard NZS 4431, *Code of Practice of Earthfilling for Residential Development*, 1989.

We recommend that inferred CBR testing of the subgrade is carried out during engineering plan approval to determine suitable hardfill thickness (Subbase and/or Basecourse) for the driveway. It is anticipated that the CBR value will be between 3 and 7% for the subgrade.

6.2 Sensitive Soils

Due to the nature of the underlying geology, the soils may exacerbate rapidly upon site excavations and drilling potentially leading to soil cracking and degradation to which care is therefore required during construction to ensure soil protection and moisture conditioning for subgrade performance.

6.3 Ground Stabilisation

For general land upkeep and erosion protection, it is recommended that, temporary cleared land due to construction processes are either revegetated or stabilised with the final surface covering or wearing course as soon as practicable.

6.4 Geotechnical Investigation

It is recommended that the during initial building consent preparation, further site-specific investigation and confirmation of design parameters shall be carried out once resource consent is granted and the exact locations of proposed buildings are known.

6.5 Services

It is recommended that stormwater and wastewater is disposed of in a manner as to not exacerbate erosion of the surrounding land. It is important that all stormwater runoff from the proposed development including, roof, driveway and other sealed areas, is collected by means of sealed pipes and discharged in a controlled manner away from the development.

7 Limitations

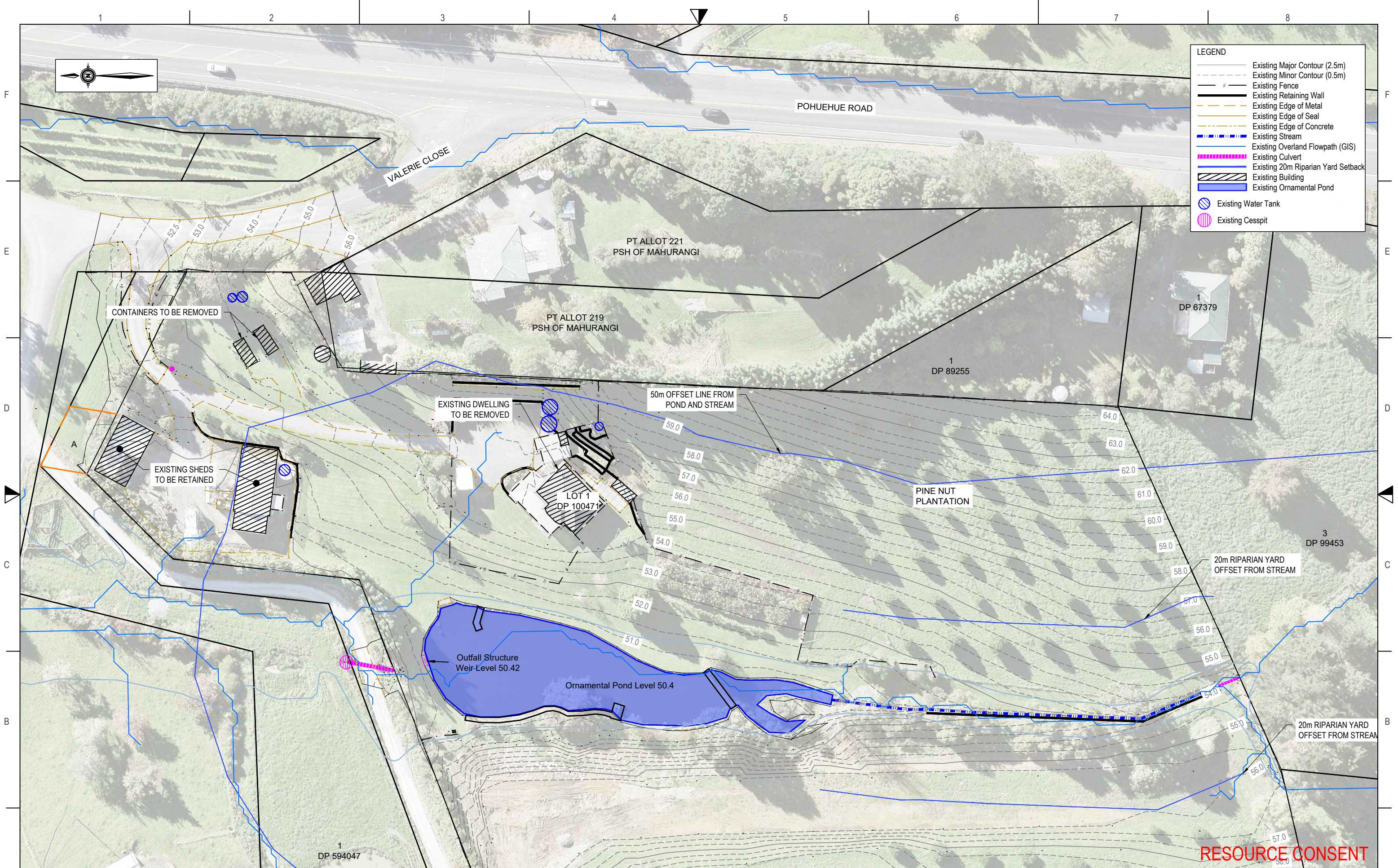
This report is intended to support the application for the resource consent with the Auckland Council. It is to be used by the Council when considering the application for the proposed development. The information and opinions expressed in this report shall not be used in any other context without prior approval from Haigh Workman Ltd.

All distances and measurements given in this report and adjoining figures are approximations for guidance only. This includes the setbacks for proposed buildings, areas for on-site effluent removal, access roads, proposed stormwater channels, and flood inundations. The accuracy is sufficient for consent consideration. If at the design stage the proposed subdivision diverges from the conceptual brief, the engineering assessment will need to be revisited. It has been assumed in the production of this report that the sites are to be subsequently developed into low-rise residential housing. If the assumption is incorrect, amendments to the recommendations made in this report may be required.

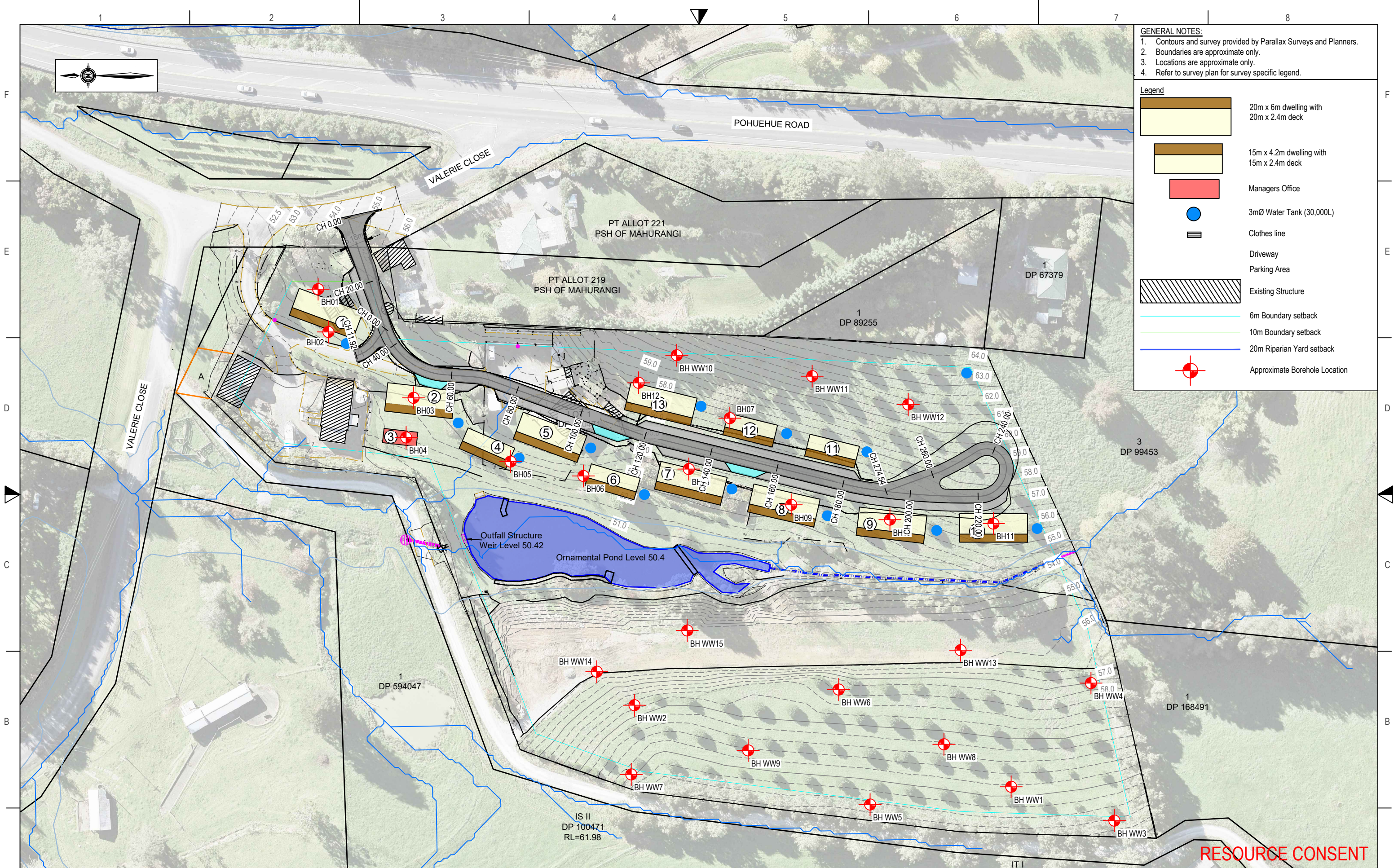
Haigh Workman Ltd does not take responsibility for factors that affect the site suitability of the proposed development that are not covered in the agreed brief.

This report shall not be reproduced, except in full.

Appendix A – Drawings



A			Rev		Date	Description	By	Checked	DWG EXISTING SITE PLAN			Project		1695 Pohuehue Road Lot 1 DP 100471	Stage		A
A			1		27/05/2025	1st ISSUE	AS	JB				Client		Pohuehue Community Housing Ltd	Dwg No.		GEO-01
B			2		13/06/2025	RESOURCE CONSENT	AS	BR				Project No.		25 050	RC no.		
C			3		28/08/2025	RPI RESPONSE	BR	JB							Sheet No.		1 of 13
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									DIMENSIONS MUST NOT BE SCALE MEASURED FROM THESE DRAWINGS. THE CONTRACTOR SHALL CHECK & VERIFY ALL DIMENSIONS INCLUDING, SITE LEVELS, HEIGHTS AND ANGLES ON SITE PRIOR TO COMMENCING ANY WORK. THE COPYRIGHT TO THESE DRAWINGS AND ALL PARTS THEREOF REMAIN THE PROPERTY OF HAIGH WORKMAN LTD. ©2020								



- GENERAL NOTES:
1. Contours and survey provided by Parallax Surveys and Planners.
 2. Boundaries are approximate only.
 3. Locations are approximate only.
 4. Refer to survey plan for survey specific legend.

Legend

- 20m x 6m dwelling with 20m x 2.4m deck
- 15m x 4.2m dwelling with 15m x 2.4m deck
- Managers Office
- 3mØ Water Tank (30,000L)
- Clothes line
- Driveway
- Parking Area
- Existing Structure
- 6m Boundary setback
- 10m Boundary setback
- 20m Riparian Yard setback
- Approximate Borehole Location

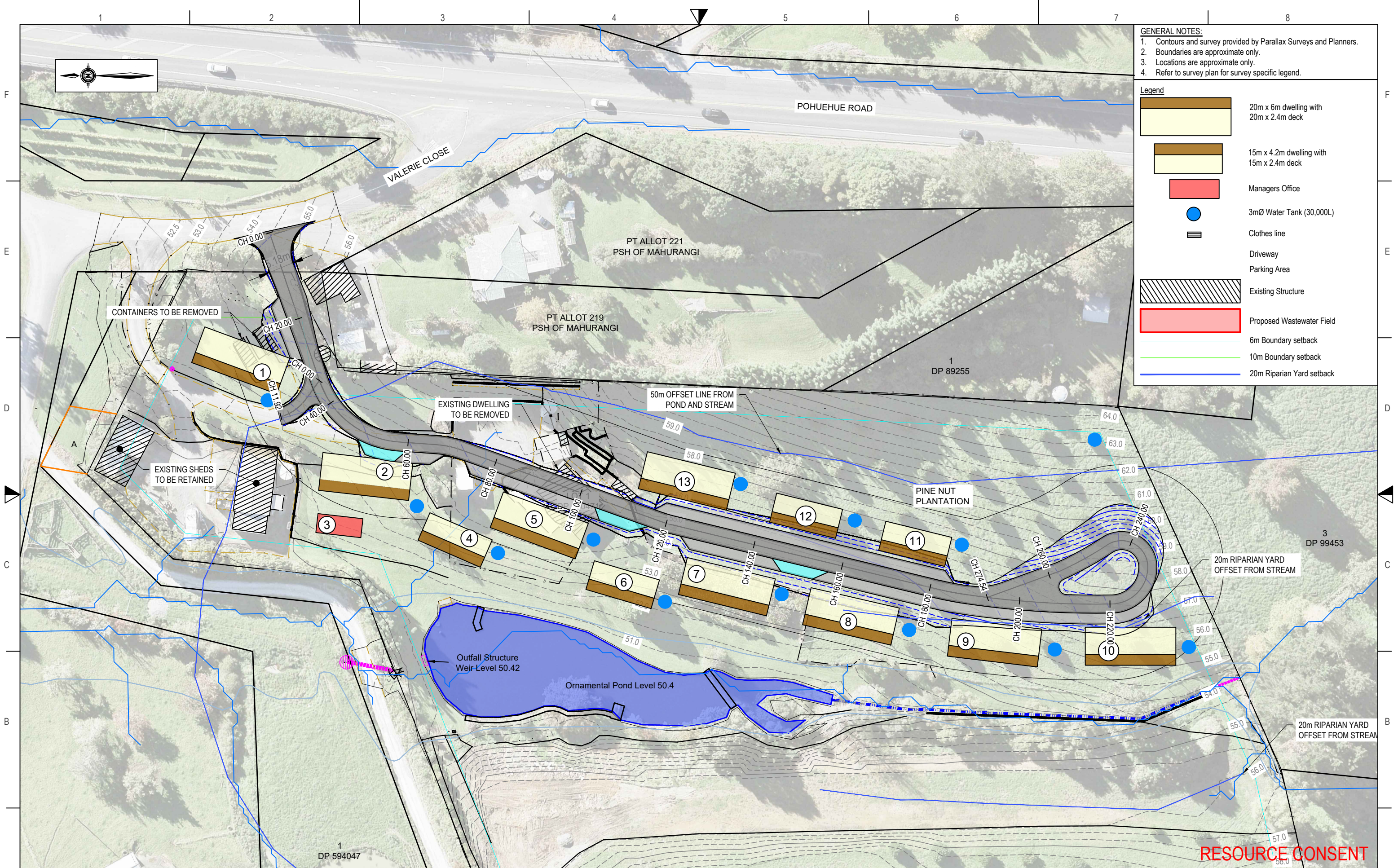
Rev			Date	Description	By	Checked	DWG SITE INVESTIGATION PLAN			Project 1695 Pohuehue Road Lot 1 DP 100471			Stage
A			27/05/2025	1st ISSUE	AS	JB	A3 SCALE 1:1000 0 20m 50m Date 27/05/2025			Client Pohuehue Community Housing Ltd			Dwg No. GEO-02
B			13/06/2025	RESOURCE CONSENT	AS	BR							Sheet No. 2 of 13
C			28/08/2025	RPI RESPONSE	BR	JB							
							Drawn AS Checked BR Approved JB			Project No. 25 050			RC no.
							File T:\CLIENTS\POHUEHUE COMMUNITY HOUSING LIMITED\25 050 - 1695 POHUEHUE ROAD, POHUEHUE\ENGINEERING\DRAWINGS\25_050_1695 POHUEHUE ROAD_EARTHWORKS.DWG						

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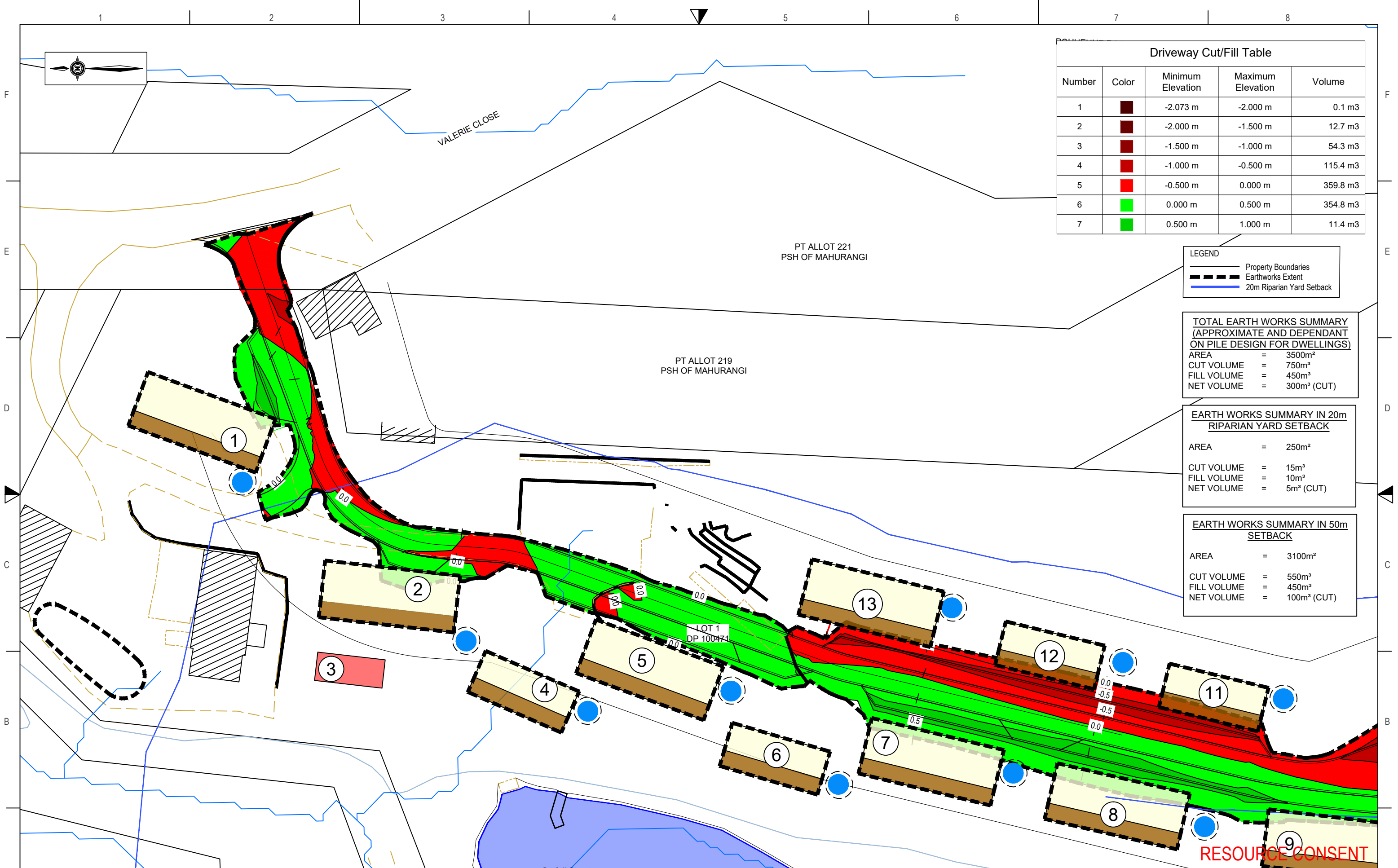
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- GENERAL NOTES:
1. Contours and survey provided by Parallax Surveys and Planners.
 2. Boundaries are approximate only.
 3. Locations are approximate only.
 4. Refer to survey plan for survey specific legend.

- Legend
- 20m x 6m dwelling with 20m x 2.4m deck
 - 15m x 4.2m dwelling with 15m x 2.4m deck
 - Managers Office
 - 3mØ Water Tank (30,000L)
 - Clothes line
 - Driveway
 - Parking Area
 - Existing Structure
 - Proposed Wastewater Field
 - 6m Boundary setback
 - 10m Boundary setback
 - 20m Riparian Yard setback

A	Rev	Date	Description	By	Checked	DWG PROPOSED SITE PLAN					Project 1695 Pohuehue Road Lot 1 DP 100471		Stage		A		
	A	27/05/2025	1st ISSUE	AS	JB	 A3 SCALE 1:750 Date 27/05/2025			6 Fairway Drive Kerikeri, BOI T: 09 407 8327 F: 09 407 8378 E: info@haighworkman.co.nz		Client Pohuehue Community Housing Ltd		Dwg No. GEO-03				
	B	13/06/2025	RESOURCE CONSENT	AS	BR				DIMENSIONS MUST NOT BE SCALE MEASURED FROM THESE DRAWINGS. THE CONTRACTOR SHALL CHECK & VERIFY ALL DIMENSIONS INCLUDING, SITE LEVELS, HEIGHTS AND ANGLES ON SITE PRIOR TO COMMENCING ANY WORK. THE COPYRIGHT TO THESE DRAWINGS AND ALL PARTS THERE OF REMAIN THE PROPERTY OF HAIGH WORKMAN LTD. ©2020		Project No. 25 050		RC no.			Sheet No. 3 of 13	
	C	28/08/2025	RPI RESPONSE	BR	JB												
						Drawn AS		Checked BR		Approved JB							
						File		T:\CLIENTS\POHUEHUE COMMUNITY HOUSING LIMITED\25 050 - 1695 POHUEHUE ROAD, POHUEHUE\ENGINEERING\DRAWINGS\25_050_1695 POHUEHUE ROAD_EARTHWORKS.DWG									



Driveway Cut/Fill Table				
Number	Color	Minimum Elevation	Maximum Elevation	Volume
1		-2.073 m	-2.000 m	0.1 m3
2		-2.000 m	-1.500 m	12.7 m3
3		-1.500 m	-1.000 m	54.3 m3
4		-1.000 m	-0.500 m	115.4 m3
5		-0.500 m	0.000 m	359.8 m3
6		0.000 m	0.500 m	354.8 m3
7		0.500 m	1.000 m	11.4 m3

LEGEND	
	Property Boundaries
	Earthworks Extent
	20m Riparian Yard Setback

TOTAL EARTH WORKS SUMMARY (APPROXIMATE AND DEPENDANT ON PILE DESIGN FOR DWELLINGS)	
AREA	= 3500m ²
CUT VOLUME	= 750m ³
FILL VOLUME	= 450m ³
NET VOLUME	= 300m ³ (CUT)

EARTH WORKS SUMMARY IN 20m RIPARIAN YARD SETBACK	
AREA	= 250m ²
CUT VOLUME	= 15m ³
FILL VOLUME	= 10m ³
NET VOLUME	= 5m ³ (CUT)

EARTH WORKS SUMMARY IN 50m SETBACK	
AREA	= 3100m ²
CUT VOLUME	= 550m ³
FILL VOLUME	= 450m ³
NET VOLUME	= 100m ³ (CUT)

Rev	Date	Description	By	Checked
A	27/05/2025	1st ISSUE	AS	JB
B	13/06/2025	RESOURCE CONSENT	AS	BR
C	28/08/2025	RPI RESPONSE	BR	JB

DWG EARTHWORKS PLAN

A3 SCALE 1:500

0

10m

25m

Date 27/05/2025

Drawn AS

Checked BR

Approved JB

File T:\CLIENTS\POHUEHUE COMMUNITY HOUSING LIMITED\25 050 - 1695 POHUEHUE ROAD, POHUEHUE\ENGINEERING\DRAWINGS\25_050_1695 POHUEHUE ROAD_EARTHWORKS.DWG

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Project 1695 Pohuehue Road
Lot 1 DP 100471

Client Pohuehue Community Housing Ltd

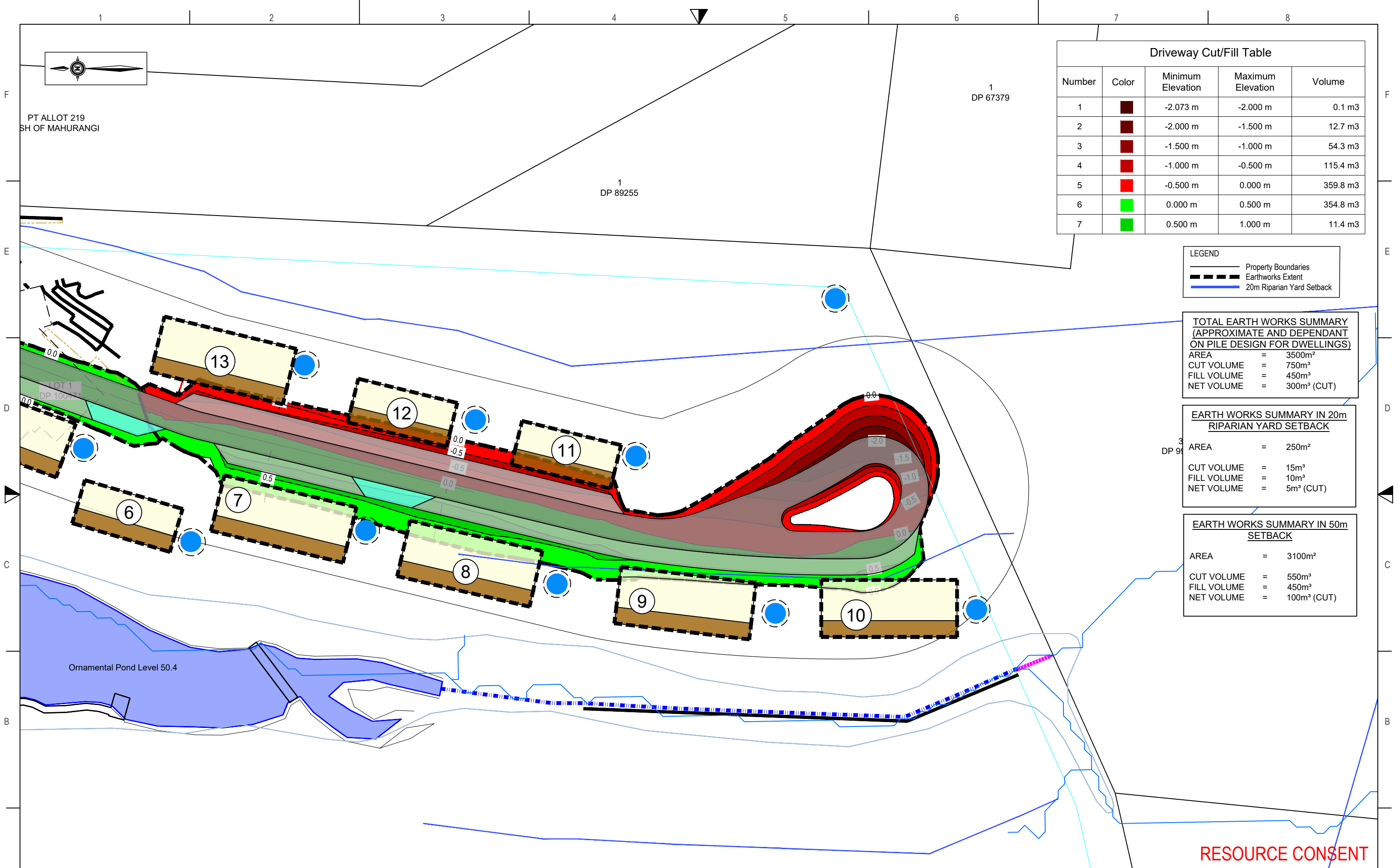
Project No. 25 050

Stage

Dwg No. GEO-04

Sheet No. 4 of 13

RESOURCE CONSENT



Driveway Cut/Fill Table				
Number	Color	Minimum Elevation	Maximum Elevation	Volume
1		-2.073 m	-2.000 m	0.1 m3
2		-2.000 m	-1.500 m	12.7 m3
3		-1.500 m	-1.000 m	54.3 m3
4		-1.000 m	-0.500 m	115.4 m3
5		-0.500 m	0.000 m	359.8 m3
6		0.000 m	0.500 m	354.8 m3
7		0.500 m	1.000 m	11.4 m3

LEGEND	
	Property Boundaries
	Earthworks Extent
	20m Riparian Yard Setback

TOTAL EARTH WORKS SUMMARY (APPROXIMATE AND DEPENDANT ON PILE DESIGN FOR DWELLINGS)	
AREA	= 3500m²
CUT VOLUME	= 750m³
FILL VOLUME	= 450m³
NET VOLUME	= 300m³ (CUT)

EARTH WORKS SUMMARY IN 20m RIPARIAN YARD SETBACK	
AREA	= 250m²
CUT VOLUME	= 15m³
FILL VOLUME	= 10m³
NET VOLUME	= 5m³ (CUT)

EARTH WORKS SUMMARY IN 50m SETBACK	
AREA	= 3100m²
CUT VOLUME	= 550m³
FILL VOLUME	= 450m³
NET VOLUME	= 100m³ (CUT)

RESOURCE CONSENT

Rev	Date	Description	By	Checked
A	27/05/2025	1st ISSUE	AS	JB
B	13/06/2025	RESOURCE CONSENT	AS	BR
C	28/08/2025	RPI RESPONSE	BR	JB

DWG EARTHWORKS PLAN

A3 SCALE 1:500

Date 27/05/2025

Drawn AS Checked BR Approved JB

File T:\CLIENTS\POHUEHUE COMMUNITY HOUSING LIMITED\25 050 - 1695 POHUEHUE ROAD, POHUEHUE\ENGINEERING\DRAWINGS\25_050_1695 POHUEHUE ROAD_EARTHWORKS.DWG

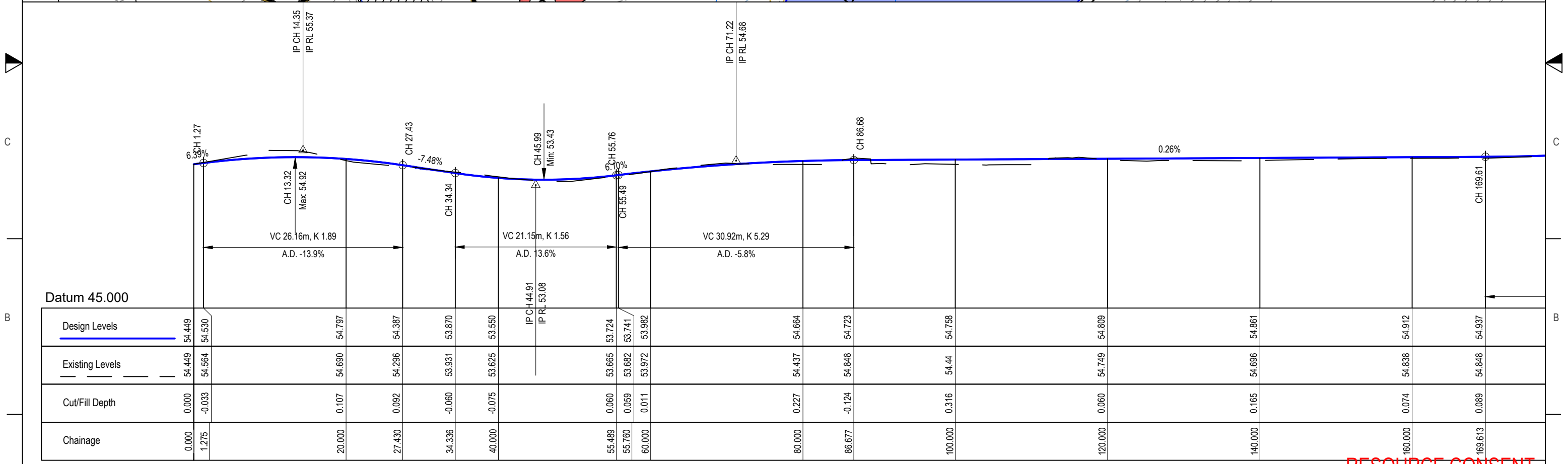
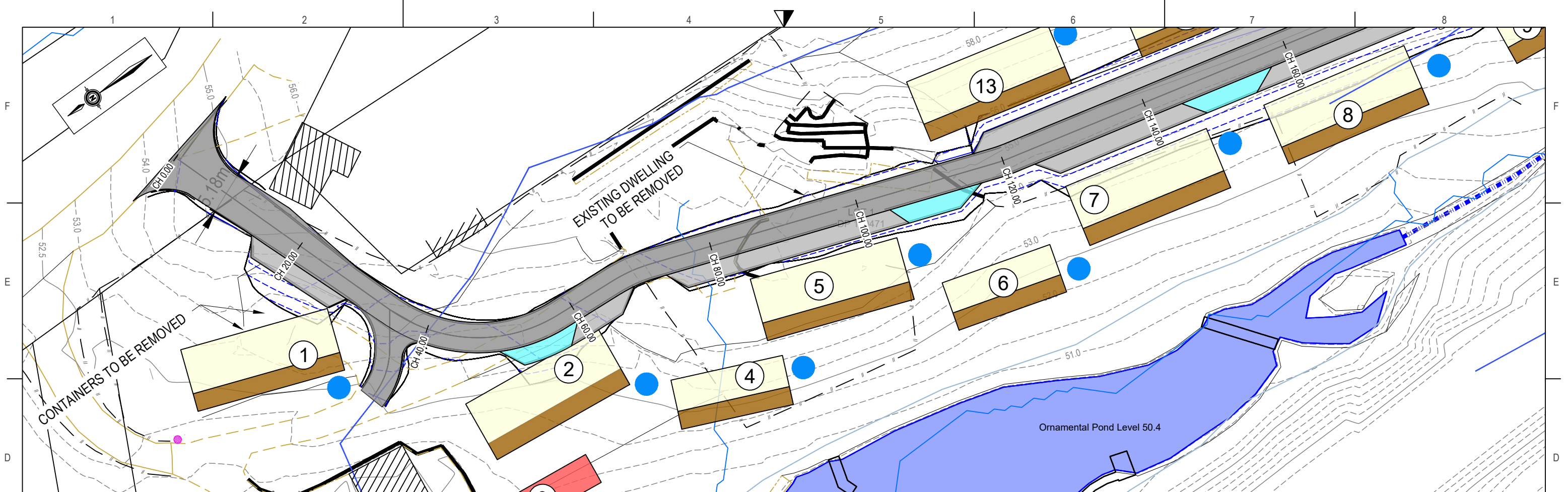
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6 Fairway Drive
Kerikeri, B01

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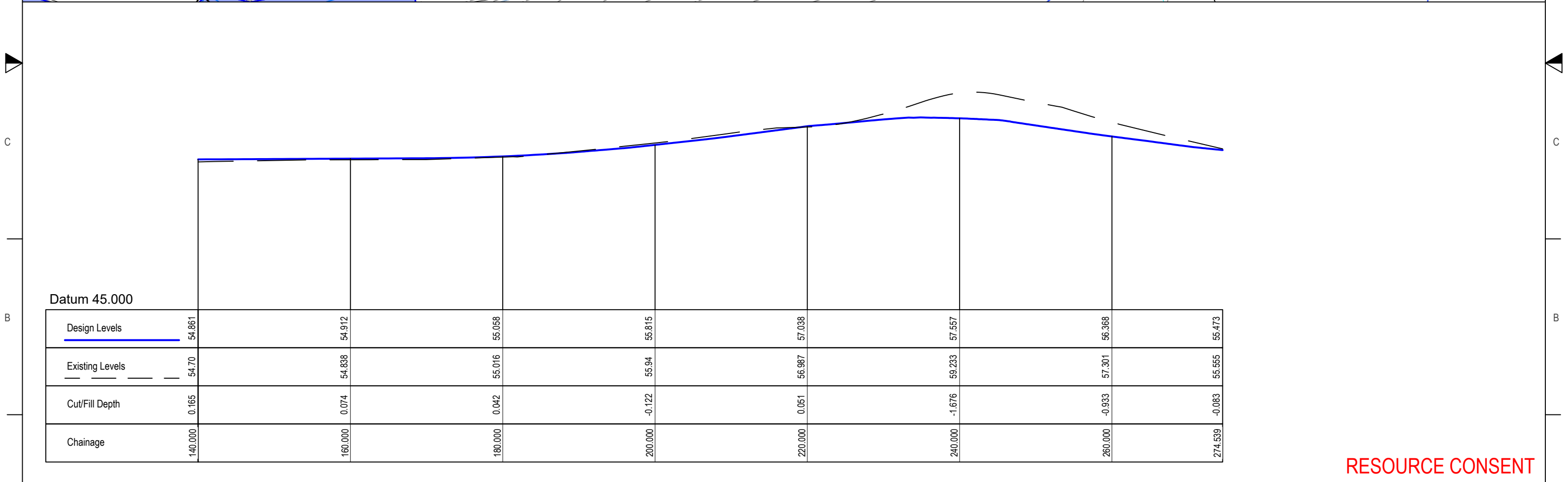
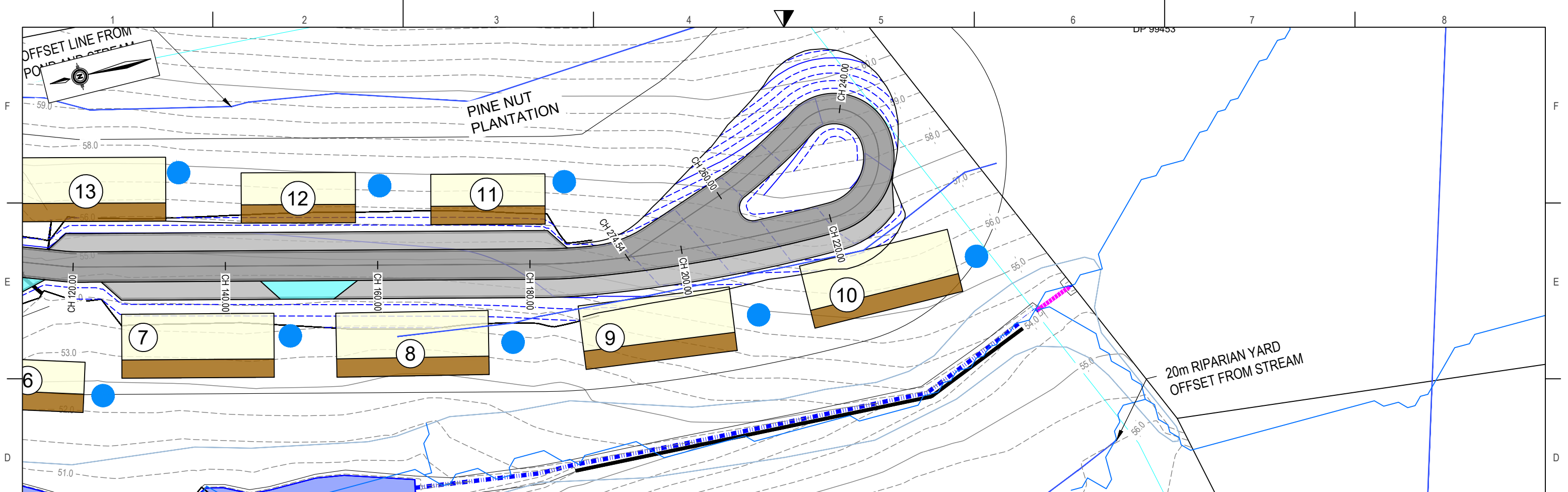
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Project	1695 Pohuehue Road Lot 1 DP 100471	Stage
Client	Pohuehue Community Housing Ltd	Dwg No. GEO-05
Project No. 25 050	RC no.	Sheet No. 5 of 13



RESOURCE CONSENT

A	Rev	Date	Description	By	Checked	DWG LONGITUDINAL SECTION - DRIVEWAY CH. 0.000 - 160.000	HAIGH WORKMAN Civil & Structural Engineers 6 Fairway Drive Kerikeri, BOI T: 09 407 8327 F: 09 407 8378 E: info@haighworkman.co.nz DIMENSIONS MUST NOT BE SCALE MEASURED FROM THESE DRAWINGS. THE CONTRACTOR SHALL CHECK & VERIFY ALL DIMENSIONS INCLUDING, SITE LEVELS, HEIGHTS AND ANGLES ON SITE PRIOR TO COMMENCING ANY WORK. THE COPYRIGHT TO THESE DRAWINGS AND ALL PARTS THERE OF REMAIN THE PROPERTY OF HAIGH WORKMAN LTD. ©2020	Project 1695 Pohuehue Road Lot 1 DP 100471	Stage	A
	A	27/05/2025	1st ISSUE	AS	JB					
	B	13/06/2025	RESOURCE CONSENT	AS	BR					
	C	28/08/2025	RPI RESPONSE	BR	JB					
						A3 SCALE H500 V250	010.0m25.0m Date 27/05/2025	Client Pohuehue Community Housing Ltd	Dwg No. LS-01	Sheet No. 6 of 13
						Drawn AS Checked BR Approved JB	File T:\CLIENTS\POHUEHUE COMMUNITY HOUSING LIMITED\25 050 - 1695 POHUEHUE ROAD, POHUEHUE\ENGINEERING\DRAWINGS\25_050_1695 POHUEHUE ROAD_EARTHWORKS.DWG	Project No. 25 050	RC no.	

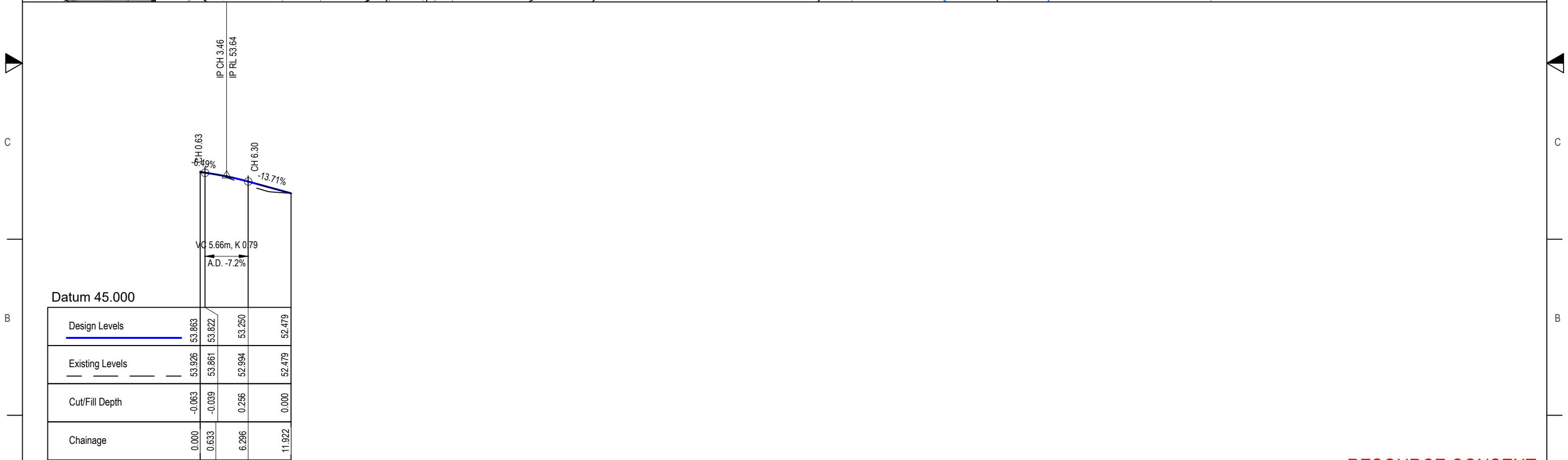
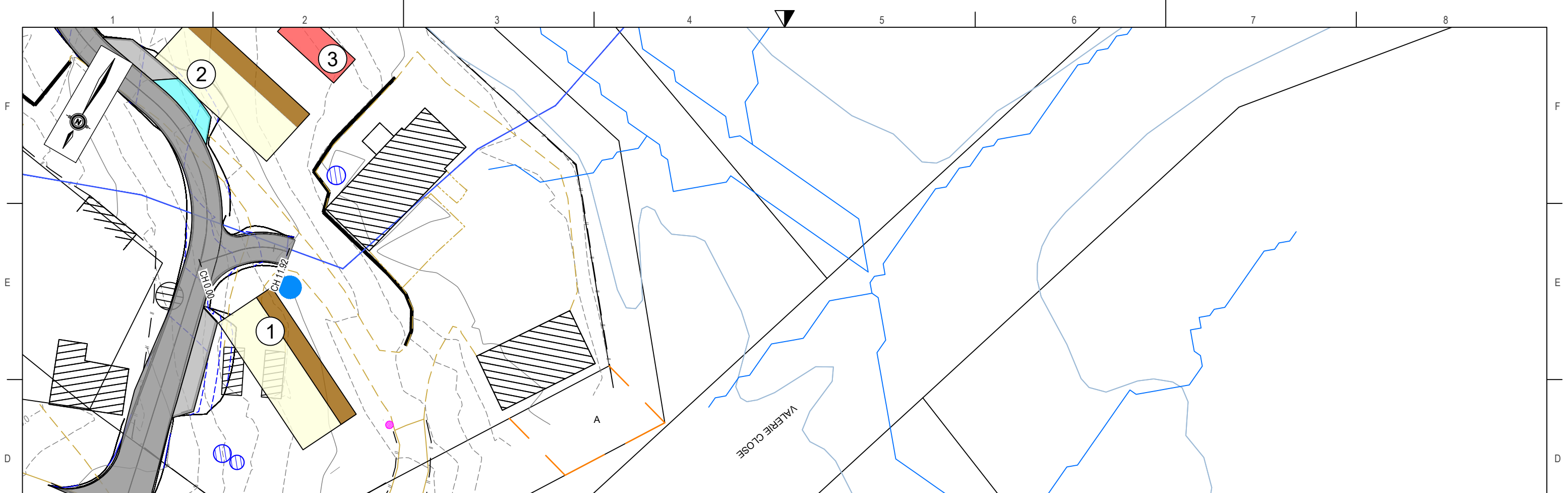


Datum 45.000

Design Levels	54.861	54.912	55.058	55.815	57.038	57.557	56.368	55.473
Existing Levels	54.70	54.838	55.016	55.94	56.987	59.233	57.301	55.555
Cut/Fill Depth	0.165	0.074	0.042	-0.122	0.051	-1.676	-0.933	-0.083
Chainage	140.000	160.000	180.000	200.000	220.000	240.000	260.000	274.539

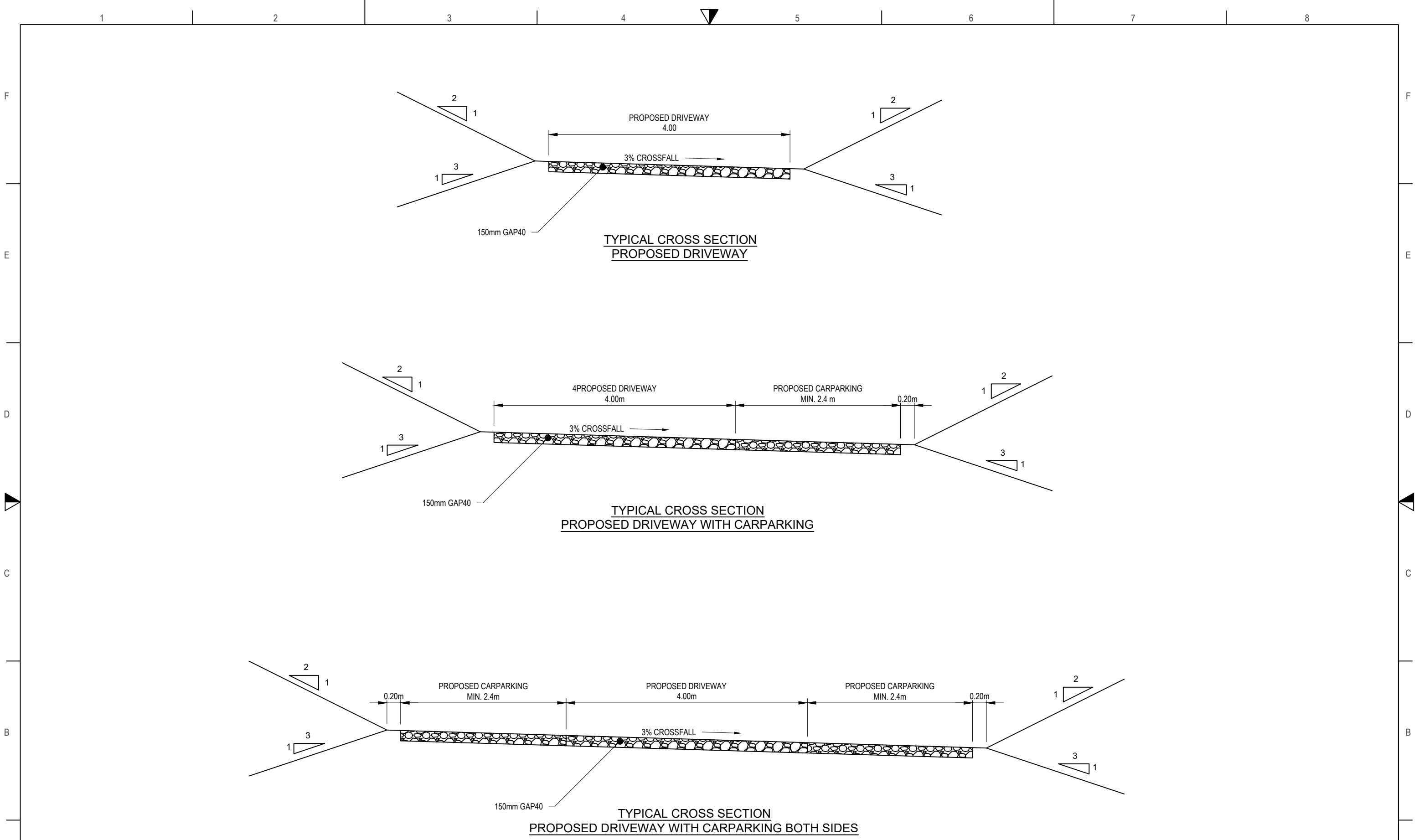
RESOURCE CONSENT

Rev	Date	Description	By	Checked	DWG DRIVEWAY CH. 140.000 - 278.169	 Civil & Structural Engineers	Project 1695 Pohuehue Road Lot 1 DP 100471		Stage
							Client Pohuehue Community Housing Ltd		Dwg No. LS-02
							Project No. 25 050		RC no.
							Sheet No. 7 of 13		
					A3 SCALE H500 V250 0 10.0m 25.0m		Date 27/05/2025		
					Drawn AS Checked BR Approved JB		DIMENSIONS MUST NOT BE SCALE MEASURED FROM THESE DRAWINGS. THE CONTRACTOR SHALL CHECK & VERIFY ALL DIMENSIONS INCLUDING, SITE LEVELS, HEIGHTS AND ANGLES ON SITE PRIOR TO COMMENCING ANY WORK. THE COPYRIGHT TO THESE DRAWINGS AND ALL PARTS THEREOF REMAIN THE PROPERTY OF HAIH WORKMAN LTD. ©2020		
					File T:\CLIENTS\POHUEHUE COMMUNITY HOUSING LIMITED\25 050 - 1695 POHUEHUE ROAD, POHUEHUE\ENGINEERING\DRAWINGS\25_050_1695 POHUEHUE ROAD_EARTHWORKS.DWG				



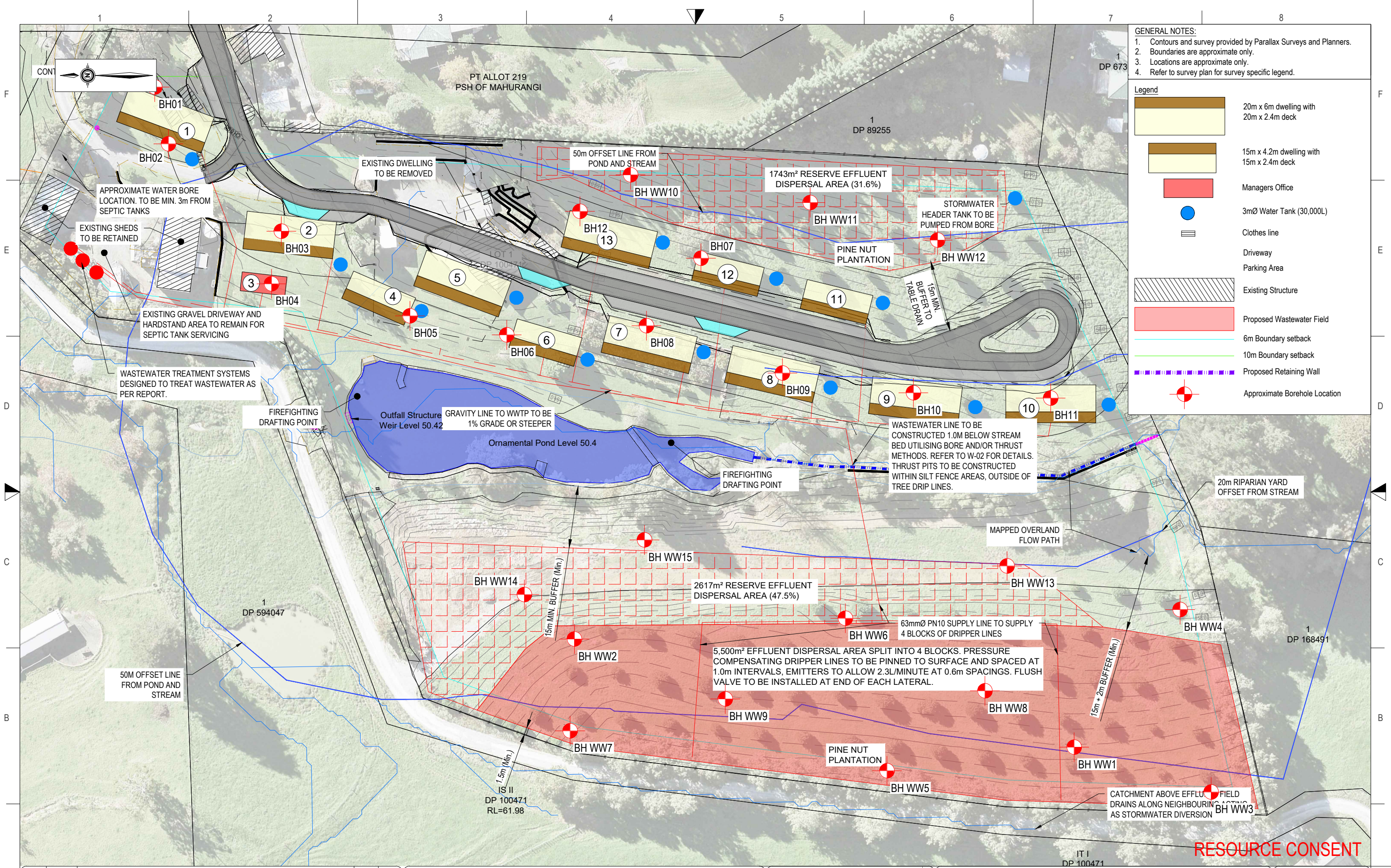
RESOURCE CONSENT

A	Rev	Date	Description	By	Checked	DWG LONGITUDINAL SECTION - DRIVEWAY 2 CH. 0.000 - 11.922	HAIGH WORKMAN Civil & Structural Engineers 6 Fairway Drive Kerikeri, BOI T: 09 407 8327 F: 09 407 8378 E: info@haighworkman.co.nz DIMENSIONS MUST NOT BE SCALE MEASURED FROM THESE DRAWINGS. THE CONTRACTOR SHALL CHECK & VERIFY ALL DIMENSIONS INCLUDING, SITE LEVELS, HEIGHTS AND ANGLES ON SITE PRIOR TO COMMENCING ANY WORK. THE COPYRIGHT TO THESE DRAWINGS AND ALL PARTS THERE OF REMAIN THE PROPERTY OF HAIGH WORKMAN LTD. ©2020	Project 1695 Pohuehue Road Lot 1 DP 100471		Stage	A
	A	27/05/2025	1st ISSUE	AS	JB			Client Pohuehue Community Housing Ltd	Dwg No. LS-03		
	B	13/06/2025	RESOURCE CONSENT	AS	BR				Project No. 25 050	RC no.	
	C	28/08/2025	RFI RESPONSE	AS	JB						
						A3 SCALE H500 V250	0 10.0m 25.0m	Date 27/05/2025			
						Drawn AS	Checked BR	Approved JB			
						File	T:\CLIENTS\POHUEHUE COMMUNITY HOUSING LIMITED\25 050 - 1695 POHUEHUE ROAD, POHUEHUE\ENGINEERING\DRAWINGS\25_050_1695 POHUEHUE ROAD_EARTHWORKS.DWG				



RESOURCE CONSENT

A	Rev	Date	Description	By	Checked	DWG TYPICAL CROSS SECTIONS		 6 Fairway Drive Kerikeri, B01 T: 09 407 8327 F: 09 407 8378 E: info@haighworkman.co.nz DIMENSIONS MUST NOT BE SCALE MEASURED FROM THESE DRAWINGS. THE CONTRACTOR SHALL CHECK & VERIFY ALL DIMENSIONS INCLUDING, SITE LEVELS, HEIGHTS AND ANGLES ON SITE PRIOR TO COMMENCING ANY WORK. THE COPYRIGHT TO THESE DRAWINGS AND ALL PARTS THERE OF REMAIN THE PROPERTY OF HAIGH WORKMAN LTD. ©2020	Project 1695 Pohuehue Road Lot 1 DP 100471		Stage	A
	A	27/05/2025	1st ISSUE	AS	JB				Dwg No. DE-01			
	B	13/06/2025	RESOURCE CONSENT	AS	BR				Pohuehue Community Housing Ltd			
	C	28/08/2025	RPI RESPONSE	BR	JB							
							A3 SCALE Not to Scale			Date 27/05/2025		
					Drawn AS	Checked BR	Approved JB					
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								Client Pohuehue Community Housing Ltd		Sheet No. 9 of 13		
								Project No. 25 050		RC no.		



- GENERAL NOTES:**
- Contours and survey provided by Parallax Surveys and Planners.
 - Boundaries are approximate only.
 - Locations are approximate only.
 - Refer to survey plan for survey specific legend.
- Legend**
- 20m x 6m dwelling with 20m x 2.4m deck
 - 15m x 4.2m dwelling with 15m x 2.4m deck
 - Managers Office
 - 3mØ Water Tank (30,000L)
 - Clothes line
 - Driveway
 - Parking Area
 - Existing Structure
 - Proposed Wastewater Field
 - 6m Boundary setback
 - 10m Boundary setback
 - Proposed Retaining Wall
 - Approximate Borehole Location

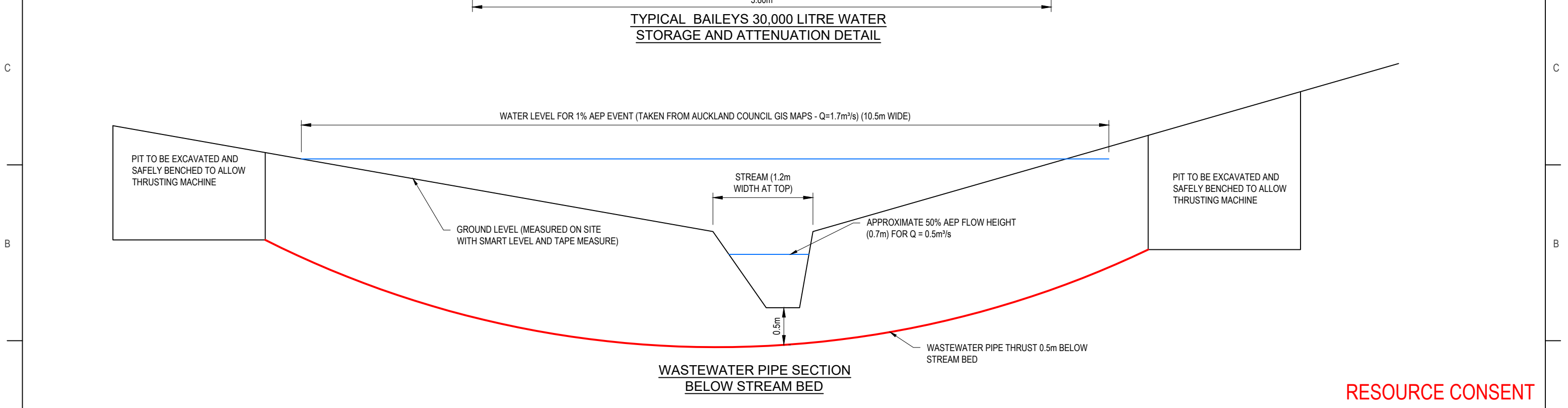
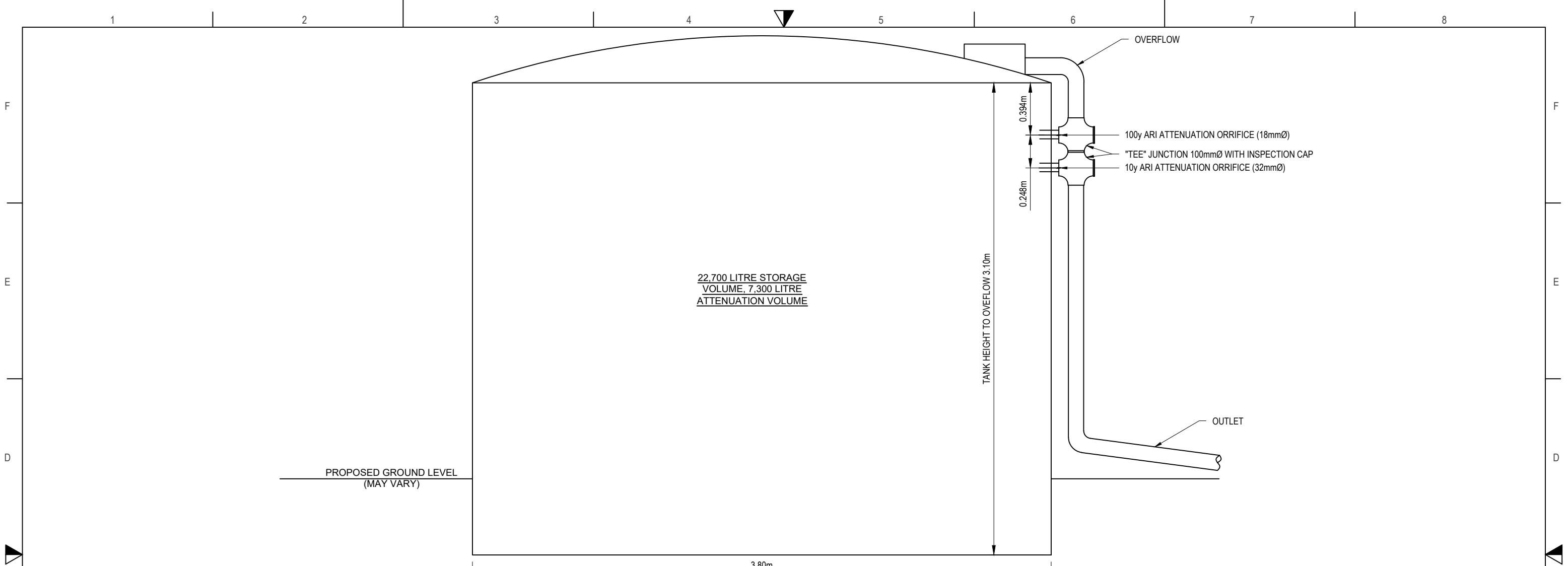
Rev	Date	Description	By	Checked	DWG	WASTEWATER AND STORMWATER PLAN	Project	1695 Pohuehue Road Lot 1 DP 100471	Stage
A	27/05/2025	1st ISSUE	AS	JB					
B	13/06/2025	RESOURCE CONSENT	AS	BR					
C	28/08/2025	RFI RESPONSE	BR	JB					
D	29/10/2025	UPDATED FOR RFI	BR	JB					
E	18/12/2025	UPDATED SEPTIC SYSTEM	BR	JB					

3	4	5	6	7	8	9	10	11	12	13
BH01	BH02	BH03	BH04	BH05	BH06	BH07	BH08	BH09	BH10	BH11
BH WW1	BH WW2	BH WW3	BH WW4	BH WW5	BH WW6	BH WW7	BH WW8	BH WW9	BH WW10	BH WW11
BH WW12	BH WW13	BH WW14	BH WW15							

0	15m	37.5m
A3 SCALE 1:750		
Drawn AS	Checked BR	Approved JB
Date	27/05/2025	

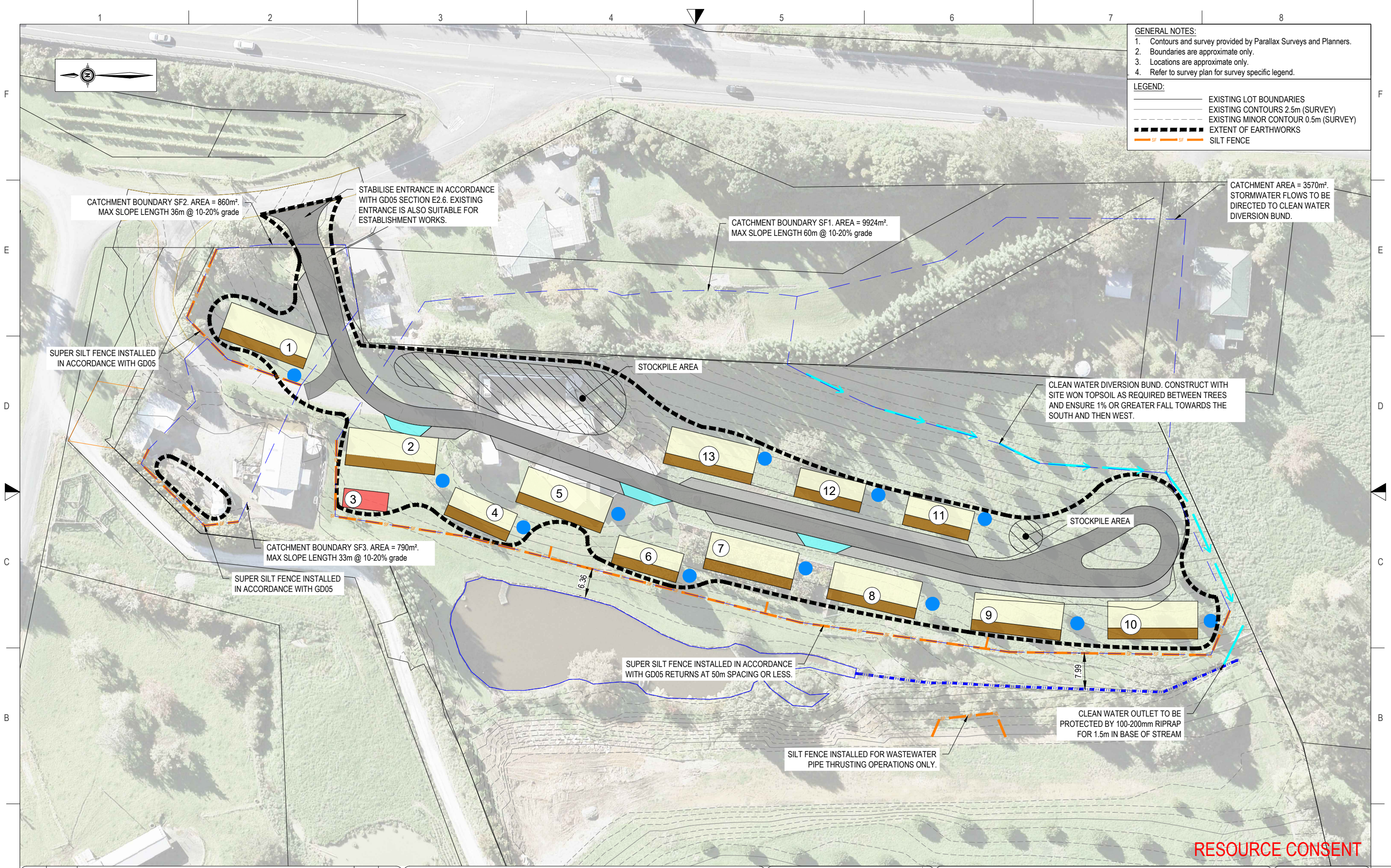
6 Fairway Drive Kerikeri, BOI	T: 09 407 8327 F: 09 407 8378 E: info@haighworkman.co.nz
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Project No. 25 050	RC no.
Pohuehue Community Housing Ltd	
Dwg No. W-01	
Sheet No. 10 of 13	



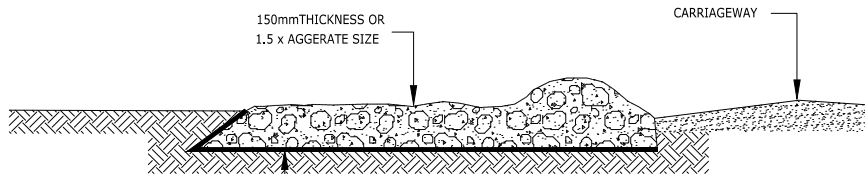
RESOURCE CONSENT

A	Rev	Date	Description	By	Checked	DWG STORMWATER AND WASTEWATER DETAILS			 HAIGH WORKMAN Civil & Structural Engineers 6 Fairway Drive Kerikeri, B01 T: 09 407 8327 F: 09 407 8378 E: info@haighworkman.co.nz DIMENSIONS MUST NOT BE SCALE MEASURED FROM THESE DRAWINGS. THE CONTRACTOR SHALL CHECK & VERIFY ALL DIMENSIONS INCLUDING, SITE LEVELS, HEIGHTS AND ANGLES ON SITE PRIOR TO COMMENCING ANY WORK. THE COPYRIGHT TO THESE DRAWINGS AND ALL PARTS THERE OF REMAIN THE PROPERTY OF HAIGH WORKMAN LTD. ©2020	Project 1695 Pohuehue Road Lot 1 DP 100471		Stage	A
	A	27/05/2025	1st ISSUE	AS	JB	A3 SCALE Not to Scale		Date 27/05/2025		Client Pohuehue Community Housing Ltd	Dwg No. W-02		
	B	13/06/2025	RESOURCE CONSENT	AS	BR								
	C	28/08/2025	RFI RESPONSE	BR	JB	Drawn AS	Checked BR	Approved JB		Project No. 25 050	RC no.		
	D	29/10/2025	UPDATED FOR RFI	BR	JB								
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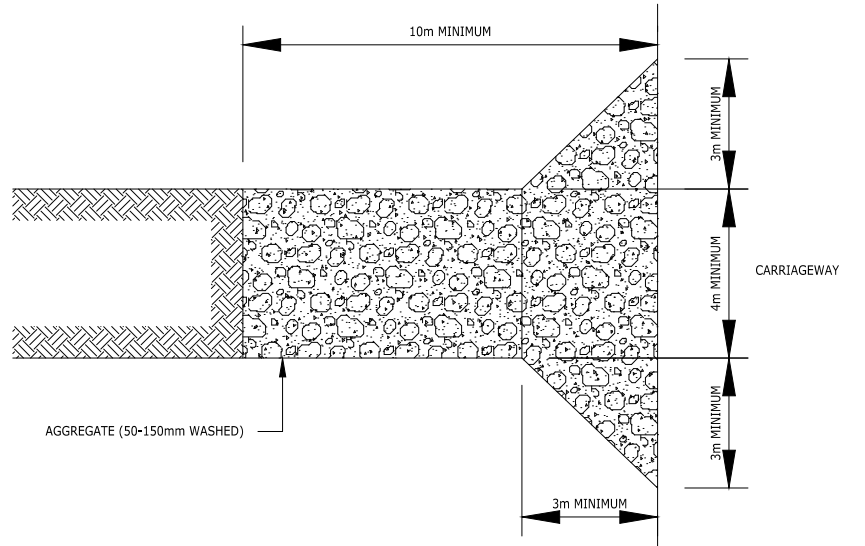


- GENERAL NOTES:**
- Contours and survey provided by Parallax Surveys and Planners.
 - Boundaries are approximate only.
 - Locations are approximate only.
 - Refer to survey plan for survey specific legend.
- LEGEND:**
- EXISTING LOT BOUNDARIES
 - EXISTING CONTOURS 2.5m (SURVEY)
 - EXISTING MINOR CONTOUR 0.5m (SURVEY)
 - EXTENT OF EARTHWORKS
 - SILT FENCE

A	Rev	Date	Description	By	Checked	DWG Erosion and Sediment Control Plan				HAIGH WORKMAN Civil & Structural Engineers 6 Fairway Drive Kerikeri, BOI T: 09 407 8327 F: 09 407 8378 E: info@haighworkman.co.nz DIMENSIONS MUST NOT BE SCALE MEASURED FROM THESE DRAWINGS. THE CONTRACTOR SHALL CHECK & VERIFY ALL DIMENSIONS INCLUDING, SITE LEVELS, HEIGHTS AND ANGLES ON SITE PRIOR TO COMMENCING ANY WORK. THE COPYRIGHT TO THESE DRAWINGS AND ALL PARTS THERE OF REMAIN THE PROPERTY OF HAIGH WORKMAN LTD. ©2020	Project 1695 Pohuehue Road Lot 1 DP 100471		Stage	A	
	A	21/08/2025	RESOURCE CONSENT	BR	JB						Client Pohuehue Community Housing Ltd	Dwg No. ESCP-01			
	B	29/10/2025	Updated for RFI	BR	JB							Project No. 25 050	RC no.		Sheet No. 13 of 13
							A3 SCALE 1:750 0 15m 37.5m Date 21/08/2025								
							Drawn BR Checked BR Approved JB								
							File T:\CLIENTS\POHUEHUE COMMUNITY HOUSING LIMITED\25 050 - 1695 POHUEHUE ROAD, POHUEHUE\ENGINEERING\DRAWINGS\25_050_1695 POHUEHUE ROAD_EARTHWORKS.DWG								



SIDE ELEVATION



PLAN VIEW

STABILISED CONSTRUCTION ENTRANCE

STABILISED CONSTRUCTION ENTRANCE - SPECIFICATIONS:

APPLICATION

USE A STABILISED CONSTRUCTION ENTRANCE AT ALL POINTS OF CONSTRUCTION SITE INGRESS AND EGRESS WITH A CONSTRUCTION PLAN LIMITING TRAFFIC TO THESE ENTRANCES ONLY.

DESIGN:

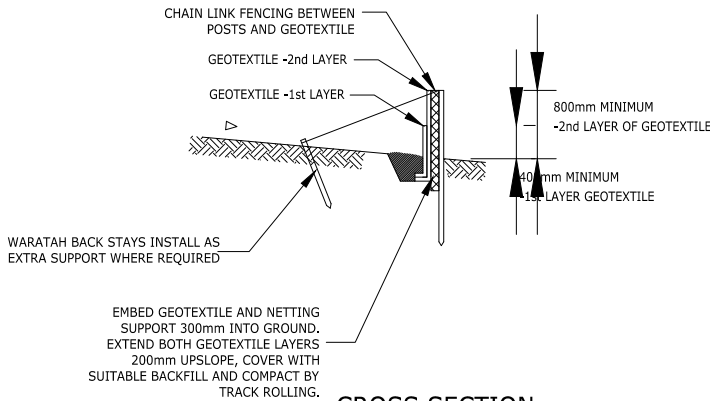
- CLEAR THE ENTRANCE AND EXIT AREA OF ALL VEGETATION, ROOTS AND OTHER UNSUITABLE MATERIAL AND PROPERLY GRADE IT.
- LAY WOVEN GEOTEXTILE; PIN DOWN EDGES AND OVERLAP JOINS;
- PROVIDE DRAINAGE TO CARRY RUNOFF FROM THE STABILISED CONSTRUCTION ENTRANCE TO A SEDIMENT CONTROL MEASURE.
- PLACE AGGREGATE TO THE SPECIFICATIONS BELOW AND SMOOTH IT.

STABILISED CONSTRUCTION ENTRANCE AGGREGATE SPECIFICATIONS:

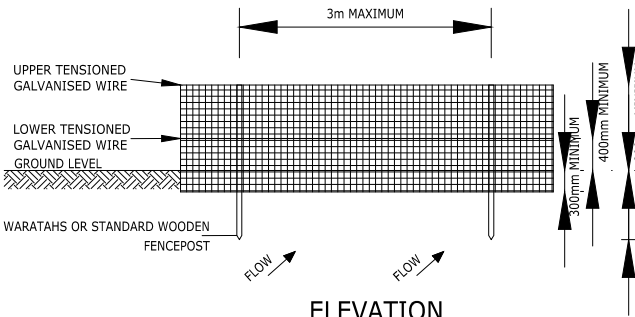
AGGREGATE SIZE	50-150mm WASHED AGGREGATE
THICKNESS	150mm MINIMUM OR 1.5 x AGGREGATE SIZE
LENGTH	10m MINIMUM LENGTH RECOMMENDED
WIDTH	4m MINIMUM

MAINTENANCE

- MAINTAIN THE STABILISED CONSTRUCTION ENTRANCE IN A CONDITION TO PREVENT SEDIMENT FROM LEAVING THE CONSTRUCTION SITE. AFTER EACH RAINFALL INSPECT ANY STRUCTURE USED TO TRAP SEDIMENT FROM THE STABILISED CONSTRUCTION ENTRANCE AND CLEAN OUT AS NECESSARY.
- WHEN WHEEL WASHING IS ALSO REQUIRED, ENSURE THIS IS DONE ON AN AREA STABILISED WITH AGGREGATE WHICH DRAINS TO AN APPROVED SEDIMENT RETENTION FACILITY.

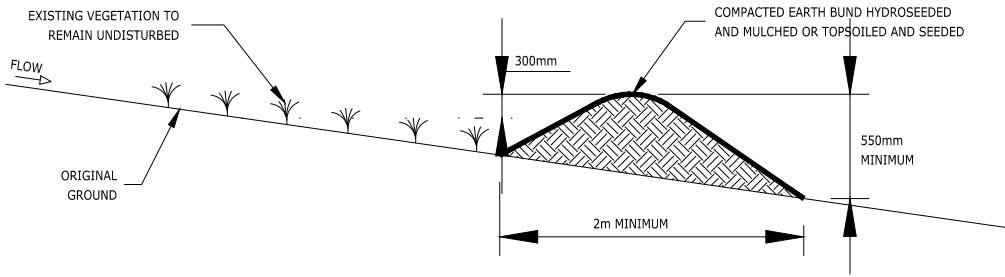


CROSS SECTION



ELEVATION

SUPER SILT FENCE CONSTRUCTION



CLEANWATER RUNOFF DIVERSION BUND - CROSS SECTION (1)

GENERAL NOTES:

STABILISED ENTRANCE.

THERE IS EXISTING ACCESS TO THE SITE FROM VALERIE CLOSE. THE EXISTING ENTRANCE IS SUITABLE AS A STABILISED ENTRANCE DURING CONSTRUCTION AND THE NEW ACCESS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE ESCP AND GD05 IF IT IS TO BE USED AS CONSTRUCTION TRAFFIC.

SURFACE ROUGHENING.

CUT AND FILL BATTER SLOPES SHOULD BE ROUGHENED BY TRACK ROLLING AS SPECIFIED IN GD05

TOPSOILING AND GRASS SEEDING.

THE CLEAN WATER DIVERSION BUND SHALL BE MULCHED DURING AFTER PLACEMENT. ANY OPEN AREAS SHALL BE TOPSOILED AND RE-GRASSED AS SOON AS PRACTICABLE FOLLOWING COMPLETION OF EARTHWORKS.

MAINTENANCE.

SILT CONTROLS (SILT FENCES) SHALL BE CHECKED ON A REGULAR BASIS AND IMMEDIATELY PRIOR TO AND FORECAST FOR RAIN. MAINTENANCE SHALL BE CARRIED OUT AS NECESSARY AND ANY BUILD-UP OF SILT REMOVED FOLLOWING RAIN EVENTS.

HEAVY OR PROLONGED RAINFALL

WHERE HEAVY RAIN IS FORECAST, THE SITE WILL BE STABILISED AS MUCH AS PRACTICABLE AND SEDIMENT CONTROL MEASURES CHECKED TO ENSURE THE ARE IN CORRECT WORKING CONDITION. EARTHWORKS OPERATIONS WILL CEASE DURING HEAVY OR PROLONGED RAINFALL EVENTS. PRIOR TO WORK RESUMING, ALL SEDIMENT CONTROL MEASURES WILL BE INSPECTED AND MAINTAINED AS NECESSARY

RESOURCE CONSENT

Rev	Date	Description	By	Checked
-A	29/10/2025	RESOURCE CONSENT	-BR	-JB

DWG		Erosion and Sediment Control Details	
A3 SCALE		1:750	
0		15m	
37.5m		Date	
28/10/2025		Drawn BR	
Checked JB		Approved JB	
File		T:\CLIENTS\POHUEHUE COMMUNITY HOUSING LIMITED\25 050 - 1695 POHUEHUE ROAD, POHUEHUE\ENGINEERING\DRAWINGS\25_050_1695 POHUEHUE ROAD_EARTHWORKS.DWG	

 HAIGH WORKMAN INC Civil & Structural Engineers	
6 Fairway Drive Kerikeri, BOI	T: 09 407 8327 F: 09 407 8378 E: info@haighworkman.co.nz
DIMENSIONS MUST NOT BE SCALE MEASURED FROM THESE DRAWINGS. THE CONTRACTOR SHALL CHECK & VERIFY ALL DIMENSIONS INCLUDING, SITE LEVELS, HEIGHTS AND ANGLES ON SITE PRIOR TO COMMENCING ANY WORK. THE COPYRIGHT TO THESE DRAWINGS AND ALL PARTS THERE OF REMAIN THE PROPERTY OF HAIGH WORKMAN LTD. ©2020	

Project	1695 Pohuehue Road Lot 1 DP 100471	Stage
Client	Pohuehue Community Housing Ltd	Dwg No. ESCP-02
Project No.	25 050	RC no.
		Sheet No. 13 of 13

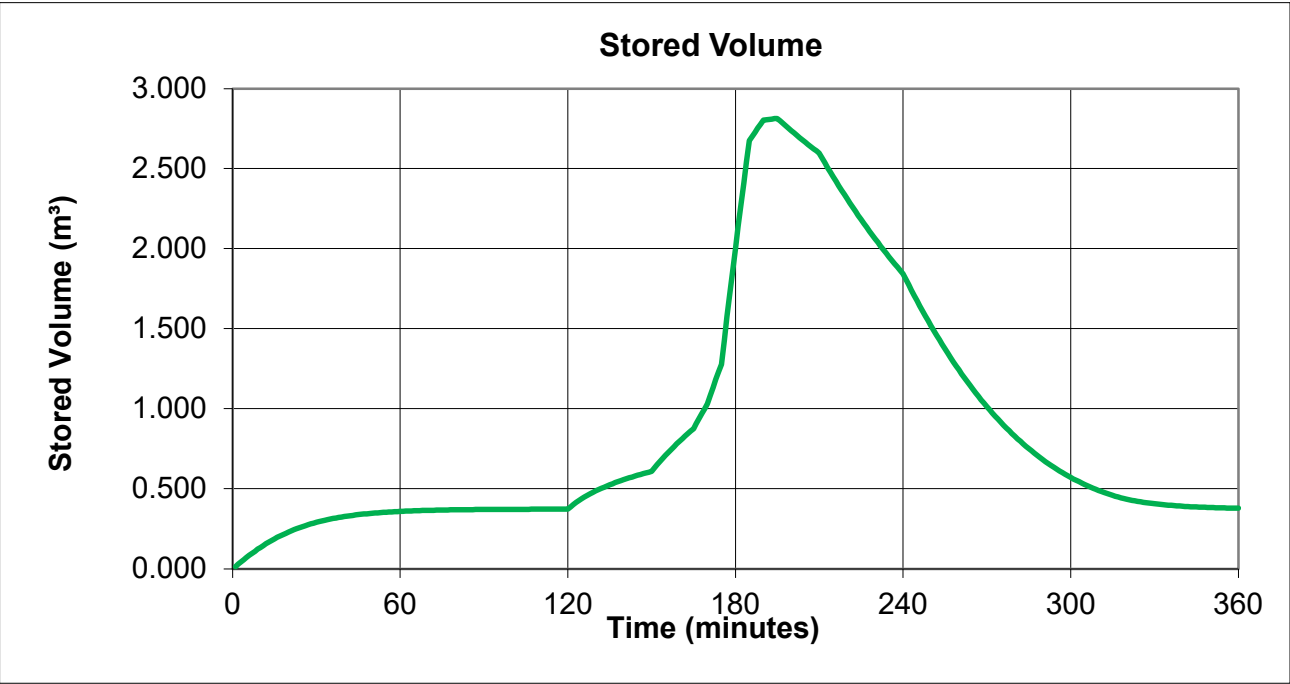
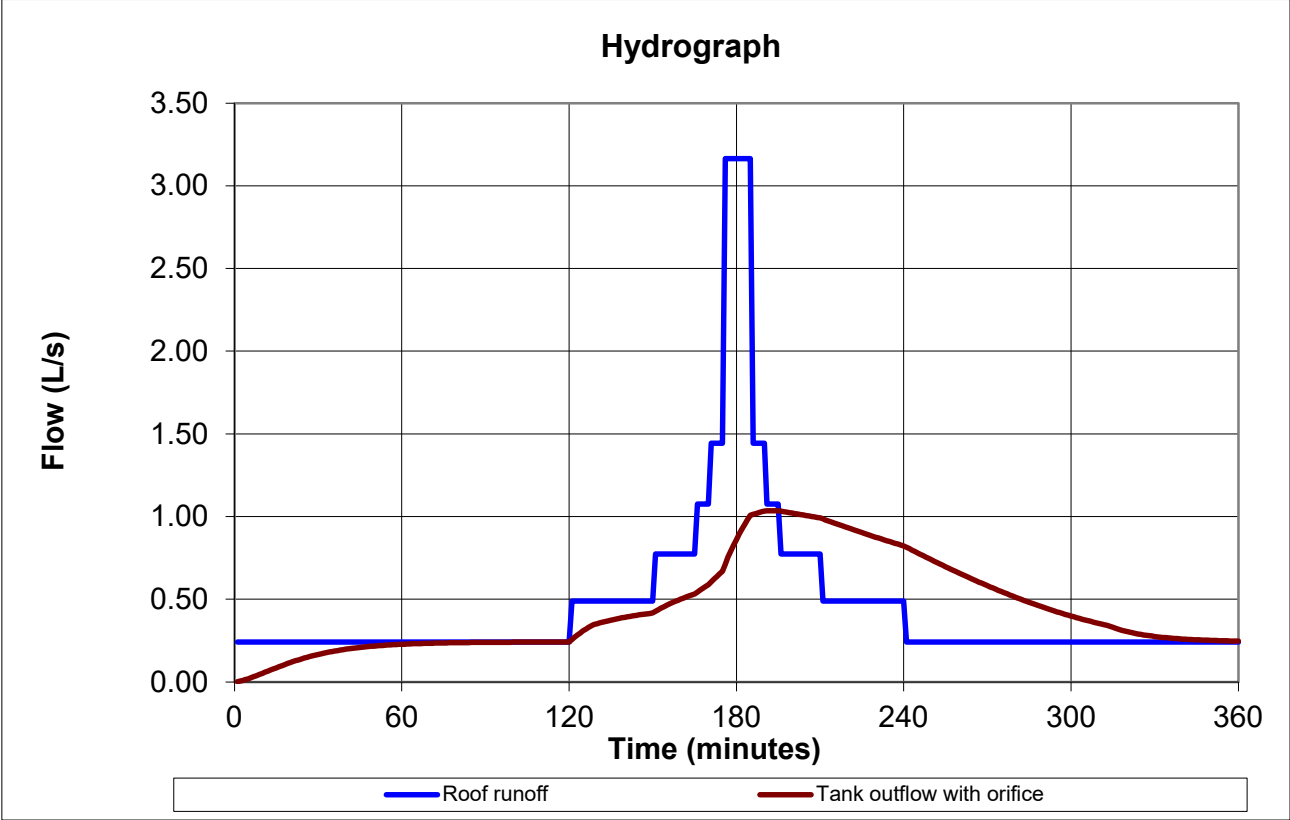
Appendix B – Stormwater calculations

Stormwater Runoff Calculation
Haigh Workman Ltd

Project Number 25 050

Project: Development of Lot 1 DP 100471
Location: 1695 Pohuehue Road
Client: Poehuehue Community Housing Ltd.
Designer: Ben Richardson
Date: 18/06/2025

Roof area 102 m2
Area of tank 11.3 m2
Diameter of lower orifice 32 mm
Maximum attenuation 2.1 L/s
Height from Overflow 395 mm

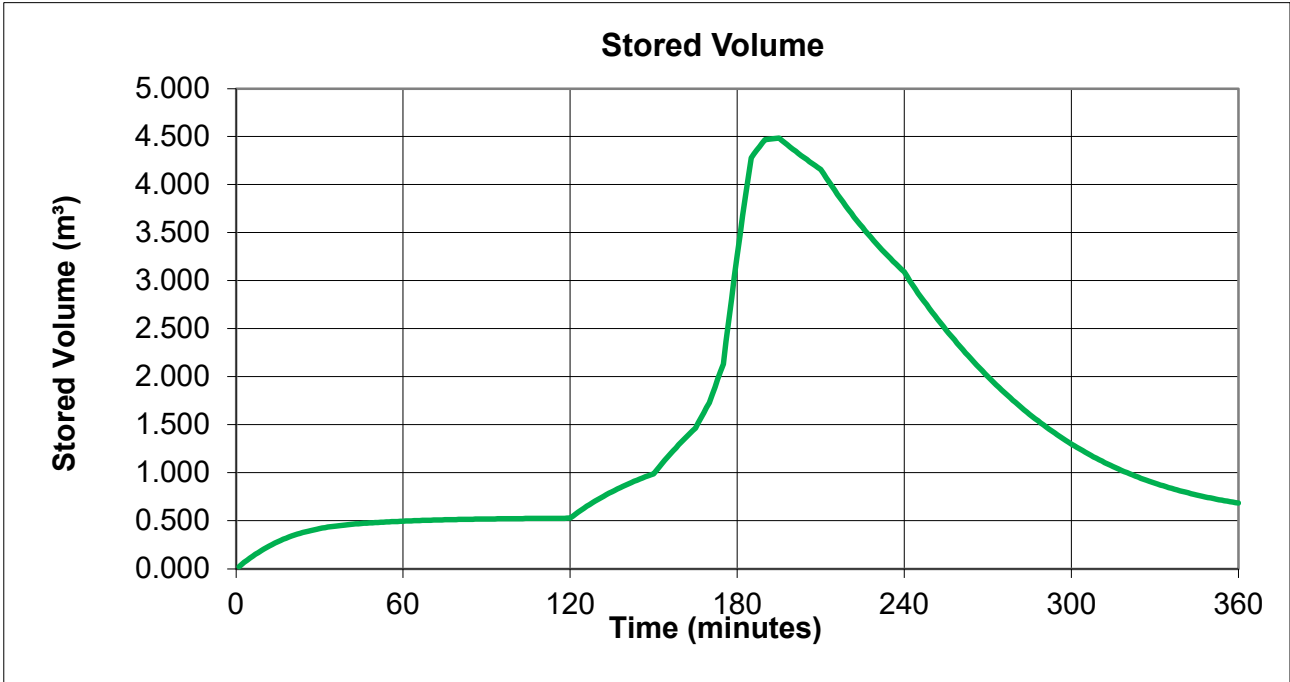
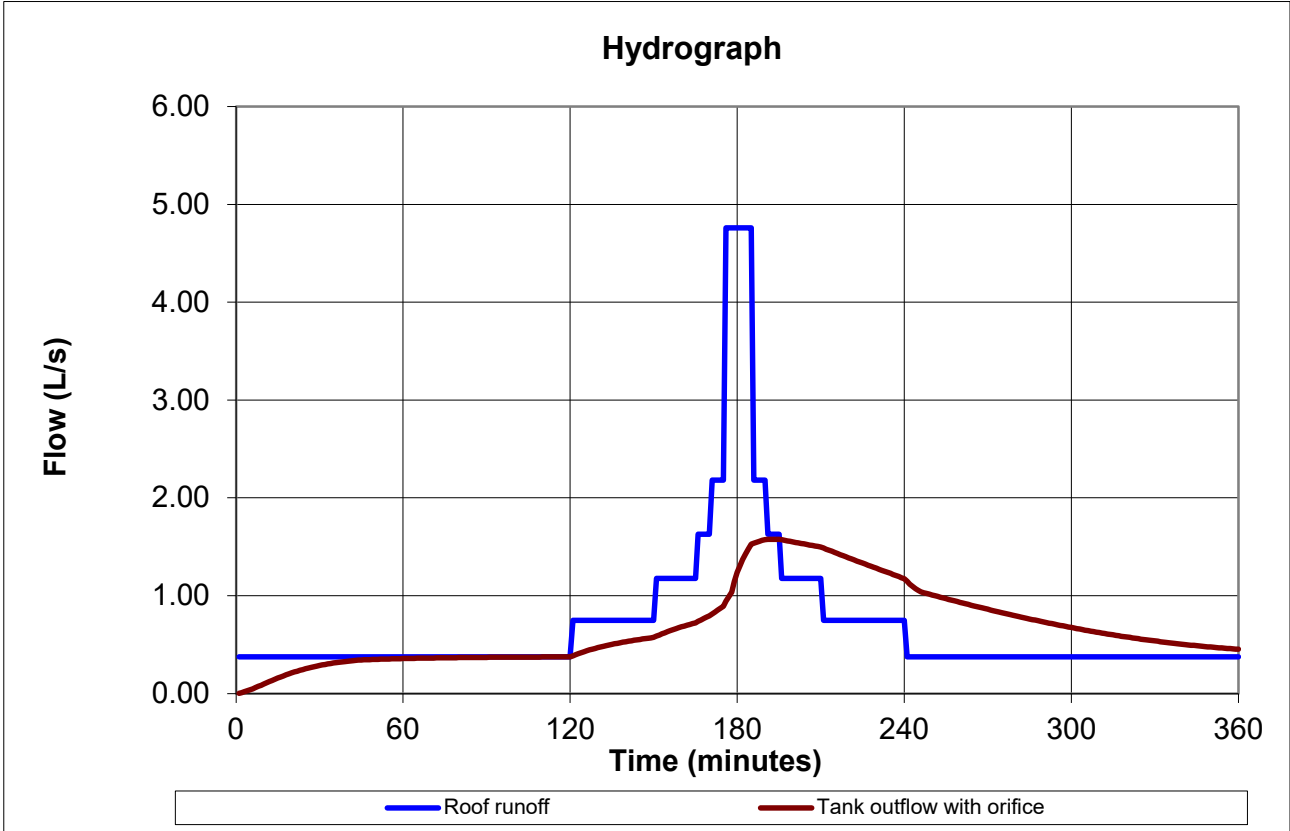


Stormwater Runoff Calculation
Haigh Workman Ltd

Project Number 25 050

Project: Development of Lot 1 DP 100471
Location: 1695 Pohuehue Road
Client: Poehuehue Community Housing Ltd.
Designer: Ben Richardson
Date: 18/06/2025

Roof area 102 m2
Area of tank 11.3 m2
Diameter of upper orifice 18 mm
Maximum attenuation 3.2 L/s
Height from Overflow 147 mm



Stormwater Runoff Calculation
Haigh Workman Ltd

Project: Development of Lot 1 DP 100471
 Location: 1695 Pohuehue Road
 Client: Poehuehue Community Housing Ltd.
 Designer: Ben Richardson
 Date: 18/06/25
 REF: 25 050

Surface definitions (for this site)

Impermeable	Permeable
Buildings (roof area)	Heavy Clay Pasture/Bush Cover

Design Additional Impermeable Area

Component	Units	Area (m²)	Total Area (m²)
6 bedroom roof	8	116.0	928.0
3 bedroom roof	4	64.0	256.0
Managers unit	1	45.0	45.0
		Total	1,229.0

Proposed Future Condition

	Area m2	C	i2 mm/hr	Q2 L/s	i10 mm/hr	Q10 L/s	i100 mm/hr	Q100 L/s
Roof Area	1,229	0.90	81	24.89	123.6	37.98	186	57.1
Average per Tank (12 tanks)	102	0.90	81	2.07	123.6	3.16	186	4.8

Current Condition

	Area m2	C	i2 mm/hr	Q2 L/s	i10 mm/hr	Q10 L/s	i100 mm/hr	Q100 L/s
Heavy Clay Pasture/Bush cover	1,229	0.35	81	9.68	123.6	14.77	186	22.2

TOTAL Difference
 (increased runoff)

Q2 L/s
15.2

Q10 L/s
23.2

Q100 L/s
34.9

Per Tank Difference
 (increased runoff)

Q2 L/s
1.4

Q10 L/s
2.1

Q100 L/s
3.2

Appendix C – Wastewater calculations, specifications and TP58

ENVIRONMENTAL EFFECTS, MITIGATION MEASURES

A. Assessment of Environmental Effects

Impact on Surface Water (incl. flood times) Minor

Impact on Ground Water Minor

Impact on Soils Very minor

Impact on Amenity Values Minor

B Public Health Issues:

Should access to the disposal area be discouraged? Yes

Will odour effects be greater than usual? No

Will noise effects be greater than usual? No

C. Mitigation Measures

Has conservative approach been taken in choosing system design capacity? Yes

Is system design robust (cope with fluctuations of load, climate)? Yes

Is level of treatment high? Medium – final treatment within soil

Protection against failure storage, alarms? Alarm

Is hydraulic loading rate conservative? Yes

Is distribution area protected from hydraulic overload (interception drains)? Yes

Will soil type enhance treatment? Yes

Are desired separation distances attainable? (to surface water, groundwater, bores) Yes

Is the reserve area adequate? Yes

Project Name	SW and WW report
Project Number	25 050
Client Name	Pohuehue Community Housing Ltd.
Address	1695 Pohuehue Road
Designer	BR
Date	20/05/2025

Hazen - Williams for smooth pipes

$$H/L = 662 Q^{1.85} D^{-4.87}$$

H/L in m/m

Q in L/min

D in mm

Delivery line

External Diameter	63	▼
Pressure Rating	PN 10	▼
Internal diameter	51 mm	
Length	250 m	
Elevation lift to highest dripper	15 m	
Elevation lift to lowest dripper	10 m	

Dripper line

Area required	5500 m2
Lateral spacing	1.0 m
Length per lateral	50 m
Linear length of dripper line	5500m
Dripper spacing	0.6 m
Flow rate/dripper	2.30 L/hr
No. of drippers	9167
No. Of blocks	4
Flow rate to dripper field	87.8 L/min

Irrigation Hydraulics

Pump type	Lowara Scuba SC411	▼
Required residual pressure	10 m	
Unblocked filter head loss	2 m	from Rory - feel free to change
Blocked filter head loss	5 m	from GD06
Delivery line velocity	0.71 m/s	
Delivery line headloss	3.04 m	
Pump total head	45 m	
Head at start of top dripperline	22 m	OK
Maximum emitter pressure	30 m	check emitter datasheet

Note: negligible losses from DNL valves

Delivery line

External Diameter	63
Pressure Rating	PN 10
Internal diameter	51 mm
Length	250m
Elevation lift	15m

Flushing Hydraulics

Number of laterals	110
Laterals per flush valve	1
Delivery line Headloss	3.88 m
Frictional loss through dripline	8.58 m
Diameter of dripline	14.2 mm from product data sheets
Kd value for emitters	1.3 from product data sheets
x-sectional area of dripperline	1.58E-04 m ²
Number of emitters per lateral	83.33333333
Flow per lateral	0.21 L/s
Total loss due to emitters	9.46 m
Length of return line	0 m assume same pipe type as delivery line
Return line headloss	0.00 m
Dynamic head (m)	39 m
Q calculated	100.3 L/min
Q flush	12.4 L/min
Q test	100.3 L/min
Root	0.000
Flush velocity	1.31 m/s OK
Head at lowest drip line	21 m
Head at highest drip line	16 m

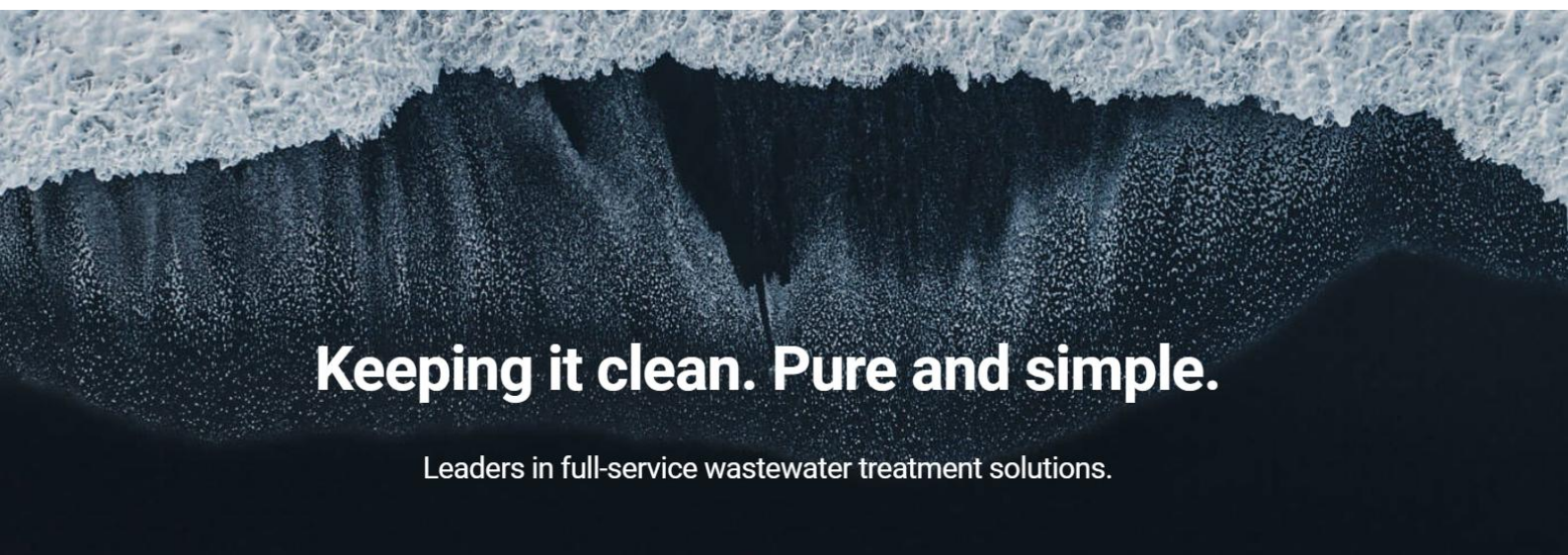
Dosing volume

Volume of dripperfield	218 L
Specified dosing volume	1200 L Approx. 200 L
Length of time per dose	14 min
Volume per emitter per dose	0.13 L

Leaders in full-service wastewater treatment solutions.



**WASTEWATER SYSTEM SPECIFICATION
FOR
POHUEHUE COMMUNITY HOUSING LTD**

A close-up, high-magnification photograph of a water surface, showing a complex, textured pattern of light and dark areas, likely representing the surface tension and flow of water. This image serves as a background for the bottom section of the page.

Keeping it clean. Pure and simple.

Leaders in full-service wastewater treatment solutions.

1st December 2025

Pohuehue Community Housing Ltd
1695 Pohuehue Road
Warkworth

RE: - WASTEWATER SYSTEM SPECIFICATIONS AND PRICING

Dear Bill

Thank you for the opportunity to provide a system specification on the wastewater requirements, for Pohuehue Community Housing Ltd

Waimauku-based Reflection Treatment Systems has an outstanding reputation for quality delivery in the wastewater treatment sector. Since its inception in 1995, the company has specialised in the design, manufacture, implementation and ongoing monitoring and maintenance of wastewater treatment plants and disposal systems, and is today recognised as one of the most experienced, capable companies of its kind in New Zealand.

Providing turnkey solutions for wastewater treatment plants and disposal systems for the public sector and for commercial and residential purposes, we stand apart in our industry for the quality service and technically-advanced products that are an integral part of the 4,000 systems we have installed. In addition, we provide an excellent service for the 400 systems we inspect, monitor, maintain and service every month.

The Reflection Treatment Systems team is outstanding, which is a result of the skills and experience of our key team members, their longevity with Reflection (ten years average), and the exceptional length of time they have worked together on projects identical or very similar in nature to this one.

As a team, they are unified in their commitment to 'getting it right first time' and doing whatever it takes for projects to be delivered at the highest possible level; as individuals, they are hugely knowledgeable and experienced. The depth and integration of their skills is in no small way the key to our success.

Our Contract Manager for this contract – Nigel Paull – has a strong vested interest in ensuring that our reputation for excellence is retained and, wherever possible, boosted even further on every project we undertake. It's about reaching beyond expectations and yesterday's achievements, and extending this commitment for excellence and continued improvement to each member of the Reflections' team.

- **Extensive experience in identical/similar projects:** We have designed manufactured and installed more than 3000 wastewater treatment and disposal systems (100 of them for public works and commercial facilities) – and we service 300 systems every month. This provides your client with certainty that we can deliver the requirements of the contract

- **Employees, not subcontractors:** With the exception of an electrician, our crew will be our own employees – not subcontractors. This key point of difference eliminates miscommunications and conflicts between contractor and subcontractors, and ensures that the entire team works under our own rigorous management systems. The result is a quicker, smoother, safer project delivery, and clear accountability by Reflection
- **Speed:** Many of our clients are surprised at our quick delivery of projects. This is the result of our efficient methodologies and a unified team who know their work thoroughly and ‘just get on with the job’ every day. A top priority will be to ensure this project is carried out in the shortest possible time with no compromise to quality
- **Capability:** We own all of the plant and equipment required for this contract (other than the HIAB crane for transporting) which will avoid the risk of delays due to equipment hireage.
- **Cost efficiencies:** Our knowledgeable team and streamlined processes keep costs as low as possible so that we can pass cost efficiencies on wherever possible to the council
- **Outstanding quality management:** We meet our clients’ and our own exacting standards project after project and are committed to doing the same on this contract. We have never received a formal complaint and have never been required to carry out a rework (other than for minor remedial): we intend to continue with this on this project.

Working with other stakeholders: Reflections has worked on many large commercial projects, often having to communicate between multiple stake holders and concessionaires. We understand the importance of communication between all parties involved or impacted by our work and work hard to mitigate any issues.

At Reflection Treatment Systems, our specialist capabilities, resources and capacity, backed by our relevant experience and track record, will combine to undertake every aspect of this contract.

Kind regards

Nigel Paull
Managing Director

PROPOSED SYSTEM SPECIFICATIONS – 10,980L/Day

The system design is based on the information provided by Haigh Workman and has been specified to meet a design flow of 10,980L/day. The system has been designed to treat wastewater with an influent strength having a BOD of 300mg/L, TSS of 200mg/L

PRIMARY TREATMENT

Septic Tank

One 25,000 litre, solid pour concrete tank will be installed to act as the systems 25,000 litre Septic Tank.

This tank will act as the primary stage, providing a minimum of 2.27 days settling time, during peak loading events.

Two Zoeller Commercial Filter 5000-007, capable of filtering flows of up to 16,000 litres a day will be fitted to the discharge, to retain solids larger than 1.5mm.

ADVANCED SECONDARY TREATMENT

Recirculation Tank

One 25,000 litre solid pour concrete tank is to be installed creating the systems 25,000 litre re-circulation tank and also provide 24 hours emergency storage and peak flow buffering.

This tank will receive filtered wastewater from septic tank and is used to hold diluted effluent which is then pumped to our textile filter for treatment.

Dosing to the textile filters, the next stage of the process, will be controlled via pre-set on/off timers. Float switches will over-ride the timed switches and turn the pump off if low levels are reached.

The pumping of the untreated wastewater will be done by a Reflections pump, designed to pump wastewater with suspended solids up to 5mm in diameter.

The tank will also include a high water level alarm to operate in event of pump failure.

Textile Media Filter

A textile media bed measuring 17.47m² is proposed. The textile bed has been sized to cope with the specified levels of BOD and TSS.

The recirculating textile filter is also known as a recirculating textile pack bed reactor (rtPBR). Pack bed reactors are biological and physical treatment systems, which provide additional treatment for screened, and primary treated wastewater, producing a clear odourless, 'advanced secondary quality' wastewater suitable for irrigation onto/into the ground.

The Reflection Treatment Systems Textile Filter has been developed in New Zealand for New Zealand conditions. Recognised, by Councils and large public sector companies, as a market leader in wastewater treatment, the Reflection Treatment Systems Textile Filter has been subjected to in-depth regulatory testing.

Primary treated and screened effluent is diluted in the in the recirculation tank by treated effluent and timer dose loaded, by pumping, onto the textile filter as a series of controlled and frequent pulses over the day. This ensures non-saturated flow through the contactor media that, in turn, enhances the primary mechanisms involved in the effluent treatment.

As the effluent flows through the media it is treated to a high quality, with a large reduction in BOD, Total Suspended Solids and faecal organisms. Naturally occurring micro-organisms adhering to the textile particles utilise the organic component of the applied effluent as a source of food.

The Textile Filters do not hold any electrical components or pump and therefore do not need any controls

Recirculation Assembly

Treated water flowing out of the Textile Filters, enters a distribution box where 20% of the flow is directed to the Treated Effluent Holding Tank and the other 80% returned to the Recirculation Tank to be treated again.

Continuous operation of the filter at times of low flows without draining the RT, is effected by a float valve directing all treated effluent back to the RT when tank levels fall to 20%.

Treated Effluent Quality

Treated wastewater is expected to be Advanced Secondary level having the following discharge quality.

BOD5 (5 day Biochemical Oxygen Demand)	less than 20mg/l
Suspended Solids	less than 30mg/l

Irrigation tank

One 10,000 litre solid pour concrete tank will act as the systems 10,000 litre Irrigation Tank, which receives gravity feed treated wastewater from the Textile Media Filters. The Irrigation Tank will have a Reflections pump installed and will also be fitted with a high level alarm.

Water Meter

A water meter is to be installed, in line, following the Irrigation Tank with an accuracy of +/- 5%, to monitor discharge to the land disposal system. The water meter readings will be recorded and stored by the system control panel.

Land Disposal Area

Disposal of the treated wastewater is via 5,500m of Netafim UniRaam AS, which will be installed sub-surface laid or surface laid, depending on site constraints. The disposal field is to be split into 4 zones.

Drippers will operate at 2.3l/hour and will be spaced every 600mm along the irrigation line.

The disposal system will include: -

Air Release Valve (ARV) – An ARV will be installed at the most elevated point of the main supply line from the pump chamber, prior to the supply submain.

Dripper line Non Leakage Valve (DNL) – DNL valves are to be installed at the start of each lateral line.

Manual Flush Taps – Manual flush taps are to be installed at the end of each lateral line.

Remote Monitoring and Management Control Panel

A Unitronics PLC Controller is to be installed to provide remote monitoring and management of the wastewater treatment plant. The system requires a dedicated mobile phone line, with good signal strength, for the main treatment plant and allows instant notification to Reflection Treatment Systems, or its service provider, in the event of an alarm.

An Outpost Telemetry Unit* will be installed to give 24 hour remote alarm monitoring and recording of flow data.

The web based application can be accessed from any internet connected device, providing instant data on the systems performance or alarm state.

*Outpost requires a monthly subscription of \$40/month + GST

APPENDIX 1. PRICING SCHEDULE

Pohuehue Community Housing

System Specifications

1 x 25,000 litre Septic Tank with Commercial Outlet Filter
1 x 25,000 litre Recirculation Tank
1 x 10,000 litre Treated Effluent Tank
2 x Reflection Treatment Textile filters
Associated pumps and controller with alarm telemetry
1 x flow meter connect to system telemetry
5,500m² PCDI sub-surface or surface laid disposal field

Total Price Fully Installed

\$135,600.00 + GST

Assumptions and Exceptions

- All consents supplied by others
- PS1 and PS4 supplied by others
- PS3 supplied by Reflection Treatment Systems
- Assumes ground is suitable for installation, no shoring included
- Power connection by others
- Excavate spoil to be left onsite
- No pump out are included in the pricing
- Cutting of concrete and re-instatement not included
- Fencing not included
- Subject to site visit

APPENDIX 2. RELEVANT EXPERIENCE

Central and Local Government Facilities

(Toilet Blocks, Lodges, Community Treatment Plants)

Customer	Location	Flow (m3/day)
Auckland City Council	Oneroa Township & Matiatia	70
Auckland City Council	Little Oneroa Toilets	6
Auckland Regional Council	Muriwai Toilets	65
Auckland Regional Council	Muriwai Campground	40
Auckland Regional Council	Arataki Visitor Centre	10
Auckland Regional Council	Huia Toilets	5.2
Auckland Regional Council	Whatipu Lodge	5.5
Department of Conservation	Goat Island Toilets	13
Department of Conservation	Motuihe Island	5
Manukau City Council	Puhinui Toilets	4
Manukau City Council	Clevedon Showgrounds & Clevedon Toilets	10
Manukau City Council	Umupuia Toilets	8.2
Manukau City Council	Clevedon Toilets and Hall	6
Manukau City Council	Clevedon Scenic Reserve	6
Manukau City Council	Council Homes	2
Manukau City Council	Orere Point Toilets	2.5
Rodney District Council	Riverhead Toilets	2
Rodney District Council	Huapai Domain Toilets	2
Rodney District Council	Waimauku Hall	2
Rodney District Council	Pakiri Hall	1
Waitakere City Council	Taupaki Park Toilets	1
Waitakere City Council	Piha South Toilets	4
Waitakere City Council	Huia Toilets	2
Waitakere City Council	Bethells Beach Public Toilets	7
Waitakere City Council	Waitakere Train Station	1
Waikato District Council	Maramarua Township	15
Waikato District Council	Matangi Township	50

INSTITUTIONS		
Customer	Location	Flow (m3/day)
Taupaki Gables Rest Home	Taupaki	12
Hare Krishna Temple/School/Accommodation	Riverhead	24
Te Kotahitanga Marae	Pt Waikato	18
Hunua Presbyterian Camp	Hunua	12
Huapai Golf Club	Riverhead	7
Goodwood Park Trust	Riverhead	10
IHC NZ	Warkworth	2
IHC NZ	Waitakere	2
IHC NZ	Waitakere	3
IHC NZ	Waitakere	2
IHC NZ	Dairy Flat	2
Piha Surf Club	Piha	3
New Zealand Scouts	Camp Maynard	6
Pinehaven Lodge	Hatfields Beach	3
Housing New Zealand	Opotiki	9
Housing New Zealand	Ardmore	5
Puatahi Marae	Kaipara	3
Rewiti Marae	Waimauku	2
NZ Kennel Club	Papakura	4
Ohui Enterprises Campground	Whangamata	6
Town & Country Motel	Hamilton	3
Vineyard Cottages	Waimauku	6
Nikau Caves	Waikaretu	2
Waimauku Shopping Centre	Waimauku	4
Vipassana Meditation Centre	Makarau	16
Maharishi Vedic Academy	Silverdale	10
Waitakere Soccer Club	Massey	6
University of Auckland (Goldies Wines)	Waiheke	7

RESTAURANTS

Customer	Location	Flow (m3/day)
Allely House	Kumeu	4
Bees on Line	Waimauku	10
Blossoms	Riverhead/Kumeu	2
Hunting Lodge	Waimauku	8
Soljan's	Kumeu	5
Sookie Lee	Kumeu	2
Tasting Shed	Huapai	3

SUBDIVISIONS

Subdivision	Reticulation	No. of Lots
The Sands – Mangawhai	STEG	130
Sea Breeze – Mangawhai	STEP	63
Oneroa Township	STEG/STEP	60
Park View – Universal Homes	Gravity Sewer	30
Longview	STEP	30
Solan Estate	Gravity Sewer	30
Nautical Heights	STEP	29
Mangawhai Grove	STEG	26
Taranga Estate Stage 1	STEP	26
Sunlea Estate	STEG	25
Riverside Estate (Matakana)	STEP/STEG	17
IMF Kumeu	Gravity Sewer	15
Flavell – Mangawhai x 2	STEP	14
J McDonald Trust	Gravity Sewer	10
Lotus – Mangawhai	STEP	8
Raven – Mangawhai	STEP	8
De Boer – Mangawhai	STEP	4

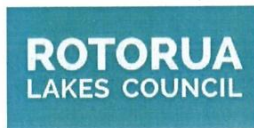
SCHOOLS

Customer	Flow (m3/day)
St Stevens	48
Dilworth Rural Campus	40
Waiheke Primary	16
Waimauku School	12
Clevedon	10
Taupaki	8
Henderson Valley	5
Kings College – Ahuroa	5
Te Hihi	5
Woodhill	4
Tomarata	3.5
Brookby	3
Ararimu	1
Ardmore	Upgrade

INDUSTRIAL / PROCESSING

Customer	Location	Flow (m3/day)
St Stevens School Oxidation Pond Dewatering	Bombay	80
Metrowater	Owhanake Phosphate Removal Slag	80
Soljan Winery	Kumeu	10
Kumeu Industrial	Kumeu	10
Brinks Poultry	Karaka	10
Matua Valley Wines	Waimauku	5
Westbrook Winery	Waimauku	4
Gourmet Paprika	Woodhill	3
Dricon	Tuakau	2
Formula Cruisers	Kumeu	1
Kajes Petroleum x 3	Waiheke	1
Caltex	Dairy Flat	1

APPENDIX 3. OSET RESULTS



On-site Effluent Treatment National Testing Programme (OSET NTP)

PERFORMANCE CERTIFICATE Reflections Textile 5000 OSET NTP Trial 13, 2017/2018

System Tested

The Reflection Textile 5000 treatment plant, comprising a recirculating textile filter packed bed reactor (RTF), participated in Trial 13 of the On-site Effluent Treatment National Testing Programme (OSET NTP). This commenced on 23 October 2017 and ran over ten months (44 weeks) during which the treated effluent discharge was monitored generally every six days. The Reflection Textile 5000 treatment plant tested had a normal operational capacity of 2,000L/day and maximum capacity of 2,400L/day. The plant comprised two 5,100L concrete tanks, Tank 1 being a primary chamber with a Zoeller 170-0078 effluent filter and Tank 2 having 3 chambers, recirculation chamber (1950L) with a reflection 250DP 200L/h recirculation pump operating 60min/day, textile filter chamber (2250L) with 2.6m² needle punched non woven polyester media and effluent pump chamber (900L) with a Reflection 400IR Vortex 400W pump.

The emergency storage which includes the effluent pump station and media submergence is 2,000L.

The service requirement is annual

Test Flow Rate

The Reflection Textile 5000 treatment plant was tested at 1,000L/day (equivalent to servicing a 3-bedroom 5 to 6 person household) over an 10 month (40 week) period November 2017 to August 2018 including a 1 month (4 week) high load effects test involving 5 days at 2,000L/day then 1,000L/day over the following 3 weeks. Note that the manufacturer's advised design capacity for this plant is 2,000L/day.

Testing and Evaluation Procedures

A two-month (8 week) media development and settling-in period was initially proposed, but this was extended to 12 weeks due to an unscheduled geothermal waste influent flow on 23 November, followed by extreme weather events in Rotorua, resulting in widespread flooding and high infiltration into the sewerage system, along with an electrical storm impacting on the testing facility control system in early December. Ten samples were taken during this period (Weeks 4 to 12). Neither the geothermal influent nor the weather events had any significant impact upon the Reflection plant performance, which showed only a minor and short-duration increase in both BOD₅ and TSS.

The performance evaluation testing programme followed involving a three-month pre-benchmarking period (20 samples over Weeks 13 to 28), and a three-month benchmarking period (19 samples over Weeks 29 to 40). Within each block, a five-day consecutive sample period occurred (Weeks 25 and 34). A one-month high load assessment period followed in Weeks 42 to 44 (three samples).

The 39 samples taken through the pre-benchmarking and benchmarking periods were used to assess treatment performance against the **Secondary Effluent Quality** requirements for biochemical oxygen demand (BOD₅) and total suspended solids (TSS) defined by AS/NZS 1547:2012 as set out in AS/NZS 1546.3:2008

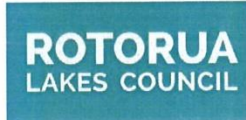
A total of 19 treated effluent samples of organic matter (BOD₅), total suspended solids (TSS), total nitrogen (TN), ammonia nitrogen (NH₄-N), total phosphorus (TP) and faecal coliforms (FC) at generally six day intervals during weeks 28 through 40 were tested and the results benchmarked and rated on their median values.

General Performance

The Reflection Textile 5000 treatment plant performed well throughout the study, with no equipment failures or attendance required throughout the trial period.

In terms of effluent quality, the plant performed well overall, with low and stable BOD₅ and TSS results, each having median results of 2.0mg/L throughout the analysis period. The plant achieved a high level of

On-site Effluent Treatment National Testing Programme,
c/- Technical Manager 10 Tide Close, Mount Wellington, AUCKLAND 2013
Mob: 021 626 772 E-mail: ray@hedgland.co.nz



On-site Effluent Treatment National Testing Programme (OSET NTP)

nitrification throughout, but with poor denitrification, resulting in low levels of $\text{NH}_4\text{-N}$, and high levels of TOXN and TN. The median Total Nitrogen level was 40mg/L. The high flow test was handled well with no change in BOD_5 , TSS, or TN levels, although it should be noted the high flow of 2,000L/day was the same as the plant's nominated operational capacity. Bacteria removal was only moderate.

The plant's power usage at 0.61kWh/day, was low for a package secondary treatment plant.

AS/NZS 1547:2012 Secondary Effluent Quality Requirements

These requirements are that 90% of all test samples must achieve a BOD_5 of $\leq 20 \text{ g/m}^3$ and TSS of $\leq 30 \text{ g/m}^3$ with no one result for BOD_5 being $>30 \text{ g/m}^3$ and no one result for TSS being $>45 \text{ g/m}^3$.

The plant had low BOD and TSS results throughout except for one high TSS result of 53mg/L on 5 June which SWANS-MAG considered could be deleted from the AS/NZS 1547 evaluation analysis as an unexplained outlier.

The Reflection Textile 5000 plant therefore had **100% of BOD_5 results** and **100% of TSS results** within the **Secondary Effluent Quality** requirements for both the 90 percentile and maximum limits above. **The Reflection Textile 5000 plant thus achieved AS/NZS 1547 secondary effluent quality performance requirements** when operated at 1,000L/day, which is 50% of the manufacturer's advised normal flow design capacity.

Benchmark Ratings

The Reflection Textile 5000 system achieved the following effluent quality ratings:

Indicator Parameters	Median	Std Dev	Rating	Rating System				
				A+	A	B	C	D
BOD_5 (mg/L)	2	0.4	A+	<5	<10	<20	<30	≥ 30
TSS (mg/L)	1	11.7	A+	<5	<10	<20	<30	≥ 30
Total Nitrogen (mg/L)	39	3.1	D	<5	<15	<25	<30	≥ 30
$\text{NH}_4\text{-Nitrogen}$ (mg/L)	3.0	1.3	A	<1	<5	<10	<20	≥ 20
Total Phosphorus (mg/L)	4.0	0.5	B	<1	<2	<5	<7	≥ 7
Faecal Coliforms (cfu/100mL)	47,500	30,500	C	<10	<200	<10,000	<100,000	$\geq 100,000$
Energy (kWh/d) (mean)	0.61	0.12	A	0	<1	<2	<5	≥ 5

This Certificate of Performance only applies to the Reflection Textile 5000 treatment plant as described in the 'System Tested' above when operated at 1,000 L/day, which is 50% of manufacturer's advised normal flow design capacity. The certificate is valid for 5 years from the date below. For the full OSET NTP report on the performance of the Reflection Textile 5000 treatment plant contact Nigel Paull, Phone: 09 411 7337 , Mobile: 021 909 026 or Email: nigel@rwts.co.nz

Authorised By:



Ray Hedgland, Technical Manager, OSET NTP
27 November 2018

AUCKLAND COUNCIL
Appendix E TP58
On-Site Wastewater Disposal Site Evaluation
Investigation Checklist

Part A –Owners Details

1. Applicant Details:

Applicant Name	<i>Pohuehue Community Housing Ltd.</i>
Company Name	
Property Owner Name(s)	<i>Pohuehue Community Housing Ltd.</i>

Nature of Applicant*	<i>Owner</i>
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(*i.e. Owner, Lessee, Prospective Purchaser, Developer)

2. Consultant / Site Evaluator Details:

Consultant/Agent Name	<i>Haigh Workman</i>		
Site Evaluator Name	<i>Ben Richardson</i>		
Postal Address	<i>PO Box 124</i>		
	<i>Warkworth</i>		
Phone Number	Business	<i>09 425 9422</i>	Private
	Cell Phone	<i>021 244 8217</i>	Fax
Name of Contact Person	<i>Ben Richardson</i>		
E-mail Address	<i>ben@haighworkman.co.nz</i>		

3. Are there any previous existing discharge consents relating to this proposal or other waste discharge on this site?

Yes		No	<i>unknown</i>	(Please tick)
If yes, give Reference Numbers and Description				

4. List any other consent in relation to this proposal site and indicate whether or not they have been applied for or granted

If so, specify Application Details and Consent No.

(eg. LandUse, Water Take, Subdivision, Earthworks, Stormwater Consent)

<i>The site contains an existing Dwelling. Consent numbers are not known to us.</i>

Part B- Property Details**1. Property for which this application relates:**

Physical Address of Property	<i>1695 Pohuehue Road</i>		
	<i>Warkworth</i>		
Territorial Local Authority	<i>AUCKLAND COUNCIL</i>		
Regional Council	<i>AUCKLAND COUNCIL</i>		
Legal Status of Activity	Permitted:	Controlled:	Discretionary: ☒
	<i>E5.6.2.1</i>		
Relevant Regional Rule(s) (Note 1)			
	<i>28,714</i>		
Total Property Area (m ²)			
Map Grid Reference of Property If Known			

2. Legal description of land (as shown on Certificate of Title)

Lot No.	<i>1</i>	DP No.	<i>100471</i>	CT No.	
Other (specify)					

Please ensure copy of Certificate of Title is attached

PART C: Site Assessment - Surface Evaluation

(Refer TP58 - Sn 5.1 General Purpose of Site Evaluation and Sn 5.2.2(a) Site Surface Evaluation)

Note: Underlined terms defined in Table 1, attached

Has a relevant property history study been conducted?

Yes	☒	No	☐
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 (Please tick one)

If yes, please specify the findings of the history study, and if not please specify why this was not considered necessary.

<i>Included within Environmental report, Haigh Workman reference: 25 050</i>

1. Has a Slope Stability Assessment been carried out on the property?

Yes	✓	No	(Not for disposal field).
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If No, why not?

*Ground slope is up to 18° and vegetated. Qualitative stability assessment included in report ref.:25 050-GEO
The geology is Waitemata Sedimentary, and shows no existing instability.*

If Yes, please give details of report (and if possible, please attach report):

Author	<i>Ben Richardson</i>
Company/Agency	<i>Haigh Workman Ltd.</i>
Date of Report	May 2025
Brief Description of Report Findings:- Qualitive analysis shows gentle slopes and not considered to exhibit signs of instability	

2. Site Characteristics (See Table 1 attached):

Provide descriptive details below:

Performance of Adjacent Systems:*Adequate from donor site.***Estimated Rainfall and Seasonal Variation:***1,200 mm per year. 700 mm winter, 500 mm summer***Vegetation / Tree Cover:***Mature Pine Nut Tree Plantation***Slope Shape: (Please provide diagrams)***East facing hill side***Slope Angle:***Up to 14 degrees across disposal area (15m + 2m buffer setback from nearest downslope surface water)***Surface Water Drainage Characteristics:***Driveway above site with overland flowpath diverting surface water away from effluent field.***Flooding Potential: YES/NO***No – well elevated*

If yes, specify relevant flood levels on appended site plan, i.e. one in 5 years and/or 20 year and/or 100 year return period flood level, relative to disposal area.

Surface Water Separation:*15 m + buffer is available downslope. surface water diversion for the main effluent field is in place.***Site Characteristics: or any other limitation influencing factors***14° slope protected by vegetation*

3. Site Geology**Check Rock Maps**

Underlying rock is sedimentary - sandstone and mudstone of Waitemata Group.

Geological Map Reference Number

[GNS Webmap](#)

4. What Aspect(s) does the proposed disposal system face? (please tick)

North		West	
North-West		South-West	
North-East		South-East	
East	✓	South	

5. Site clearances, (Indicate on site plan where relevant)

Separation Distance from	Treatment Separation Distance (m)	Disposal Field Separation Distance (m)	AC minimum
Boundaries	> 1.5	> 1.5	1.5 m
Surface water, creeks, drains	>3.0	> 17	15 + 2m slope buffer for field
Groundwater	N/A	> 1.5	0.9 (Secondary)
Stands of Trees/Shrubs	N/A	N/A	N/A
Wells, water bores	3.0+	100+	20 m for field
Embankments/retaining walls	N/A	N/A	N/A
Buildings	> 3	>3	1.5-3.0 m
Rivers, Coastal Marine area	> 30	> 30	15+2 slope buffer

PART D: Site Assessment - Subsoil Investigation

(Refer TP58 - Sn 5.1 General Purpose of Site Evaluation, and Sn 5.2.2(a) Site Surface Evaluation and Sn 5.3 Subsurface Investigations)

Note: Underlined terms defined in Table 2, attached

1. Please identify the soil profile determination method:

Test Pit		(Depth _____ m	No of Test Pits	
Bore Hole	✓	(Depth 1.5m	No of Bore Holes	2
Other (specify):				

Soil Report attached? – Borehole in autumn season

Yes	✓	No		Please tick
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2. Was fill material intercepted during the subsoil investigation?

Yes		No	✓	Please tick
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If yes, please specify the effect of the fill on wastewater disposal

3. Percolation testing (mandatory and site specific for trenches in soil type 4 to 7)

Please specify the method; conservative value chosen

Test Report Attached?	Yes		No	✓	Please tick
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4. Are surface water interception/diversion drains required?

Yes	☒	No	☐
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Please tick

If yes, please show on site plan

4a Are subsurface drains required

Yes	☐	No	☒
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Please tick

If yes, please provide details

5. Please state the depth of the seasonal water table:

Winter	> 1.5	m	Measured	☐	Estimated	☒
Summer	> 1.5	m	Measured	☒	Estimated	☐

6. Are there any potential storm water short circuit paths?

Yes	☐	No	☒
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Please tick

If the answer is yes, please explain how these have been addressed

7. Based on results of subsoil investigation above, please indicate the disposal field soil category (Refer TP58 Table 5.1)

Is Topsoil Present?	Yes	If so, Topsoil Depth?	0.1(m)
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Soil Category	Description	Drainage	
1	Gravel, coarse sand	Rapid draining	
2	Coarse to medium sand	Free draining	
3	Medium-fine & loamy sand	Good drainage	
4	Sandy loam, loam & silt loam	Moderate drainage	
5	Sandy clay-loam, clay loam & silty clay-loam	Moderate to slow drainage	
6	Sandy clay, non-swelling clay & silty clay	Slow draining	☒
7	Swelling clay, grey clay, hardpan	Poorly or non-draining	

Reasons for placing in stated category

*Visual assessment of soils recovered from hand augered boreholes and review of geological mapping***PART E: Discharge Details****1. Water supply source for the property (please tick):**

Rainwater (roof collection)	☒
Bore/well	☒
Public supply	☐

2. Calculate the maximum daily volume of wastewater to be discharged, unless accurate water meter readings are available

(Refer TP58 Table 6.1 and 6.2)

Number of Bedrooms	54			
Design Occupancy	57			(Number of People)
Per capita Wastewater Production	145	160	180 ✓	(tick) (Litres per person per day)
	200	220		
Daily Wastewater Production	10,800			(litres per day)

3. Do any special conditions apply regarding water saving devices

a) Full Water Conservation Devices?	Yes		No	✓	(Please tick)
b) Water Recycling - what %?		%			(Please tick)

If you have answered yes -state what conditions apply and include the estimated reduction in water usage

4. Is Daily Wastewater Discharge Volume more than 2,000 litres:

Yes	✓	(Please tick)
No		(Please tick)

Note if answer to the above is yes, a wastewater discharge permit may be required

5. Gross Lot Area to Discharge Ratio:

Gross Lot Area	28,714	m ²
Total Daily Wastewater Production	10,800	(Litres per day) (from above)
Lot Area to Discharge Ratio	2.7:1	

7. Does this proposal comply with the Auckland Council Gross Lot Area to Discharge Ratio of greater than 3.0?

Yes		No	✓	Please tick
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8. Is a Auckland Council Discharge Consent Required?

Yes	✓	No		(Please tick)
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PART F: Primary Treatment (Refer TP58 Section 7.2)

1. Please indicate below the no. and capacity (litres) of all septic tanks including type (single/dual chamber grease traps) to be installed or currently existing: If not 4,500 litre, dual chamber, explain why not

Number of Tanks	Type of Tank	Capacity of Tank (Litres)
1	Primary	25,000
1	Secondary	25,000
1	Irrigation	10,000
	Total Capacity	60,000

2. Type of Septic Tank Outlet Filter to be installed?

130 Micron Red Arkal disk filter

PART G: Secondary and Tertiary Treatment

(Refer TP58 Section 7.3, 7.4, 7.5 and 7.6)

1. Please indicate the type of additional treatment, if any, proposed to be installed in the system: (please tick)

Secondary Treatment (Advanced)	☒	
Home aeration plant	☐	
Commercial aeration plant	☐	
Intermediate sand filter	☐	
Recirculating sand filter	☐	
Recirculating textile filter	☒	
Clarification tank	☐	
Tertiary Treatment	☐	
Ultraviolet disinfection	☐	
Chlorination	☐	
Other	☐	Specify

PART H: Land Disposal Method

(Refer TP58 Section 8)

1. Please indicate the proposed loading method: (please tick)

Gravity	☐
Dosing Siphon	☐
Pump	☒

2. High water level alarm to be installed in pump chambers

Yes ☒ No ☐

If not to be installed, explain why

3. If a pump is being used, please provide the following information:

Total Design Head	35+	(m)
Pump Chamber Volume	Minimum: 3600 L (Minimum pump dose: 1200 L)	(Litres)
Emergency Storage Volume	Minimum 1 day's storage 10,620 L	(Litres)

4. Please identify the type(s) of land disposal method proposed for this site: (please tick)*(Refer TP58 Sections 9 and 10)*

Surface Dripper Irrigation	☒	
Sub-surface Dripper irrigation	☐	
Standard Trench	☐	
Deep Trench	☐	
Mound	☐	
Evapo-transpiration Beds	☐	
Other		Specify

5. Please identify the loading rate you propose for the option selected in Part H, Section 4 above, stating the reasons for selecting this loading rate:

Loading Rate	2	(Litres/m2/day)
Disposal Area	Design	5500 (m2)
	Reserve	5500 (m2)

Explanation *(Refer TP58 Sections 9 and 10)*

Design irrigation rate for secondary treated effluent in TP58 'Category 6' soils using conservative loading rate.

6. What is the available reserve wastewater disposal area *(Refer TP58 Table 5.3)*

Reserve Disposal Area (m ²)	5,500
Percentage of Primary Disposal Area (%)	100

7. Please provide a detailed description of the design and dimensions of the disposal field and attach a detailed plan of the field relative to the property site:**Description and Dimensions of Disposal Field:**

For a 57-person occupancy, 5,500 m length of trickle tubing installed as per manufacturer's recommendations.

Dripper lines to be spaced at 1.0m between lines.

Plan Attached?	Yes	☒	No	☐	(Please tick)
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If not, explain why not

PART I: Maintenance & Management

(Refer TP58 Section 12.2)

1. Has a maintenance agreement been made with the treatment and disposal system suppliers?

Yes		No	✓	(Please tick)
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Name of Suppliers

Reflections. Maintenance agreement to be in place during commissioning

PART J: Assessment of Environmental Effects

1. Is an assessment of environmental effects (AEE) included with application?

(Refer TP58 section 5. Ensure all issues concerning potential effects addressed)

Yes	✓	No		(Please tick)
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If Yes, list and explain possible effects

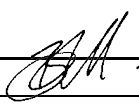
PART K: Is Your Application Complete?

1. In order to provide a complete application you have remembered to:

Fully Complete this Assessment Form	✓
Include a <i>Location Plan</i> and <i>Site Plan</i> (with Scale Bars)	✓
Attach an Assessment of Environmental Effects (AEE)	✓

1. Declaration

I hereby certify that, to the best of knowledge and belief, the information given in this application is true and complete.

Name	<i>Ben Richardson</i>	Signature	
Position	<i>Civil Engineer</i>	Date	<i>18/12/2025</i>

Note

Any alteration to the site plan or design after approval will result in non-compliance.