

*Pursuant to the Resource Management Act 1991, the Northland Regional Council (hereinafter called "the council") does hereby grant a Resource Consent to:*

**KERIKERI LAND LIMITED, LEVEL 1, 39 MARKET PLACE, AUCKLAND CENTRAL, AUCKLAND 1010**

To undertake the following activities associated with Stage 1 of a retirement village development on Lot 1 DP 163762, Lot 1 DP 173449 and Lot 2 DP 435929 (56 and 57C Hall Road, Kerikeri), at or about location co-ordinates 1686505E 6100152N:

*Note: All location co-ordinates in this document refer to Geodetic Datum 2000, New Zealand Transverse Mercator Projection.*

- |                         |  |
|-------------------------|--|
| <b>AUT.040597.01.01</b> | <b>Cut and fill earthworks for the construction of access roads, building platforms, culvert construction, and ancillary activities.</b> |
| <b>AUT.040597.02.01</b> | <b>Discharge stormwater to land from land disturbance activities.</b>  |
| <b>AUT.040597.03.01</b> | <b>Divert stormwater associated with land disturbance activities.</b>  |
| <b>AUT.040597.04.01</b> | <b>Temporarily dam and divert stream flows during the period of culvert construction.</b>  |
| <b>AUT.040597.05.01</b> | <b>Installation and use of a culvert within the bed of an unnamed tributary of Wairoa Stream.</b>  |

Subject to the following conditions:

## General Conditions

- 1 The Consent Holder shall notify the council's assigned monitoring officer in writing of the date that earthworks and culvert installation are intended to commence, at least two weeks beforehand. The Consent Holder shall arrange for a site meeting between the Consent Holder's principal earthmoving contractor and the council's assigned monitoring officer, which shall be held on site prior to any earthworks or culvert construction activities commencing.

**Advice Note:** *Notification of the commencement of works may be made by email to [info@nrc.govt.nz](mailto:info@nrc.govt.nz).*

- 2 The exercise of these consents shall not cause in any of the following effects on water quality, as measured at the downstream property boundary, compared to an upstream site unaffected by land disturbance activities during the same sampling event:
  - (a) The production of any conspicuous oil or grease films, scums or foams, floatable or suspended materials, or emissions of objectionable odour;
  - (b) Suspended solids concentration greater than 100 grams per cubic metre.

- 3 The Consent Holder shall, on becoming aware of any discharge associated with the Consent Holder's operations that is not authorised by these consents:
- (a) Immediately take such action, or execute such work as may be necessary, to stop and/or contain the discharge; and
  - (b) Immediately notify the council by telephone of the discharge; and
  - (c) Take all reasonable steps to remedy or mitigate any adverse effects on the environment resulting from the discharge; and
  - (d) Report to the council's Compliance Manager in writing within one week on the cause of the discharge and the steps taken, or being taken, to effectively control or prevent the discharge.

For telephone notification during the council's opening hours, the council's assigned monitoring officer for these consents shall be contacted. If that person cannot be spoken to directly, or it is outside of the council's opening hours, then the Environmental Hotline shall be contacted.

**Advice Note:** *The Environmental Hotline is a 24 hour, seven day a week, service that is free to call on 0800 504 639.*

- 4 In the event of archaeological sites or kōiwi being uncovered, activities in the vicinity of the discovery shall cease and the Consent Holder shall contact Heritage New Zealand Pouhere Taonga. Work shall not recommence in the area of the discovery until the relevant Heritage New Zealand Pouhere Taonga approval has been obtained.

**Advice Note:** *The Heritage New Zealand Pouhere Taonga Act 2014 makes it unlawful for any person to destroy, damage or modify the whole or any part of an archaeological site without the prior authority of Heritage New Zealand Pouhere Taonga.*

- 5 The council may, in accordance with Section 128 of the Resource Management Act 1991, serve notice on the Consent Holder of its intention to review the conditions annually during the month of August for any one or more of the following purposes:
- (a) To deal with any adverse effects on the environment that may arise from the exercise of the consents and which it is appropriate to deal with at a later stage; or
  - (b) To require the adoption of the best practicable option to remove or reduce any adverse effect on the environment.

The Consent Holder shall meet all reasonable costs of any such review.

#### **Earthworks and Stormwater AUT.040597.01 to AUT.040597.03**

- 6 The Consent Holder shall undertake the works generally in accordance with the following **attached** Haigh Workman drawings entitled:
- (a) *"Proposed Development – Stage 1 – Extent of Earthworks and Sediment Control Plan"*; Project Number: 18 282, Drawing No: P6, Sheet 6, Revision B; Dated 19/11/2018;
  - (b) *"Proposed Development – Stage 1 – Longitudinal Section Road 1"*; Project Number: 18 282, Drawing Nos: LS1 and LS2, Sheets 1 and 2, Revision B; Dated 19/11/2018;
  - (c) *"Proposed Development – Stage 1 – Erosion & Sediment Control Details"*; Project Number: 18 282, Drawing No: D3, Sheet 3, Revision B; Dated 19/11/2018.

- 7 Sediment control measures shall be constructed and maintained in accordance with the principles and practices contained within the Auckland Council document entitled “*GD05: Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region*” (GD05). Where there are inconsistencies between any part of GD05 and the conditions of these consents, then the conditions of these consents shall prevail.
- 8 As part of the notification required by Condition 1, the Consent Holder shall provide to the council’s assigned monitoring officer a final sediment and erosion control plan (ESCP) that shall set out the practices and procedures to be adopted in order that compliance with the conditions of these consents is achieved. The ESCP shall be certified by the council’s Compliance Manager prior to any earthworks associated with these consents being undertaken. As a minimum, the ESCP shall include the following:
- (a) The expected duration (timing and staging) of the cut and fill operations, drainage works, and clean water diversions.
  - (b) Details of erosion and sediment controls including specific pond design and calculations.
  - (c) The commencement and completion dates for the implementation of the proposed erosion and sediment controls.
  - (d) Details of surface revegetation of disturbed sites and other surface covering measures to minimise erosion and sediment runoff following construction.
  - (e) Measures to prevent spillage of fuel, oil and similar contaminants.
  - (f) Contingency containment and clean-up provisions in the event of accidental spillage of hazardous substances.
  - (g) Measures to control the effects of dust during construction.
  - (h) Means of ensuring contractor compliance with the ESCP.
  - (i) The name and contact telephone number of the person responsible for monitoring and maintaining all erosion and sediment control measures.
  - (j) Contingency provisions for the potential effects of large/high intensity rain storm events.
- 9 The earthworks shall be undertaken in accordance with the erosion and sediment control plan provided in accordance with Condition 8, or any subsequent plan that is certified by the council’s Compliance Manager.
- 10 Erosion and sediment controls shall be installed prior to the commencement of any earthworks (other than those earthworks required for the erosion and sediment controls) within the works area. The installation of all erosion and sediment controls shall be supervised by an appropriately qualified and experienced person(s).
- 11 Prior to the commencement of earthworks operations, the Consent Holder shall provide a stabilised construction entrance to minimise the tracking of spoil or debris onto off-site public road surfaces. All material tracked onto off-site surfaces as a result of the Consent Holder’s operations shall be removed as soon as possible, but at least daily. The stabilised construction entrance shall be maintained throughout the duration of earthworks operations to the above standards.
- 12 No earthworks shall be carried out between 1 May and 30 September in any year unless the prior written agreement of the council’s Compliance Manager has been obtained.
- 13 Stormwater shall be directed away from earthworks areas.

- 14 No stormwater diversions, drains or channels shall be constructed or permitted to flow over fill areas in a manner that creates erosion of the fill material.
- 15 All stormwater diversions, drains and channels shall be capable of conveying storm water during not less than the estimated 1 in 20 year rainfall event.
- 16 No slash, soil, debris and detritus shall be placed in a position where it may be washed into a water body.
- 17 All bare areas of land and fill shall be covered with aggregate, or topsoiled and established with a suitable grass/legume mixture to achieve an 80% groundcover within three months of the completion of earthworks. Temporary mulching or other suitable groundcover material shall be applied to achieve total groundcover of any areas unable to achieve the above requirements.
- 18 The Consent Holder's operations shall not give rise to any discharge of contaminants, including dust, which in the opinion of a monitoring officer of the council is noxious, dangerous, offensive or objectionable at or beyond the property boundary of Lot 1 DP 163762, Lot 1 DP 173449 and Lot 2 DP 435929.

#### **Culvert construction and use - AUT.040597.04 and AUT.040597.05**

- 19 Prior to any works authorised by these consents being undertaken, the Consent Holder shall install a culvert of 525 millimetres diameter parallel to the existing 525 millimetre culvert within the accessway on Lot 2 DP 164771. This work shall be undertaken in general accordance with the **attached** Haigh Workman Ltd drawing entitled "Les Franks Culvert Duplication", DWG No. P7A, Sheet 7A of 14, dated 28/8/19.
- 20 The Consent Holder shall undertake the culvert construction works generally in accordance with the following **attached** Haigh Workman drawings entitled:
  - (a) "*Culvert Plan*"; Project Number: 18 282, Drawing No: P7; Sheet 7, Revision E; Dated 13/06/2019;
  - (b) "*Culvert Headwall Elevation (Downstream) Road 1*"; Project Number: 18 282, Drawing No: LS5; Sheet 5, Revision A; Dated 19/02/2019;
  - (c) "*Conceptual Culvert Details*"; Project Number: 18 282, Drawing No: D2; Sheet 2, Revision C; Dated 19/02/2019.
- 21 The Consent Holder shall, prior to the commencement of culvert replacement activities, provide to the council's assigned monitoring officer a Construction Management Plan (CMP). As a minimum, the CMP shall include the following:
  - (a) The timing and duration of the proposed culvert construction activities.
  - (b) Details of any changes to the locations of the proposed coffer dams, and stream diversions.
  - (c) Locations for the placement of unsuitable material excavated from the bed of the stream.
  - (d) Measures to be employed to minimise the adverse effects of the temporary damming and diversion activities during periods of higher stream flows.
- 22 Installation of the new culvert and associated works shall only be undertaken during a predicted period of low stream flows, and outside of periods of fish spawning except where the temporary stream diversion works provides for the free movement of fish at all times.



- 23 The coffer dams shall be designed and constructed to withstand moderate flood events that may overtop the structures during the period of culvert construction activities.
- 24 Materials used for construction of the temporary coffer dams shall be free of fine material and contaminants, and shall not be placed in a position where they may be washed into the downstream water body.
- 25 During the period of construction all works shall avoid the contact of wet concrete and concrete ingredients with flowing or standing water.
- 26 The temporary coffer dams and stream diversion works shall be removed as soon as possible following installation of the new culvert crossing.
- 27 The Consent Holder shall remove all unwanted materials and refuse from the consent area upon the completion of the works authorised by this consent, to the satisfaction of the council's assigned monitoring officer.
- 28 The invert of the culvert pipes shall be installed and maintained level or slightly below the stream bed.
- 29 The culvert shall be installed and maintained to allow for the free flow of water and passage of fish at all times.
- 30 All outflows of water from the culvert and the overland flow path shall be maintained to effectively dissipate the energy of the water so as to prevent scouring of the bed and banks of the overland flow path and the downstream watercourse.
- 31 The culvert crossing and the overland flow path shall be maintained at all times and any defects that would compromise their integrity shall be promptly repaired using methods and materials designed for that purpose.

**EXPIRY DATE:**           **AUT.040597.01.01**  
                                  **TO**  
                                  **AUT.040597.04.01**  
  
                                  **AUT.040597.05.01**

**30 SEPTEMBER 2024**

**30 AUGUST 2054**

These consents are granted this Twentieth day of September 2019 under delegated authority from the council by:

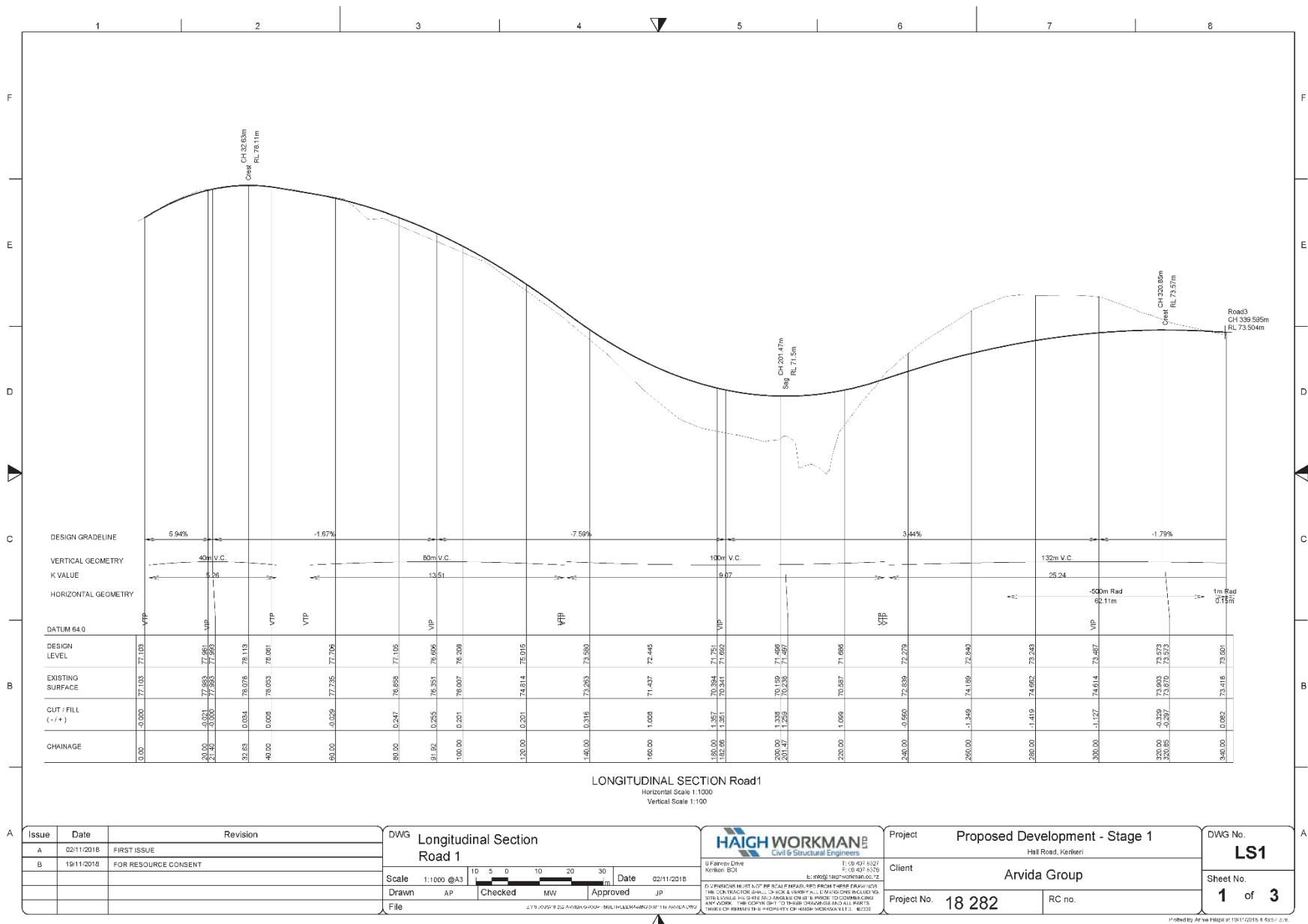


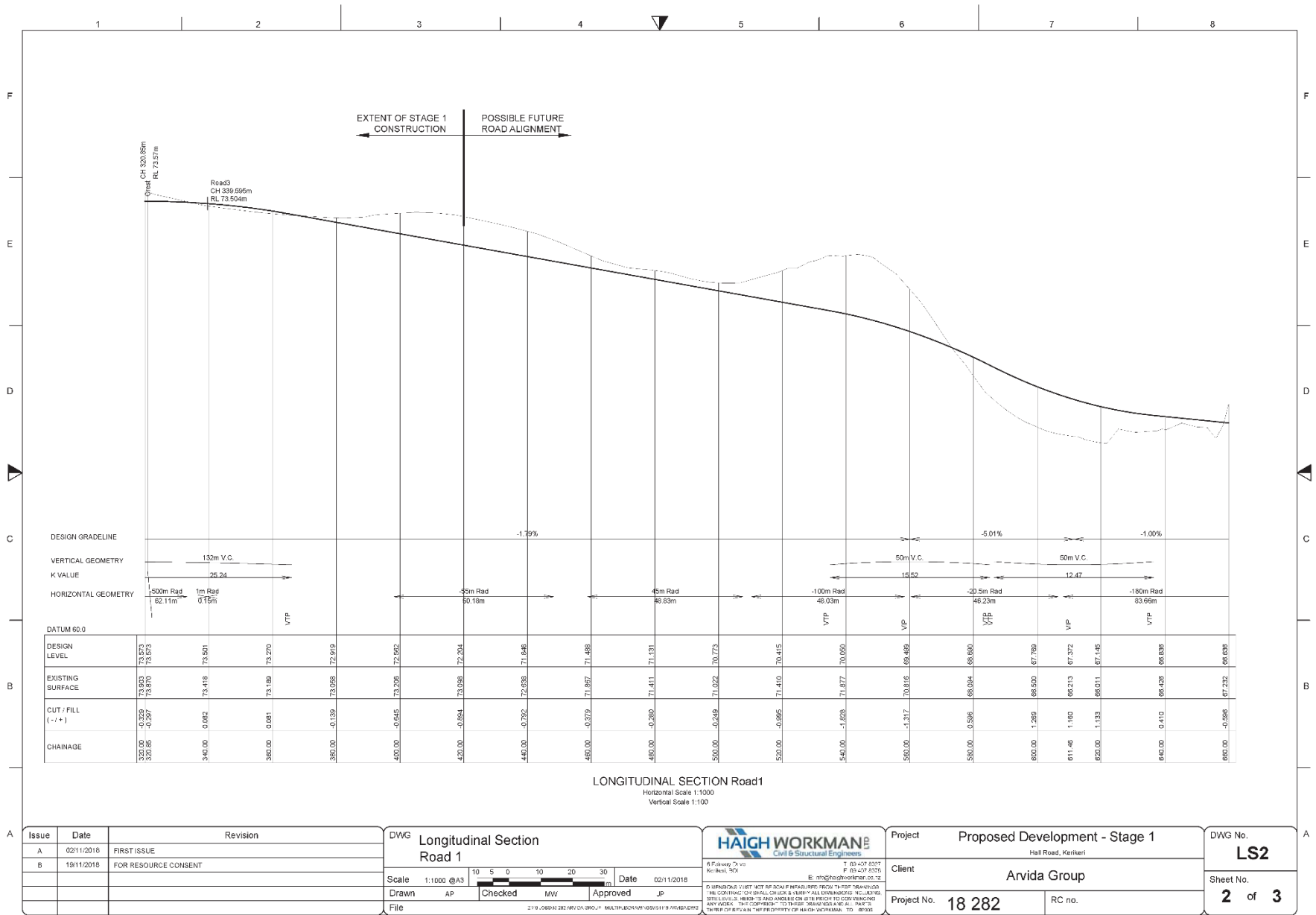
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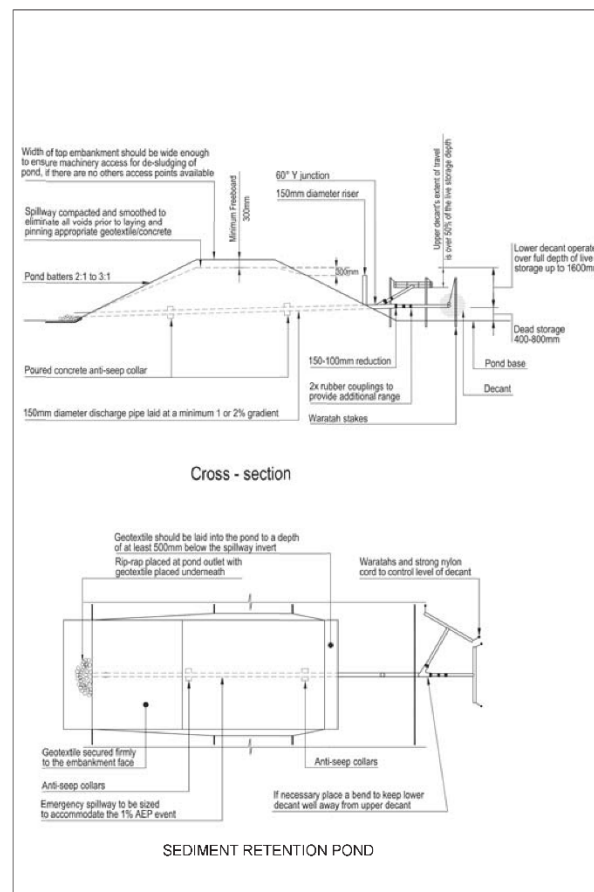
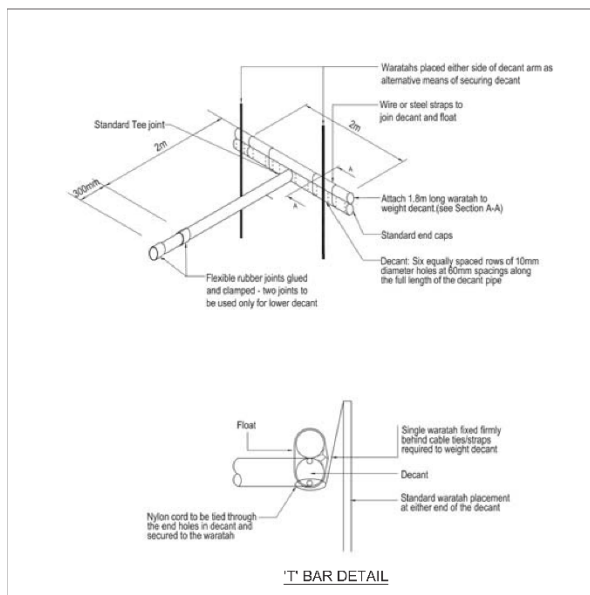
Stuart Savill  
Consents Manager

**Note:** *The plans attached to this consent are reduced copies and therefore may not be to scale and may be difficult to read. In the event that compliance and/or enforcement action is to be based on compliance with the attached plans, it is important that the original plans, are sighted and used. Originals of the plans referred to are available for viewing at the council's Whangārei office.*

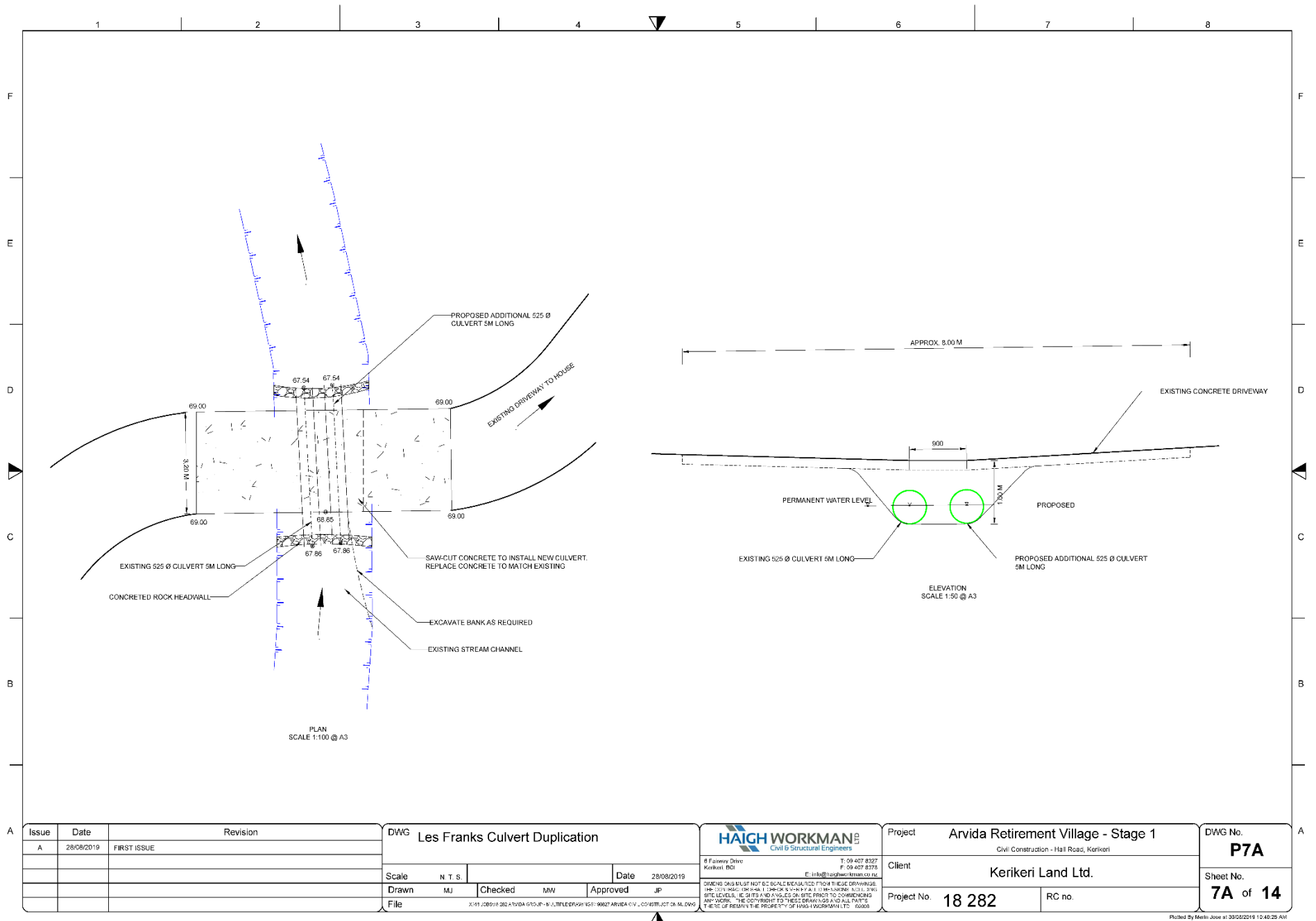




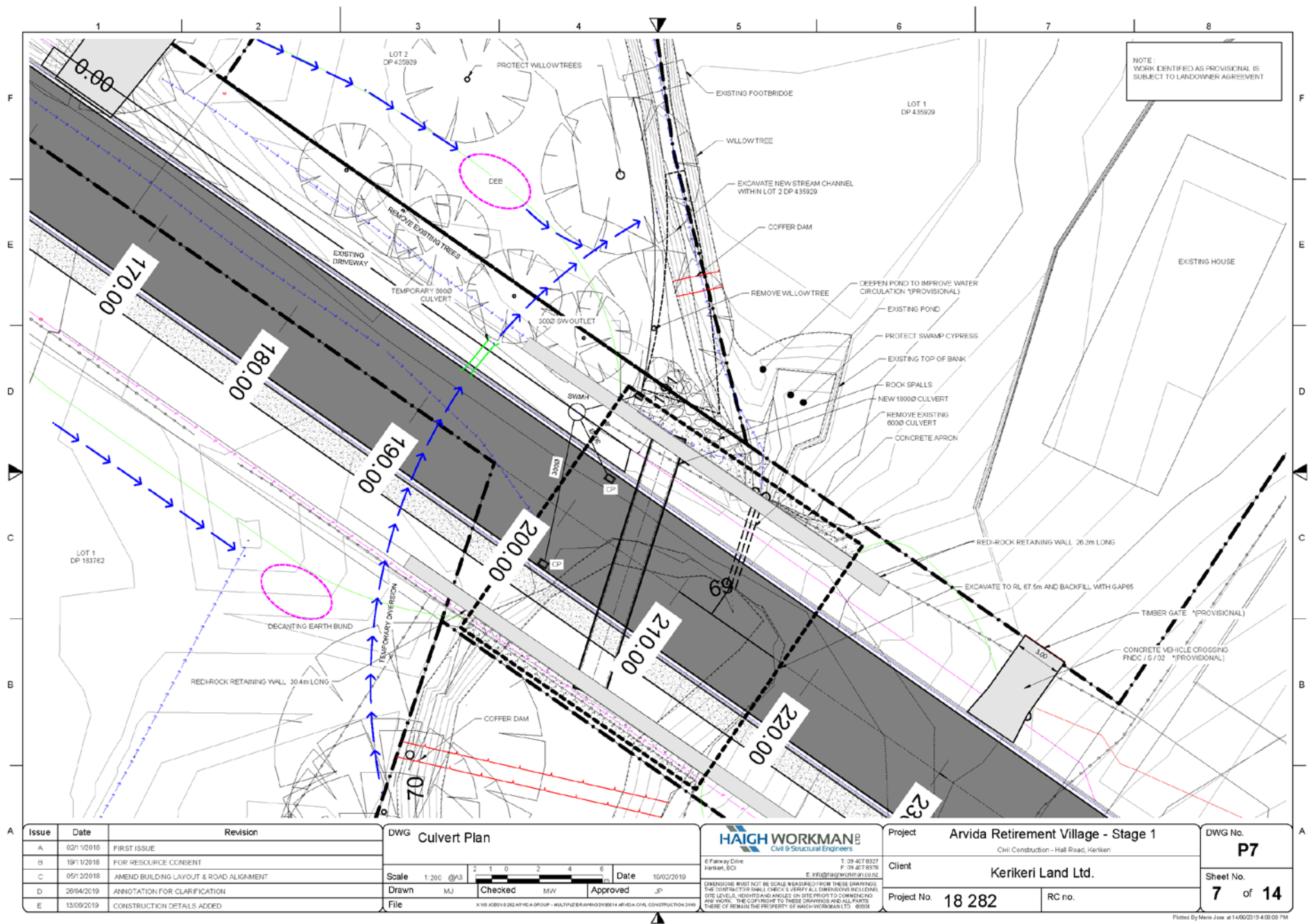


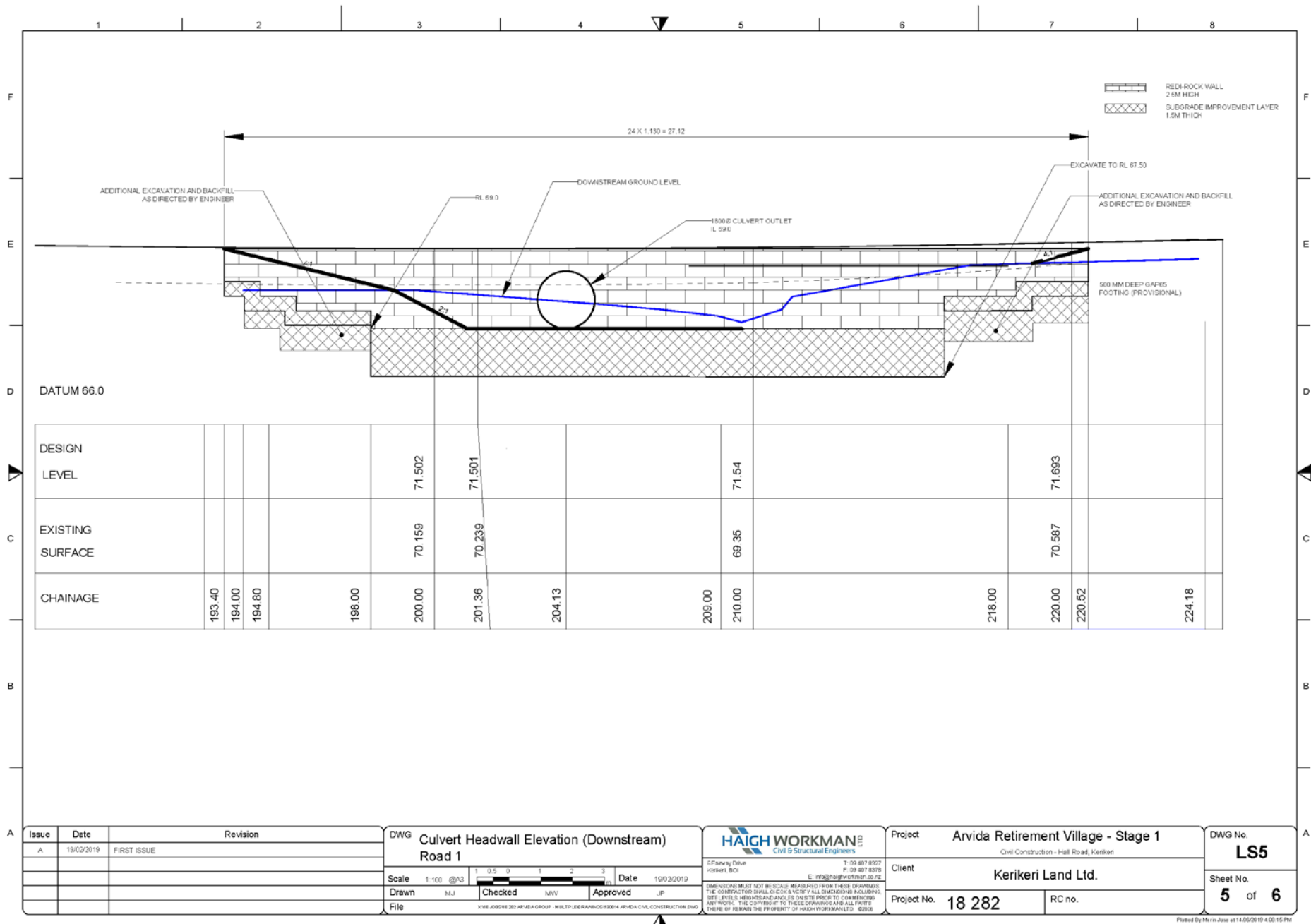


Issue	Date	Revision	DWG Erosion & Sediment Control Details				Project Proposed Development - Stage 1 Hall Road, Kerkira		DWG No. <b>D3</b>
A	02/11/2018	FIRST ISSUE	Scale N, T, S Date 02/11/2018				Client Arvida Group	Sheet No. <b>3</b> of <b>3</b>	
B	19/11/2018	FOR RESOURCE CONSENT					Drawn AP Checked MW Approved JP		
			File				Project No. <b>18 282</b> RC no.		

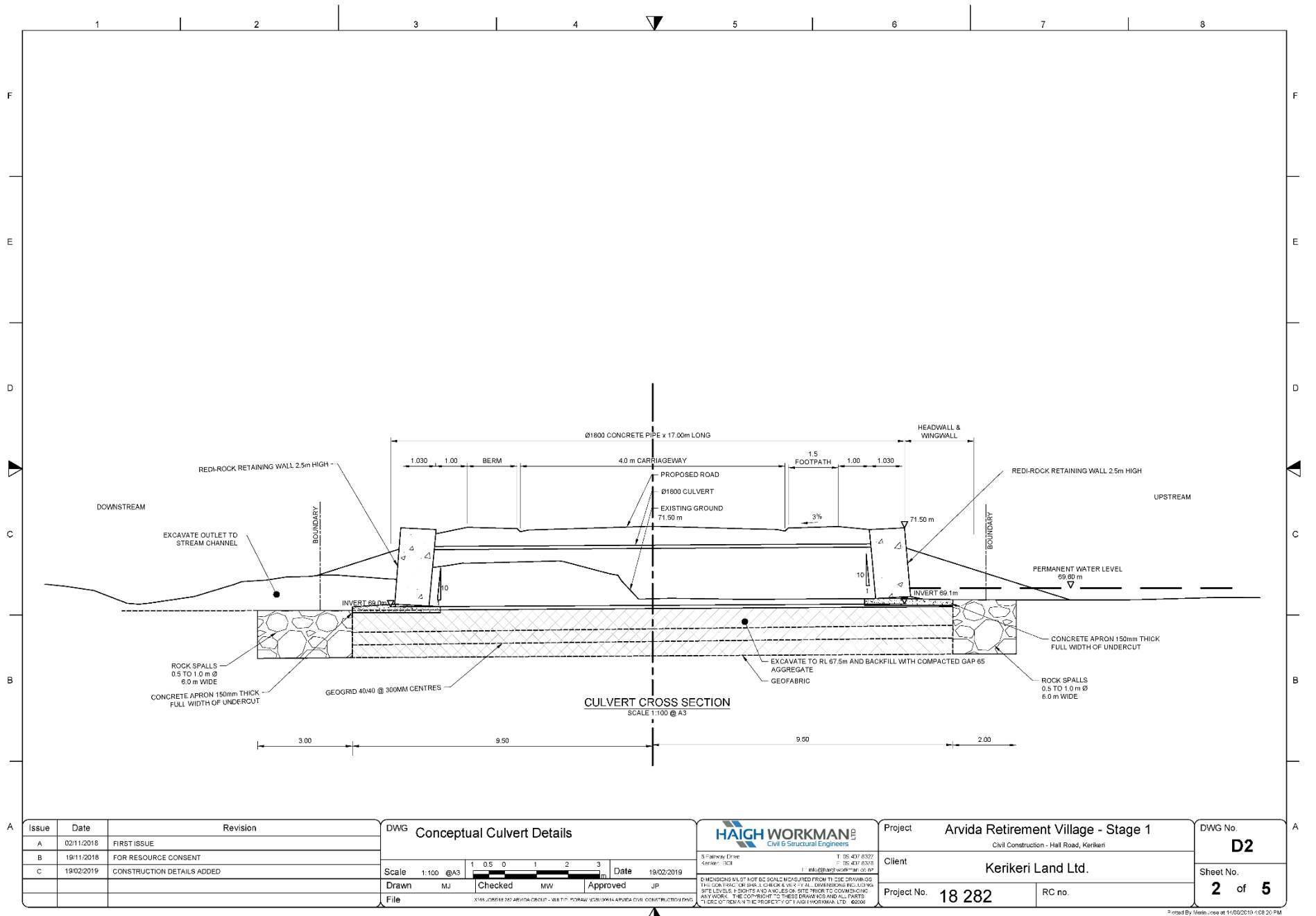














**RECORD OF TITLE  
UNDER LAND TRANSFER ACT 2017  
FREEHOLD  
Search Copy**



  
R.W. Muir  
Registrar-General  
of Land

**Identifier** **538491**  
**Land Registration District** **North Auckland**  
**Date Issued** 09 February 2011

**Prior References**

NA100C/683      NA103A/943

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**Estate** Fee Simple  
**Area** 7.4512 hectares more or less  
**Legal Description** Lot 1 Deposited Plan 173449 and Lot 2  
Deposited Plan 435929

**Registered Owners**

Kerikeri Land Limited

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**Interests**

Subject to a water supply right (in gross) over Lot 1 DP 173449 in favour of the Kerikeri Irrigation Company Limited created by Transfer B341468.1 - 19.10.1984 at 1:36 pm

Appurtenant hereto is a right of way and electricity, telecommunications and water rights created by Transfer C872756.6 - 2.8.1995 at 1:56 pm

Subject to a right of way and telephone, electricity and water supply rights over Lot 1 DP 173449 marked A on Plan 164771 specified in Easement Certificate C897572.4 - 19.9.1995 at 1.50 pm

The easements specified in Easement Certificate C897572.4 are subject to Section 243 (a) Resource Management Act 1991

Subject to an electricity supply, telephone and water supply rights over Lot 1 DP 173449 marked A and electricity, telephone and water supply rights over Lot 1 DP 173449 marked B on Plan 169285 specified in Easement Certificate C932934.6 - 12.12.1995 at 2.26 pm

Appurtenant to Lot 2 DP 435929 is a water supply, electricity supply and telephone and electricity rights specified in Easement Certificate C932934.6 - 12.12.1995 at 2.26 pm

Some of the easements specified in Easement Certificate C932934.6 are subject to Section 243 (a) Resource Management Act 1991 (See DP 169285)

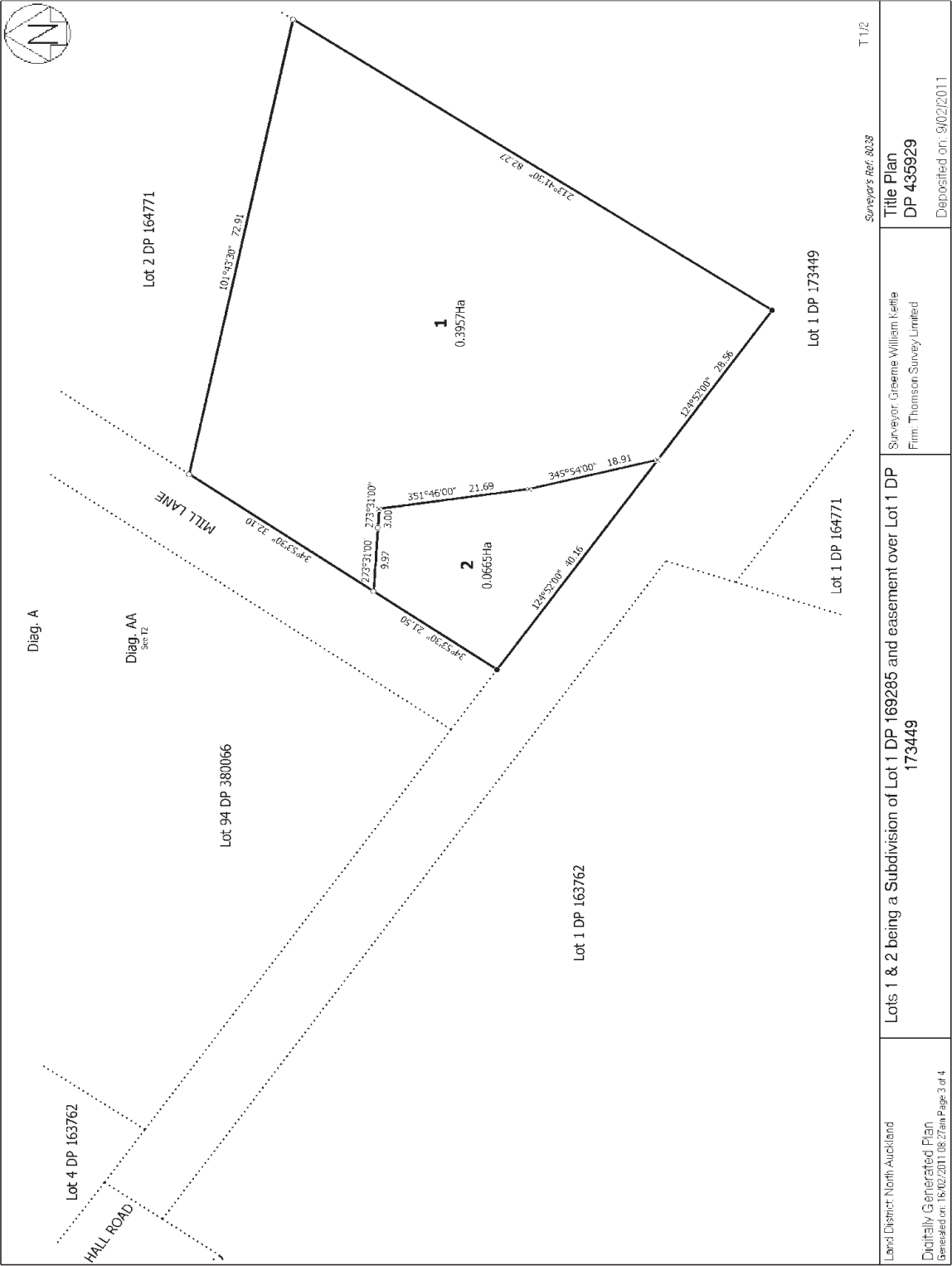
Subject to Section 241(2) and Sections 242(1) and (2) Resource Management Act 1991(affects DP 435929)

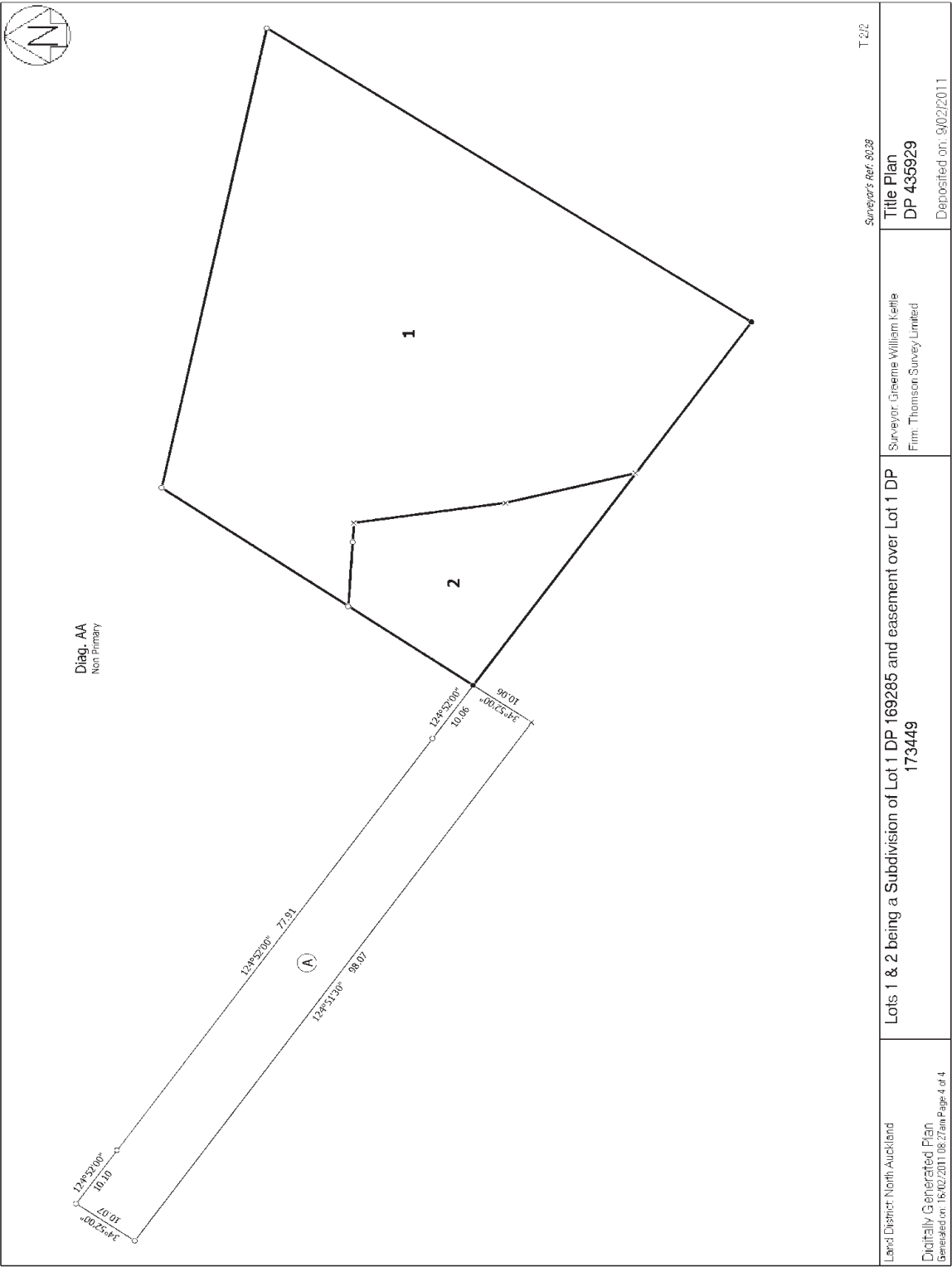
Subject to a right of way over Lot 1 DP 173449 marked A on DP 435929 created by Easement Instrument 8691548.6 - 9.2.2011 at 10:06 am

The easements created by Easement Instrument 8691548.6 are subject to Section 243 (a) Resource Management Act 1991

11275974.1 Mortgage to ANZ Bank New Zealand Limited - 5.11.2018 at 5:11 pm

[illegible]







**RECORD OF TITLE  
UNDER LAND TRANSFER ACT 2017  
FREEHOLD  
Search Copy**



  
R.W. Muir  
Registrar-General  
of Land

**Identifier** NA89A/336  
**Land Registration District** North Auckland  
**Date Issued** 23 November 1992

**Prior References**

NA19B/741

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<b>Estate</b>	Fee Simple
<b>Area</b>	3.6618 hectares more or less
<b>Legal Description</b>	Lot 2 Deposited Plan 149521

**Registered Owners**

Kerikeri Land Limited

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**Interests**

Appurtenant hereto is a right of way created by Transfer A519258

C433332.2 Resolution under Section 321(3)(c) Local Government Act 1974 (DP 149521) - 23.11.1992 at 10.42 am

Appurtenant hereto is a right to convey water, and telephonic and electric power rights specified in Easement Certificate C433332.6 - 23.11.1992 at 10.42 am

The easements created by Easement Certificate C433332.6 are extinguished over the part marked A on DP 338962 - see DP 343644

11275974.1 Mortgage to ANZ Bank New Zealand Limited - 5.11.2018 at 5:11 pm

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
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**RECORD OF TITLE  
UNDER LAND TRANSFER ACT 2017  
FREEHOLD  
Search Copy**



  
R.W. Muir  
Registrar-General  
of Land

**Identifier** **NA99B/322**  
**Land Registration District** **North Auckland**  
**Date Issued** 19 September 1995

**Prior References**

NA19B/740

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<b>Estate</b>	Fee Simple
<b>Area</b>	5.5512 hectares more or less
<b>Legal Description</b>	Lot 1 Deposited Plan 164771

**Registered Owners**

Kerikeri Land Limited

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**Interests**

Appurtenant hereto are rights of way and electricity, telecommunications and water rights created by Transfer C872756.6

C897572.2 Certificate pursuant to Section 321(3) (c) Local Government Act 1974 - 19.9.1995 at 1.50 pm

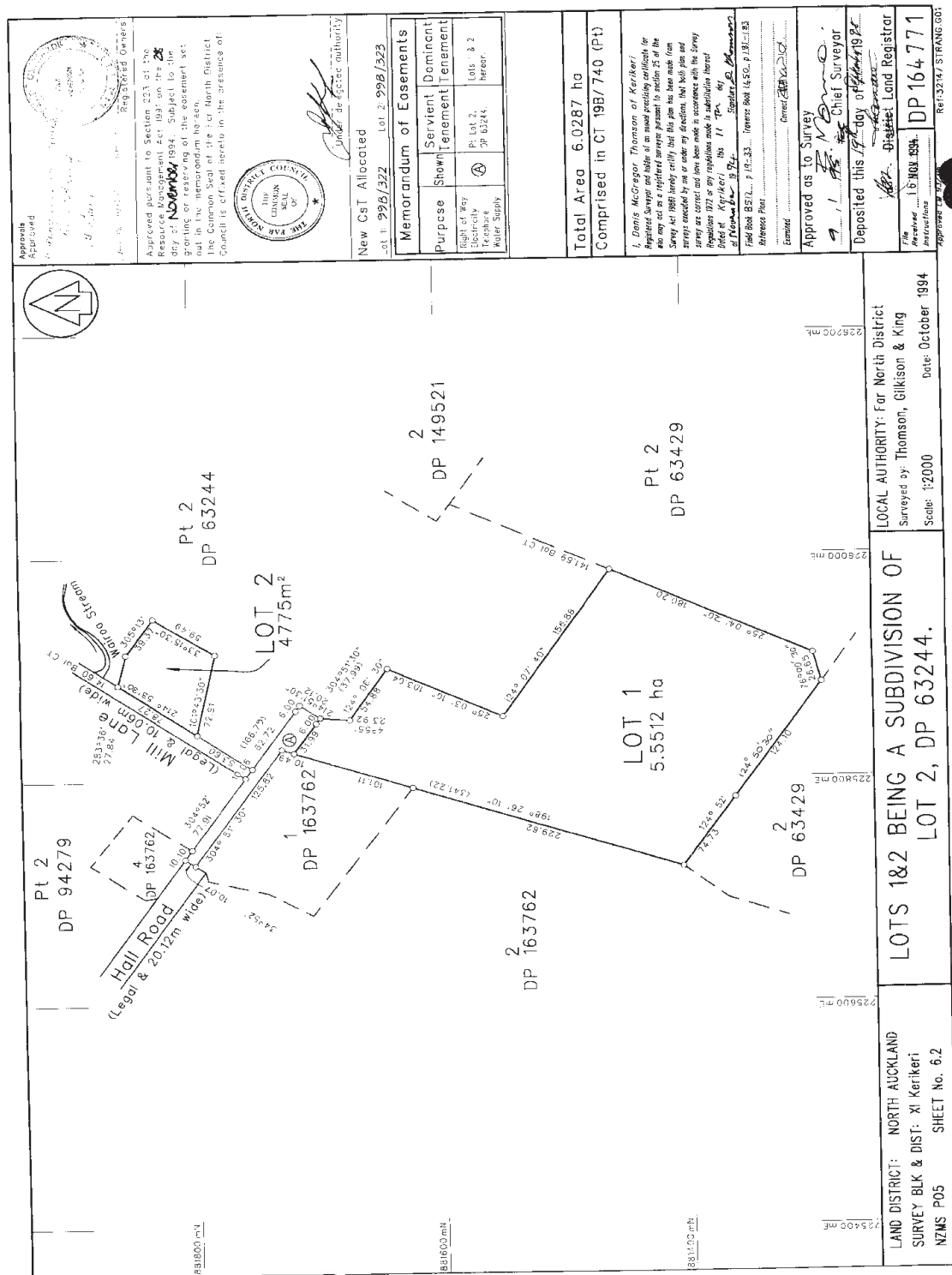
Appurtenant hereto is a right of way and telephone, electricity and water supply rights specified in Easement Certificate C897572.4 - 19.9.1995 at 1.50 pm

The easements specified in Easement Certificate C897572.4 are subject to Section 243 (a) Resource Management Act 1991

Appurtenant hereto are electricity, telephone and water supply rights specified in Easement Certificate C93934.6 - 12.12.1995 at 2.26 pm

11275974.1 Mortgage to ANZ Bank New Zealand Limited - 5.11.2018 at 5:11 pm





Site Suitability Report  
Arvida Retirement Village - Masterplan  
Hall Road, Kerikeri  
for  
Kerikeri Land Ltd

*Supporting report for Applications to Far North District Council and Northland Regional Council  
Haigh Workman reference 18 282*

March 2020



## Revision History

Revision N <sup>o</sup>	Issued By	Description	Date
A	Michael Winch	Draft for Comment	19/2/2020
B	John Papesch	For resource consents	11/3/2020

Prepared By



Michael Winch

Senior Civil Engineer  
BE Civil

Reviewed By



John Papesch

Senior Civil Engineer  
BE Civil, NZCE,  
CPEng, CMEngNZ, IntPE(NZ)

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## ***Executive Summary***

Haigh Workman Ltd (Haigh Workman) has been engaged by Kerikeri Land Limited to complete a site suitability report for use in support of resource consent applications to the Northland Regional Council (NRC) and the Far North District Council (FNDC) for a proposed retirement village located at the end of Hall Road, Kerikeri.

The overall project is described as 200 retirement units with a 76-bed care unit and communal facilities. Resource consents have been obtained for Stage 1 of the development comprising 28 two- and three-bedroom retirement units. The present application relates to the full Masterplan.

This report assesses the suitability of the development with regard to earthworks, natural hazards, stormwater, water supply and wastewater and should be read in conjunction with the statutory planning and assessment of environment effects (AEE) report and any specialist reports also undertaken for the Site.

Under the Far North District Plan the Site is zoned Residential.

### Natural Hazards

Parts of the Site adjoining the Wairoa Stream and tributary are subject to flooding in the modelled 10% and 1% AEP MPD + CC scenario. It is proposed to elevate the streamside building sites above the modelled 1% AEP MPD + CC flood level. This will provide more than the minimum 500mm freeboard required by FNDC and NRC rules.

To avoid the increase in flood levels, it is proposed to maintain the 1% AEP waterway area by excavating the floodplain adjacent to the Wairoa Stream. To reduce flood levels and improve access and amenity values alongside the Tributary, it is proposed to lower a ridge that constricts flood flows in the tributary.

The Masterplan development site does not contain any natural hazards that would warrant action under Section 71(1) of the Building Act 2004.

### Earthworks

Earthworks for the subdivision comprise

- stripping of topsoil,
- forming roads and berms,
- excavating trenches for stormwater and services,
- forming building platforms
- excavation to maintain floodway
- excavating stormwater treatment wetlands.

Resource consents are required for earthworks under District Plan, Operative Regional Water and Soil Plan, and Proposed Regional Plan rules.

To reduce the quantum of environmental risk associated with earthworks operations, it is proposed to limit the area of bare soil exposed at any time to a maximum of 50,000m<sup>2</sup>.

Appropriate erosion and sediment control measures are detailed in Auckland Council Guideline Document GD05 *Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region*.

A separate geotechnical assessment report has been commissioned which contains information required for proposed earthworks, as well as outlining geotechnical design issues that need to be considered for subsequent building design and construction of the retirement village.

### Stormwater Management

The Site lies within the Wairoa Stream catchment. The Wairoa Stream extends upstream from the Site approximately 5 km in a southerly direction encompassing a catchment area of around 6.0 km<sup>2</sup>. Access to the Site from Hall Road crosses a tributary with a catchment area of 0.8 km<sup>2</sup>. The tributary joins the Wairoa Stream at the northern boundary of the Site. The Wairoa Stream continues a further 2.6 km before joining the Kerikeri River estuary.

The full Retirement Village development involves 81,675 m<sup>2</sup> of impermeable surfaces over a gross site area of 166,642 m<sup>2</sup>. The percentage of gross site area covered by impermeable surfaces is 49.0%. The proposed development therefore complies with Far North District Plan permitted activity rule 7.6.5.1.6. A resource consent is required for the breach of Rule 12.7.6.1.1 (Setback From Lakes, Rivers And The Coastal Marine Area).

It is understood that the proposal may technically infringe Condition (a) of permitted activity Rule 21.1.2 of the Regional Water and Soil Plan for Northland. All other conditions in Rule 21.1.2 can be complied with. The proposed stormwater discharge complies with the Proposed Regional Plan for Northland permitted activity Rule C.6.4.2.

The following design principles apply to stormwater management for the proposed retirement village development:

- Stormwater reticulation within the site to suitable discharge points designed for the 10% AEP design flows
- Overland flow paths within the site to suitable discharge points designed for the 1% AEP design flows
- Control scour, particularly at discharge points
- Improve stormwater quality where practicable
- Avoid increases in flooding downstream as a result of the development.

The proposed Masterplan retirement village stormwater management system comprises:

#### Primary System

- Piped stormwater reticulation network;
- Catch pit inlets;
- Kerb & channel on the main roads
- Stormwater treatment wetlands.

#### Secondary System

- Swale drains, roads and driveways lower than surrounding houses;
- Overland flow paths through drainage / access paths.

Stormwater from 74% of the developed site area will discharge to five constructed wetlands adjacent to the Wairoa Stream and tributary downstream of Mill Lane. The wetlands are designed to improve water quality and provide some attenuation of peak flows.

Stormwater from the remaining 26% of the developed site discharges to the Wairoa Stream Tributary upstream of the site access road.

Peak stormwater flows from the site will increase as a result of the proposed development. However, discharges will occur before the peak flows in the Wairoa Stream and tributary, and will not add to peak stream flows. We recommend that stormwater from the site be discharged with only minor attenuation to avoid exacerbating downstream flooding.

### Water Supply

The Site is proposed to be served by reticulated water from the Kerikeri Town Water Scheme.

A reticulated water system within the site will service each retirement unit, the care facility and community buildings.

### Firefighting

Fire hydrants will be installed on the main water supply pipelines. The care facility and communal buildings will be sprinklered.

A 150mm diameter water main along Hall Road is scheduled for construction early 2020. When the 150mm diameter water main is connected, there will be adequate flow and pressure within the site for firefighting.

### Wastewater

FNDC infrastructure staff have confirmed that the Site can be served by the Kerikeri Wastewater Treatment Scheme when it is upgraded (estimated to be complete in April 2020 and fully operational by October 2020).

It is proposed to construct a 75mm OD pipe from the retirement village to the existing 110mm diameter FNDC pressure sewer on Mill Lane. This will be suitable for the full Masterplan development.

Wastewater from the buildings within the site will drain by gravity sewer to a number of pump stations connected to pressure sewers as shown on the drawings. The pump stations will include dual pumps and 24-hour storage capacity.



# **1 Introduction**

## **1.1 Project Brief and Scope**

Haigh Workman Ltd (Haigh Workman) have been engaged by Kerikeri Land Limited to prepare a site suitability report for use in support of Land Use Consent and Stormwater Discharge Consent applications for a proposed retirement village.

The overall project is described as 200 retirement units with a 76-bed care unit and communal facilities. Resource consents have been obtained for Stage 1 of the development comprising 28 two- and three-bedroom retirement units. The present application relates to the full Masterplan which will be developed in stages.

In most cases, a key condition contained within resource consent for a land development project is the need to obtain engineering plan approval for new infrastructure prior to commencing construction. It is therefore important that planning for infrastructure at the consenting stage includes an in-depth understanding of how to comply with the requirements of local regulatory environment, so that any challenges can be identified and addressed prior to commencing the detailed design phase.

The principal objectives of this engineering assessment are therefore to develop engineering solutions for the proposed development to ensure that infrastructure is fit for purpose, resilient and comply with local regulatory environment. This report should be read in conjunction with the statutory planning and assessment of environment effects (AEE) report and any specialist reports also undertaken for the Site.

The scope of this report includes an assessment of:

- Natural hazards (particularly flood hazards);
- Earthworks required to complete the development;
- Stormwater management (with a water sensitive design integrated approach);
- Water supply, and;
- Wastewater reticulation

## **1.2 Limitations**

This report has been prepared for the use of Kerikeri Land Limited with respect to the particular brief outlined to us. This report is to be used by our Client and their Consultants and may be relied upon when considering our engineering advice. Furthermore, this report may be utilised in the preparation of resource consent applications with local authorities. The information and opinions contained within this report shall not be used in other context for any other purpose without prior review and agreement by Haigh Workman Ltd.

It has been assumed in the production of this report that under the Masterplan, the site is to be developed for low-rise residential dwellings including a care facility and communal buildings. If any of these assumptions are incorrect, then amendments to the recommendations made in this report may be required.

The comments and opinions presented in this report are based on the findings of the desk study and ground conditions encountered during site visits performed by Haigh Workman. There may be other conditions prevailing on the site which have not been revealed by this investigation and which have not been taken into account by this report. Should conditions encountered differ to those outlined in this report we ask that we be given the opportunity to review the continued applicability of our recommendations.

## 2 *Site Description and Proposed Development*

### 2.1 Site Description

Site Address: 57C Hall Road and 22 Limelight Lane, Kerikeri

Legal Description: Lot 1 DP 173449, Lot 2 DP 435929, Lot 1 DP 164771 and Lot 2 DP 149521

Site Area: 166,642 m<sup>2</sup>

Situated approximately one kilometre south east of Kerikeri town centre, the Site comprises an irregular shaped parcel of land encompassing 166,642 m<sup>2</sup>. The Site, formerly market garden and kiwifruit orchard, is currently in pasture. There is one existing dwelling on the Site (22 Limelight Lane).

The Wairoa Stream traverses the northeastern boundary of the Site. A tributary of the Wairoa Stream bounds the west and north of the site. Surrounding land to the northeast comprises residential properties, with a mix of horticultural land and lifestyle blocks surrounding other boundaries. Further afield to the north is an industrial area accessed off Mill Lane.

**Figure 1 – Site location**



Approximately 55% of the Site drains directly towards Wairoa Stream to the northeast across a gentle to moderate gradient, falling moderately along the site boundary towards the Wairoa Stream. The remaining 45% drains across a gentle slope towards a tributary of the Wairoa Stream. The tributary includes approximately 11,500m<sup>2</sup> of wetland / flood area that is unsuitable for residential development. The Esplanade priority area along the Wairoa Stream and tributary, and building set-backs further restrict the area of the site

that is able to be developed for residential use. Of the developable areas, 65% drains to the Wairoa Stream and 35% to the tributary.

## **2.2 Proposed Development**

The overall project comprises:

- 12 x One-bedroom villas
- 131 x Two-bedroom villas
- 57 x Three-bedroom villas
- A Care Facility of 5603m<sup>2</sup> GFA with 76 care rooms
- A Health and Wellness Centre of 813 m<sup>2</sup> GFA including indoor swimming pool, gym and café
- A community Clubhouse of 730 m<sup>2</sup> GFA including lounge, dining, kitchen, bar, library, cinema, multi-use rooms and outdoor bowling green.
- Associated roads, driveways, carparking, footpaths, lawns, gardens, stormwater and services.

The retirement village will be developed in stages. Resource consents have been granted for Stage 1 comprising 28 residential units; Stage 1 is currently under construction. The remaining stages 2 to 6 will be developed over a period of 8 years or more. An indicative staging plan is shown on Ignite drawing A1046.

## **2.3 District Plan Zoning**

According to the Far North District Council (FNDC) district plan the Site is currently zoned as 'Residential'.

### 3 Environmental Setting

#### 3.1 Geology

Sources of Information:

- Institute of Geological & Nuclear Sciences, 1:250,000 Scale, 2009: *"Geology of the Whangarei area"*;
- NZMS Sheet 290 P04/05, 1:100,000 scale map, Edition 1, 1980: *"Whangaroa-Kaikohe"* (Soils);
- NZMS Sheet 290 P04/05, 1:100,000 scale map, Edition 1, 1981: *"Whangaroa-Kaikohe"* (Rocks).

The site is within the bounds of the GNS Geological Map 2 *"Geology of the Whangarei area"*, 1:250,000 scale. The published geology indicates the site comprises Kerikeri Volcanic Group, comprising basalt lava, volcanic plugs and minor tuff. Evidence of volcanic rock can be seen within the Wairoa Stream.

NZMS soil maps show the site to be directly underlain by soils of the 'Rolling and Hill Land' formation comprising Kerikeri friable clay (KE) and Kerikeri friable clays with boulders (KEb) towards Wairoa stream. Residual soils at the site comprising KE and KEb are typically described and categorised as *'well to moderately-well drained'*. NZMS mapping indicates residual soils to be *'weathered to soft red-brown or dark grey brown clay to depths of 20 m with many rounded corestones'*.

Locally, to the west of the site and beyond the boundaries bedrock geology is indicated to comprise older Ruatangata Sandstone (Etr) of the Te Kuiti Group, of Paleogene age. Etr rocks are described by the GNS map as *'greenish grey to dark green calcareous, glauconitic, muddy fine-grained to medium-grained sandstone, conglomerate'*.

Locally within and around the unnamed tributary which follows the western boundary it is anticipated that soft, alluvial Holocene deposits have accumulated which may include soft cohesive, loose sand and gravels and/or peat soils.



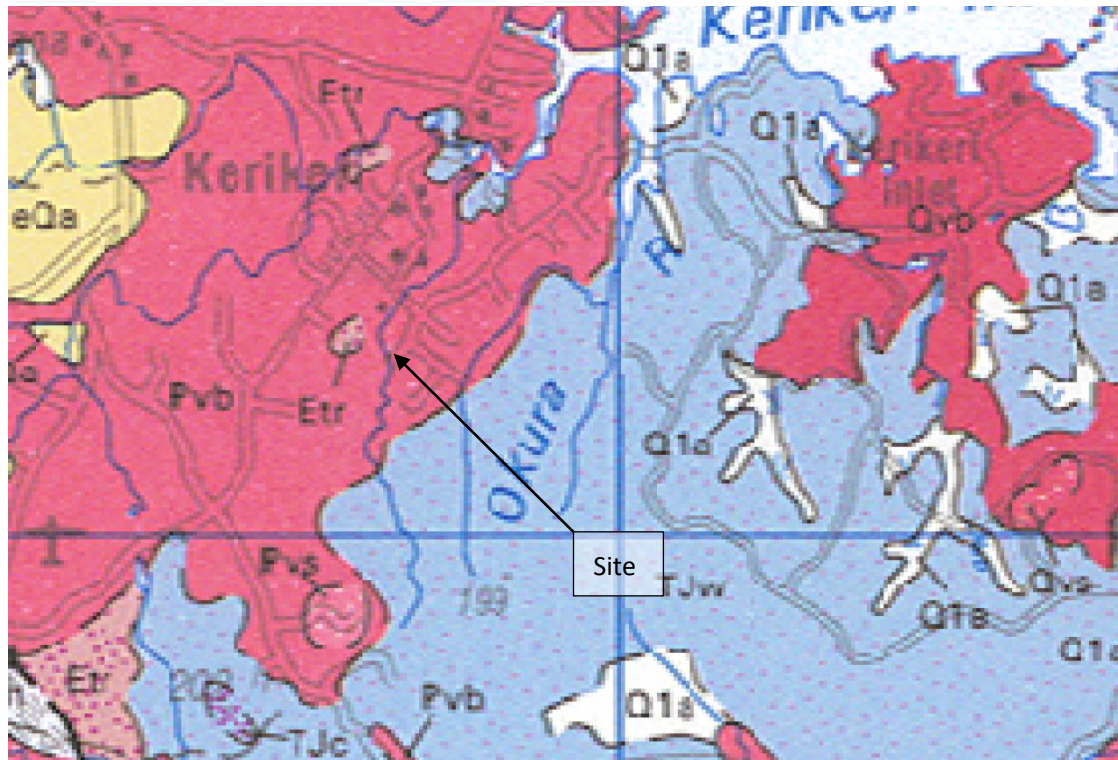


Figure 2 – GNS Science, Geology of the Whangarei Area, Map 2

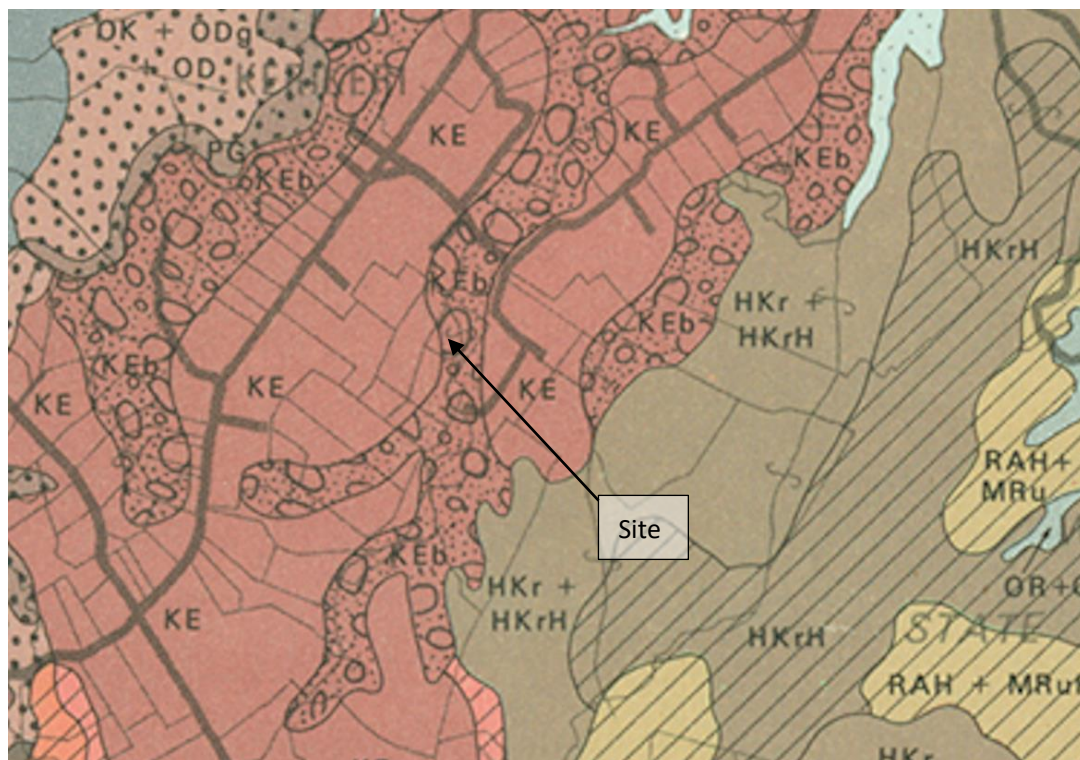


Figure 3 – NZMS 290 Sheet P04/05 Soil Map

### 3.2 Surface Water Features and Flooding

A review of relevant information pertaining to flooding and water courses is included in Table 3.1. An examination of Far North District Council (FNDC) and Northland Regional Council (NRC) online GIS databases is included below.

**Table 3.1 - Flooding and Water Courses**

	Presence/Location	Comments
<b>Watercourses (within 500 m)</b>	Wairoa Stream is situated alongside the north-eastern site boundary flowing to the north prior to entering the Kerikeri Inlet to the north of the site.  A tributary of the Wairoa Stream traverses the western boundary of the site, joining the Wairoa Stream at the northern site boundary.	
<b>Surface Water Features (Ponds, Lakes etc) within 250 m)</b>	None recorded except for natural ponding/swampland within the Wairoa Stream tributary.	
<b>Flood Risk Status</b>	Some of the site area adjacent to Wairoa Stream and tributary is mapped as of flood risk (for 10-year ARI and 100-year ARI flood events).	Refer Section 5 for detailed assessment
<b>Flood Susceptibility</b>	As above.	Upstream and downstream flood levels shall not be increased by the development unless any increase can be shown to have not more than a minor impact on upstream and downstream properties

### 3.3 Natural Hazards

Under Section 2 of the Resource management Act 1991, **natural hazard** means any atmospheric or earth or water related occurrence (including earthquake, tsunami, erosion, volcanic and geothermal activity, landslip, subsidence, sedimentation, wind, drought, fire, or flooding) the action of which adversely affects or may adversely affect human life, property, or other aspects of the environment.

Natural hazards listed in Section 71(3) of the Building Act 2004 include: erosion, falling debris, subsidence, inundation or slippage. We assess the susceptibility of the proposed development to these potential hazards as;

**Table 3.2 – Natural Hazards**

Natural Hazard	Risk
Erosion (including coastal erosion, bank erosion, and sheet erosion)	No
Falling debris (including soil, rock, snow, and ice)	No
Subsidence (vertical settlement)	No
Inundation (including flooding, overland flow, storm surge, tidal effects, and ponding)	Yes, part of the development is located in the 1% AEP flood plain. Refer section 5 for site specific assessment
Slippage	No

## 4 Earthworks

### 4.1 Proposed Earthworks

Earthworks will be required for road formation and stormwater infrastructure on the subdivision Site, comprising:

- Stripping of topsoil,
- Forming roads and berms,
- Excavating trenches for stormwater and services
- Forming building platforms
- Excavation to maintain floodway
- Excavating stormwater treatment wetlands

Our calculation of the total areas and volumes of works required for the development (excluding Stage 1) is as follows:

**Table 4.1 – Earthworks Volumes**

Development	Area (m <sup>2</sup> )	Cut Volume (m <sup>3</sup> )	Fill Volume (m <sup>3</sup> )	Aggregate Volume (m <sup>3</sup> )
<b>Bulk Earthworks</b>				
Strip topsoil	108,400	21,680		
Cut to Fill		20,000	20,000	10,000
Surplus fill from Stage 1 stockpile		7,000	7,000	
Extra cut in floodway	3,100	3,030	3,030	
Stormwater and services trenches		7,000	4,000	3,000
Spread topsoil			9,500	
<b>Wetlands</b>				
Excavate soil	1,200	1,700		
Aggregate and soil			700	600
<b>Total Earthworks</b>	<b>112,700</b>	<b>60,410</b>	<b>44,230</b>	<b>13,600</b>

The earthworks quantities do not include Stage 1 development which is already consented and will occur during the 2020 earthworks season.

Overall, there will be a net surplus of approximately 16,200 m<sup>3</sup> of cut material (including 12,200 m<sup>3</sup> of topsoil) that will be removed from site.

### 4.2 Batters and Retaining Walls

The northern part of the site slopes towards the Wairoa Stream at a gradient of 5 to 10%. To facilitate the type of residential development suitable for a retirement village, it is proposed to form a series of level terraces as illustrated on drawing DE4. The terraces will have a longitudinal slope allowing stormwater drainage along the roads and accessways as shown on drawings DP5 to DP7.



The terraces will be separated by planted batters and retaining walls. Planted batters are proposed at slopes no steeper than 2:1 (26 degrees) where formed in cut. Where the height between terraces is greater than can be accommodated by a batter alone, a retaining wall may be constructed at the toe of the batter. Retaining walls may be cantilever timber pole walls, Mechanically Stabilised Earth with earth or concrete facing or other retaining structures.

Full height walls (without a batter on top) are required at the eastern end of the Streamside wall, and along the boundary with the neighbouring property Lot 2 DP 321732 (identified as Limelight Boundary Wall on the drawings).

The Streamside wall is expected to be up to 3.6 m high and formed predominantly with earth fill. It could be engineered as Mechanically Stabilised Earth with earth or concrete facing.

The Limelight Boundary wall is up to 3.0 m high. This wall supports an excavation; hence a cantilever pole wall is expected to be the appropriate solution.

### 4.3 Earthworks Staging

The earthworks will be carried out in stages over a period of 8 years or more. The staging of bulk earthworks does not necessarily align with the timing for the construction of buildings because material excavated from one construction stage may be placed directly as engineered fill for a later stage of development.

To reduce the quantum of environmental risk associated with earthworks operations, it is proposed to limit the area of bare soil exposed at any time to a maximum of 50,000m<sup>2</sup>.

An indicative earthwork staging plan is shown on Haigh Workman drawing 18 282/MP9A. Earthworks Stage 2A for the club house site may be carried out either in conjunction with Stage 2 or Stage 3 earthworks.

Based on the indicative earthworks staging plan, the maximum area of earthworks at any one time is calculated as follows:

**Table 4.2 – Earthworks Areas**

Stage	Area Calculation(m <sup>2</sup> )	Total Area (m <sup>2</sup> )
2	27,500 m <sup>2</sup> cut/fill plus 12,500 m <sup>2</sup> extra fill = Plus 5,000 m <sup>2</sup> for Stage 2A =	40,000 m <sup>2</sup> 45,000 m <sup>2</sup>
3	32,000 m <sup>2</sup> cut/fill plus 13,000 m <sup>2</sup> extra fill = Plus 5,000 m <sup>2</sup> for Stage 2A =	45,000 m <sup>2</sup> 50,000 m <sup>2</sup>
4	16,000 m <sup>2</sup> cut/fill	} 50,000 m <sup>2</sup>
5	14,000 m <sup>2</sup> cut/fill	
6	20,000 m <sup>2</sup> cut/fill	

It is proposed to use suitable soil excavated from Stages 2 and 3 as engineered fill for Stages 4 and 5 residential development. Construction traffic between the cut and fill sites will use a separate unpaved haulage road to avoid Stage 1 residential area and the existing dwelling at 57 Hall Road (Les Franks' property) as indicated on the drawing.

In Earthworks Stages 4 and 5, some re-working of the fill placed at an earlier stage is envisaged as being necessary to complete the batter / retaining walls adjacent to the Wairoa Stream and between residential terraces.

Earthworks for Stages 4, 5 and 6 may be carried out in one operation or separately.

Additional earthworks will be required beyond the areas shown on the drawing for sediment control measures, most likely in the locations of the proposed water quality wetlands.

#### **4.4 Far North District Plan**

The land is zoned Residential. Under the District Plan rules, cut, fill and aggregate volumes are added together making a total of 118,000 m<sup>3</sup> of earthworks over the whole project. It is conservatively estimated that up to 65,000m<sup>3</sup> of bulk earthworks (cut plus fill plus imported aggregate) may be required over any 12 months period. The proposed earthworks will exceed the 200 m<sup>3</sup> per year per site maximum for a Permitted activity and 500 m<sup>3</sup> per year per site maximum for a Restricted Discretionary activity under the District Plan. The maximum cut / fill depth in places will exceed the 1.5m depth of cut or fill specified in the permitted and controlled activity rules [District Plan Rules 12.3.6.1.3 and 12.3.6.2.2].

#### **4.5 Regional Water and Soil Plan**

The threshold volumes under the Regional Water and Soil Plan are based on the volume of soil moved and excludes aggregate. The total volume of soil moved within the Site over the whole project is estimated to be 60,410m<sup>3</sup>. It is conservatively estimated that up to 30,000 m<sup>3</sup> may be moved within in any year. This will exceed the 5,000 m<sup>3</sup>/year permitted activity threshold in Rule 33.1.3. The Chapter 32 Environmental Standards can be complied with. Bulk earthworks is a controlled activity under Rule 33.2.1.

Permitted activity Rule 34.1.3 provides for up to 200m<sup>2</sup> or 50m<sup>3</sup> of earthworks within the Riparian Management Zone. Permitted activity Rule 34.1.2 provides for associated vegetation clearance. The dominant slope in the Riparian Management Zone where earthworks are proposed varies from 3 to 16 degrees. The RMZ therefore varies from 5 to 20m wide. The proposed earthworks exceed the permitted activity thresholds. Earthworks in the RMZ is a discretionary activity under Rule 34.3.1.

The proposed vegetation clearance and earthworks within the RMZ will exceed permitted activity rules 34.1.2 and 34.1.3. Because the width of the RMZ varies according to slope, a detailed assessment of RMZ width would be required to determine total areas and volumes within the RMZ. This may not be necessary if NRC accept the assessment below for a constant RMZ width of 10m, in line with Table 13 of the Proposed Regional Plan

Rules 22.1 to 22.3 for stormwater discharges from earthworks areas mirror the activity status of the earthworks activity.

#### **4.6 Proposed Regional Plan**

The Northland Regional Council is reviewing its Regional Plans and a Proposed Regional Plan for Northland was notified in September 2017, decisions notified in May 2019 and appeals closed July 2019. It has statutory effect at this stage, alongside the operative Water and Soil Plan. Proposed Rule C.8.3.1 contains limits on general earthworks, earthworks within 10m of a river or wetland, and earthworks in flood hazard areas.

It is proposed that the maximum area of exposed soil be limited to 50,000 m<sup>2</sup> at any one time.

Some of the earthworks will be adjacent to rivers and within flood hazard areas. The total areas and volumes are estimated as follows:

Location	Area	Volume
Within 10m of the Wairoa Stream	1100 m <sup>2</sup>	1700m <sup>3</sup> cut+ 700 m <sup>3</sup> fill
Within 10m of the Tributary	700 m <sup>2</sup>	400m <sup>3</sup> cut+ m <sup>3</sup> 60 m <sup>3</sup> fill
High-risk flood hazard area (10% AEP)	2500 m <sup>2</sup>	4200m <sup>3</sup> cut + 1400 m <sup>3</sup> fill
Flood hazard area (1% AEP)	4000 m <sup>2</sup>	4700m <sup>3</sup> cut + 4700m <sup>3</sup> fill

Note: All fill within 20m of the stream bank will be specific 'bioretention media' (soil) required for the constructed wetlands: excavated soil will be replaced with the bioretention media.

Compliance with the Proposed Regional Plan Rule C.8.3.1 is assessed as follows:

Location	Threshold	Compliance
Within 10m of a natural wetland, the bed of a continually or intermittently flowing river or lake	200 square metres of exposed earth at any time, and 50 cubic metres of moved or placed earth in any 12month period.	Exceeds both thresholds
Catchment of an outstanding lake		N/A
Erosion-prone land		N/A
High-risk flood hazard area (10% AEP)	50 cubic metres of moved or placed earth in any 12month period.	Exceeds threshold
Coastal riparian and foredune management area		N/A
Flood hazard area (1% AEP)	100 cubic metres of moved or placed earth in any 12month period.	Exceeds threshold
Other areas	5000 square metres of exposed earth at any time.	Exceeds threshold

Under the Proposed Regional Plan, a resource consent is required for earthworks.

## 4.7 Earthworks Operations

Site formation will comprise cuts and fills using material won from the site, clear of any unsuitable material such as non-engineered fill, topsoil, soft or organic soils or vegetation. Unsuitable materials should be stripped from any areas of earthworks and stockpiled well clear of earthwork operations or removed from the site.

All earthworks should be carried out to the requirements of NZS 4404:2010 'Land Development and Subdivision Infrastructure' and NZS 4431:1989, 'Code of Practice for Earthworks for Residential Development'. It is recommended that any unsuitable material identified during excavation be removed and replaced with granular hardfill or engineered cohesive fill.

Where soil is moved from one part of the site to another (for example when taking excavated soil from Stage 2 to a fill site near the Wairoa Stream), it is recommended that a haul road be constructed separate from the permanent roads to avoid pavement damage, soil on the road and nuisance to residents established in an earlier stage of development.

Detailed earthworks design will be completed prior to each stage of construction.

## 4.8 Erosion and Sediment Control

The location and extent of earthworks to be carried out in any earthworks season has not been finalised at this stage. We suggest that, as a condition of consent, an Erosion and Sediment Control Plan (including identifying areas and volumes of earthworks proposed within the season) be required to be submitted to and approved by Council prior to start of earthworks in any earthworks season.

Appropriate erosion and sediment control measures are detailed in Auckland Council Guideline Document GD05 *Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region*.

The erosion sediment control measures predominantly comprise:

- Clean water diversions
- Stabilised construction entrance
- Silt fences
- Sediment Retention Ponds
- Decanting Earth Bunds
- Prompt stabilisation of earthworks areas
- Silt fence around pockets of unstabilised areas subject to earthworks
- Catch pit protection, deployed only at key stages of pavement construction operations

Relevant sections of GD05 are listed in brackets below and should be referred to in constructing and maintaining the sediment control measures. All sedimentation controls shall be maintained in place until bare earthworks areas have been stabilised with aggregate or re-grassing has established.

### Clean Water Diversion (E2.1)

Separation of clean and dirty water greatly reduces the effort needed to prevent sediment run-off by limiting the quantity of run-off that can become contaminated with silt. Intercept drains will be constructed uphill of the earthworks in these areas to divert clean runoff away from the earthworks areas.

### Stabilised Entrance (E2.6)

Access to the site is off the end of Hall Road constructed as part of the Stage 1 development works.

At each stage of development, a stabilised entrance should be formed from the earthworks area on to the sealed road to reduce dust and sediment being tracked off-site onto the road network.

Remedial action should be undertaken should sediment be transported on to public roads

### Surface Roughening (E2.7)

Cut and fill batter slopes should be roughened by track rolling as specified in GD05.

### Topsoiling and Grass Seeding (E3.1)

Cut and fill batter slopes and berms will be topsoiled and re-grassed as soon as practicable following completion of each stage of earthworks.

### **Mulching (E3.4)**

Temporary mulching may be appropriate where uncompleted earthworks areas need to be left over winter to be completed in the following earthworks season.

### **Sediment Retention Pond (F1.1)**

Sediment retention ponds are appropriate for catchment areas of 0.3 to 5 ha (3,000 to 50,000 m<sup>2</sup>). Sediment retention ponds may be constructed in the locations of the proposed constructed wetlands and converted to the constructed wetland once an earthworks area has been stabilised with pavement, grass or garden.

### **Decanting Earth Bunds (F1.2)**

Decanting earth bunds are appropriate for catchment areas of less than 0.3 ha (3,000 m<sup>2</sup>).

### **Silt Fences (F1.3)**

Silt fences are useful for small, disturbed areas or sloping areas and are considered appropriate for this site. These will be deployed down-slope area of the earthworks areas.

Stormwater from the silt fences will normally discharge on to undisturbed pasture and travel overland more than 100m to any defined watercourse allowing further sediment to be trapped in the grass.

### **Stormwater Inlet Protection (F1.6)**

Once the piped stormwater system has been constructed, cesspits will initially intercept stormwater from unsealed pavement areas.

### **Hay Bales**

Hay bales can impound sediment-laden water at points of discharge, but can be problematic if not installed correctly and become sodden and un-manageable with time. Hay bales are not a recommend solution in more modern GD05 publications.

### **On Site Works**

Operations involving concrete washings such as water blasting concrete surfaces, washing down equipment, concrete and tile cutting shall be undertaken with care since these products are highly alkaline and can contain oxides, heavy metals (copper drill lubricants) and or petroleum products. Release of these products into the stormwater system or waterways shall be prevented.

- If washing cement or concrete fines, make sure the wash water is contained on site and the contaminants removed preferably by allowing time for the sediment to settle out.
- When water blasting, contain the run-off. Cement and chemical additives must not be discharged to stormwater drains.

**Pumped Water**

The need to pump sediment laden water from trenches or foundations on the site is not anticipated. However, should the need arise dirty water shall be directed to the sediment controls on site. Under no circumstances shall sediment laden water be pumped off site untreated.

**Plant Re-fuelling**

To contain any spillage of fuel, oil or similar contaminants vehicles and plant are to be re-fueled on a gravel pad, where potential spillage can be contained by on site controls. A spill kit comprising saw dust shall be kept on site as a first defence to deal with any spillages.

**Maintenance**

Silt controls shall be checked on a regular basis and immediately prior to forecast heavy rain. Maintenance shall be carried out as necessary and any build-up of silt removed following major rainfall events.

**Heavy or Prolonged Rainfall**

Earthworks operations should not be carried out during heavy or prolonged rainfall events.

**Monitoring and Review**

Review of sedimentation control measures is to be undertaken at each major stage of the earthworks and following heavy rain storm events.

## 4.9 Assessment Criteria

The proposed earthworks have been assessed against the Assessment Criteria in Section 12.3.7 of the Far North District Plan as follows:

**Table 4.3 – FNDC Earthworks Assessment Criteria**

Criterion	Assessment
(a) the degree to which the activity may cause or exacerbate erosion and/or other natural hazards on the site or in the vicinity of the site, particularly lakes, rivers, bush blocks and the coastline;	The proposed earthworks will not cause or exacerbate erosion.
(b) any effects on the life supporting capacity of the soil;	Soil beyond the roads, accessways and buildings will be suitable for lawn and landscape planting
(c) any adverse effects on stormwater flow within the site, and stormwater flow to or from other properties in the vicinity of the site including public roads;	The proposed earthworks will not obstruct local drainage paths.
(d) any reduction in water quality;	Sediment control will be implemented during the earthworks operation using the Auckland Council GD05 guidelines. Once built on or grassed the proposed earthworks will have no adverse effect on water quality.
(e) any loss of visual amenity or loss of natural character of the coastal environment;	N/A
(f) effects on Outstanding Landscape Features and Outstanding Natural Features (refer to <b>Appendices 1A</b> and <b>1B</b> in <b>Part 4</b> , and <b>Resource Maps</b> );	N/A
(g) the extent to which the activity may adversely affect areas of significant indigenous vegetation or significant habitats of indigenous fauna;	N/A
(h) the extent to which the activity may adversely affect heritage resources, especially archaeological sites;	Refer Planner's report
(i) the extent to which the activity may adversely affect the cultural and spiritual values of Maori, especially Sites of Cultural Significance to Maori and waahi tapu (as listed in <b>Appendix 1F</b> in <b>Part 4</b> , and shown on the <b>Resource Maps</b> );	Refer Planner's report
(j) any cumulative adverse effects on the environment arising from the activity;	Refer Planner's report
(k) the effectiveness of any proposals to avoid, remedy or mitigate any adverse effects arising from the activity;	The sediment control plan is designed to avoid or mitigate erosion and sediment runoff.
(l) the ability to monitor the activity and to take remedial action if necessary;	The sediment control plan is required to be monitored and action taken to avoid, remedy or mitigate risks.
(m) the criteria in <b>Section 11.20 Development Plans</b> in <b>Part 2</b> .	Not applicable

## **5 Flood Hazard**

### **5.1 Flood Hazard Model**

Flood flows and flood levels have been modelled by Northland Regional Council for 10- and 100-year rainfall events including allowances for maximum probable development (under existing zone rules) and 2°C climate change.

The modelled flood extent is shown on Haigh Workman drawing 18 282 / MP8.

### **5.2 Proposed Hazard Mitigation**

As shown on drawing MP8, parts of the site adjoining the Wairoa Stream and tributary are subject to flooding in the modelled 1% AEP MPD + CC scenario. It is proposed to elevate the streamside building sites to a minimum of 0.7m above the modelled 1% AEP MPD + CC flood level. Building floor levels will be at least 0.2m above ground level. This will provide more than the minimum 500mm freeboard required by FNDC and NRC rules.

Placing fill in the 1% AEP flood hazard area would reduce the waterway area and increase flood levels on adjoining properties. To avoid the increase in flood levels, it is proposed to maintain the 1% AEP waterway area by excavating the floodplain adjacent to the Wairoa Stream as shown on Haigh Workman drawings 18 282 / MP9 and CS1 to CS16.

The proposed buildings adjacent to the Tributary are well elevated above the 1% AEP flood levels. However, approximately 70m upstream of the Wairoa Stream confluence, the Tributary waterway is restricted by a ridge extending down from the retirement village site. To reduce flood levels and improve access and amenity values alongside the Tributary, it is proposed to excavate approximately 300m<sup>3</sup> of soil from the streamside area. The extent of proposed excavation is shown on drawing 18 282/MP9.

### **5.3 Statutory Framework**

Following the proposed earthworks, the site will not contain any natural hazards that would warrant action under Section 71(1) of the Building Act 2004.



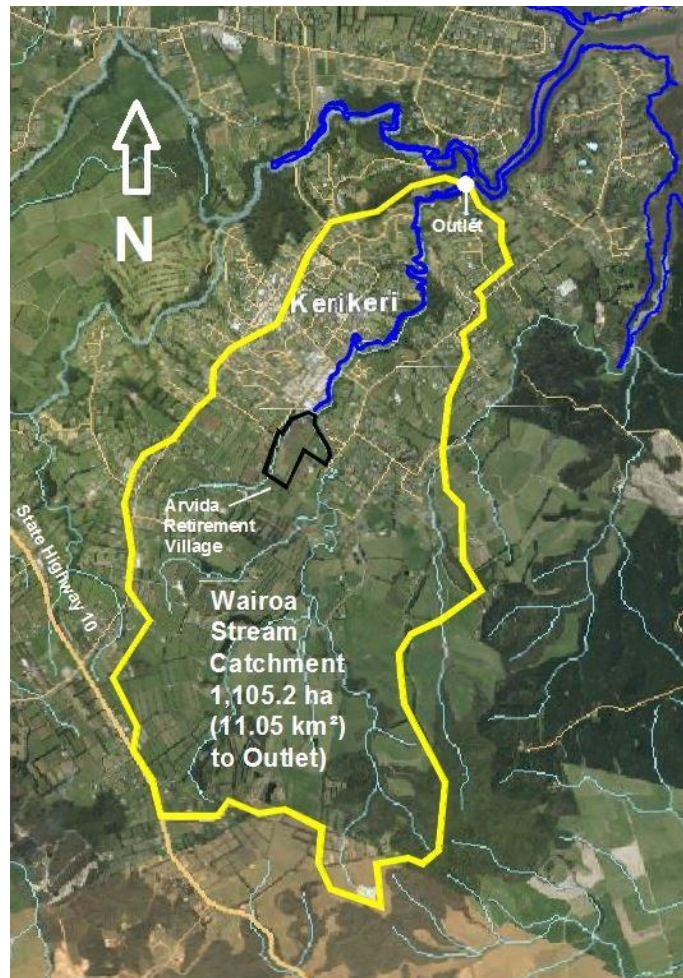
## 6 Stormwater Management

### 6.1 Wairoa Stream

#### 6.1.1 Catchment

The Site lies within the Wairoa Stream catchment which is 8 km long with a total area of 11.05 km<sup>2</sup> as shown below.

Figure 4 – Wairoa Stream Catchment



The Arvida Retirement Village site is located in the lower half of the catchment.

#### 6.1.2 Upstream Catchment

The extent of the Wairoa Stream catchment upstream of the Site is mapped below.

The Wairoa Stream extends upstream from the Site approximately 5 km in a southerly direction encompassing a catchment area of around 6.0 km<sup>2</sup>.



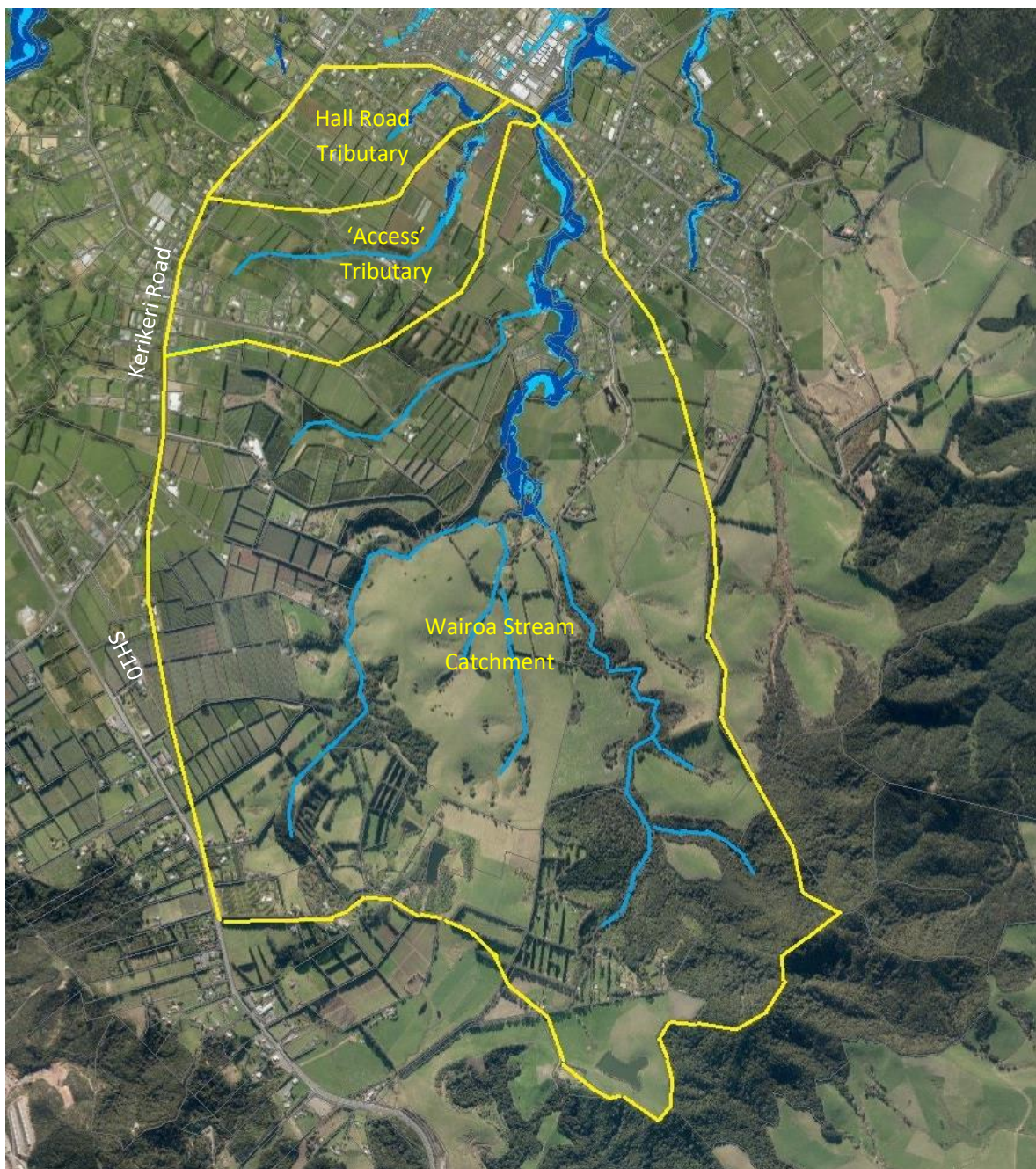
Two tributaries join the Wairoa Stream at the northern boundary of the site as shown in Figure 5 below:

- The 'Access Tributary' with a catchment area of 0.8 km<sup>2</sup> crossing the Site Access 100m beyond the end of Hall Road.
- The 'Hall Road Tributary' with a catchment area of 0.28 km<sup>2</sup> crossing Hall Road 420m from Kerikeri Road.

Approximately 55% of the site drains to the Wairoa Stream; the remaining 45% drains to the 'Access Tributary'.

Upstream of the Site, the catchment is predominantly orchard land with some pasture (farmland and lifestyle blocks).

**Figure 5 – Wairoa Stream Catchment Upstream**





### 6.1.3 Downstream Catchment

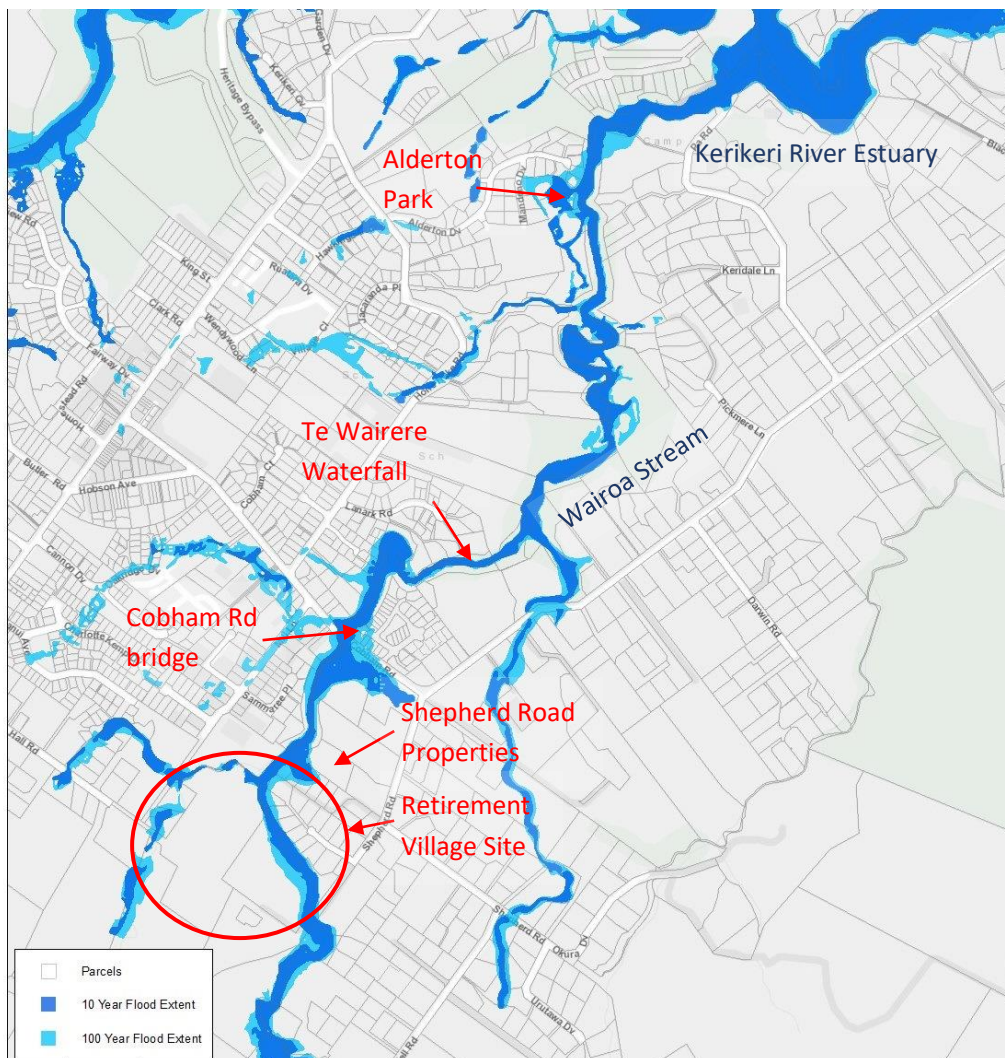
Downstream of the Site, the catchment contains part of the Kerikeri commercial centre, the Mill Lane industrial area and residential land.

The Wairoa Stream and tributaries join at the northern boundary of the Site and flow past the Mill Lane industrial area and under Cobham Road bridge.

Te Wairere waterfall is 1.1 km downstream of the Site. Below the waterfall, the Wairoa Stream flows a further 1.5 km before joining the Kerikeri River estuary. The final 400m of the Wairoa Stream is tidal.

The extent of flooding downstream of the Site is mapped on the NRC GIS system (with additional location details) as follows:

**Figure 6 – Downstream Flooding 10 and 100 year Flood Events**



Flood flows and flood levels have been modelled by Northland Regional Council for 10 and 100 year rainfall events including allowances for maximum probable development (under existing zone rules) and 2°C climate change.

The flood model shows flooding upstream and downstream of the Cobham Road bridge. The extent of flooding in the vicinity of Retirement Village site is shown on Haigh Workman drawing 18 282 / MP8.

Immediately downstream of the Arvida Retirement Village site, the flood model indicates that Lots 7, 8 and 9 DP 391984 (accessed off Shepherd Road) would be subject to flooding in the 10% and 1% AEP + CC MPD events. Similarly, the models indicate much of Lot 1 DP 140983 and parts of Lot 2 DP 195513 on Cobham Road are subject to flooding in the 10% and 1% AEP + CC MPD events.

The models were run prior to the NRC carrying out flood relief on the Wairoa Stream. The approach to the Cobham Road bridge was widened and straightened in 2012, and a spillway was excavated on the hairpin bend downstream of the bridge in 2014. These works have reduced flooding upstream, possibly extending to the Retirement Village Site. The flood levels modelled by NRC are therefore a conservative estimate of the flood risk.

Downstream of the Cobham Road spillway, the Wairoa Stream valley becomes more incised and drops over a waterfall (Te Wairere Falls). Towards the lower reaches of the stream, the valley opens out again, and floods land at Alderton Park. The 10% AEP flood extends on to esplanade reserve, FNDC reserve Lot 79 DP 349941 and the Waahi Paraone Ltd balance lot, Lot 2 DP 76567. The 2% and 1% AEP floods extend on to five residential lots, Lots 42 to 46 DP 349941. It is understood that the recently constructed buildings on these lots have been built with adequate freeboard above the 100 year flood level.

## 6.2 Regulatory Framework

### 6.2.1 Far North District Plan

The site is zoned Residential. The relevant stormwater management/ impermeable surface rules for residential land are as follows:

Permitted Activity:

#### 7.6.5.1.6 Stormwater Management

The maximum proportion of the gross site area covered by buildings and other impermeable surfaces shall be 50 %.

Impermeable surfaces associated with Masterplan development (including the already consented Stage 1 development) are calculated as follows:

Impermeable Surface	Area
Roof	40,346 m <sup>2</sup>
Road, accessways and driveways	24,567m <sup>2</sup>
Carparks	2,815 m <sup>2</sup>
Footpaths and paved patios	13,947 m <sup>2</sup>
<b>Total Impermeable</b>	<b>81,675 m<sup>2</sup></b>

The gross site area (Lot 1 DP 173449, Lot 2 DP 435929, Lot 1 DP 164771 and Lot 2 DP 149521) totals 166,642 m<sup>2</sup>. The percentage of gross site area covered by impermeable surfaces is 49.0%. The proposed development therefore complies with permitted activity rule 7.6.5.1.6.

District Plan Rule 12.7.6.1.1 specifies a minimum setback of 26m from the boundary of any lake (where a lake bed has an area of 8ha or more), river (where the average width of the riverbed is 3m or more) or the boundary of the coastal marine area, for any building and any impermeable surface. While the proposed development generally complies with this rule, parts of some dwellings and their associated impermeable surfaces at the eastern end of the site extend to a minimum of 22m from the Wairoa Stream bank. A resource consent is required for the breach of Rule 12.7.6.1.1.

#### 6.2.2 ***Regional Water and Soil Plan for Northland***

Rule 21.1.2 provides, as a permitted activity, for *'The diversion and discharge of stormwater, not otherwise permitted by Rule 21.01.01, ...'* subject to a number of conditions. The conditions most relevant to this development are:

- (a) For new subdivision and development, the best practicable option for on-site stormwater disposal shall be identified and incorporated into the stormwater management design to avoid or minimise changes to stormwater flows after development for the 1 in 5 year return period storm event.*
- (f) The discharge does not cause scour or erosion of the beds or banks of the receiving water body*
- (i) The diversion and/or discharge does not cause flooding of adjacent properties*

It is understood that the proposal may technically infringe Condition (a) of Rule 21.01.02 – peak stormwater flows from the site will increase significantly as a result of the proposed development. However, the key elements to the permitted activity rule will be complied with – the proposed stormwater management is the best practicable option for the Site, changes to stormwater flows in the Wairoa Stream and Tributary will be minimal, and increases in downstream flooding will be avoided. All other conditions in Rule 21.01.02 can be complied with.

The proposed stormwater discharge complies with all conditions of Controlled Activity Rule 21.02.01.

#### 6.2.3 ***Proposed Regional Plan for Northland***

The Northland Regional Council is reviewing its Regional Plans and a Proposed Regional Plan for Northland was notified in September 2017, decisions notified in May 2019 and appeals closed July 2019. It has statutory effect at this stage, alongside the Operative Water and Soil Plan.

Proposed Rule C.6.4.2 provides for the diversion and discharge of stormwater from outside a public stormwater network ' subject to a number of conditions. The conditions most relevant to this development are:

- 2) the diversion and discharge does not cause or increase flooding of land on another property in a storm event of up to and including a 10 percent annual exceedance probability, or flooding of buildings on another property in a storm event of up to and including a one percent annual exceedance probability.*
- 6) the diversion and discharge does not cause permanent scouring or erosion of the bed of a water body at the point of discharge.*

The proposed development stormwater management will comply with permitted activity Rule C.6.4.2(2) because discharge to the Wairoa Stream will occur well before the peak stream flow, future development will not result in increased flood flows in the Wairoa Stream in any storm event. All other conditions in Rule C.6.4.2 will be complied with.

### 6.3 Design Principles

The proposed stormwater management has been designed to comply with District and Regional Plan rules and District Council standards, and to avoid adverse effects on the receiving environment. The following technical publications provide guidance on the design principles are relevant to the proposed development:

#### 6.3.1 ***FNDC Engineering Standards, NZS 4404:2004***

Stormwater pipelines and overland flow paths should be designed to FNDC's Engineering Standards and Guidelines 2009 / NZS 4404:2004.

Section 4.3.2.5.1 (as amended by FNDC standards) requires pipelines to be designed for the 10 year ARI storm, with secondary protection (combination of pipelines and overland flow paths) designed for the 100 year ARI storm.

#### 6.3.2 ***Auckland Council TP10***

Auckland Council TP10 (2003) is referred to in the Far North District Plan and Regional Water and Soil Plan, and is considered an appropriate guideline for stormwater management in Northland.

The key objectives for managing downstream effects are identified in TP10 Section 1.5:

- Water quantity
- Water quality
- Aquatic resource protection

Further details are contained in Section 4.2. Water quantity control comprises:

- Flood control
- Stream channel protection
- Infiltration or low stream flow augmentation

Water quality control comprises source control and treatment methods.

#### 6.3.3 ***Auckland Council GD01***

TP10 has been superseded by Auckland Council '*Stormwater Management Devices in the Auckland Region*' December 2017 Guideline Document 2017/001. GD01 is largely written to support the Auckland Council Unitary Plan, however, it does contain stormwater design principles that are applicable to Northland.

The objectives of stormwater management (Section 1 Introduction) include:

- Reducing pollution
- Reducing erosion
- Protecting marine and freshwater systems
- Reducing flooding
- Allowing urban development while preserving and restoring our land and waterways.

GD01 Section B1.7.1.3 *Design for larger storm events* states:

Under the Auckland Unitary Plan Standards (Section E8.6) any development must ensure that the diversion and discharge does not result in, or increase, the following:

- Flooding of other properties in rainfall events up to the 10% AEP, or
- Inundation of buildings on other properties in rainfall events up to the 1% AEP.

This is consistent with District Plan Rule 13.7.3.4 and Proposed Regional Plan Rule C.6.4.2. GD01 Section B1.7.1.3 further specifies:

To meet the diversion and discharge requirements of the Auckland Unitary Plan, all developments that lead to an increase in impervious surface must provide detention for larger storm events as follows:

- Detention for the difference between pre- and post-development runoff in a 10% AEP rainfall event for the total site area
- Detention for the difference between pre- and post-development runoff in a 1% AEP event, where Auckland Council flood maps show downstream flooding with an actual or potential risk of inundation of buildings
- Detention of 10% AEP and 1% AEP rainfall events is not required for developments that are located within the lower half of the catchment or for which a validated flood modelling study has shown that the development does not increase downstream flooding

The last bullet point is applicable to the site as demonstrated in Section 6.8 of this report.

#### 6.3.4 **Summary**

The following design principles apply to stormwater management for the proposed retirement village development:

- Stormwater reticulation within the site to suitable discharge points designed for the 10% AEP design flows
- Overland flowpaths within the site to suitable discharge points designed for the 1% AEP design flows
- Control scour, particularly at discharge points
- Improve stormwater quality where practicable
- Avoid increases in flooding downstream as a result of the development.

## 6.4 **Water Quality**

Auckland Council GD01 Section A2.2.1 notes the following in relation to stormwater quality:

Stormwater runoff naturally contains numerous physical, chemical and biological constituents (from soils, plant material and aerial deposition). However, urbanisation and urban activities, including development and redevelopment, typically increase and introduce new constituents into water which impact the health of the receiving ecosystem.

Some of the key pollutants associated with stormwater include sediment, nutrients, bacteria and viruses, oil and grease, total and dissolved metals, organics, pesticides and gross pollutants. An additional impact of urbanisation is an increase in water temperature. For detailed information regarding the pollutants of concern and their specific prevalence in Auckland, refer to Auckland Council's technical report, TR 2013/035.

Managing water quality also requires an understanding of the "first flush" where the initial runoff from a surface contains (by volume) the highest proportion of contaminant load compared to runoff in the remainder of the storm<sup>10</sup>. The first flush is generally characterised by a peak in some pollutant loads (such as sediments and metals) immediately prior to the peak in flow volumes. Best practice for water quality improvement



therefore promotes the capture and treatment of the first flush, where practicable, as this is often more practical and cost effective than treating flow volumes from the entire storm event.

The following contaminants may be present in stormwater discharges from the Retirement Village site (refer TP10 2.4.2):

Contaminant	Source	Control Methods
Suspended sediments	Earthworks	GD05 Sediment control during construction
Oxygen demanding substances	Sewage	Closed sewerage system with standby pumps and at least 24 hours emergency storage
Pathogens	Sewage	Refer above
Metals	Vehicles (zinc, lead, copper and chromium) Roofs (zinc)	Source control Bioretention devices Avoid uncoated zinc roofs
Hydrocarbons and oils	Pavement Vehicles	Sediment ponds during construction and bioretention devices on completion of construction
Pesticides	Orcharding and gardening	Reduction in use
Nutrients	Orcharding and gardening	Reduction in use
Litter	People	Responsible residents and litter collection.

The temperature of stormwater discharging from hot roofs and pavements will increase as a result of the development. However, it will be reduced to ambient temperature through the proposed bioretention devices before stormwater discharges to the receiving environment.

With appropriate control methods proposed in this report, the contaminant load of stormwater discharging from the site will be lower than the stormwater runoff from the original orchard, garden and pasture.

## 6.5 On-Site Stormwater Management

### 6.5.1 Introduction

Stormwater management within the proposed development is to encompass several designs including 'green engineering' principles to aid infiltration, promote water quality improvements, avoid increasing peak flows in the receiving environment, control scour and ensure compliance with District and Regional Plan rules.

The proposed Masterplan retirement village stormwater management system comprises:

#### Primary System

- Piped stormwater reticulation network;
- Catch pit inlets;

- Kerb & channel on the main roads
- Central V drainage on accessways
- Stormwater treatment wetlands
- Stormwater outlets to the Wairoa Stream and Tributary designed to disperse flow and control scour.

#### Secondary System

- Roads and driveways lower than surrounding houses;
- Overland flow paths through drainage / access paths.

The proposed piped stormwater reticulation network and overland flow paths are shown on Haigh Workman drawing 18 282 / MP5 and DP1 to DP16.

#### **6.5.2 Piped Stormwater Network**

Stormwater pipelines are to be designed for the 10% AEP (10-year ARI) storm event in accordance with clause 4.3.2.5.1 of Council's Engineering Standards and Guidelines March 2009. Adopting the 10% AEP rather than the 20% AEP (5-year ARI) specified in the Regional Water and Soil Plan rules and NZS 4404:2004, provides a conservative design approach and the risk of pipeline failure is therefore considered minor. Rainfall intensity should take into account the likelihood of more frequent and more intense storms as a result of climate change.

The proposed stormwater network is shown on drawing 18 282 / MP5.

The pipelines will generally comprise:

- 100 mm diameter PVC pipe outlets from each dwelling
- 150 mm minimum diameter PVC pipe outlets from two or more dwellings
- 300 mm minimum diameter concrete pipes along the roads in accordance with FNDC Engineering minimum sizing standards.
- Manholes at all changes in direction, gradient and at junctions.
- Catch pits at inlets
- A double catch pit at low points to reduce the risk of blockage.

Standard catch pits collect coarse sediment and litter and prevent it being taken into the piped stormwater system and receiving environment downstream. We recommend that regular inspection and clean-out take place to ensure the catch pit remains effective.

#### **6.5.3 Secondary Overland Flow Paths**

The roads, driveways, footpaths and swale drains will be constructed lower than the surrounding residential properties to act as secondary flow paths as shown on the drawings.

Secondary flow paths will be designed for the 1% AEP flood flow assuming there is no stormwater attenuation and all pipe inlets are blocked. While this approach is very conservative, it ensures that buildings within the development will not be flooded even under the most extreme circumstances.

#### 6.5.4 **Wetlands**

The majority (74%) of the built development will discharge to five stormwater treatment wetlands as shown on the drawings. The wetlands will be designed as Bioretention devices to improve water quality in accordance with Auckland Council GD01 Section C3. In frequent, low intensity rainfall events, the wetlands will intercept all stormwater runoff and allow it to soak into the subsoil so there is no discharge to the Wairoa Stream.

As discussed in Sections 6.7 and 6.8 below, the wetlands are not designed to attenuate flows. However, in the 10% AEP + CC design rainfall event, the wetlands will attenuate peak runoff from the site to some extent.

The remaining 26% of the built development discharges to the 'Access Tributary' at the existing pond upstream of the access road. The pond has a permanent water surface area of 470 m<sup>2</sup>. The margins of the pond and the watercourse upstream of the pond will be planted with appropriate riparian species to improve water quality and amenity values.

#### 6.5.5 **Stormwater Outlets**

Each constructed wetland will have a piped outlet to the Wairoa Stream or Tributary. Catchments 6 to 13 will have piped outlets directly to the tributary as shown on Haigh Workman drawing 18 282/MP5. Concreted rock outlets will be constructed to disperse flows and control scour as illustrated on Haigh Workman drawing 18 282/DE4.

### 6.6 **Peak Flows**

#### 6.6.1 **Rational Method**

Run-off for catchments up to 500 hectares may be calculated using the Rational Method:

$$Q = \frac{C I A}{3600}$$

- Where:
- Q = run-off in litres per second, (l/s)
  - C = run-off coefficient (unit less)
  - I = rainfall intensity in millimetres per hour (mm/hr)
  - A = area of catchment in square metres (m<sup>2</sup>)

#### 6.6.2 **The Run-off Coefficient C**

The run-off co-efficient C is the variable in the rational formula least able to be precisely determined and has a direct result on the estimation of the discharge. The coefficient represents the integrated effects of infiltration, storage, evaporation, natural retention, interception etc., which all affect the time distribution and peak rate of run-off. The factors required to determine a value for 'C' are surface type characteristics topography and land use. NZBC Clause E1, Surface Water Table 1 recommends runoff coefficients for various surfaces.

Typical run-off coefficients specified in NZBC E1 Table 1 are:

Surface Type	Table 1 C Value
Pasture and scrub cover (Medium soakage soil types)	0.30
Bush and scrub cover (Medium soakage soil types)	0.25
Asphalt and concrete paved surfaces	0.85
Fully roofed and/or sealed developments	0.90
Parks and reserves – mainly grassed	0.30
Gardens, lawns etc	0.25

The ground surface will be recontoured to a maximum slope of 5%. For ground slopes of 0 to 5%, NZBC Clause E1 Table 2 recommends subtracting 0.05 from the runoff coefficient. Roofs will be pitched, so the reduction in runoff coefficient is not applicable.

The following values have been adopted for the run-off coefficient:

Surface Type	Adopted C Value
Pre-development orchard and pasture	0.25
Asphalt and concrete paved surfaces	0.80
Roofs	0.90
Lawn	0.25
Gardens	0.20

### 6.6.3 Rainfall Intensity

The rainfall intensity is that for a storm having duration equal to the time of concentration and a probability of occurrence as appropriate. The time of concentration and hence the critical storm duration of a catchment is the time taken for surface water run-off to reach the design point from the furthest point (in time) of the catchment, so that the whole catchment is contributing to the maximum discharge at the design point for any given probability of occurrence.

The minimum time of concentration for surface runoff will be 10 minutes, given the relatively small footprint of the sites.

Design rainfall intensity curves for Northland for use with the “Rational Method” are provided by The National Institute of Water and Atmospheric Research (NIWA) High Intensity Rainfall Design System (HIRDS). HIRDS is a web-based programme that can estimate rainfall frequency at any point in New Zealand. It can be used to estimate rainfall depths for hydrological design purposes, and to assess the rarity of observed storm events.

We have adopted HIRDS V4 rainfall estimates adjusted with the RCP 6.0 climate change scenario projected out to the 2081-2100 time period. This accounts for 1.63°C of warming and an associated increase in rainfall of approximately 20% compared with existing short-duration rainfall events.

Design rainfall intensities for a 10-minute rainfall duration are:

- 10% AEP 122 mm/hr.
- 1% AEP 182 mm/hr.

#### 6.6.4 Peak design flow rates

The developed site has been divided into 14 catchment areas as shown on drawing 18 282 / MP5. Each catchment drains to a different discharge point as shown on the drawing. The areas of impermeable surfaces within each catchment are detailed in Appendix A.

Catchments 1 to 4 will drain through constructed wetlands to the Wairoa Stream. Catchment 5 will drain through a constructed wetland to the combined 'Access tributary' and 'Hall Road Tributary' approximately 130m upstream of the Wairoa Stream confluence. Catchments 6 to 14 drain to the 'Access Tributary' pond upstream of the Retirement Village access road.

Stormwater flows from these catchments have been calculated for the 10% AEP + CC rainfall intensity of 122mm/hr as follows:

Description	Catchment			
	1 to 4	5	6 to 14	Total
Catchment Area (m <sup>2</sup> )	80,377	11,353	32,597	124,327
Pre-development C	0.25	0.25	0.25	
Pre-development Runoff (litre/sec)	681	96	276	1053
Post-development C	0.656	0.583	0.612	
Post Development Runoff (litre / sec)	1787	225	676	2688
Increased Runoff (litre/sec)	1106	127	400	1634
Percent increase	162%	133%	145%	155%

While post-development flow rates without consideration of attenuation have been used for pipeline design, some reduction in flow will occur in the landscaping features proposed for the development.

## 6.7 Constructed Wetlands

### 6.7.1 Wetland Design

The majority (74%) of the built development area will discharge to five stormwater treatment wetlands as shown on the drawings (65% of the built development area drains to wetlands discharging to the Wairoa Stream and 9% of the built development area drains to wetlands discharging to the combined Tributary downstream of Mill Lane). The wetlands will be designed as Bioretention devices to improve water quality in accordance with Auckland Council GD01 Section C3.

Bioretention is a stormwater management practice where runoff is filtered through a vegetated filter bed made of natural soil or engineered media. It performs a water quality function by removing both particulate and dissolved contaminants, and reducing runoff temperature.

Depending on its design, bioretention may also perform a hydrological function by reducing runoff volumes (through retention) and detaining runoff flows. In this case, stormwater attenuation is not required and the wetlands will be designed for water quality treatment only.

The water quality wetlands shown on Haigh Workman drawing 18 282/DE3 have been designed for water quality treatment generally in accordance with GD01 Section C3.2.3.2.

Stormwater ponds provide effective sediment retention during earthworks operations. It is expected that Sediment Retention Ponds in accordance with Auckland Council guideline document GD05 ('Erosion and

Sediment Control Guide for Land Disturbing Activities') will be constructed initially in the locations of the proposed wetlands. The sediment retention ponds can be converted to constructed wetlands once site development in the catchment is complete and the risk of sediment runoff has been eliminated by hard surfaces and planting.

#### 6.7.2 **Pond Upstream of Hall Road Access**

The remaining 26% of the built development area discharges to the Wairoa Stream tributary into the existing pond upstream of the access road.

The minimum area required for bioretention device in accordance with the GD01 Section C3.2.3.2 methodology is 400m<sup>2</sup>. The existing pond has a permanent water surface area of 470 m<sup>2</sup> which satisfies the area requirement for water quality treatment. However, while the pond, wetland and margins will be planted in appropriate native species that will improve water quality, it is not proposed to excavate the stream bed to construct a bioretention media layer as specified in GD01 Section C3.2. It is considered that the existing pond and proposed planting will provide adequate water quality treatment, given stormwater discharges from the retirement village will have a low contaminant load in the first place.

#### 6.7.3 **Stormwater Attenuation**

As discussed in Section 6.8 below, attenuation of stormwater runoff from the site to pre-development levels is not appropriate given the location of the site towards the lower end of the Wairoa Stream catchment. However, the proposed wetlands will attenuate stormwater runoff to some extent.

In frequent, low intensity rainfall events, the wetlands will intercept all stormwater runoff and allow it to soak into the subsoil so there is no discharge to the Wairoa Stream.

In the 10% AEP + CC design rainfall event, the proposed wetlands are calculated to attenuate peak stormwater flows as follows:

Wetland	Catchment Area	Pond Area	Outlet Pipe	Flow In	Flow Out	Attenuation
1	4,481 m <sup>2</sup>	57 m <sup>2</sup>	300 mm	99.2 l/s	96.0 l/s	3.2 l/s
2	32,055 m <sup>2</sup>	428 m <sup>2</sup>	525 mm	694.3 l/s	623.0 l/s	71.3 l/s
3	32,108 m <sup>2</sup>	428 m <sup>2</sup>	525 mm	687.8 l/s	621.2 l/s	66.6 l/s
4	11,731 m <sup>2</sup>	142 m <sup>2</sup>	375 mm	264.8 l/s	257.0 l/s	7.8 l/s
5	11,353 m <sup>2</sup>	142m <sup>2</sup>	375 mm	225.0 l/s	217.2 l/s	7.8 l/s

The pond upstream of the Access road with the 1800mm diameter culvert provides little stormwater attenuation at early stages of the 10% AEP + CC design rainfall event and will not attenuate peak flows from the Site.

Stormwater flows from the Site without attenuation were calculated in Section 6.6.4 above. Stormwater flows from the site after attenuation for the 10% AEP + CC rainfall intensity of 122mm/hr are calculated as follows:

Description	Catchment			
	1 to 4	5	6 to 14	Total
Catchment Area (m <sup>2</sup> )	80,377	11,353	32,597	124,327
Pre-development C	0.25	0.25	0.25	
Pre-development Runoff (litre/sec)	681	96	276	1053
Post-development C	0.656	0.583	0.612	
Post Development Runoff (litre / sec)	1597	217	676	2490
Increased Runoff (litre/sec)	916	121	400	1437
Percent increase	135%	126%	145%	136%

## 6.8 Downstream Effects

### 6.8.1 Wairoa Stream

As noted in Section 6.1.2 above, the Wairoa Stream has a catchment area of 6.0 km<sup>2</sup> upstream of the Arvida Site.

Peak flood flows in the Wairoa Stream upstream of the tributaries have been modelled by Northland Regional Council for both 10% and 1% Maximum Probable Development (MPD) + Climate Change (CC) events. Catchments 1 to 4 drain directly to the Wairoa Stream. Peak runoff from Catchments 1 to 4 for the 10% AEP + CC rainfall event has been calculated in Section 6.6 above. Using the Rational method, peak site runoff for the 1% AEP + CC rainfall event is 1.5 times the 10% AEP + CC runoff.

The following table compares increased peak runoff from the site with peak flows in the Wairoa Stream upstream of the tributary junction:

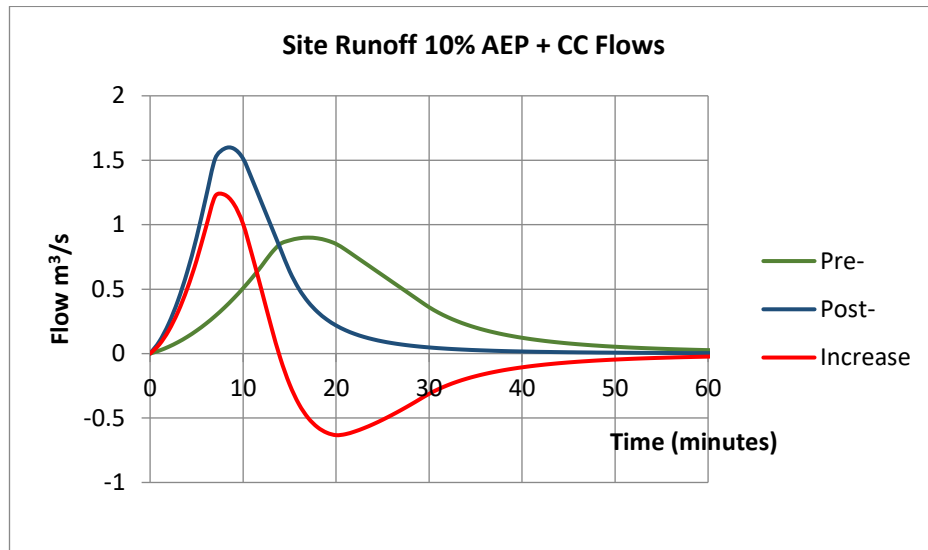
Rainfall Event	Wairoa Stream Peak Flood Flow	Post-development Site Runoff	Increased Site Runoff
10% AEP MPD + CC	63 m <sup>3</sup> /s	1.6 m <sup>3</sup> /s	0.9 m <sup>3</sup> /s
1% AEP MPD + CC	113 m <sup>3</sup> /s	2.4 m <sup>3</sup> /s	1.4 m <sup>3</sup> /s

The increases in peak runoff from the Site as a result of the development are very small in comparison to the peak flood flows in the Wairoa Stream.

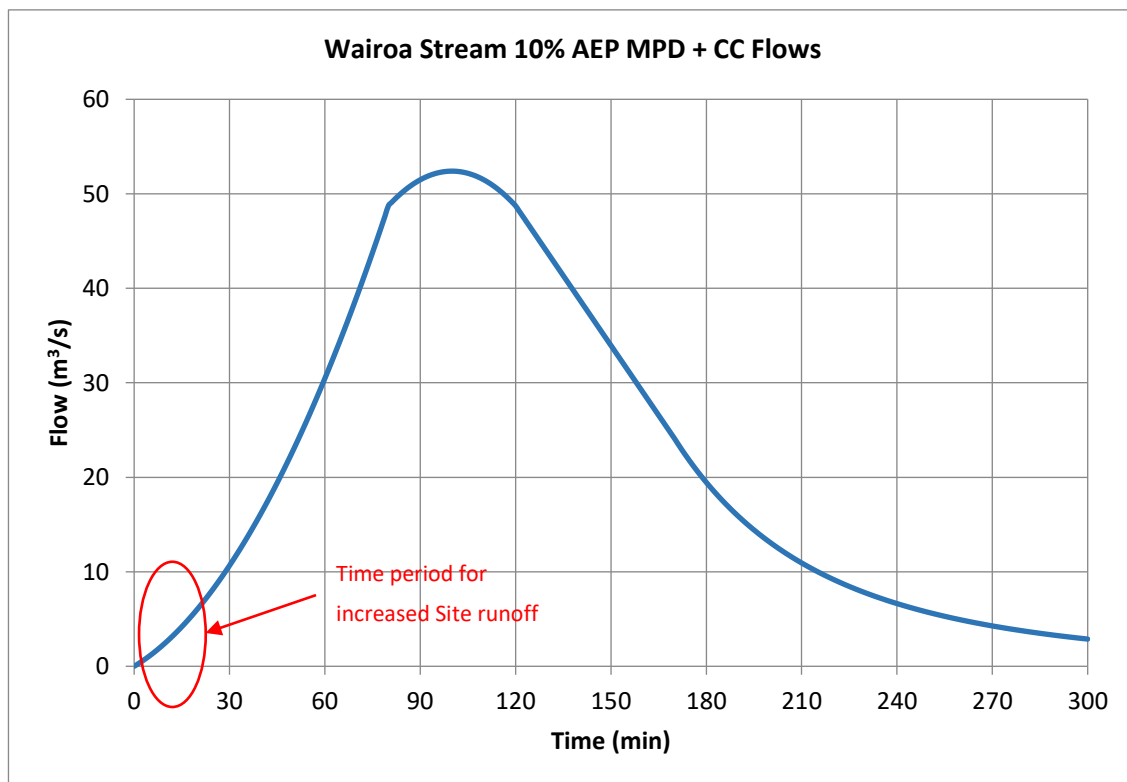
In a spatially uniform rainfall event with a single peak, the increase in runoff from the Site will not coincide with the peak tributary flow because the two catchments have considerably different times of concentration (time to peak flow at the Site after a rainfall burst in the catchment = 10 minutes for the Site, compared with approximately 1.5 hour in the Wairoa Stream).

Typical Pre- and Post-development runoff hydrographs for the Site can be illustrated as follows:





In comparison, flood flows in the Wairoa Stream for the 10% AEP flood event can be modelled as a TP108 hydrograph as follows:



It can be seen from the graph that the increase in runoff from the site at the early stage of flood flows in the Wairoa Stream will have no effect on peak flows in the stream.

#### 6.8.2 Access Tributary

The 'Access Tributary' has a catchment area of 80.8ha upstream of the Retirement Village access road. Catchments 6 to 14 drain to the 'Access Tributary'.

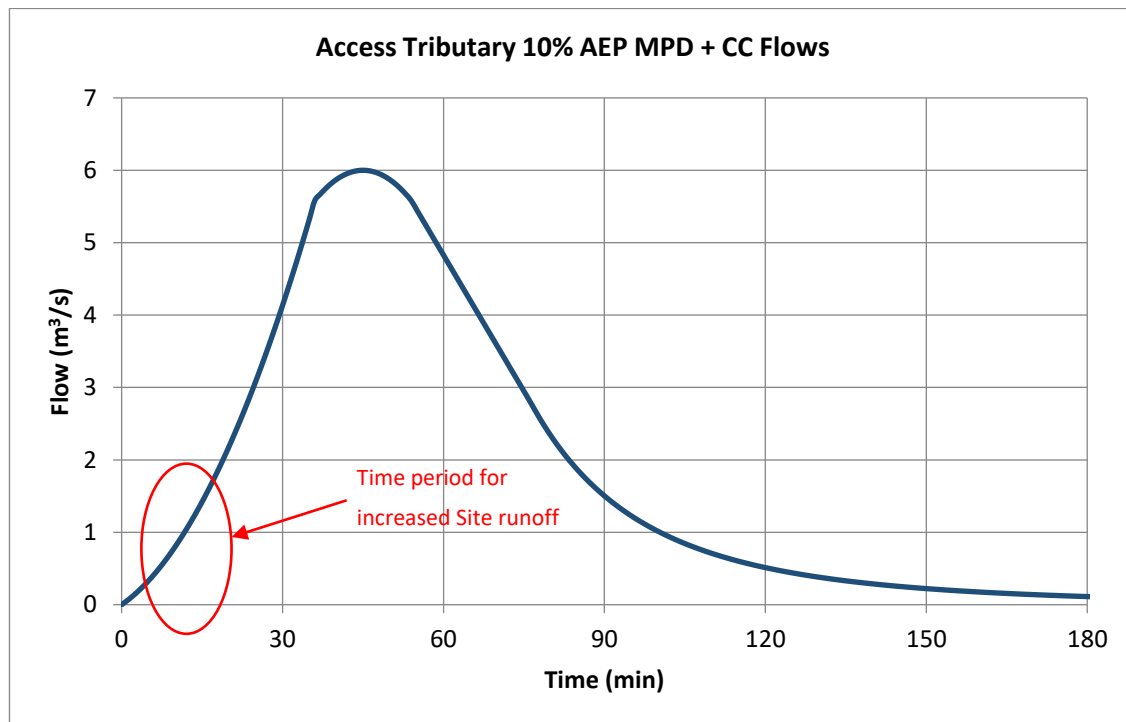
The following table compares increased peak runoff from the site with peak flows in the 'Access Tributary' upstream of the site access:

Rainfall Event	Wairoa Stream Peak Flood Flow	Post-development Site Runoff	Increased Site Runoff
10% AEP MPD + CC	6.0 m <sup>3</sup> /s	0.7 m <sup>3</sup> /s	0.4 m <sup>3</sup> /s
1% AEP MPD + CC	11.0 m <sup>3</sup> /s	1.0 m <sup>3</sup> /s	0.6 m <sup>3</sup> /s

The increases in peak runoff from the Site as a result of the development are small in comparison to the peak flood flows in the tributary.

In a spatially uniform rainfall event with a single peak, the increase in runoff from the Site will not coincide with the peak tributary flow because the two catchments have considerably different times of concentration (time to peak flow at the Site after a rainfall burst in the catchment = 10 minutes for the Site, compared with approximately 45 minutes in the Tributary).

Flood flows in the 'Access Tributary' for the 10% AEP flood event can be modelled as a TP108 hydrograph as follows:



It can be seen from the graph that the increase in runoff from the site at the early stage of flood flows in the Tributary will have no effect on peak flows in the stream.

### 6.8.3 Combined Tributary

The 'Access Tributary' and 'Hall Road Tributary' combine at Mill Lane, 255m upstream of the Wairoa Stream junction. The combined catchment area is 110 ha. Catchments 5 to 14 drain to the combined tributary.

The following table compares increased peak runoff from the site with peak flows in the 'Combined Tributary' upstream of the Wairoa Stream junction:

Rainfall Event	Wairoa Stream Peak Flood Flow	Post-development Site Runoff	Increased Site Runoff
10% AEP MPD + CC	10.7 m <sup>3</sup> /s	0.9 m <sup>3</sup> /s	0.5 m <sup>3</sup> /s
1% AEP MPD + CC	18.8 m <sup>3</sup> /s	1.3 m <sup>3</sup> /s	0.8 m <sup>3</sup> /s

The 'Combined Tributary' has a similar time of concentration to the 'Access tributary'. It can be seen from the graph in Section 6.8.2 that the increase in runoff from the site at the early stage of flood flows in the Tributary will have no effect on peak flows in the stream.

#### 6.8.4 **Other Rainfall Distributions**

Stormwater attenuation is often implemented to avoid an increase in peak flows from a site. Peak stormwater runoff is detained and released slowly over a period of time, typically up to 1 to 2 hours. It can be seen from the graphs that the increase in peak flows from the Retirement Village Site in a spatially uniform rainfall event with a single peak occurs well before the peak flow in the Wairoa Stream and tributary and will not add to the Wairoa Stream or tributary peak flows. In this case, detaining stormwater and releasing it later is likely to result in increased flows downstream closer to the time of the peak flow in the Wairoa Stream, and thus increase peak flooding in a spatially uniform rainfall event.

If a second peak in rainfall occurs at the Site coinciding with the peak stream flow, the peaks would be additive. However, the probability of two independent 1% AEP events occurring at the same time is remote (0.01% AEP). In addition, high rainfall intensities in Northland are generally associated with ex tropical cyclones which track from east to west. As such, peak flows in the river will tend to be later than the calculated time of concentration as the weather system moves upstream.

In the extremely unlikely event that peak flows were additive, an increase of 1.4% in Wairoa Stream flood flows would have no observable effect on flood levels.

The above analysis has been carried out for the 10-year ARI + CC rainfall event. The same principles apply to the 100-year ARI + CC rainfall event; stormwater attenuation is not necessary and could increase downstream flooding.

We recommend that stormwater from the site be discharged with only minor attenuation to avoid exacerbating downstream flooding.

## 6.9 Alternatives Considered

The following stormwater management options were considered:

Option	Description	Advantages	Disadvantages
1	Recommended stormwater management system	Best practicable option: provides a reticulated stormwater system for roads and buildings; provides safe overland flow paths; provides appropriate water quality improvements; discharges stormwater before the peak flows in the Wairoa Stream and tributary.	Perception that increased stormwater runoff from the site could have adverse effects.
2	Stormwater disposal by on-site soakage	Minimises discharges off site	Impracticable to dispose of all stormwater by soakage; there will still be overland flows off site in high intensity rainfall events.
3	Stormwater detention	Minimises peak discharges off site	Delays discharge until closer to peak flow in Wairoa Stream and tributary, adding to downstream flooding.
4	Fewer stormwater outlets to Wairoa Stream and Tributary	Fewer outlet structures	Increased stormwater reticulation and more concentrated discharges.

Alternatives 2 to 4 were rejected because they are either impracticable or not the best practicable option compared with the recommended stormwater management system.

## **7 Water Supply**

### **7.1 Potable Water Supply**

The Site is proposed to be served by reticulated water from the Kerikeri Town Water Scheme.

FNDC propose improving water supply to the Mill Road industrial area by constructing a new 150mm diameter water supply pipeline down Hall Road from the existing 200mm public water main on Kerikeri Road. This 150mm line is to turn down Mill Lane and connect to the existing 100mm line on the developed (northeast) end of Mill Lane and will be constructed as part of the Stage 1 development. The proposed Arvida retirement development will connect to the 150mm line at the intersection of Hall Road and Mill Lane.

A reticulated water system and connection to each residential site can service each retirement unit.

Water supply pipes are to be of the following sizes:

- Principal Mains: 100 mm internal diameter
- Rider Mains: 50 mm internal diameter
- Service Connections: 20 mm internal diameter (Service connections to each retirement unit to be in accordance with drawing FNDC/S/26).

The required minimum operating pressure for residential development is 300 kPa (30m head). Available pressures can be determined with hydraulic analysis of system once the link from Kerikeri Road has been designed.

In accordance with FNDC standards, the water supply will be installed above the proposed sewer lines.

Valves will be spaced as required in FNDC Engineering Standards.

Pipe materials are to be Polyethylene (PE) and conform to AS/NZS 4130. Pipes shall have a minimum pressure rating of PN 12.5 and all fittings shall have a minimum pressure rating of PN 16.

### **7.2 Irrigation Water Supply**

The site is currently connected to the Kerikeri Irrigation Scheme water supply. While this water is non-potable and not suitable for a water supply to dwellings, it is available for watering lawns and gardens, and washing cars. This will reduce the demand on FNDC potable water.

### **7.3 Firefighting**

Council Engineering Standards require a water supply that is adequate for firefighting purposes. Where a reticulated supply is available SNZ PAS 4509:2008 recommends a firefighting flow for a non-sprinklered home of 12.5 l/sec within a distance of 135 m plus an additional 12.5 l/sec within 270 m.

The care facility and communal buildings will be sprinklered. Independent living units will not be sprinklered.

When the 150mm diameter water main is constructed along Hall Road, there will be adequate flow and pressure within the site for firefighting.

Two hydrants can be positioned on the 100 mm branch main such that all retirement units are within 135 m of both hydrants.

## 7.4 Water Demand

Kerikeri Irrigation water will be used for watering gardens and other external uses. The demand for potable water will therefore be similar to the wastewater daily flow which has been calculated as 68,800 litre / day in Section 8.3 below. The only additional demands for potable water are for firefighting, for filling and topping up an indoor swimming pool, and for occasional car washing.

The additional potable water for the swimming pool is calculated as follows:

- Initial fill 45 m<sup>3</sup>
- Peak top-up 35m<sup>2</sup> x 3mm/day = 100 litres/day

Ongoing potable water demand is estimated to be less than 80 m<sup>3</sup>/day.

A peak flow factor has been applied in accordance with FNDC Engineering Standards and Guidelines clause 6.3.9.3 as follows:

- Total Daily Flow: 80,000 litre / day
- Average Flow: 0.93 litre / sec
- Peak Flow factor: 2.5
- Peak Flow: 2.3 litre/sec

## 7.5 Hydraulic Analysis

FNDC engaged Jeff Booth Consulting Ltd to carry out hydraulic modelling for the proposed 150mm ID water main on Hall Road and Mill Lane. The report dated November 2019 indicates a residual pressure of 30m at the end of Hall Road when a firefighting flow of 25 litres/sec is operating in conjunction with normal water demand.

Residual pressures (m head) within the Retirement Village site based on 100mm ID water mains have been calculated as follows:

### Firefighting (25 litre/sec)

Location	RL	Dist from Entry	Elevation Increase	Losses	Residual Head
Roundabout	73.5	160	2	5.9	27.5
Care Facility	69.0	325	-2.5	12.0	25.9
Road B Ch 520	65.0	445	-6.5	16.5	25.4
Road B Ch 150	71.1	310	-0.4	11.5	24.3
Coat hanger	76.9	420	5.4	15.5	14.5

### Domestic (2.3 litre/sec)

Location	RL	Dist from Entry	Elevation Increase	Losses	Residual Head
Roundabout	73.5	160	2	0.0	36.9
Care Facility	69.0	325	-2.5	0.1	41.3
Road B Ch 520	65.0	445	-6.5	0.1	45.3
Road B Ch 150	71.1	310	-0.4	0.1	39.2
Coat hanger	76.9	420	5.4	0.1	33.4

There will be adequate pressure and flow within the Retirement Village Site for firefighting and domestic supply.



## 8 Wastewater

### 8.1 Kerikeri Sewerage System

The Site is proposed to be served by the Kerikeri Wastewater Treatment Scheme when it is upgraded (estimated to be complete in April 2020 and fully operational by October 2020).

It is proposed to run a 75mm OD pipe running from the village to the proposed 110mm diameter FNDC pressure sewer on Mill Lane. This will be adequate for the full Masterplan development and still be suitable for early stages.

### 8.2 Latency

In a letter dated 10 July 2017, FNDC's consulting engineers for the Kerikeri Wastewater Project, Mott McDonald indicated that the Latent Capacity of future areas of benefit has been calculated on two scenarios:

- Future Scenario 1: 13 lots per hectare
- Future Scenario 2: 8.5 lots per hectare

Design flows per dwelling are based on 2.4 people per dwelling x 180 litre/person/day.

We understand that FNDC are working on 800m<sup>2</sup> per lot (12.5 lots per hectare). On that basis, the 16.6624 ha site has a latent capacity of 208 households, producing 90,000 litre/day of wastewater.

### 8.3 Design Flow Rates

Design Wastewater Flows have been calculated using TP58 and AS/NZS 1547 recommendations. Occupancy is based on rates for similar retirement villages throughout New Zealand.

Residential Units (6/3 flush toilets, standard water reduction fixtures and no garbage grinders)

1-bedroom units - 1.0 people x 160 litre/person/day = 160 litre/day

2-bedroom units - 1.3 people x 160 litre/person/day = 208 litre/day

3-bedroom units – 1.8 people x 160 litre/person/day = 288 litre/day

Club Building and Wellness Centre

- use by residents included in household rates; use by day visitors associated with residents - say 15% of residents = 378 residents x 0.15 = 56-day visitors at 40 litres/day visitor / day = 2,240 litres/day

- alternatively, the Club building may be used on occasions by outside groups, allow 100 people x 15 litre/person/day = 1,500 litres/day.

Care Facility (5909 m<sup>2</sup>) - residents 250 litre/person/day; staff 40 litre/person/day

### Total Wastewater Daily Flow

		Master Plan		Stage 1	
Type	litre/day/unit	Units	Flow (litre/day)	Units	Flow (litre/day)
1-bedroom unit	160	8	1,280	2	320
2-bedroom unit	208	132	27,456	22	4,576
3-bedroom unit	320	60	19,200	5	1,600
Day visitors	40	56	2,240		0
Swimming pool backwash	100	1	100		
Care Facility residents	250	76	19,000		0
Care Facility staff	40	44	1,760		0
<b>Total</b>			<b>68,796</b>		<b>6,496</b>

Wastewater from the site will be reticulated by pressure sewer, with pump chambers having at least 24 hours storage capacity. Infiltration and peaking factors used for gravity sewer reticulation do not apply.

The total wastewater flow from the ultimate development will be less than the latent capacity expected from Scenario 1; that is, there is capacity available for the proposed development.

## 8.4 Gravity Sewers

Each dwelling will be connected to one of the two pump stations by gravity sewer. In accordance with FNDC standards, pipes serving one dwelling will be 100mm and pipes serving two or more dwellings will be 150mm diameter.

## 8.5 Pressure Pumps

It is proposed to connect groups of between 13 and 41 independent living units to 'duplex' (double-pump module) pump chambers. The care facility, clubhouse and wellbeing centre will each have its own duplex pump chamber.

Each duplex pump is to incorporate a buried emergency storage tank. Each emergency storage tank is to be of sufficient size to provide 24 hours of storage.

## 8.6 Staging

Consideration will need to be made to control odours at the discharge during the early stages. Because there will only be a small flow compared with the design capacity, there may need to be a flushing regime put in place to clear the lines of any solids build-up until such time more pumps are connected and more flow going through the pipes. Due to the small diameter lines, this can readily be achieved with potable water supply pressure with a backflow prevention device. This could also be achieved with use of irrigation water or a mobile truck specialist drain clearing service.

## 8.7 Pipe Sizing

Pipe sizes are based on a probability method to determine how many pumps would be running simultaneously to give an expected flow rate. From this, total dynamic heads are calculated to determine ideal pipe sizes.

Wastewater pipes are to be of the following sizes:

- Main to connect to public sewer: 75 mm internal diameter black internally with a blue outer skin
- Internal main: 63 mm internal diameter.
- Service Connections: 40 mm internal diameter (with Service connections to each retirement unit to be in accordance with drawing FNDC/S/26.

In accordance with standards, all wastewater drainage pipes are to be installed at an elevation below the proposed stormwater and sewer lines.

- Pipe materials are to be Polyethylene (PE80B or PE100 as required) and conform to AS/NZS 4130. Pipe wall thickness is to be designed to exceed design operational pressure.
- Selection of pipe material and PN class shall take account of design for dynamic operation stresses (fatigue), and water temperature.

## *Appendix A – Impermeable Surfaces*

[illegible]

## Appendix B – Drawings

Drawing No.	Title	Revision
MP1	Site Location Master Plan	A
MP2	Existing Contours Master Plan	A
MP3	Site features Master Plan	A
MP4	Roading Master Plan Batter / Retaining Walls	A
MP5	Stormwater Master Plan	A
MP6	Sewerage Master Plan	A
MP7	Water Supply Master Plan	A
MP8	Flood Hazard Master Plan	A
MP9	Earthworks Master Plan	A
MP10	Exploratory Borehole Master Plan	A
DP1 to DP8	Roading Detailed Plan and Stormwater Overland Flowpaths	A
DP9 to DP16	Proposed Stormwater and Services Detailed Plan	A
LS1 to LS10	Longitudinal Sections	A
CS1 to CS16	Floodway Cross Sections	A
DE1	Typical Road Cross sections	A
DE2	Services and Trenching Details	A
DE3	Bioretention Wetland Details	A
DE4	Typical terrace	A
DE5	Stormwater Outfall Structures	A
DE6	Sediment Retention Pond Details	A
DE7	Decanting Earth Bund Details	A
A1046	Proposed Site Diagram – Development Staging	A





NOTES:

1. LOT BOUNDARIES AND AERIAL PHOTO INFORMATION  
TAKEN FROM LAND INFORMATION NEW ZEALAND (LINZ).

LEGEND:

— • — BOUNDARY

Issue	Date	Revision
A	04/02/2020	FOR RESOURCE CONSENT

DWG Site Location Master Plan	
Scale 1:5000 @A3	Date 07/02/2020
Drawn TV	Checked JP
Approved JP	
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Client	Kerikeri Land Ltd.	
Project No.	18 282	RC no.

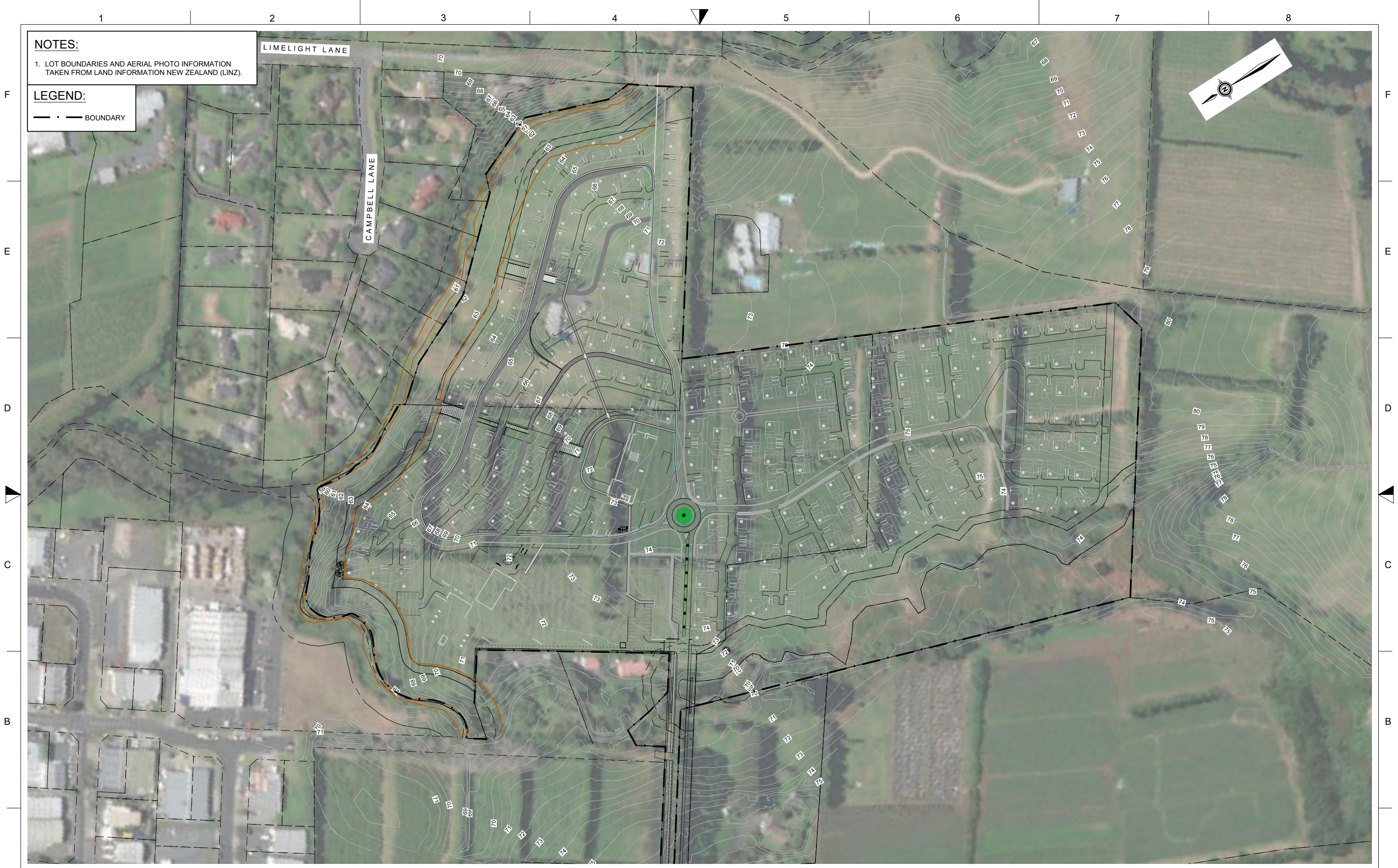
DWG No.	<b>MP1</b>	
Sheet No.	<b>1 of 10</b>	





A	Issue	Date	Revision	DWG Existing contours Master Plan			<div><div>HAIGH WORKMAN</div><div>Civil &amp; Structural Engineers</div></div>		Project Arvida Retirement Village Civil Construction - Hall Road, Kerikeri			DWG No. <b>MP2</b>	A
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				Scale 1:2500 @A3	<div><div>2512.50255075</div><div>m</div></div>	Date 07/02/2020							
				Drawn TV	Checked JP	Approved JP							
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**NOTES:**  
1. LOT BOUNDARIES AND AERIAL PHOTO INFORMATION  
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**LEGEND:**  
— • — BOUNDARY

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Issue	Date	Revision
A	04/02/2020	FOR RESOURCE CONSENT

DWG Site Features Master Plan	
Scale 1:2500 @A3	Date 07/02/2020
Drawn TV	Checked JP
Approved JP	
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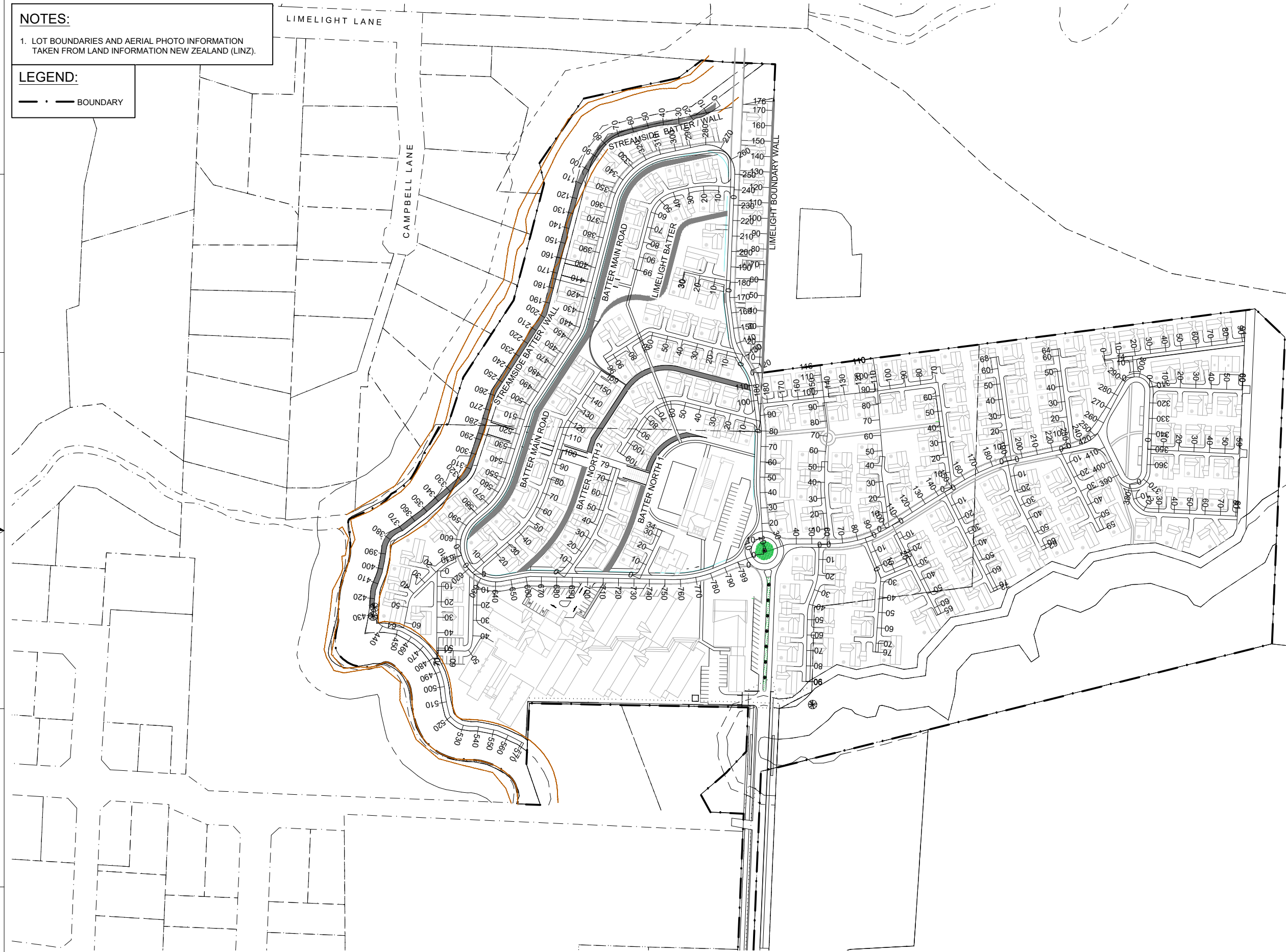
Project	Arvida Retirement Village	
	Civil Construction - Hall Road, Kerikeri	
Client	Kerikeri Land Ltd.	
Project No.	18 282	RC no.

DWG No.	<b>MP3</b>	
Sheet No.	<b>3 of 10</b>	



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LEGEND:  
- - - - - BOUNDARY



Issue	Date	Revision
A	04/02/2020	For Resource Consent

DWG **Roading Master Plan  
Batter/Retaining Walls**

Scale 1:2500 @A3

2512.50255075

Date 10/03/2020

Drawn TVChecked JPApproved JP

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	Civil Construction - Hall Road, Kerikeri	
Client	Kerikeri Land Ltd.	
Project No.	18 282	RC no.

DWG No.	<b>MP4</b>
Sheet No.	<b>4 of 10</b>

NOTES:

1. LOT BOUNDARIES AND AERIAL PHOTO INFORMATION  
TAKEN FROM LAND INFORMATION NEW ZEALAND (LINZ).

LEGEND:

- BOUNDARY  
—SW— PROPOSED STORMWATER  
○ PROPOSED SW MANHOLE  
■ PROPOSED SW CESSPIT  
— STORMWATER CATCHMENT AREA  
BUILDING CONTRACT  
—SW— STORMWATER PIPE



CATCHMENTS

CATCHMENT 1	4480.88 m <sup>2</sup>
CATCHMENT 2A	17388.55m <sup>2</sup>
CATCHMENT 2B	2902.72m <sup>2</sup>
CATCHMENT 2C	11763.73 m <sup>2</sup>
CATCHMENT 3A	20930.96 m <sup>2</sup>
CATCHMENT 3B	11177.93 m <sup>2</sup>
CATCHMENT 4	11731.41 m <sup>2</sup>
CATCHMENT 5A	2774.98 m <sup>2</sup>
CATCHMENT 5B	8578.19 m <sup>2</sup>
CATCHMENT 6	3124.10 m <sup>2</sup>
CATCHMENT 7	3562.17 m <sup>2</sup>
CATCHMENT 8	2766.41 m <sup>2</sup>
CATCHMENT 9	2708.63 m <sup>2</sup>
CATCHMENT 10	2980.74 m <sup>2</sup>
CATCHMENT 11	3015.63 m <sup>2</sup>
CATCHMENT 12	2736.08 m <sup>2</sup>
CATCHMENT 13	9783.08 m <sup>2</sup>
CATCHMENT 14	1956.37 m <sup>2</sup>

Issue	Date	Revision
A	04/02/2020	FOR RESOURCE CONSENT

DWG	Stormwater Master Plan		
Scale	1:2500 @A3	<div><div></div><div>2512.50255075</div><div>m</div></div>	Date 07/02/2020
Drawn	TV	Checked JP	Approved JP
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Client	Kerikeri Land Ltd.	
Project No.	18 282	RC no.

DWG No.	MP5
Sheet No.	5 of 10



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1. LOT BOUNDARIES AND AERIAL PHOTO INFORMATION TAKEN FROM LAND INFORMATION NEW ZEALAND (LINZ).

LEGEND:

BOUNDARY

CIVIL WORKS CONTRACT

SSP PRESSURE SEWER

SS SANITARY SEWER (GRAVITY) / MH

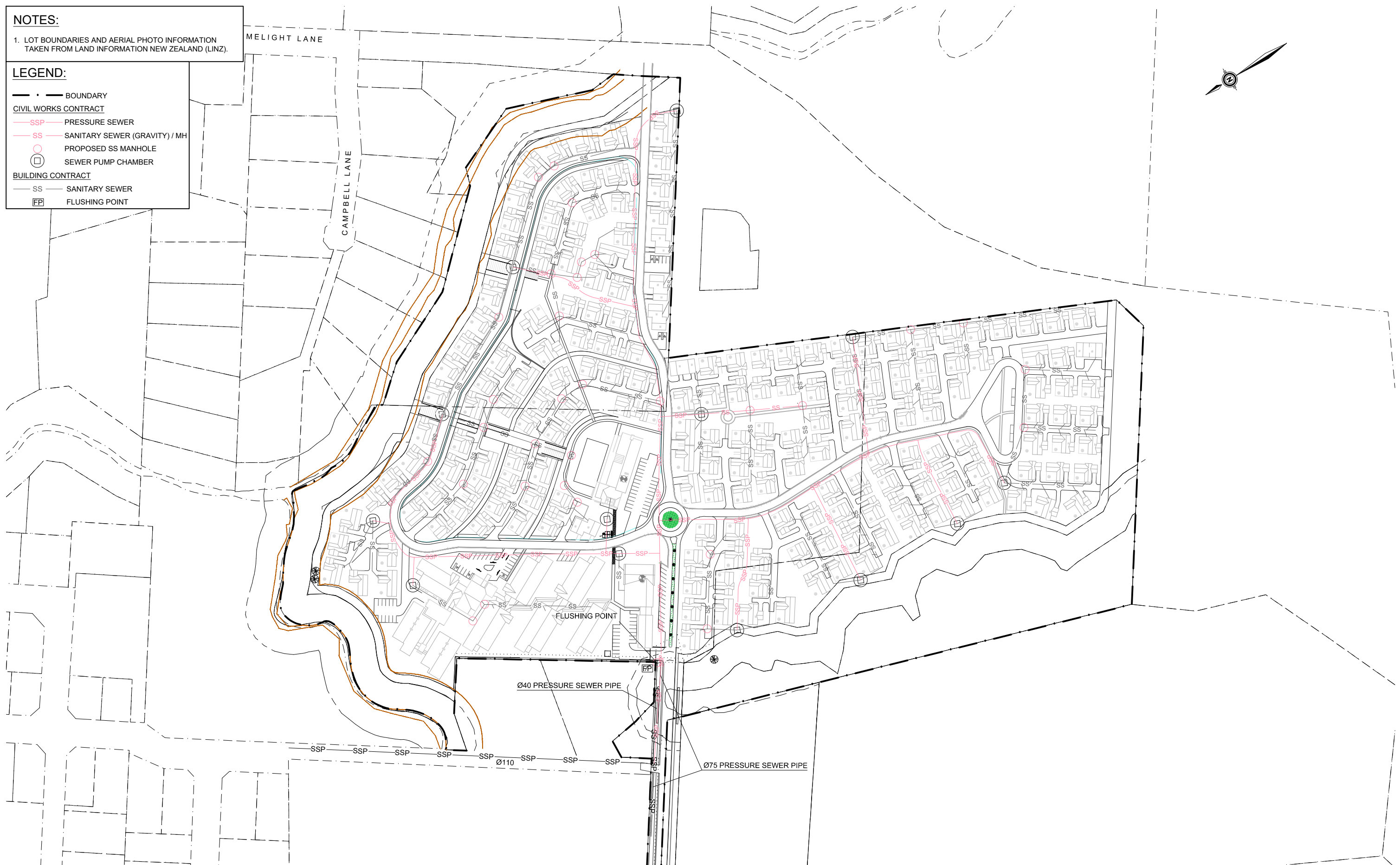
PROPOSED SS MANHOLE

SEWER PUMP CHAMBER

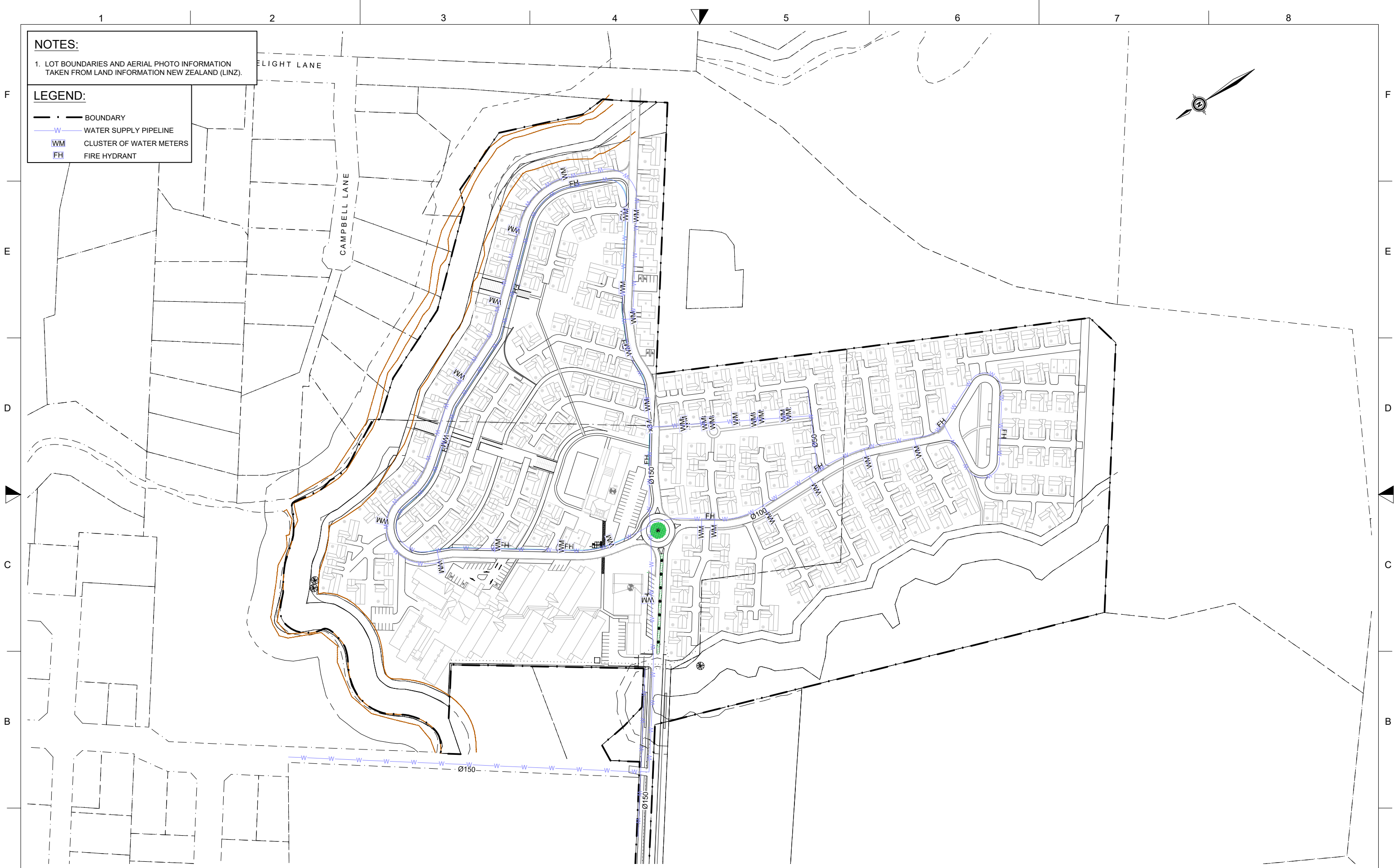
BUILDING CONTRACT

SS SANITARY SEWER

FP FLUSHING POINT



Issue	Date	Revision	DWG Sewerage Master Plan			<div><div><div>HAIGH WORKMAN</div><div>Civil &amp; Structural Engineers</div></div><div>6 Fairway Drive Kerikeri, BOI T: 09 407 8327 F: 09 407 8378 E: info@haighworkman.co.nz</div><div>DIMENSIONS MUST NOT BE SCALE MEASURED FROM THESE DRAWINGS. THE CONTRACTOR SHALL CHECK &amp; 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. ©2006</div></div>		Project Arvida Retirement Village Civil Construction - Hall Road, Kerikeri		DWG No.
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			Scale 1:2500 @A3	<div><div></div><div>2512.5075m</div></div>	Date 07/02/2020			Project No. 18 282 RC no.		Sheet No.
			Drawn TV	Checked JP	Approved JP					6 of 10
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- LEGEND:**
- • — BOUNDARY
  - W — WATER SUPPLY PIPELINE
  - WM CLUSTER OF WATER METERS
  - FH FIRE HYDRANT

Issue	Date	Revision
A	04/02/2020	FOR RESOURCE CONSENT

DWG Water Supply Master Plan

Scale 1:2500 @A3

25 12.5 0 25 50 75

Date 07/02/2020

Drawn TV

Checked JP

Approved JP

File X:\118 JOBS\18 282 ARVIDA GROUP - MULTIPLE\DRAWINGS\ARVIDA VILLAGE STAGE 1-2 - TV\ARVIDA RETIREMENT (MASTER PLAN CD30 DRAWINGS)\CORRIDORS (ST.1) OK.DWG

**HAIGH WORKMAN**  
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Client	Kerikeri Land Ltd.	
Project No.	18 282	RC no.

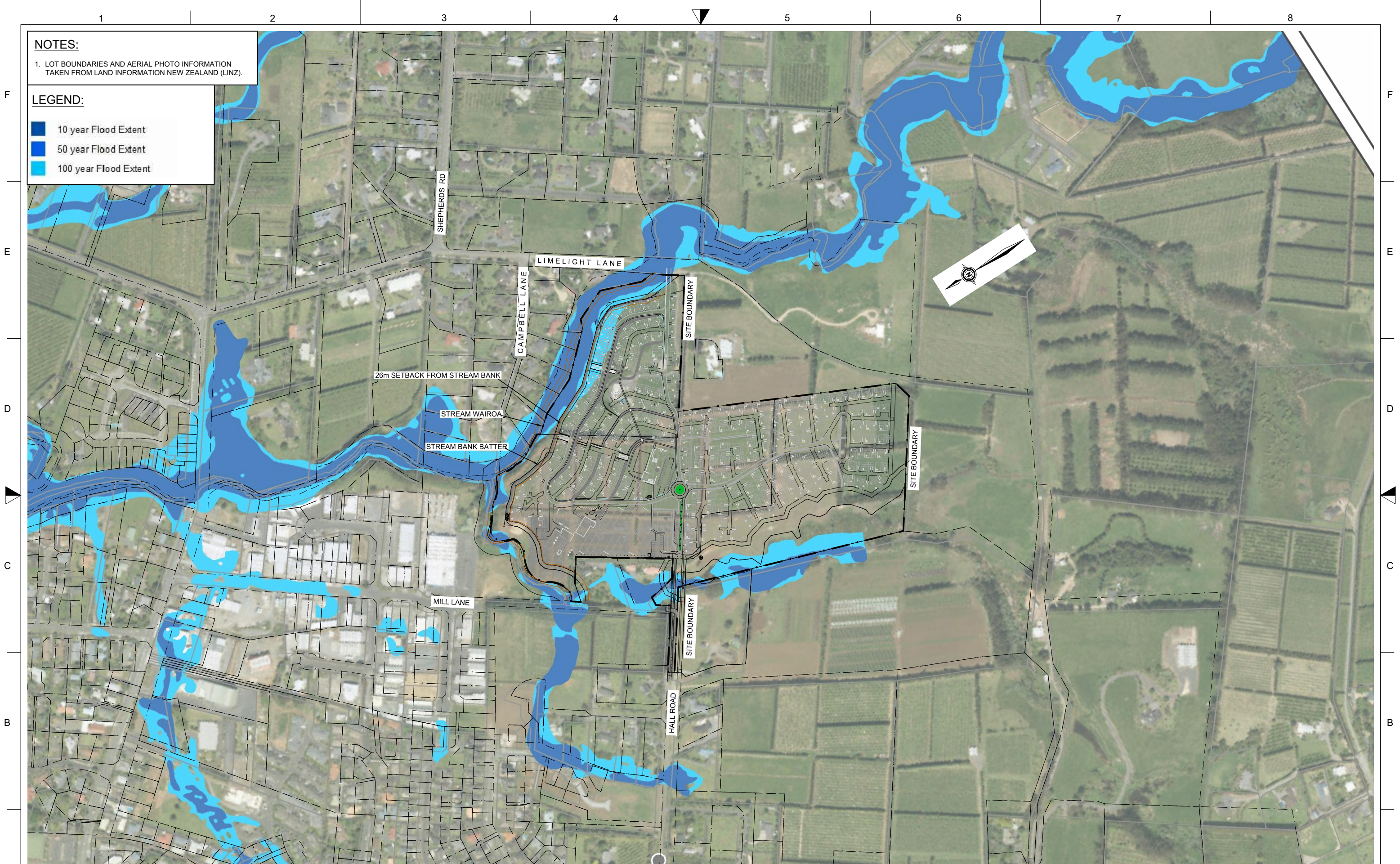
DWG No.

**MP7**

Sheet No.

**7 of 10**





NOTES:

1. LOT BOUNDARIES AND AERIAL PHOTO INFORMATION TAKEN FROM LAND INFORMATION NEW ZEALAND (LINZ).

LEGEND:

- 10 year Flood Extent
- 50 year Flood Extent
- 100 year Flood Extent

Issue	Date	Revision
A	04/02/2020	FOR RESOURCE CONSENT

DWG Flood Hazard Master Plan

Scale 1:5000 @A3

50 25 0 50 100 150 m

Date 07/02/2020

Drawn TV

Checked JP

Approved JP

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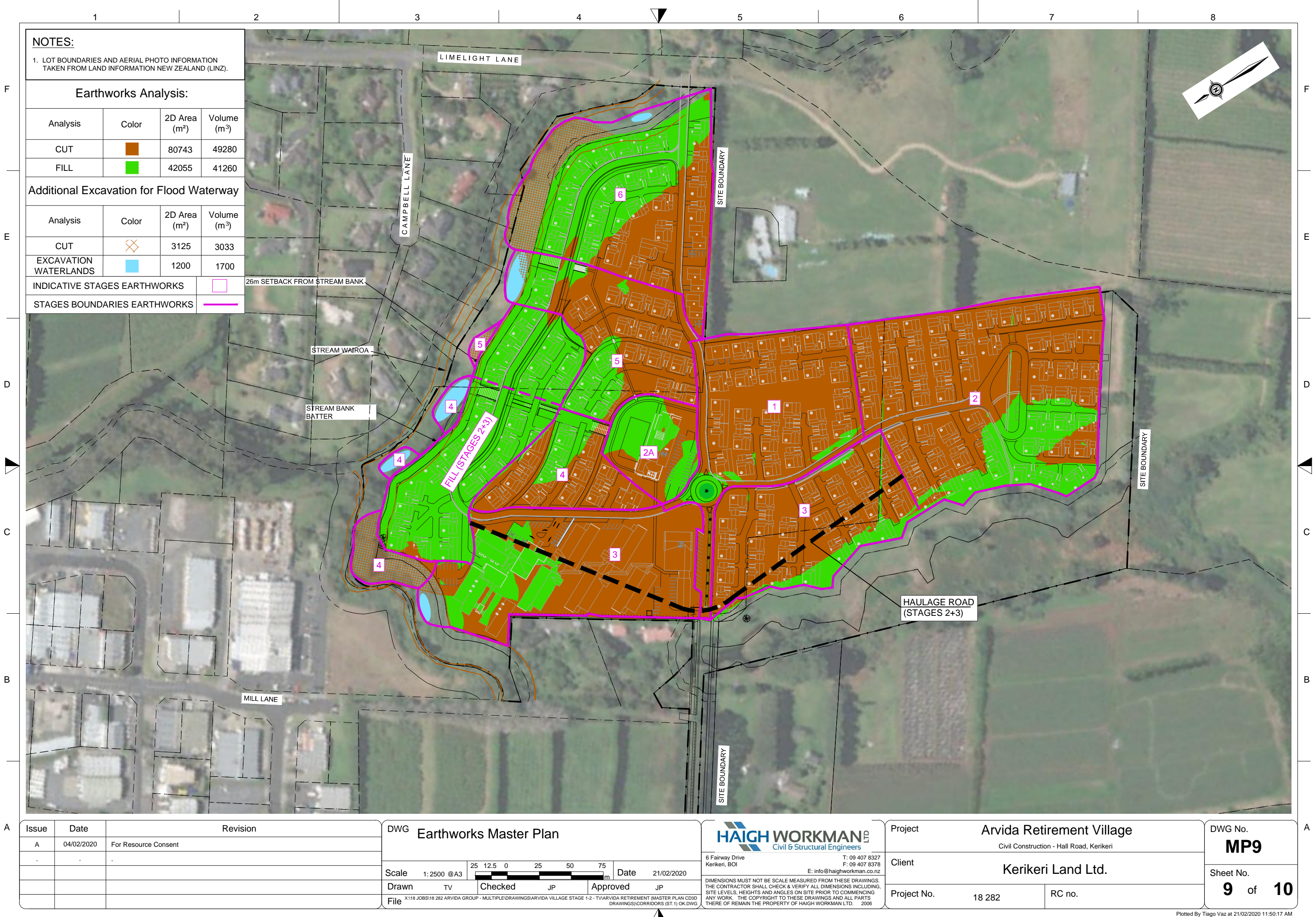
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Client	Kerikeri Land Ltd.
Project No.	18 282
	RC no.

DWG No.	MP8
Sheet No.	8 of 10





NOTES:

1. LOT BOUNDARIES AND AERIAL PHOTO INFORMATION TAKEN FROM LAND INFORMATION NEW ZEALAND (LINZ).

Earthworks Analysis:			
Analysis	Color	2D Area (m²)	Volume (m³)
CUT	<div></div>	80743	49280
FILL	<div></div>	42055	41260

Additional Excavation for Flood Waterway

Analysis	Color	2D Area (m²)	Volume (m³)
CUT	<div></div>	3125	3033
EXCAVATION WATERLANDS	<div></div>	1200	1700

INDICATIVE STAGES EARTHWORKS

26m SETBACK FROM STREAM BANK

STAGES BOUNDARIES EARTHWORKS

Issue	Date	Revision
A	04/02/2020	For Resource Consent

DWG	Earthworks Master Plan		
Scale	1:2500 @A3	<div><div>25</div><div>12.5</div><div>0</div><div>25</div><div>50</div><div>75</div></div> m	Date 21/02/2020
Drawn	TV	Checked JP	Approved JP
File	X:\118 JOBS\118 282 ARVIDA GROUP - MULTIPLE\DRAWINGS\ARVIDA VILLAGE STAGE 1-2 - TV\ARVIDA RETIREMENT (MASTER PLAN CDD DRAWINGS)\CORRIDORS (ST.1) OK.DWG		

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Client	Kerikeri Land Ltd.	
Project No.	18 282	RC no.

DWG No.	MP9
Sheet No.	9 of 10




NOTES:  
1. LOT BOUNDARIES AND AERIAL PHOTO INFORMATION  
TAKEN FROM LAND INFORMATION NEW ZEALAND (LINZ).

- NOTES:
-  MACHINE BOREHOLE  
BH1 UP TO 6x BOREHOLES
  -  CONE PENETRATION TEST  
18x TESTS
  -  HAND AUGER  
48x BOREHOLES
  -  DYNAMIC CONE PENETROMETER  
23x PROBE HOLES



Issue	Date	Revision
A	04/02/2020	FOR RESOURCE CONSENT

DWG Exploratory Borehole Master Plan	
Scale 1:500 @A3	Date 07/02/2020
Drawn TV	Checked JP
Approved JP	
File X:\118 JOBS\118 282 ARVIDA GROUP - MULTIPLE\DRAWINGS\ARVIDA VILLAGE STAGE 1-2 - TV\ARVIDA RETIREMENT (MASTER PLAN CD30 DRAWINGS)\CORRIDORS (ST.1) OK.DWG	



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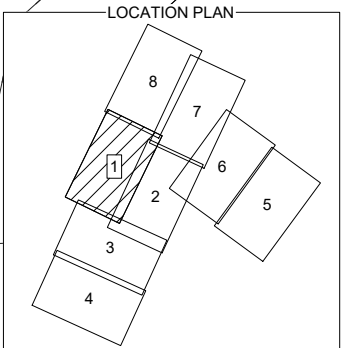
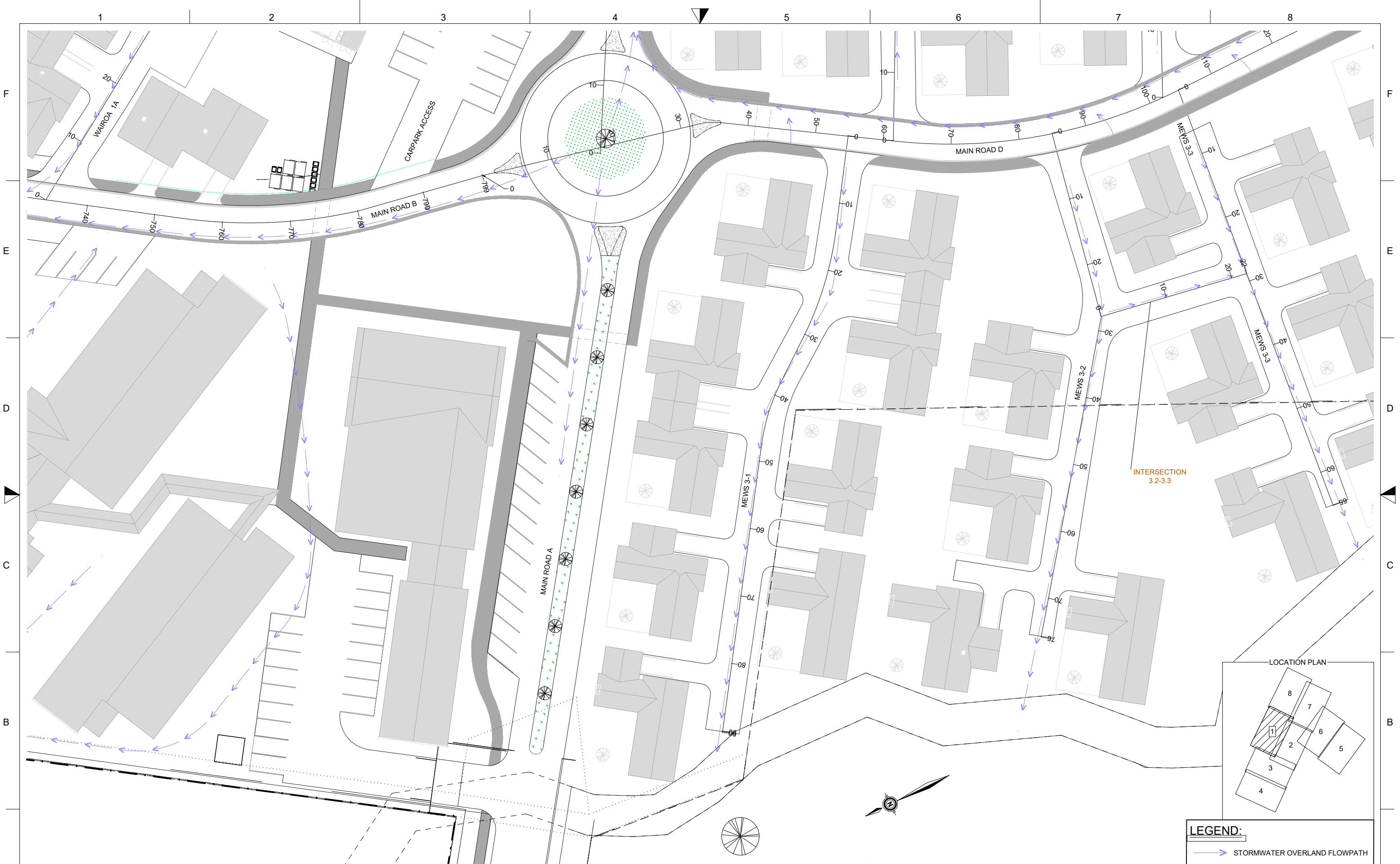
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Client	Kerikeri Land Ltd.	
Project No.	18 282	RC no.

DWG No.	MP10
Sheet No.	10 of 10





LEGEND:	
	STORMWATER OVERLAND FLOWPATH

Issue	Date	Revision
A	04/02/2020	FOR RESOURCE CONSENT

DWG		Roading Detailed Plan and Stormwater Overland Flowpath	
Scale	1:500 @A3		Date 04/02/2020
Drawn	TV	Checked JP	Approved JP
File X:\18 JOBS\18 282 ARVIDA GROUP - MULTIPLE\DRAWINGS\ARVIDA VILLAGE STAGE 1-2 - TV\ARVIDA RETIREMENT (MASTER PLAN CD30 DRAWINGS)\CORRIDORS (ST.1) OK.DWG			

Civil & Structural Engineers

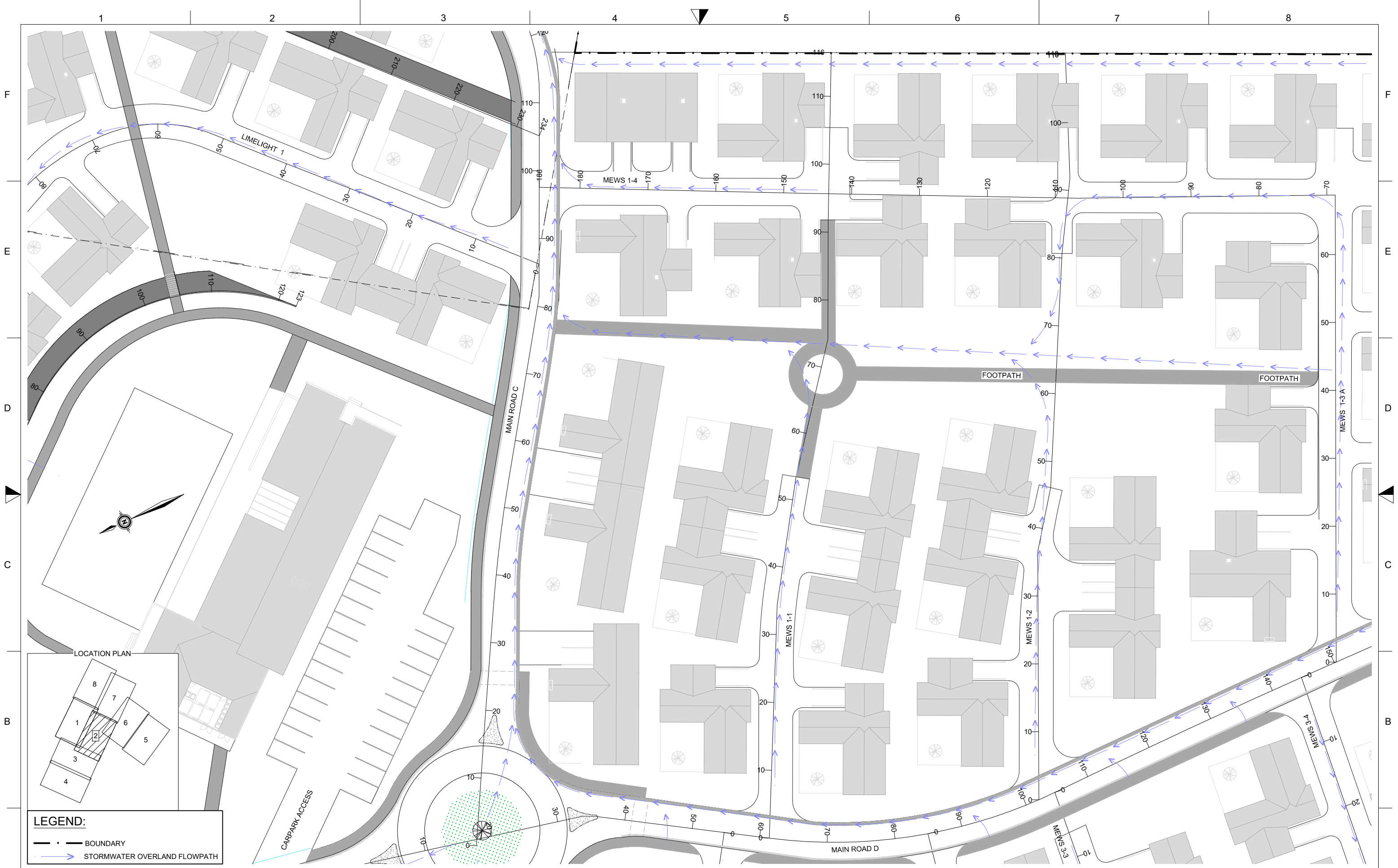
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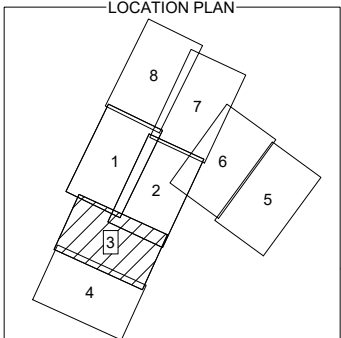
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Client	Kerikeri Land Ltd.	
Project No.	18 282	RC no.

DWG No.	DP1
Sheet No.	1 of 8



A	Issue	Date	Revision	DWG <b>Roading Detailed Plan and Stormwater Overland Flowpath</b>		Date 07/02/2020	<b>HAIGH WORKMAN LTD</b> Civil & Structural Engineers 6 Fairway Drive Kerikeri, BOI T: 09 407 8327 F: 09 407 8378 E: info@haighworkman.co.nz <small>DIMENSIONS MUST NOT BE SCALE MEASURED FROM THESE DRAWINGS. THE CONTRACTOR SHALL CHECK &amp; 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. ©2006</small>	Project <b>Arvida Retirement Village</b> Civil Construction - Hall Road, Kerikeri		DWG No. <b>DP2</b>
	A	04/02/2020	For Resource Consent					Client <b>Kerikeri Land Ltd.</b>		Sheet No. <b>2 of 8</b>
								Project No. 18 282		RC no.



LEGEND:		
	BOUNDARY	
	STORMWATER OVERLAND FLOWPATH	

Issue	Date	Revision
A	04/02/2020	For Resource Consent

DWG **Roading Detailed Plan and Stormwater Overland Flowpath**

Scale 1:500 @A3

Date 07/02/2020

Drawn TV Checked JP Approved JP

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Civil & Structural Engineers

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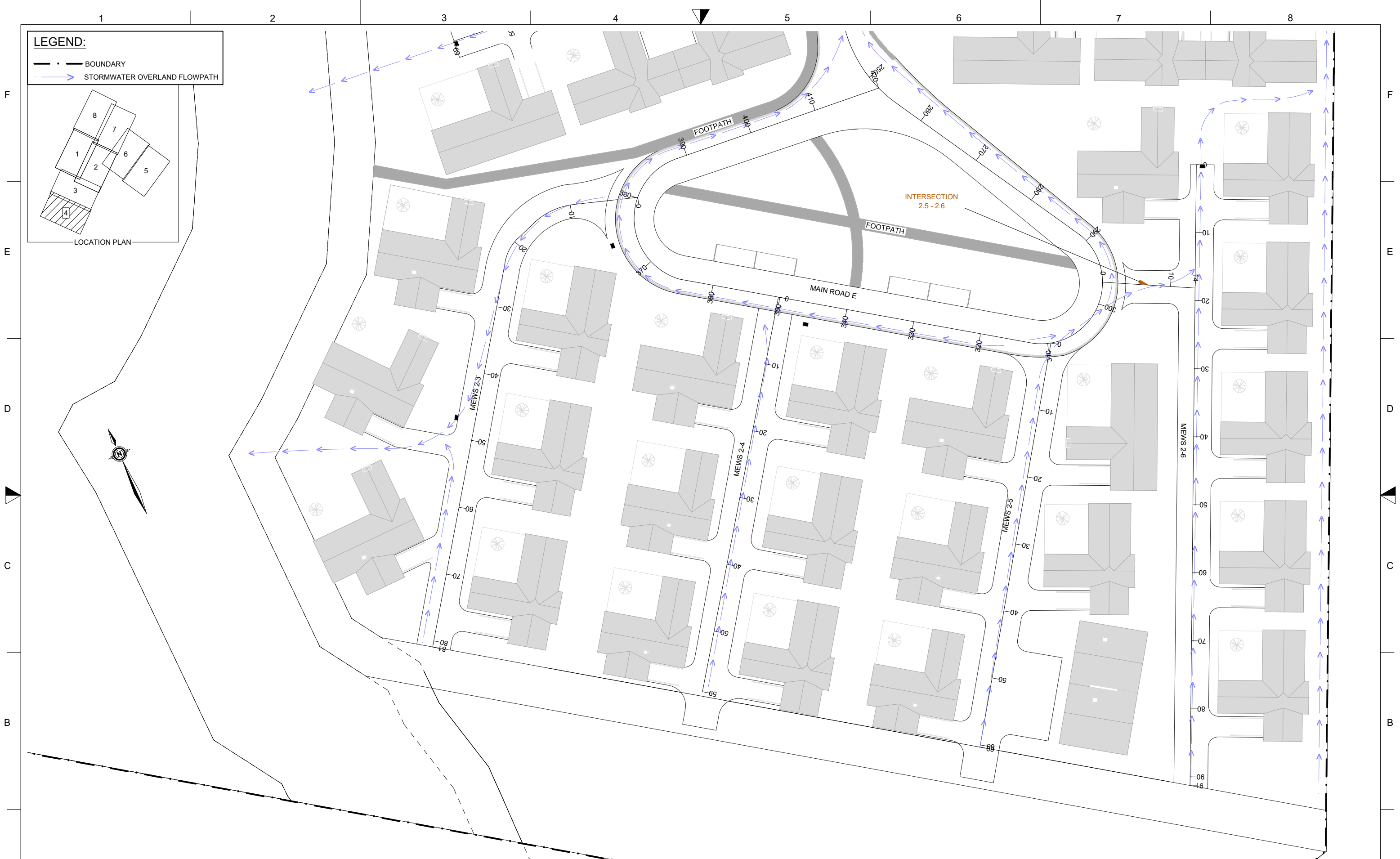
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Client	Kerikeri Land Ltd.	
Project No.	18 282	RC no.

DWG No.	<b>DP3</b>
Sheet No.	<b>3 of 8</b>

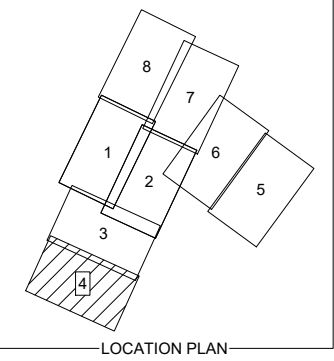




**LEGEND:**

— . — BOUNDARY

→ STORMWATER OVERLAND FLOWPATH



Issue	Date	Revision
A	04/02/2020	For Resource Consent

DWG

**Roading Detailed Plan and Stormwater Overland Flowpath**

Scale 1:500 @A3

Date 18/10/2019

Drawn TV

Checked JP

Approved JP

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Client	Kerikeri Land Ltd.	
Project No.	18 282	RC no.

DWG No.

**DP4**

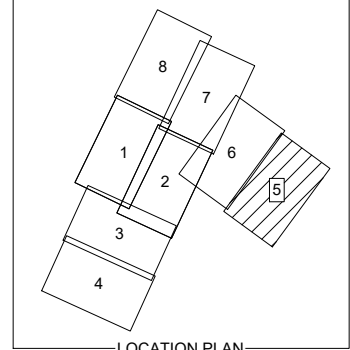
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**4 of 8**

**LEGEND:**

— • — BOUNDARY

→ STORMWATER OVERLAND FLOWPATH



Issue	Date	Revision
A	04/02/2020	For Resource Consent

DWG

Roading Detailed Plan and Stormwater Overland Flowpath

Scale 1:500 @A3

5 2.5 0 5 10 15 m

Date 18/10/2019

Drawn TV

Checked JP

Approved JP

File X:\18 JOBS\18 282 ARVIDA GROUP - MULTIPLE\DRAWINGS\ARVIDA VILLAGE STAGE 1-2 - TV\ARVIDA RETIREMENT (MASTER PLAN CD30 DRAWINGS)\CORRIDORS (ST.1) OK.DWG

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Project No.	18 282	RC no.

DWG No.

**DP5**

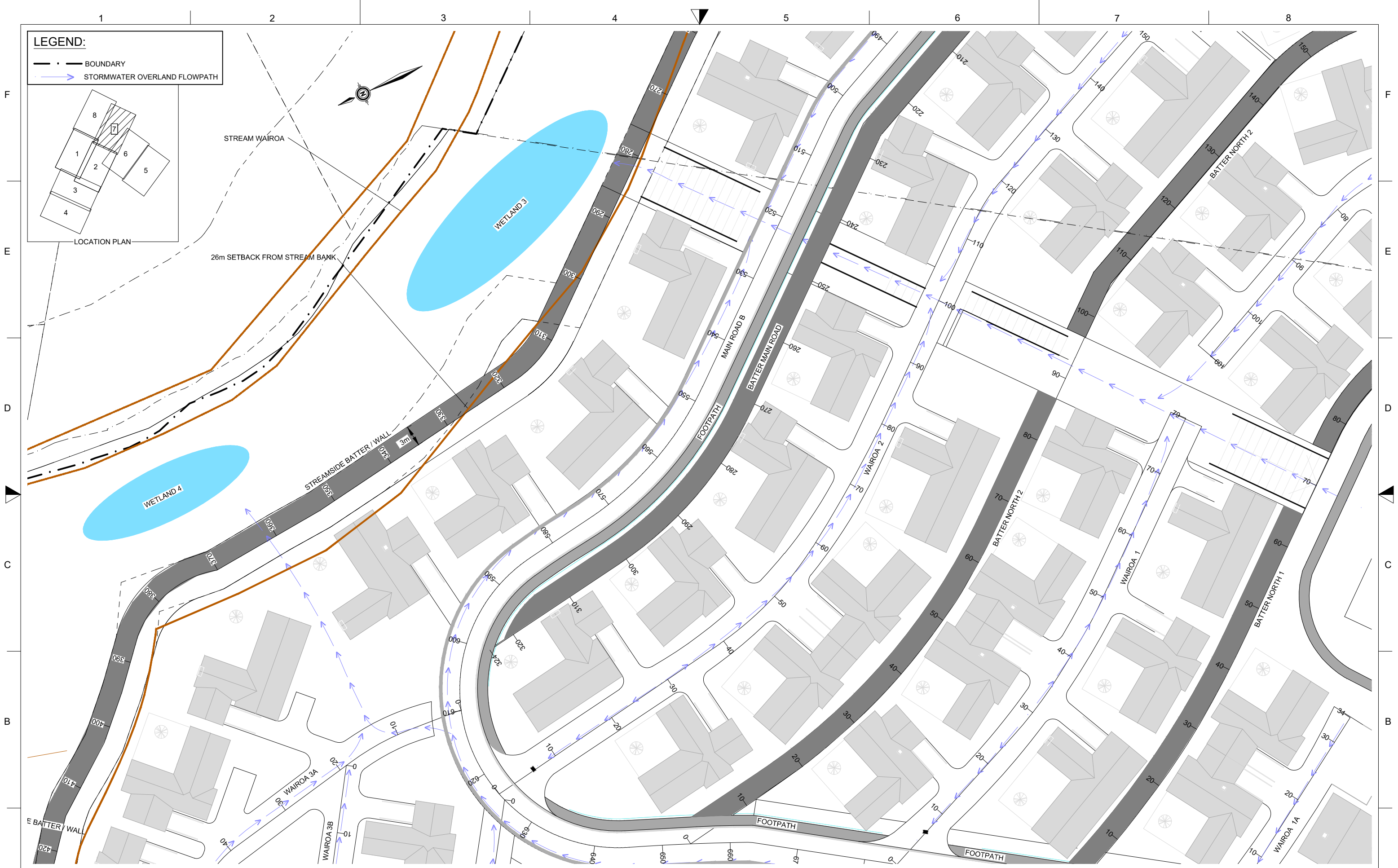
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**5 of 8**



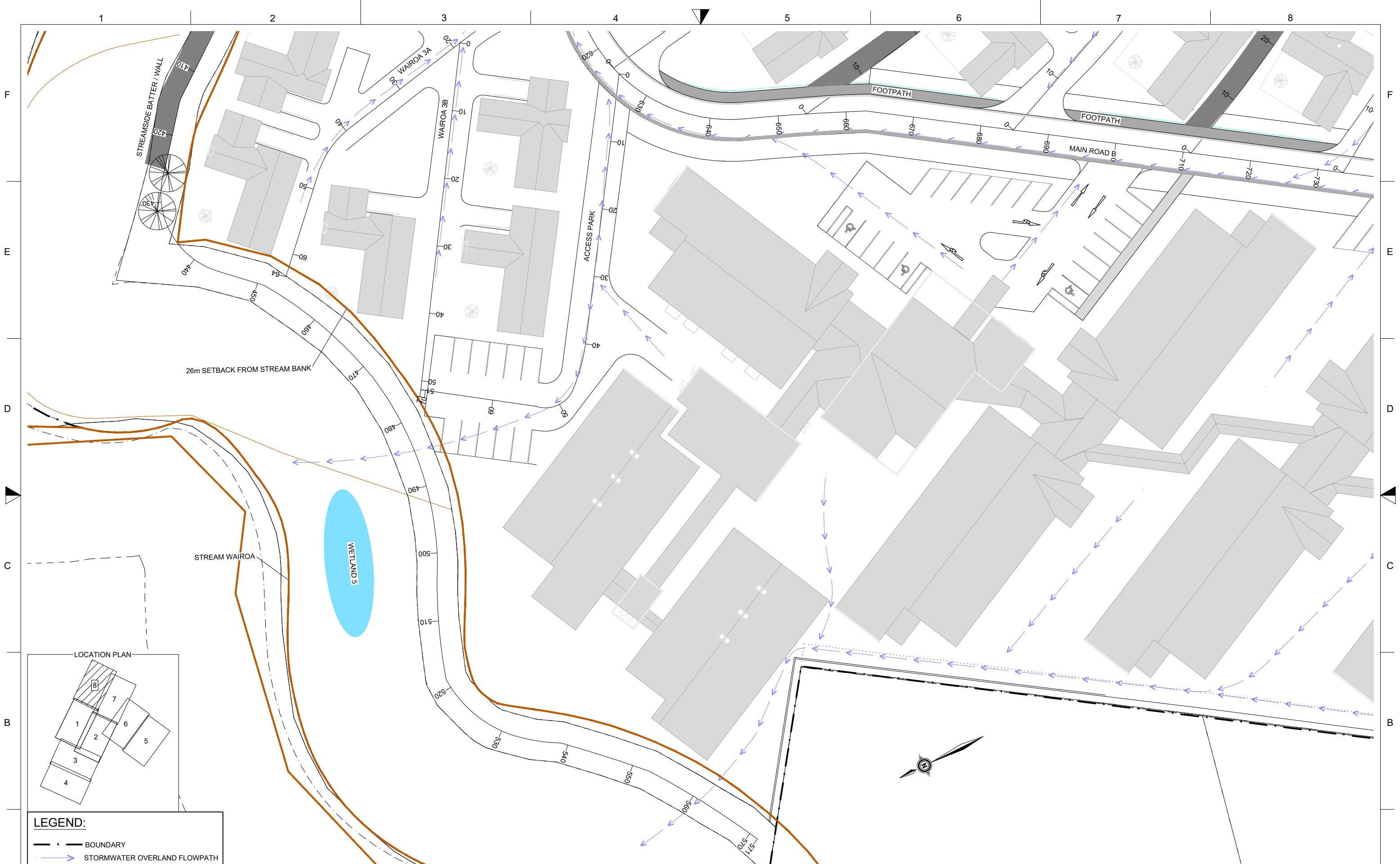


A	Issue	Date	Revision	DWG	Roading Detailed Plan and Stormwater Overland Flowpath			<div>HAIGH WORKMAN Civil &amp; Structural Engineers</div> <div>6 Fairway Drive Kerikeri, BOI</div> <div>T: 09 407 8327 F: 09 407 8378 E: info@haighworkman.co.nz</div> <div>DIMENSIONS MUST NOT BE SCALE MEASURED FROM THESE DRAWINGS. THE CONTRACTOR SHALL CHECK &amp; 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. ©2006</div>	Project		Arvida Retirement Village		DWG No.
	A	04/02/2020	For Resource Consent						Client		Kerikeri Land Ltd.		DP6
									Project No.		18 282	RC no.	
									Scale	1: 500 @A3	<div>5 2.5 0 5 10 15 m</div>	Date	
				Drawn	TV	Checked	JP	Approved		JP	6 of 8		
				File	X:\18 JOBS\18 282 ARVIDA GROUP - MULTIPLE\DRAWINGS\ARVIDA VILLAGE STAGE 1-2 - TV\ARVIDA RETIREMENT (MASTER PLAN CD30 DRAWINGS)\CORRIDORS (ST.1) OK.DWG								

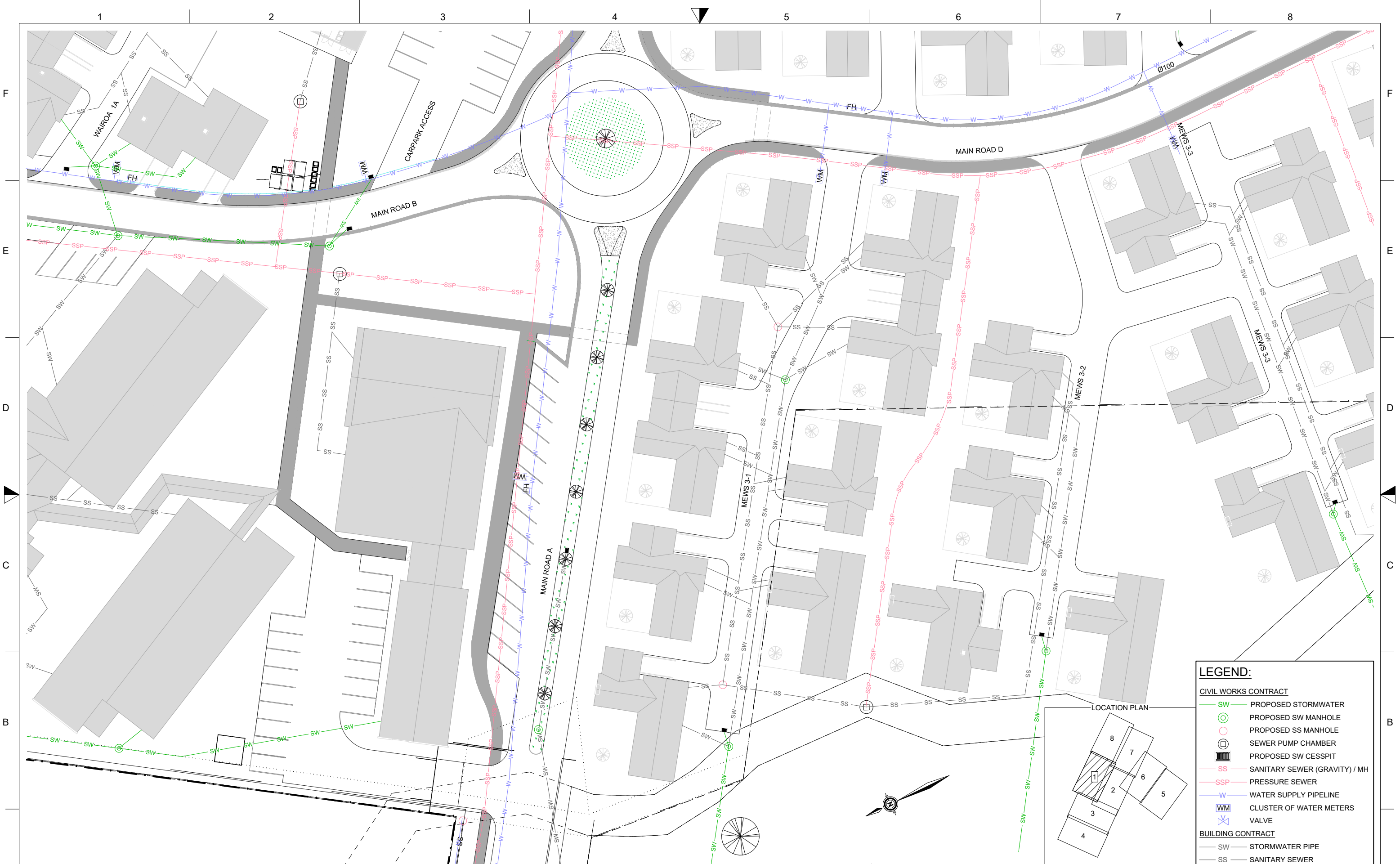


A	Issue	Date	Revision	DWG	Roading Detailed Plan and Stormwater Overland Flowpath			<div>HAIGH WORKMAN Civil &amp; Structural Engineers</div> <div>6 Fairway Drive Kerikeri, BOI T: 09 407 8327 F: 09 407 8378 E: info@haighworkman.co.nz</div> <div>DIMENSIONS MUST NOT BE SCALE MEASURED FROM THESE DRAWINGS. THE CONTRACTOR SHALL CHECK &amp; 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. ©2006</div>	Project		Arvida Retirement Village		DWG No.
	A	04/02/2020	For Resource Consent						Civil Construction - Hall Road, Kerikeri		DP7		
											Sheet No.		
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A	Issue	Date	Revision	DWG	Roading Detailed Plan and Stormwater Overland Flowpath				<div><div>HAIGH WORKMAN</div><div>Civil &amp; Structural Engineers</div></div> <div>6 Fairway Drive Kerikeri, BOI T: 09 407 8327 F: 09 407 8378 E: info@haighworkman.co.nz</div> <div>DIMENSIONS MUST NOT BE SCALE MEASURED FROM THESE DRAWINGS. THE CONTRACTOR SHALL CHECK &amp; VERIFY ALL DIMENSIONS INCLUDING, SITE LEVELS, HEIGHTS AND DRIVES ON SITE PRIOR TO COMMENCING ANY WORK. THE COPYRIGHT TO THESE DRAWINGS AND ALL PARTS THERE OF REMAIN THE PROPERTY OF HAIGH WORKMAN LTD. ©2006</div>	Project		Arvida Retirement Village		DWG No.	A
	A	04/02/2020	For Resource Consent							Client		Civil Construction - Hall Road, Kerikeri		DP8	
										Kerikeri Land Ltd.		Sheet No.			
										Project No.		18 282	RC no.	8 of 8	
	Scale	1: 500	@A3	<div><div>5</div><div>2.5</div><div>0</div><div>5</div><div>10</div><div>15</div></div> <div>m</div>	Date	18/10/2019									
	Drawn	TV		Checked	JP		Approved	JP							
	File	X:\118 JOBS\118 282 ARVIDA GROUP - MULTIPLE\DRAWINGS\ARVIDA VILLAGE STAGE 1-2 - TV\ARVIDA RETIREMENT (MASTER PLAN CD30 DRAWINGS)\CORRIDORS (ST.1) OK.DWG													



Issue	Date	Revision
A	04/02/2020	FOR RESOURCE CONSENT

DWG **Proposed Stormwater and Services Detailed Plan**

Scale 1:500 @A3 Date 04/02/2020

Drawn TV Checked JP Approved JP

File X:\18 JOBS\18 282 ARVIDA GROUP - MULTIPLE\DRAWINGS\ARVIDA VILLAGE STAGE 1-2 - TV\ARVIDA RETIREMENT (MASTER PLAN C03D DRAWINGS)\CORRIDORS (ST.1) OK.DWG

**HAIGH WORKMAN**  
Civil & Structural Engineers

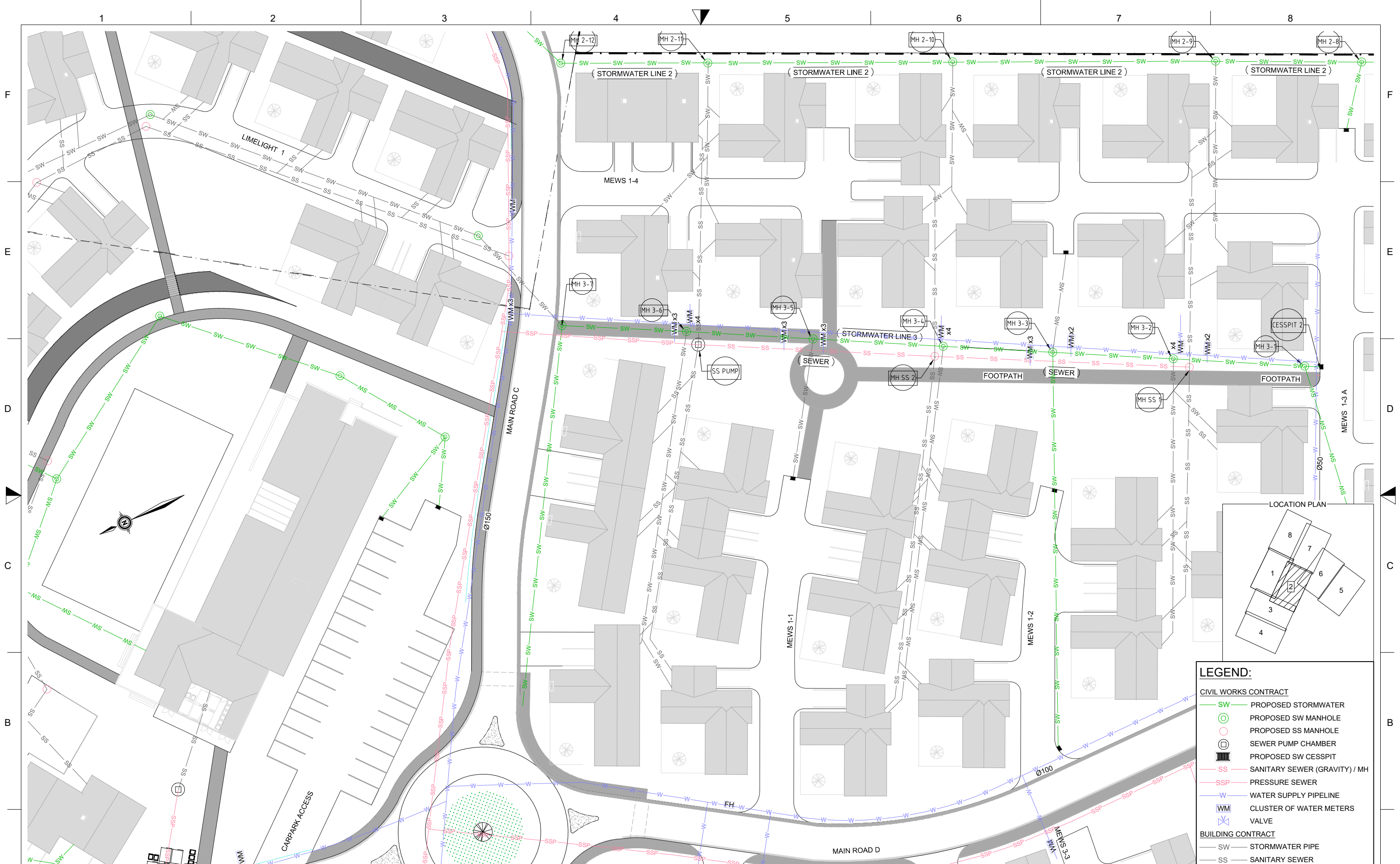
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Project	Arvida Retirement Village Civil Construction - Hall Road, Kerikeri	
Client	Kerikeri Land Ltd.	
Project No.	18 282	RC no.

DWG No.	<b>DP9</b>
Sheet No.	<b>9 of 16</b>





**LEGEND:**

**CIVIL WORKS CONTRACT**

- SW — PROPOSED STORMWATER
- ⊙ — PROPOSED SW MANHOLE
- ⊙ — PROPOSED SS MANHOLE
- ⊙ — SEWER PUMP CHAMBER
- ⊙ — PROPOSED SW CESSPIT
- SS — SANITARY SEWER (GRAVITY) / MH
- SSP — PRESSURE SEWER
- W — WATER SUPPLY PIPELINE
- WM — CLUSTER OF WATER METERS
- ⊙ — VALVE

**BUILDING CONTRACT**

- SW — STORMWATER PIPE
- SS — SANITARY SEWER

Issue	Date	Revision
A	04/02/2020	FOR RESOURCE CONSENT

DWG **Proposed Stormwater and Services Detailed Plan**

Scale 1:500 @A3

Drawn TV Checked JP Approved JP

Date 30/01/2020

File X:\118 JOBS\118 282 ARVIDA GROUP - MULTIPLE\DRAWINGS\ARVIDA VILLAGE STAGE 1-2 - TV\ARVIDA RETIREMENT (MASTER PLAN CD30 DRAWINGS)\CORRIDORS (ST. 1) OK.DWG

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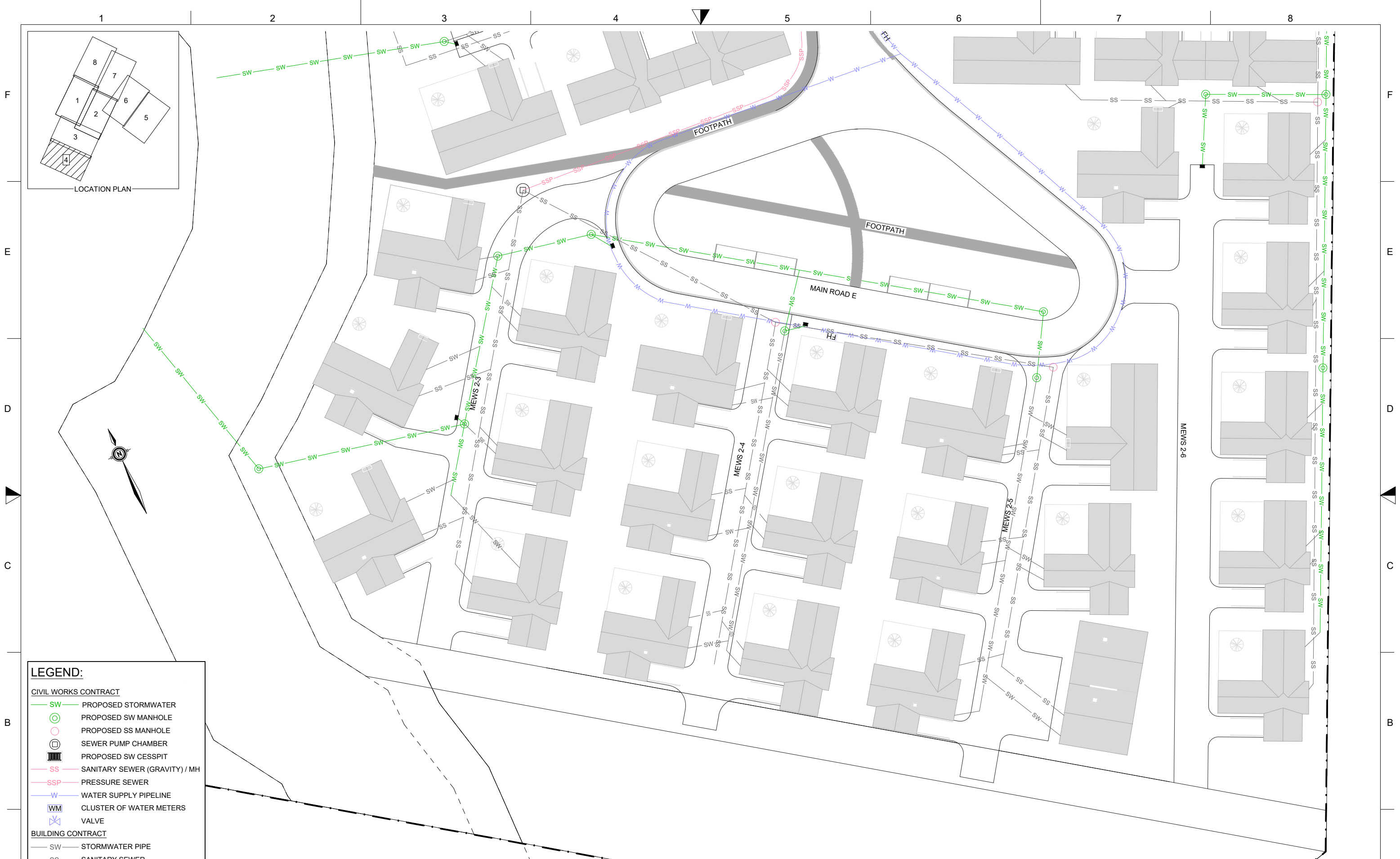
Project	Arvida Retirement Village	
	Civil Construction - Hall Road, Kerikeri	
Client	Kerikeri Land Ltd.	
Project No.	18 282	RC no.

DWG No.	<b>DP10</b>
Sheet No.	<b>10 of 16</b>



A	Issue	Date	Revision		DWG	Proposed Stormwater and Services Detailed Plan			<div><div>HAIGH WORKMAN</div><div>Civil &amp; Structural Engineers</div></div> <div>6 Fairway Drive Kerikeri, BOI</div> <div>T: 09 407 8327 F: 09 407 8378 E: info@haighworkman.co.nz</div> <div>DIMENSIONS MUST NOT BE SCALE MEASURED FROM THESE DRAWINGS. THE CONTRACTOR SHALL CHECK &amp; 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. ©2006</div>	Project		Arvida Retirement Village		DWG No.	
	A	04/02/2020	FOR RESOURCE CONSENT							Client		Kerikeri Land Ltd.		DP11	
										Project No.		18 282	RC no.	Sheet No.	
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**CIVIL WORKS CONTRACT**

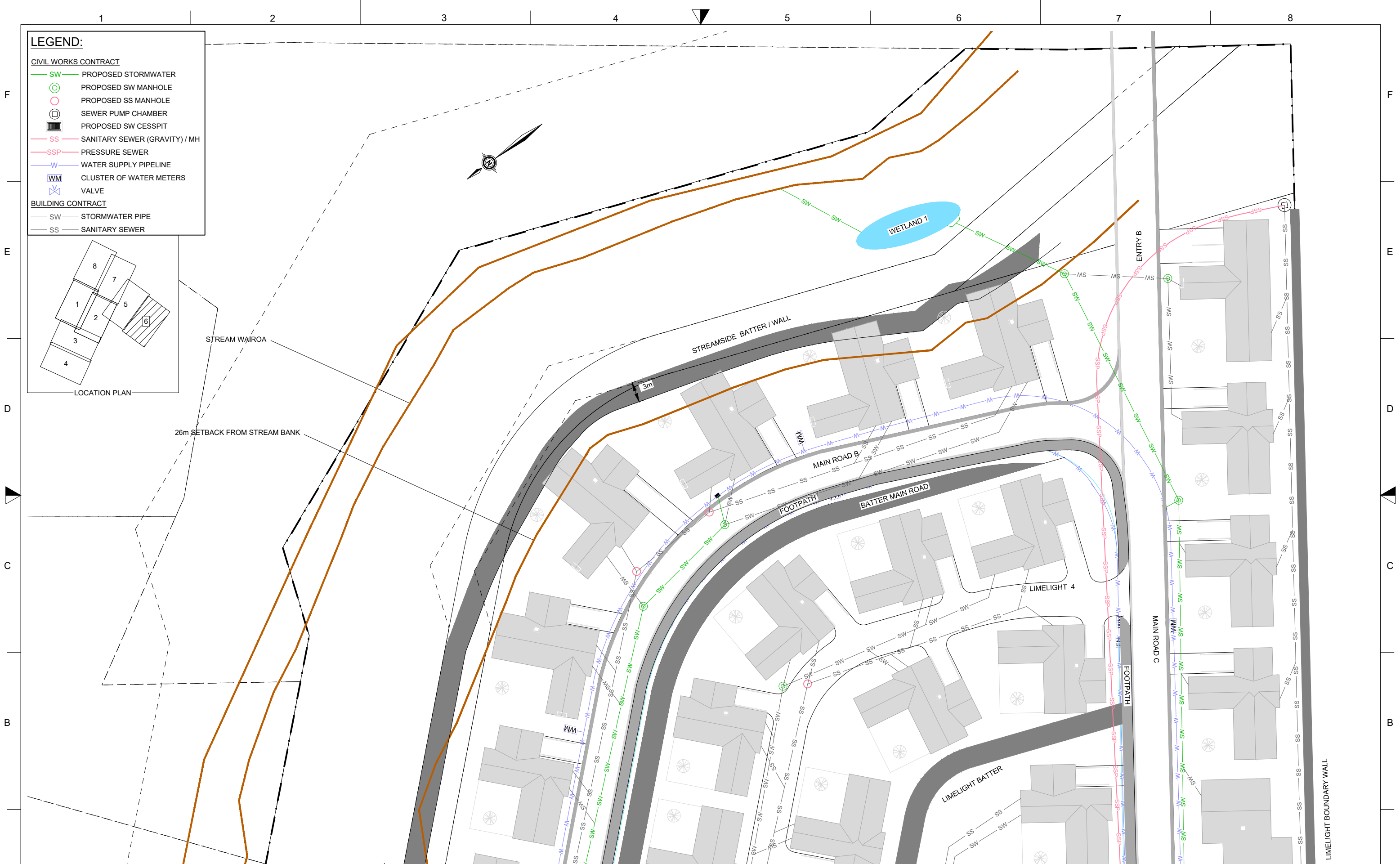
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- PROPOSED SW MANHOLE
- PROPOSED SS MANHOLE
- SEWER PUMP CHAMBER
- PROPOSED SW CESSPIT
- SS SANITARY SEWER (GRAVITY) / MH
- SSP PRESSURE SEWER
- W WATER SUPPLY PIPELINE
- WM CLUSTER OF WATER METERS
- VALVE

**BUILDING CONTRACT**

- SW STORMWATER PIPE
- SS SANITARY SEWER

A	Issue	Date	Revision	DWG	Proposed Stormwater and Services Detailed Plan				<div><div><div>HAIGH WORKMAN</div><div>Civil &amp; Structural Engineers</div></div><div>6 Fairway Drive Kerikeri, BOI</div><div>T: 09 407 8327 F: 09 407 8378 E: info@haighworkman.co.nz</div><div>DIMENSIONS MUST NOT BE SCALE MEASURED FROM THESE DRAWINGS. THE CONTRACTOR SHALL CHECK &amp; 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. ©2006</div></div>	Project		Arvida Retirement Village		DWG No.	DP12
	A	04/02/2020	FOR RESOURCE CONSENT							Client		Kerikeri Land Ltd.			
										Project No.		18 282	RC no.	Sheet No.	12 of 16





Issue	Date	Revision
A	04/02/2020	For Resource Consent

DWG Proposed Stormwater and Services Detailed Plan

Scale 1:500 @A3

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Date 18/10/2019

Drawn TV Checked JP Approved JP

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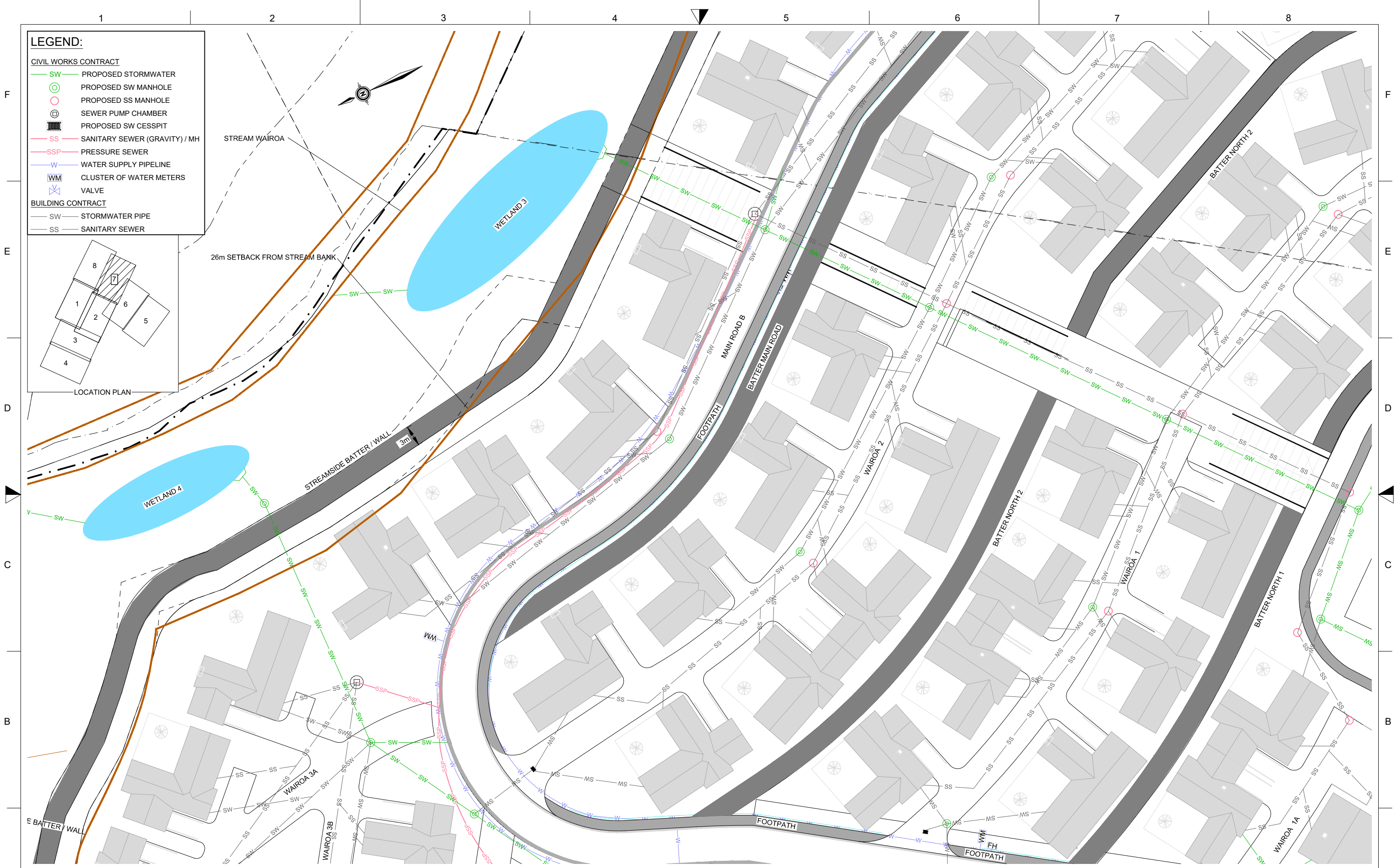
Project	Arvida Retirement Village	
	Civil Construction - Hall Road, Kerikeri	
Client	Kerikeri Land Ltd.	
Project No.	18 282	RC no.

DWG No.	DP13
Sheet No.	13 of 16



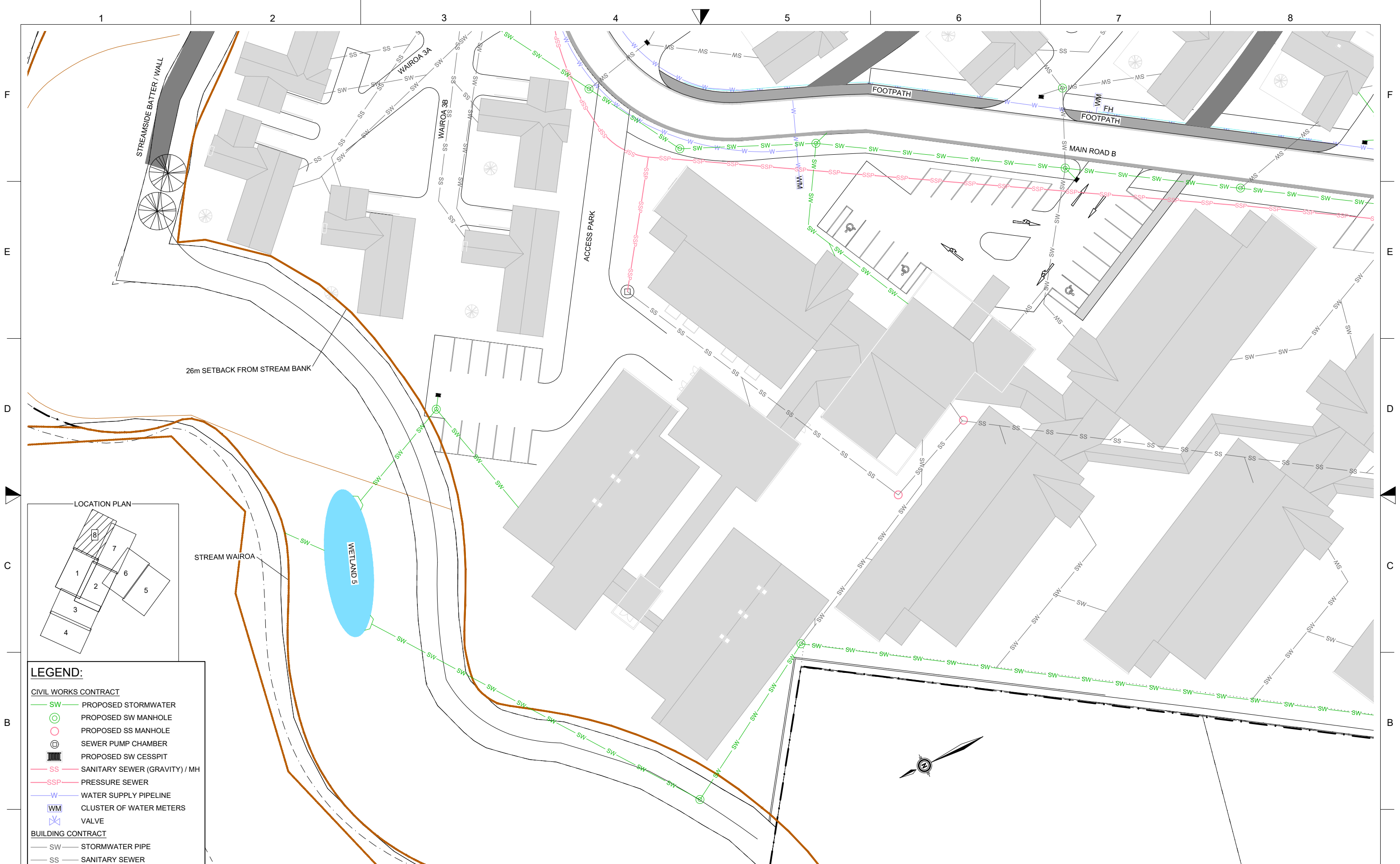
A	Issue	Date	Revision	DWG	Proposed Stormwater and Services Detailed Plan			<div>HAIGH WORKMAN Civil &amp; Structural Engineers</div> <div>6 Fairway Drive Kerikeri, BOI T: 09 407 8327 F: 09 407 8378 E: info@haighworkman.co.nz</div> <div>DIMENSIONS MUST NOT BE SCALE MEASURED FROM THESE DRAWINGS. THE CONTRACTOR SHALL CHECK &amp; VERIFY ALL DIMENSIONS INCLUDING, SITE LEVELS, HEIGHTS AND ANGLES ON SITE PRIOR TO COMMENCING ANY WORK. THE COPYRIGHT OF THESE DRAWINGS AND ALL PARTS THERE OF REMAIN THE PROPERTY OF HAIGH WORKMAN LTD. ©2006</div>	Project		Arvida Retirement Village		DWG No.	DP14	A
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A	Issue	Date	Revision	DWG	Proposed Stormwater and Services Detailed Plan				<div><div><div>HAIGH WORKMAN</div><div>Civil &amp; Structural Engineers</div></div><div>6 Fairway Drive Kerikeri, BOI T: 09 407 8327 F: 09 407 8378 E: info@haighworkman.co.nz</div><div>DIMENSIONS MUST NOT BE SCALE MEASURED FROM THESE DRAWINGS. THE CONTRACTOR SHALL CHECK &amp; 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. ©2006</div></div>	Project		Arvida Retirement Village		DWG No.	DP15	A			
	A	04/02/2020	For Resource Consent							Client		Kerikeri Land Ltd.					Sheet No.	15 of 16	
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Issue	Date	Revision
A	04/02/2020	For Resource Consent

DWG **Proposed Stormwater and Services Detailed Plan**

Scale 1:500 @A3

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Date 18/10/2019

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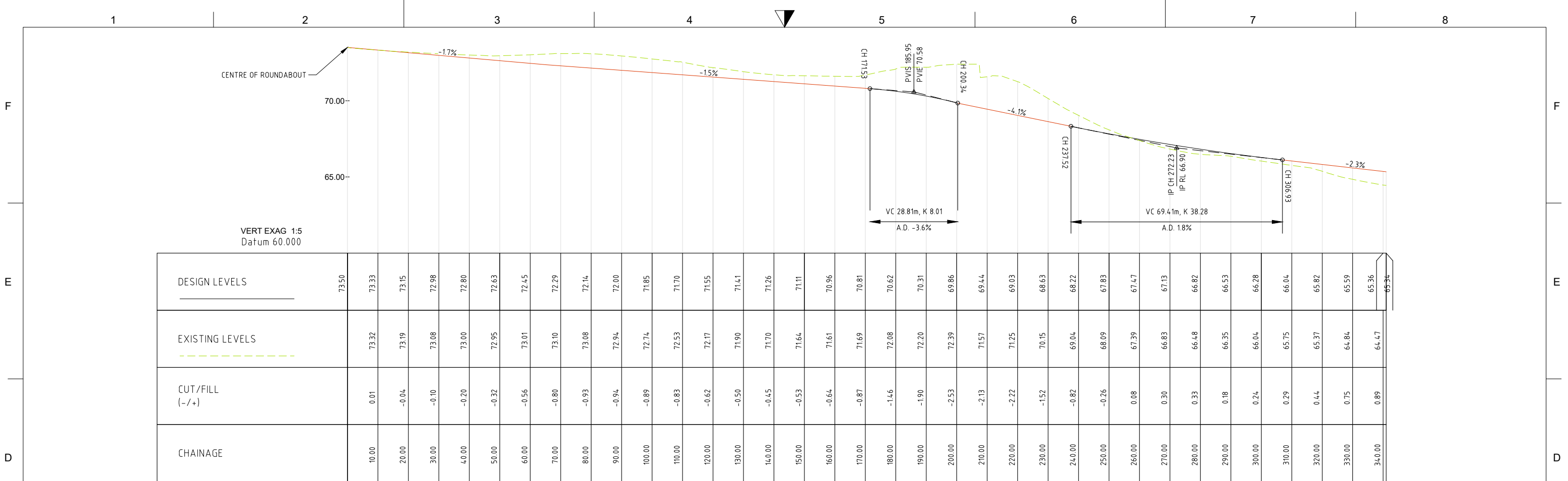
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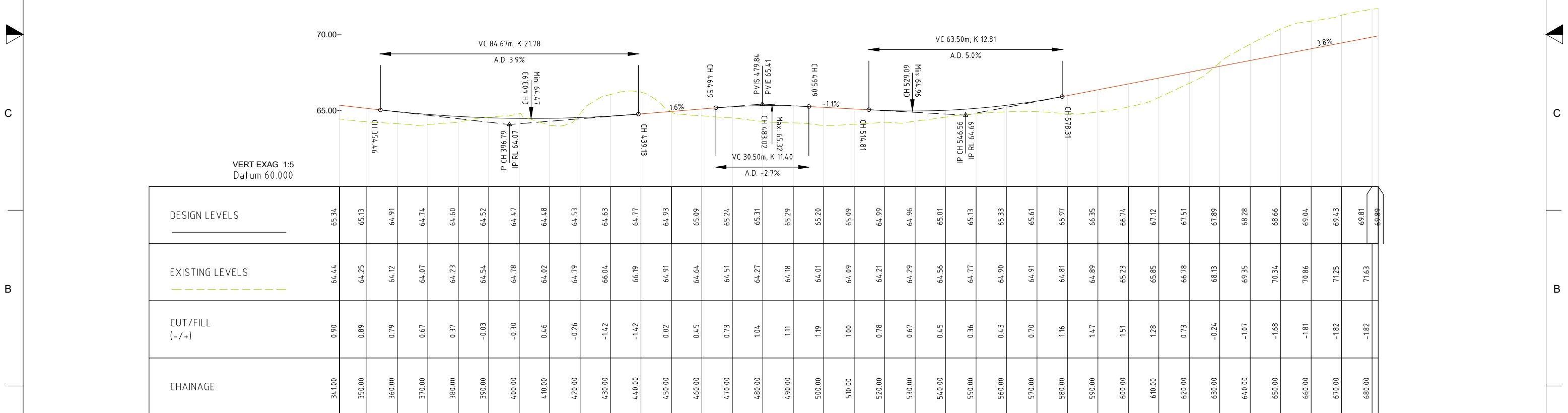
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Client	Kerikeri Land Ltd.	
Project No.	18 282	RC no.

DWG No.	<b>DP16</b>
Sheet No.	<b>16 of 16</b>



MAIN ROAD LONG SECTION



MAIN ROAD LONG SECTION

Issue

Date

Revision

A

04/02/2020

FOR RESOURCE CONSENT

DWG

Main Road B-C Long Section

Scale

1:1250 @A3

Date

04/02/2020

Drawn

TV

Checked

JP

Approved

JP

File

X:\118 JOBS\18 282 ARVIDA GROUP - MULTIPLE\DRAWINGS\ARVIDA VILLAGE STAGE 1-2 - TV\ARVIDA RETIREMENT CD3D DRAWINGS - PLEASE DO NOT MODIFY\PROFILES.DWG

HAIGH WORKMAN LTD

Civil & Structural Engineers

6 Fairway Drive

Kerikeri, BOI

T: 09 407 8327

F: 09 407 8378

E: info@haighworkman.co.nz

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Project

Arvida Retirement Village

Civil Construction - Hall Road, Kerikeri

Client

Kerikeri Land Ltd.

Project No.

18 282

RC no.

DWG No.

LS1

Sheet No.

1 of 10



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Issue	Date	Revision
A	04/02/2020	FOR RESOURCE CONSENT

DWG Main Road B Long Section	
Scale 1:1250 @A3	Date 04/02/2020
Drawn TV	Checked JP
File	Approved JP
X:\118 JOBS\118 282 ARVIDA GROUP - MULTIPLE\DRAWINGS\ARVIDA VILLAGE STAGE 1-2 - TV\ARVIDA RETIREMENT (CD3D DRAWINGS - PLEASE DO NOT MODIFY)\PROFILES.DWG	



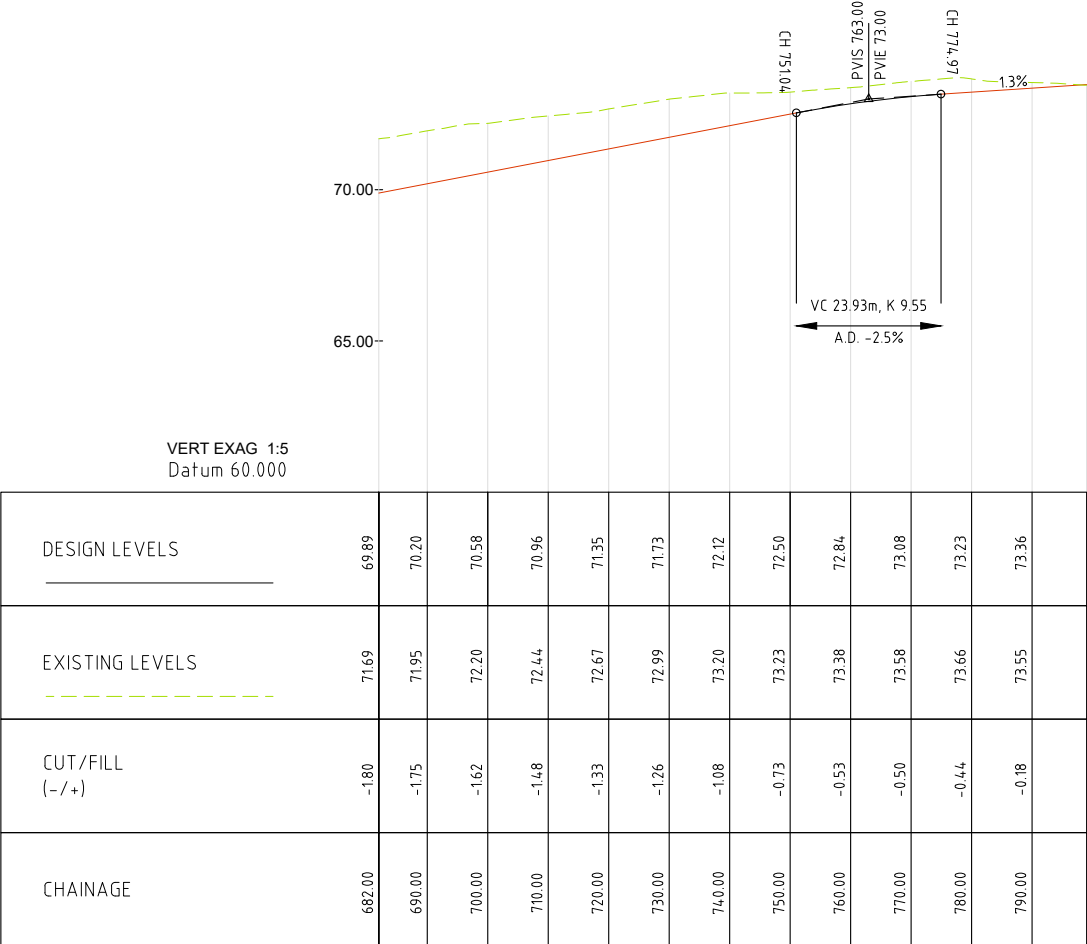
6 Fairway Drive  
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Project	Arvida Retirement Village	
	Civil Construction - Hall Road, Kerikeri	
Client	Kerikeri Land Ltd.	
Project No.	18 282	RC no.

DWG No.	LS2
Sheet No.	2 of 10



MAIN ROAD LONG SECTION



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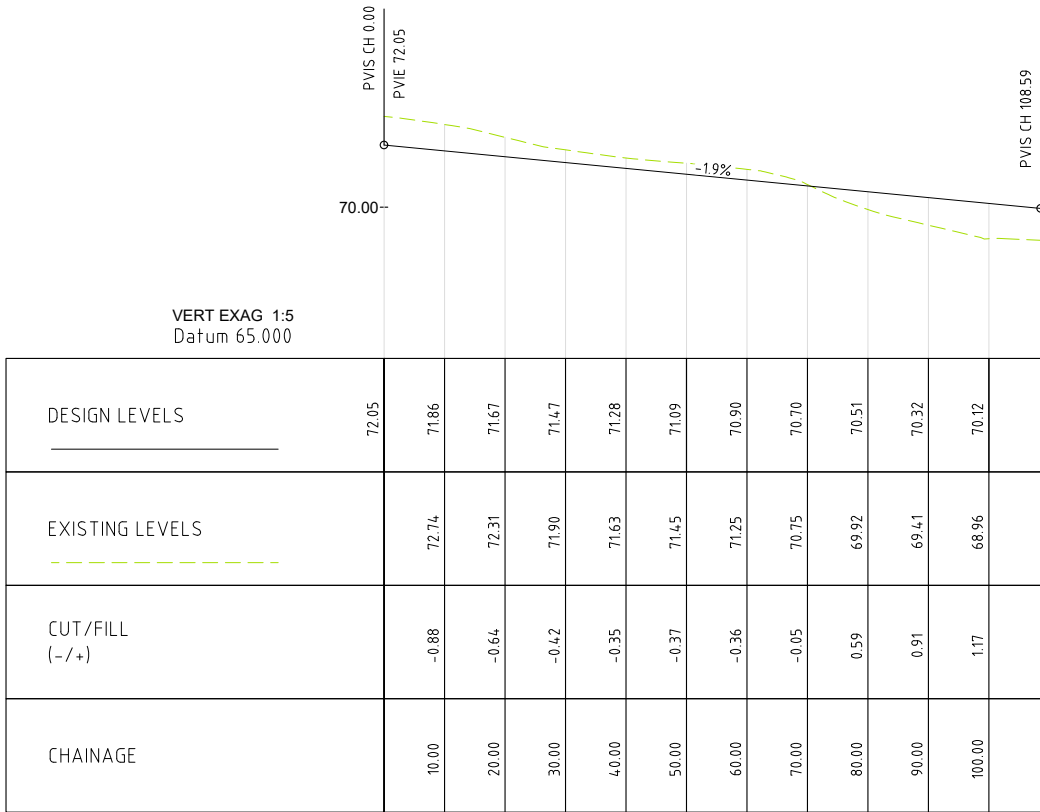
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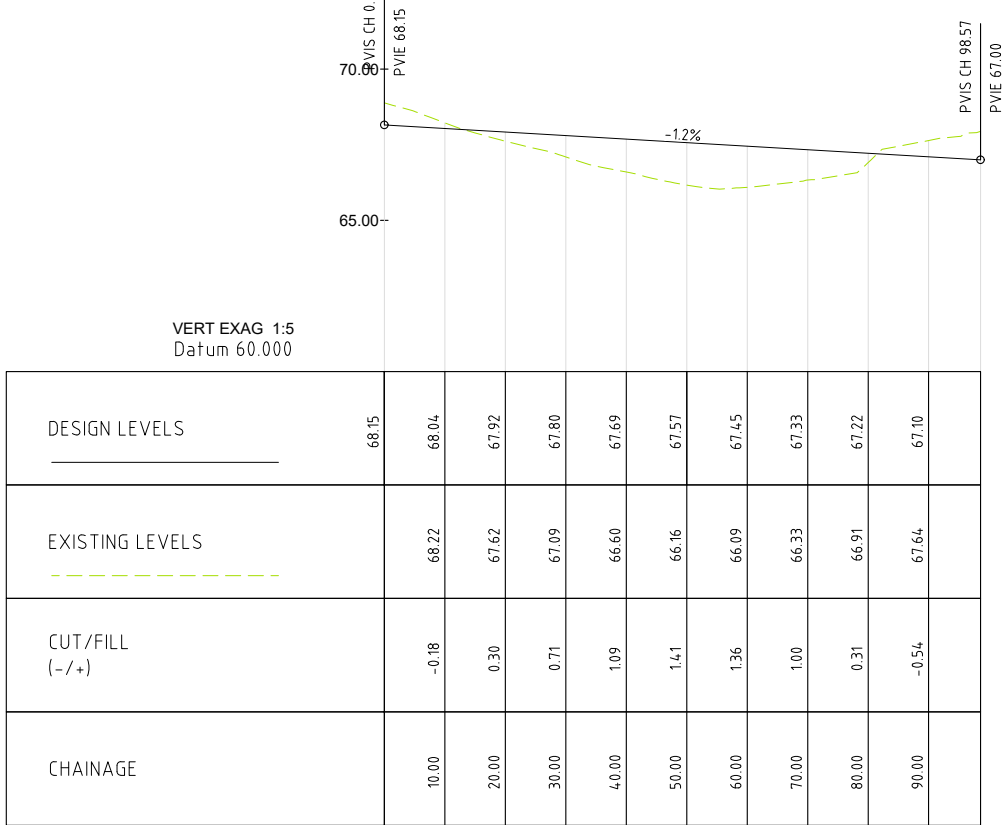
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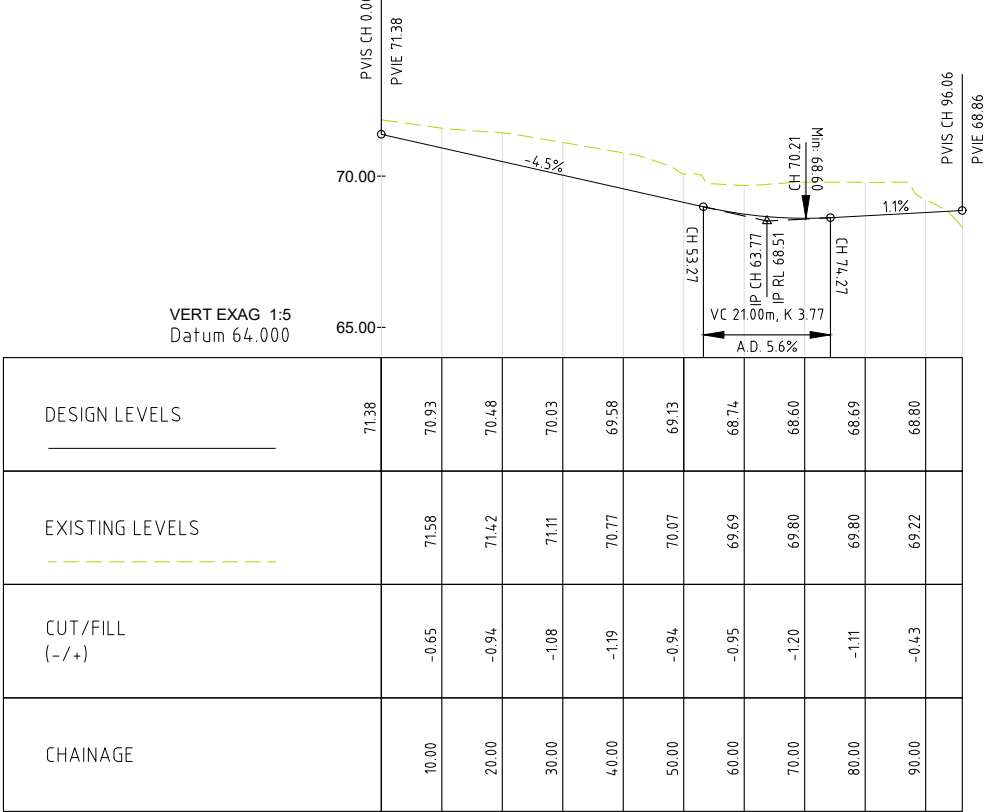
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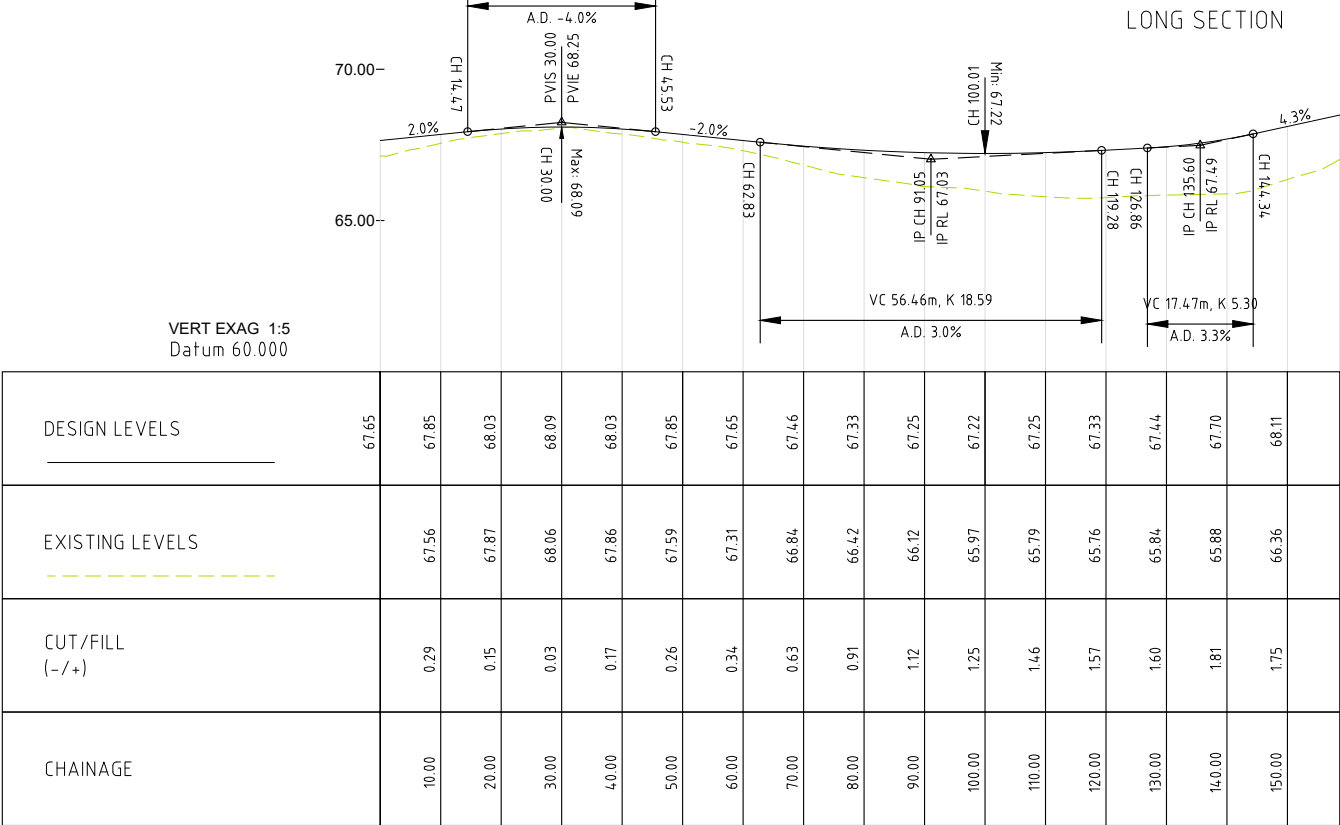
LIMELIGHT SIDE 1 LONG SECTION



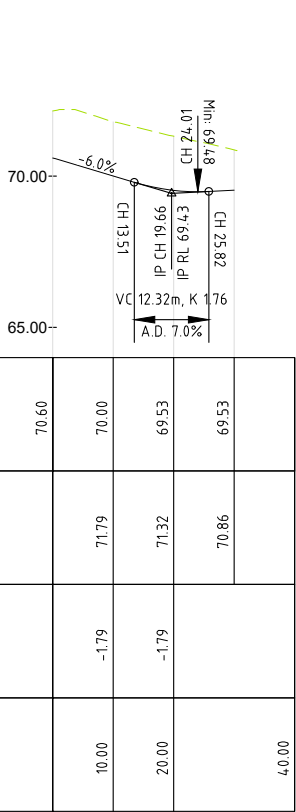
LIMELIGHT SIDE 4 LONG SECTION



LIMELIGHT SIDE 2 LONG SECTION



WAIROA SIDE 2 LONG SECTION



LIMELIGHT SIDE 3 LONG SECTION

Issue	Date	Revision
A	04/02/2020	FOR RESOURCE CONSENT

DWG		Minor Road Long Sections	
Scale	1:1250 @A3	12.5 6.25 0 12.5 25 37.5 m	Date 04/02/2020
Drawn	TV	Checked JP	Approved JP
File	X:\118 JOBS\118 282 ARVIDA GROUP - MULTIPLE\DRAWINGS\ARVIDA VILLAGE STAGE 1-2 - TV\ARVIDA RETIREMENT CD3D DRAWINGS - PLEASE DO NOT MODIFY\PROFILES.DWG		

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Civil & Structural Engineers

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Project	Arvida Retirement Village Civil Construction - Hall Road, Kerikeri	
Client	Kerikeri Land Ltd.	
Project No.	18 282	RC no.

DWG No.	LS3
Sheet No.	3 of 10

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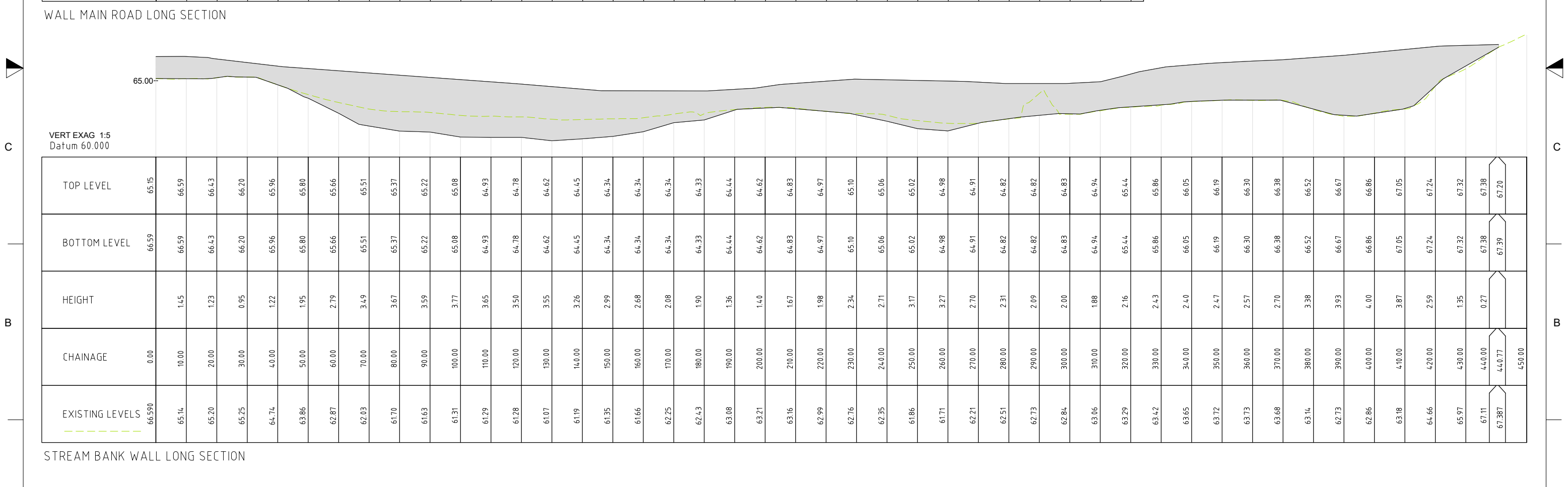
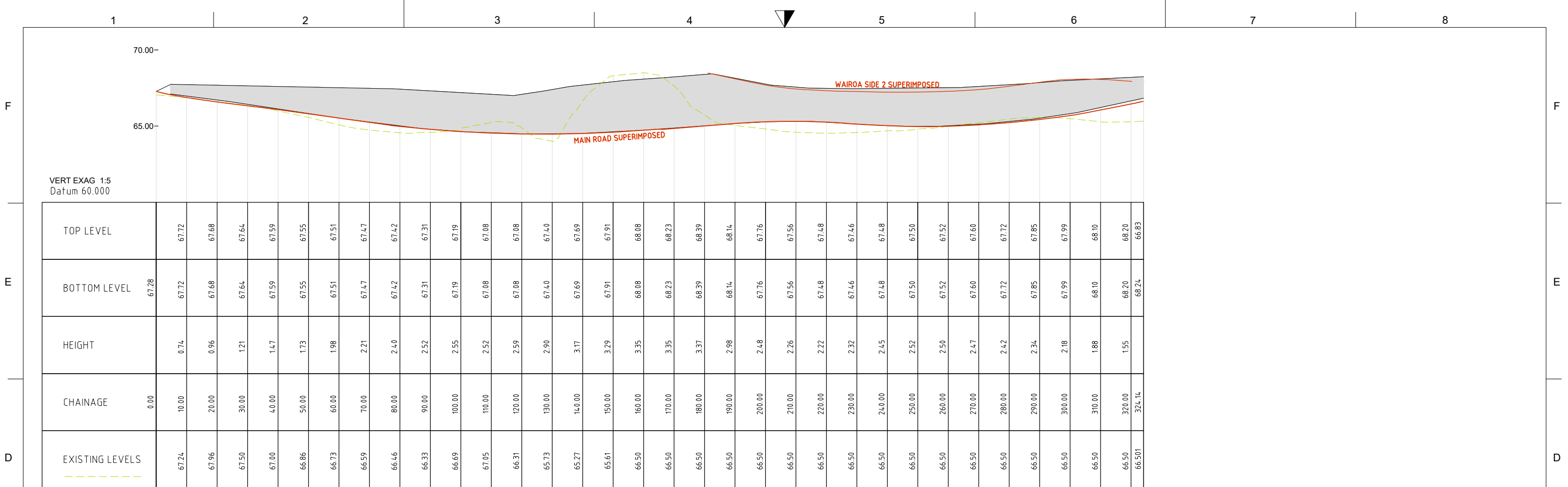
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Issue

Date

Revision

A

04/02/2020

For Resource Consent

DWG

Batter Slope/Retaining Wall Long Sections

Scale

1:1250 @A3

12.5

6.25

0

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37.5

Date

10/03/2020

Drawn

TV

Checked

JP

Approved

JP

File

X:\118 JOBS\118 282 ARVIDA GROUP - MULTIPLE\DRAWINGS\ARVIDA VILLAGE STAGE 1-2 - TV\ARVIDA RETIREMENT (CD3D DRAWINGS - PLEASE DO NOT MODIFY)\PROFILES DWG

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Civil & Structural Engineers

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Project

Arvida Retirement Village

Civil Construction - Hall Road, Kerikeri

Client

Kerikeri Land Ltd.

Project No.

18 282

RC no.

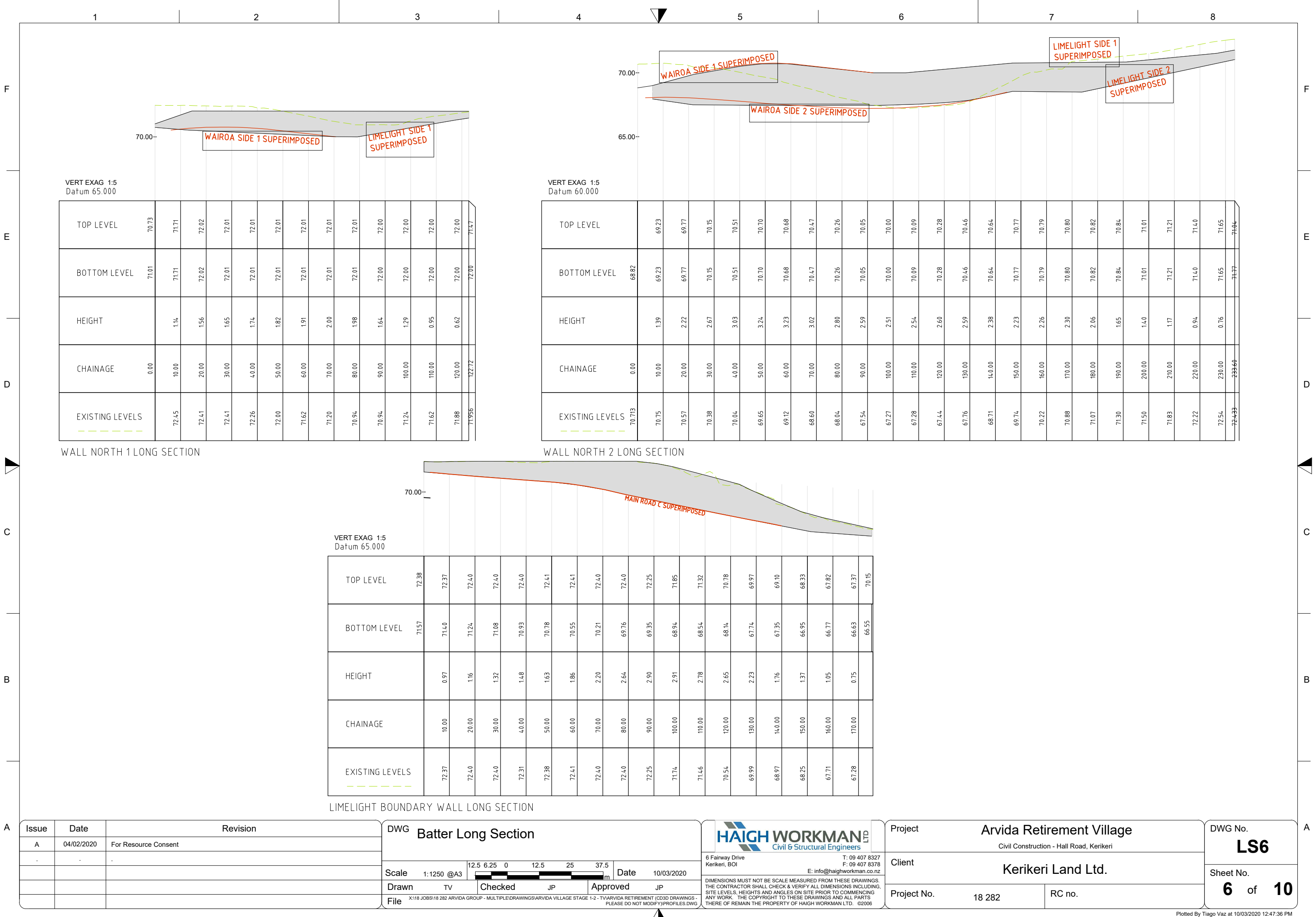
DWG No.

LS5

Sheet No.

5 of 10

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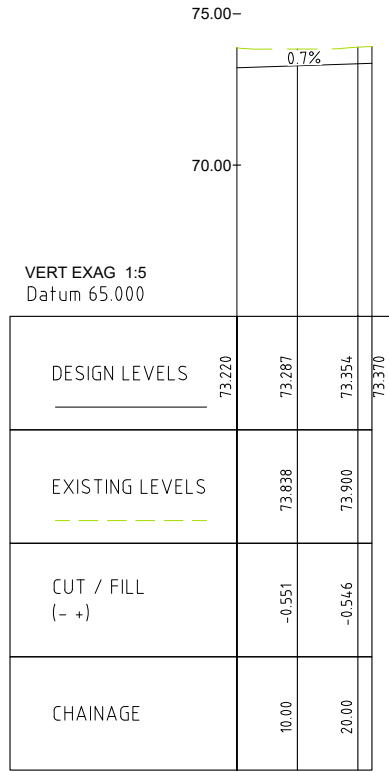
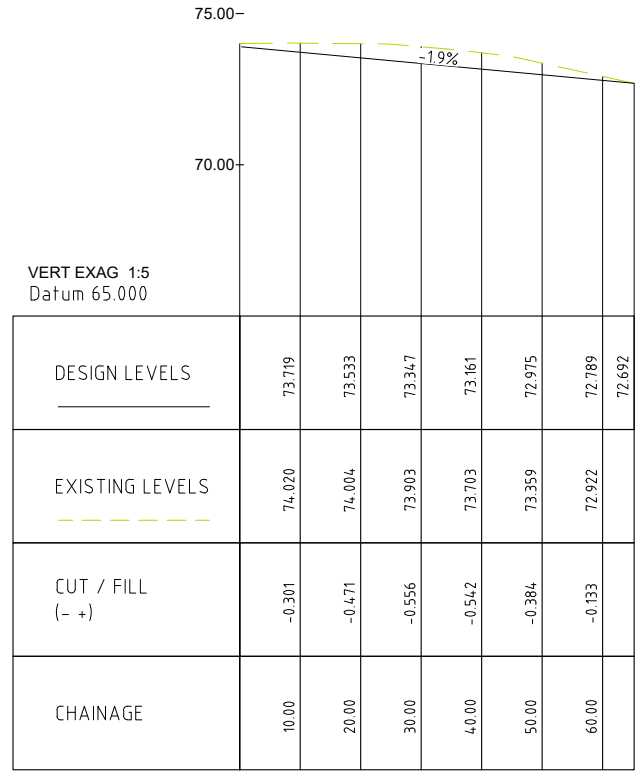
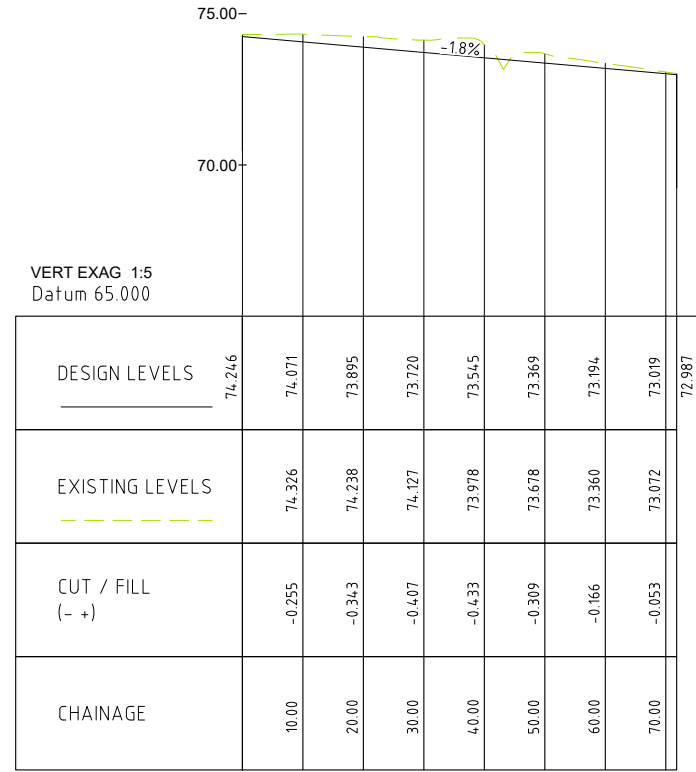
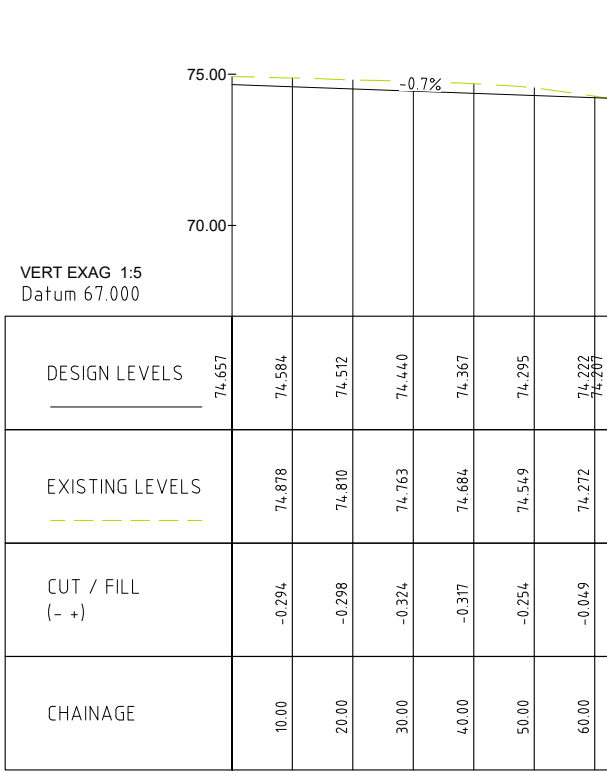
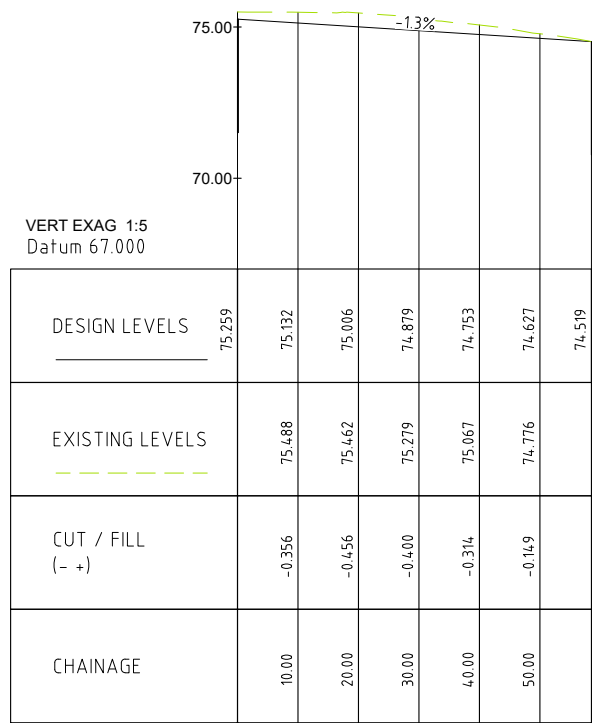
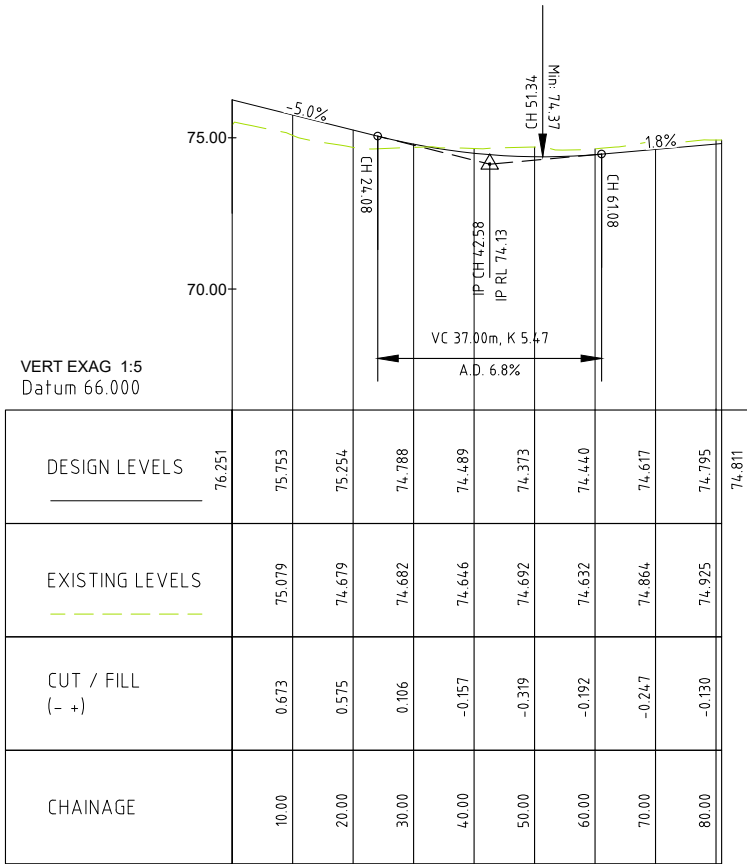
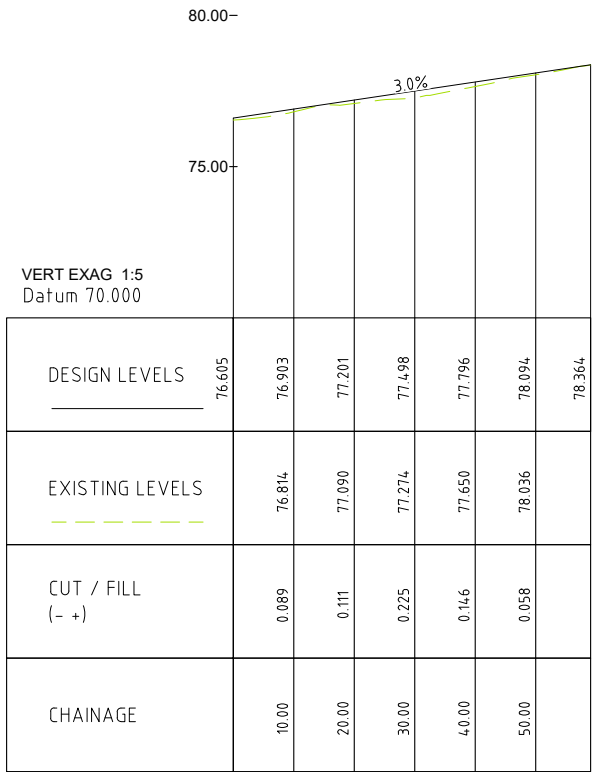
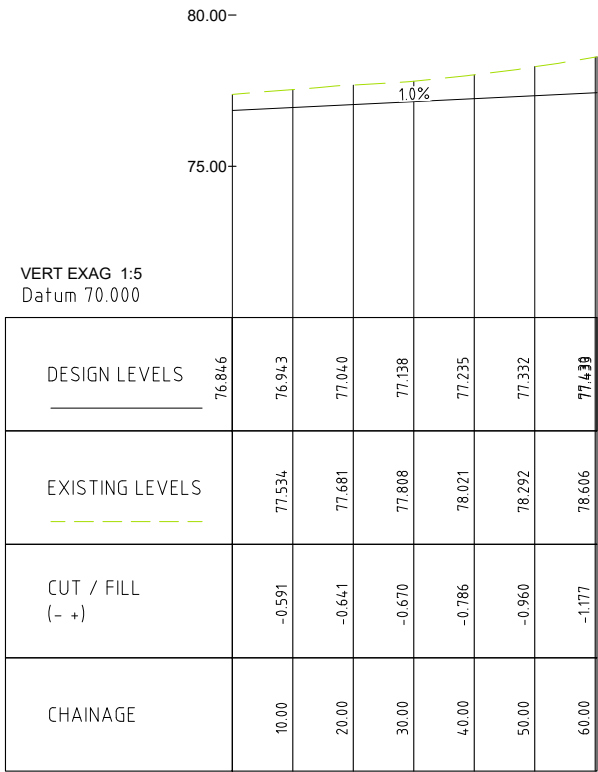






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Issue	Date	Revision
A	04/02/2020	FOR RESOURCE CONSENT

DWG  
Minor Road Long Sections

Scale 1:1250 @A3

12.5 6.25 0 12.5 25 37.5 m

Drawn TV

Checked JP

Approved JP

File X:\18 JOBS\18 282 ARVIDA GROUP - MULTIPLE\DRAWINGS\ARVIDA VILLAGE STAGE 1-2 - TV\ARVIDA RETIREMENT (MASTER PLAN CD30 DRAWINGS)\LONG SECTIONS AND PIPES (ST. 1).DWG

Date 24/01/2020

HAIGH WORKMAN LTD  
Civil & Structural Engineers

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Kerikeri, BOI

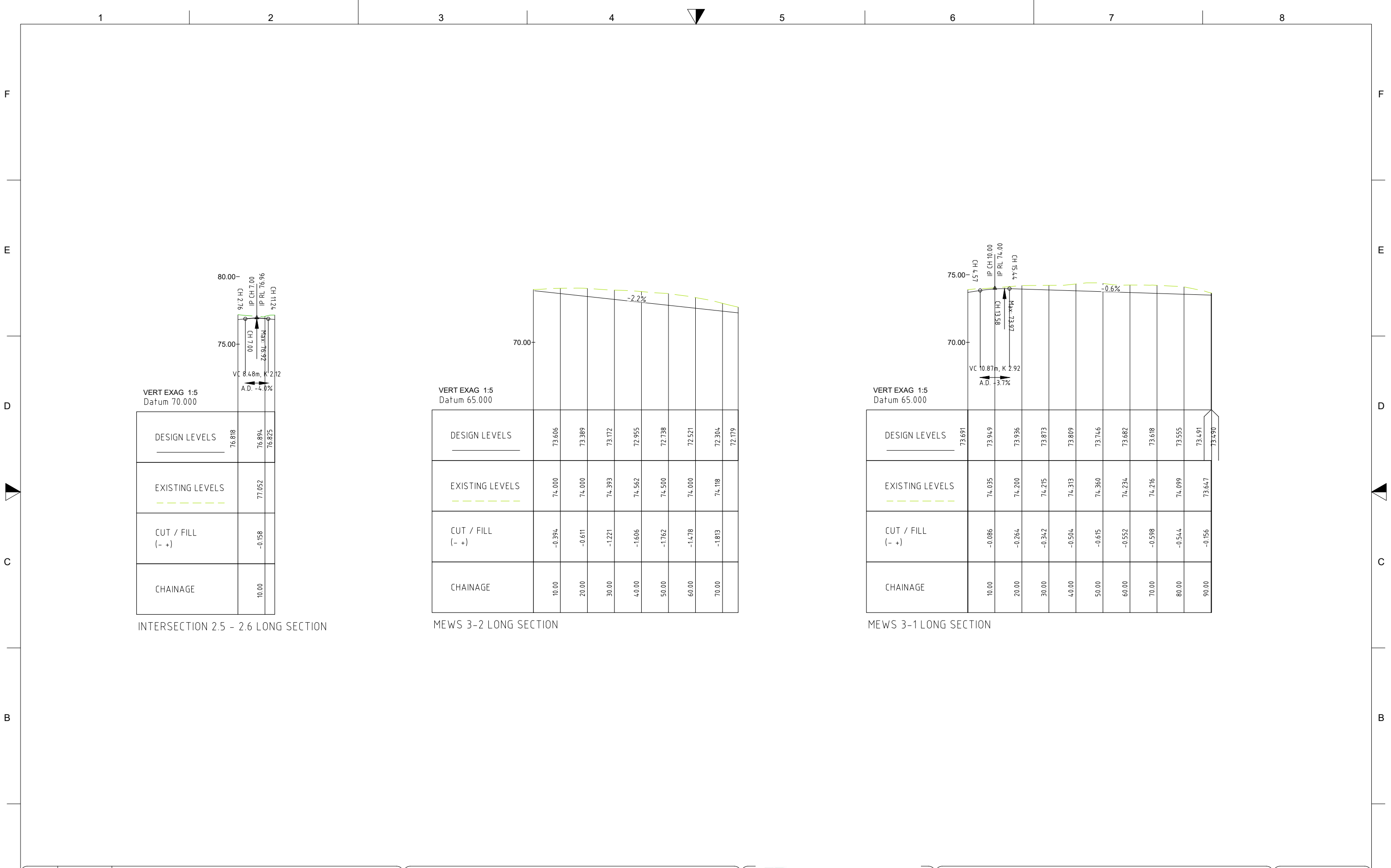
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Project	Arvida Retirement Village
Client	Kerikeri Land Ltd.
Project No.	18 282
RC no.	

DWG No.  
LS9

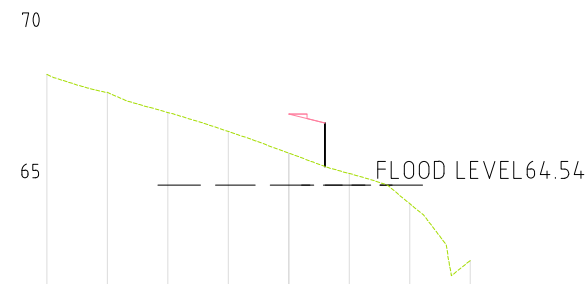
Sheet No.  
9 of 10



Issue		Date		Revision		DWG Minor Road Long Sections			<div><div><div><div>HAIGH</div><div>WORKMAN</div><div>Civil &amp; Structural Engineers</div></div><div><div>6 Fairway Drive Kerikeri, BOI</div><div><div>T: 09 407 8327 F: 09 407 8378 E: info@haighworkman.co.nz</div></div></div></div><div><div>DIMENSIONS MUST NOT BE SCALE MEASURED FROM THESE DRAWINGS. THE CONTRACTOR SHALL CHECK &amp; 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. ©2006</div></div></div>		Project Arvida Retirement Village Civil Construction - Hall Road, Kerikeri		DWG No. LS10	
A		04/02/2020		FOR RESOURCE CONSENT					Client Kerikeri Land Ltd.		Sheet No. 10 of 10			
						<div><div>Scale1:1250 @A3</div><div><div><div>12.5</div><div>6.25</div><div>0</div><div>12.5</div><div>25</div><div>37.5</div></div><div>m</div></div><div>Date24/01/2020</div></div> <div><div>DrawnTV</div><div>CheckedJP</div><div>ApprovedJP</div></div> <div><div>File</div><div>X:\118 JOBS\18 282 ARVIDA GROUP - MULTIPLE\DRAWINGS\ARVIDA VILLAGE STAGE 1-2 - TV\ARVIDA RETIREMENT (MASTER PLAN CD30 DRAWINGS)\LONG SECTIONS AND PIPES (ST. 1).DWG</div></div>			Project No. 18 282		RC no.			

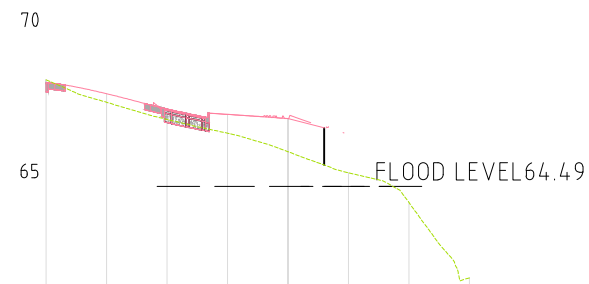




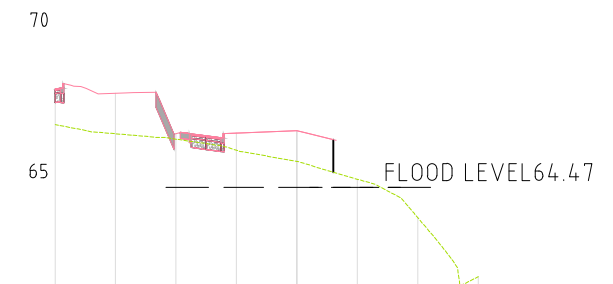


DESIGN LEVELS				66.890			
EXISTING LEVELS	68.194	67.600	66.937	66.309	65.594	64.920	63.924
CUT/FILL					1.30		
OFFSETS	-40.00	-30.00	-20.00	-10.00	0.00	10.00	20.00

Chainage -00.000

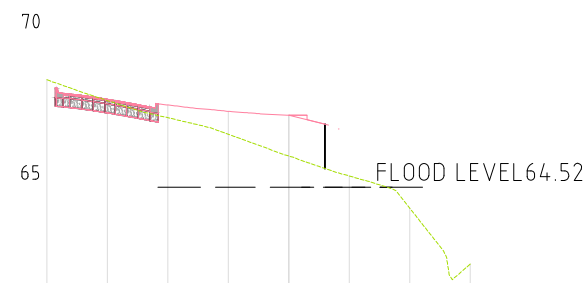
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Chainage 20.000



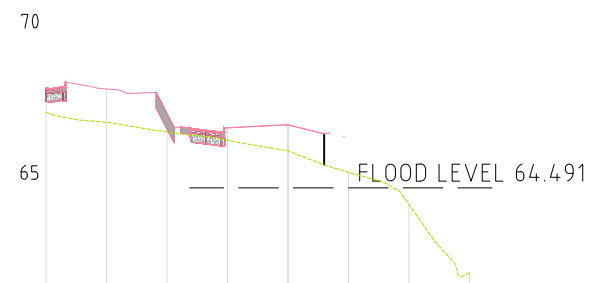
DESIGN LEVELS	67.715	67.570	66.239	66.257	66.338			
EXISTING LEVELS	66.532	66.235	66.057	65.688	65.322	64.730	63.454	64.510
CUT/FILL	1.18	1.34	0.18	0.57	1.02			
OFFSETS	-40.00	-30.00	-20.00	-10.00	0.00	10.00	20.00	30.00

Chainage 40.000



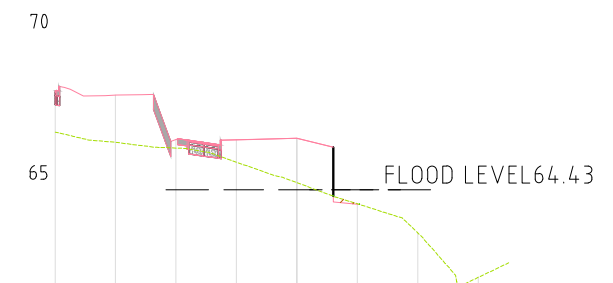
DESIGN LEVELS		67.421	67.232	67.023	66.895			
EXISTING LEVELS	66.074	67.378	66.813	66.264	65.545	64.884	63.822	63.071
CUT/FILL		0.04	0.42	0.76	1.35			
OFFSETS	-40.00	-30.00	-20.00	-10.00	0.00	10.00	20.00	30.00

Chainage 10.000




DESIGN LEVELS	67.797	67.763	66.952	66.481	66.580			
EXISTING LEVELS	67.000	66.664	66.342	66.071	65.716	65.007	63.950	63.501
CUT/FILL	0.80	1.10	0.61	0.41	0.86			
OFFSETS	-40.00	-30.00	-20.00	-10.00	0.00	10.00	19.54	23.50

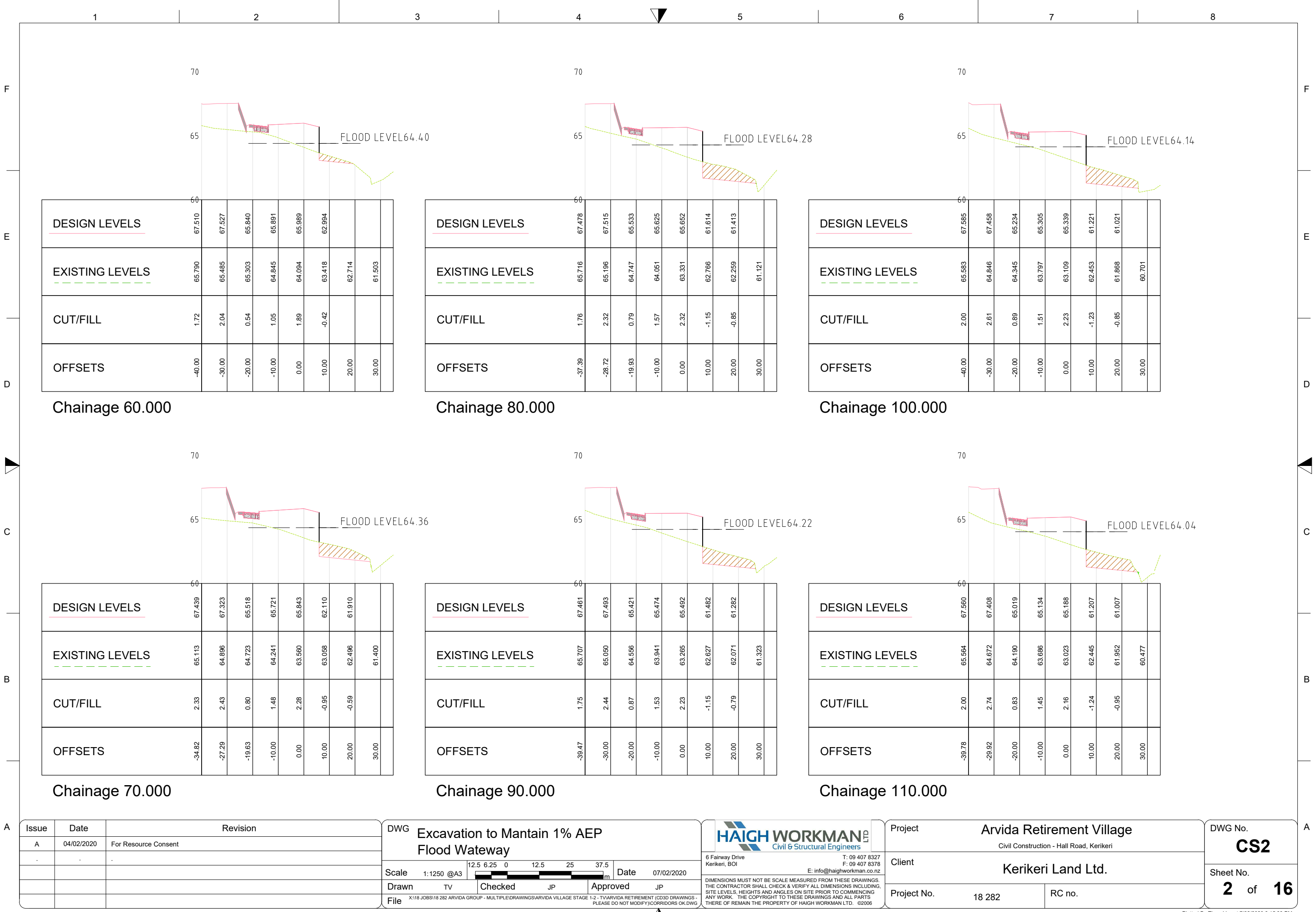
Chainage 30.000



DESIGN LEVELS	67.696	67.565	66.093	66.079	66.135	63.951		
EXISTING LEVELS	66.336	65.997	65.809	65.343	64.664	63.965	63.001	61.535
CUT/FILL	1.36	1.57	0.28	0.74	1.47	-0.01		
OFFSETS	-40.00	-30.00	-20.00	-10.00	0.00	10.00	20.00	30.00

Chainage 50.000

Issue	Date	Revision	DWG	Excavation to Mantain 1% AEP Flood Waterway			<div><div>HAIGH WORKMAN Civil &amp; Structural Engineers</div></div> <div>6 Fairway Drive Kerikeri, BOI T: 09 407 8327 F: 09 407 8378 E: info@haighworkman.co.nz</div> <div>DIMENSIONS MUST NOT BE SCALE MEASURED FROM THESE DRAWINGS. THE CONTRACTOR SHALL CHECK &amp; 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. ©2006</div>	Project		Arvida Retirement Village Civil Construction - Hall Road, Kerikeri		DWG No.	CS1
A	04/02/2020	For Resource Consent				Client		Kerikeri Land Ltd.		Sheet No.	1 of 16		
.	.	.	Scale	1:1250 @A3	<div><div>12.5 6.25 0 12.5 25 37.5</div><div>m</div></div>	Date		07/02/2020					
			Drawn	TV	Checked	JP		Approved	JP	File		X:\18 JOBS\18 282 ARVIDA GROUP - MULTIPLE\DRAWINGS\ARVIDA VILLAGE STAGE 1-2 - TV\ARVIDA RETIREMENT\CD3D DRAWINGS - PLEASE DO NOT MODIFY\CORRIDORS OK.DWG	



Issue	Date	Revision
A	04/02/2020	For Resource Consent

DWG

Excavation to Mantain 1% AEP  
Flood Watway

Scale

1:1250 @A3

12.5

6.25

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12.5

25

37.5

m

Date

07/02/2020

Drawn

TV

Checked

JP

Approved

JP

File

X:\118 JOBS\18 282 ARVIDA GROUP - MULTIPLE\DRAWINGS\ARVIDA VILLAGE STAGE 1-2 - TV\ARVIDA RETIREMENT (CD3D DRAWINGS - PLEASE DO NOT MODIFY)\CORRIDORS OK.DWG

HAIGH WORKMAN

Civil & Structural Engineers

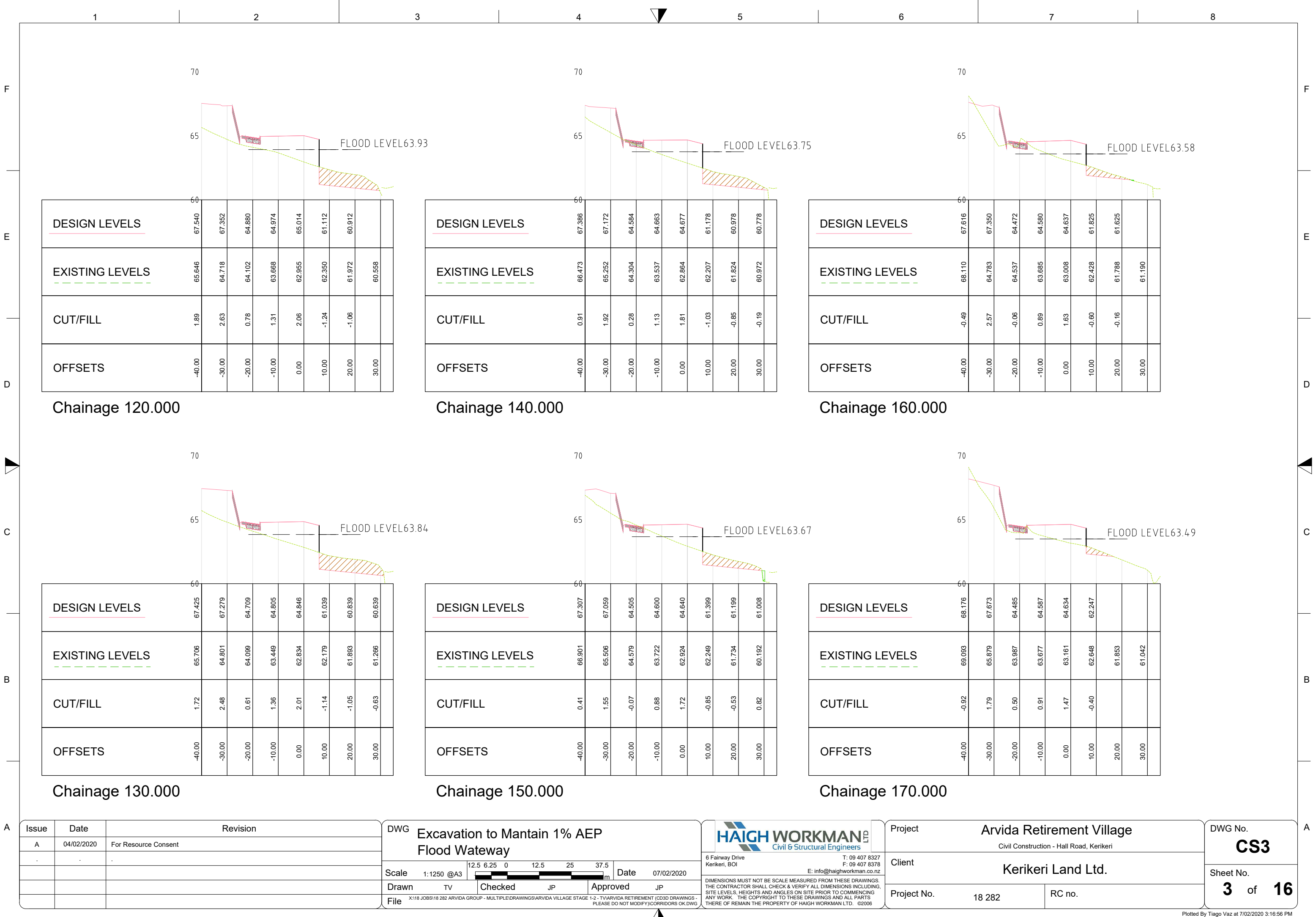
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Project	Arvida Retirement Village Civil Construction - Hall Road, Kerikeri	
Client	Kerikeri Land Ltd.	
Project No.	18 282	RC no.

DWG No.	CS2
Sheet No.	
	2 of 16



Issue	Date	Revision
A	04/02/2020	For Resource Consent

DWG

Excavation to Mantain 1% AEP  
Flood Watway

Scale

1:1250 @A3

Drawn

TV

Checked

JP

Approved

JP

Date

07/02/2020

File

X:\118 JOBS\18 282 ARVIDA GROUP - MULTIPLE\DRAWINGS\ARVIDA VILLAGE STAGE 1-2 - TV\ARVIDA RETIREMENT (CD3D DRAWINGS - PLEASE DO NOT MODIFY)\CORRIDORS OK.DWG

12.5 6.25 0 12.5 25 37.5

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HAIGH WORKMAN

Civil & Structural Engineers

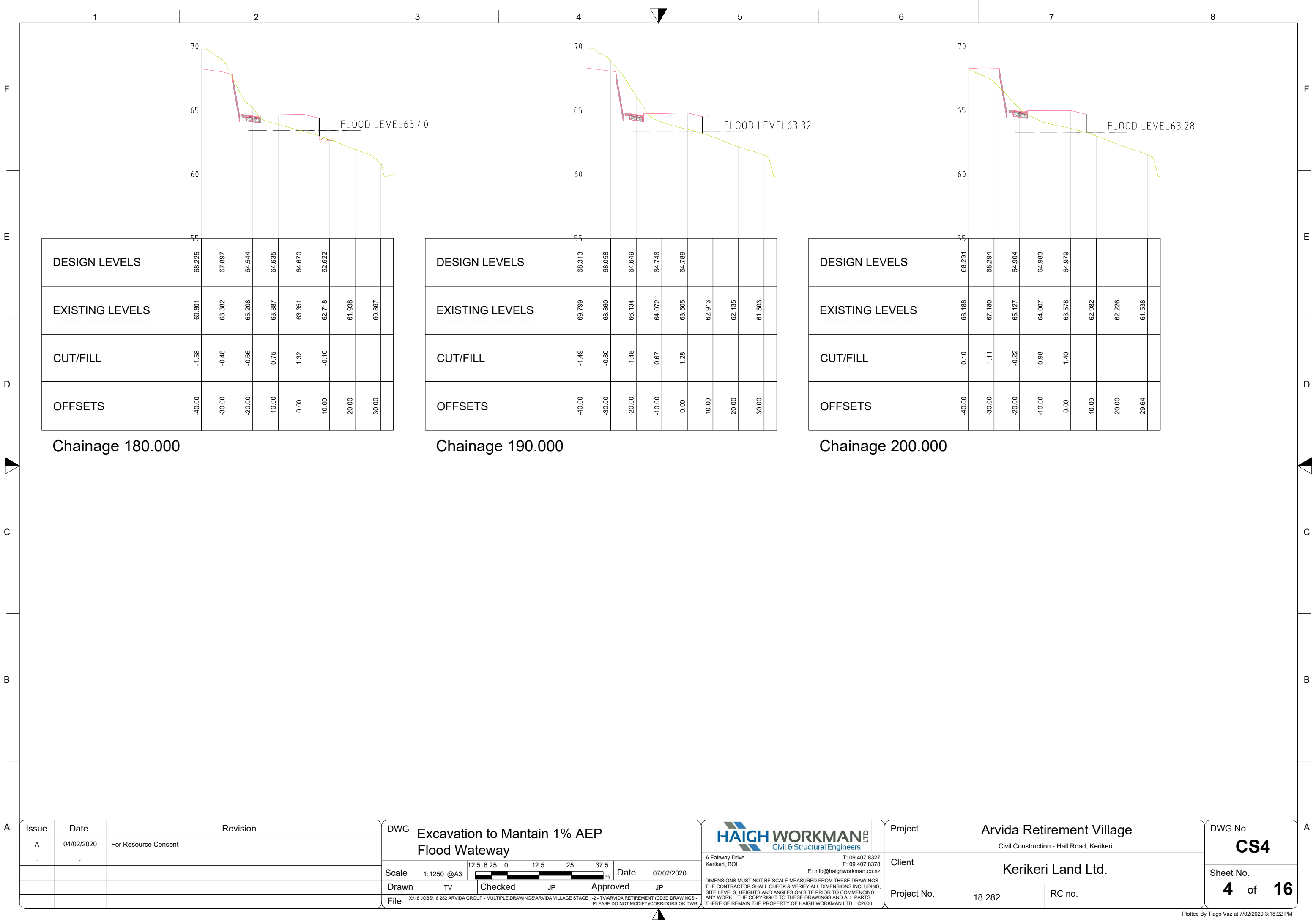
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Project	Arvida Retirement Village
	Civil Construction - Hall Road, Kerikeri
Client	Kerikeri Land Ltd.
Project No.	18 282
RC no.	

DWG No.	CS3
Sheet No.	3 of 16



DESIGN LEVELS	68.225	67.897	64.544	64.635	64.670	62.622			
EXISTING LEVELS	69.801	68.392	65.208	63.887	63.351	62.718	61.938	60.867	
CUT/FILL	-1.58	-0.48	-0.66	0.75	1.32	-0.10			
OFFSETS	-40.00	-30.00	-20.00	-10.00	0.00	10.00	20.00	30.00	

Chainage 180.000

DESIGN LEVELS	68.313	68.058	64.649	64.746	64.789				
EXISTING LEVELS	69.799	68.860	66.134	64.072	63.505	62.913	62.135	61.503	
CUT/FILL	-1.49	-0.80	-1.48	0.67	1.28				
OFFSETS	-40.00	-30.00	-20.00	-10.00	0.00	10.00	20.00	30.00	

Chainage 190.000

DESIGN LEVELS	68.291	68.294	64.904	64.983	64.979				
EXISTING LEVELS	68.188	67.180	65.127	64.007	63.578	62.982	62.226	61.538	
CUT/FILL	0.10	1.11	-0.22	0.98	1.40				
OFFSETS	-40.00	-30.00	-20.00	-10.00	0.00	10.00	20.00	29.64	

Chainage 200.000

Issue	Date	Revision
A	04/02/2020	For Resource Consent

DWG	Excavation to Mantain 1% AEP Flood Watway		
Scale	1:1250 @A3	<div><div></div><div>12.5 6.25 0 12.5 25 37.5</div><div>m</div></div>	Date 07/02/2020
Drawn	TV	Checked JP	Approved JP
File	X:\118 JOBS\18 282 ARVIDA GROUP - MULTIPLE\DRAWINGS\ARVIDA VILLAGE STAGE 1-2 - TV\ARVIDA RETIREMENT (CD3D DRAWINGS - PLEASE DO NOT MODIFY)\CORRIDORS OK.DWG		

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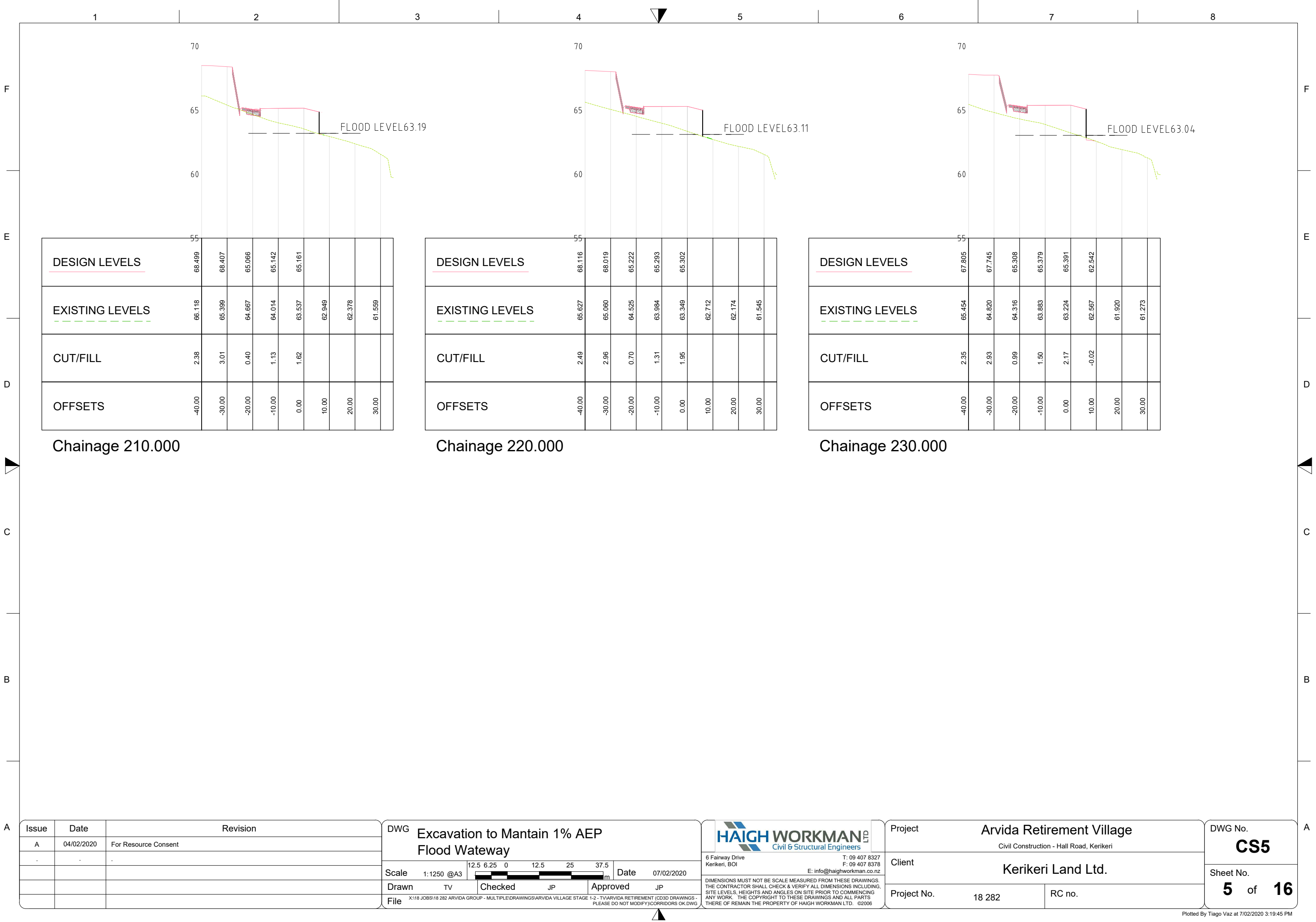
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Client	Kerikeri Land Ltd.	
Project No.	18 282	RC no.

DWG No.	CS4
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Issue	Date	Revision
A	04/02/2020	For Resource Consent

DWG

Excavation to Mantain 1% AEP  
Flood Watway

Scale

1:1250 @A3

12.5

6.25

0

12.5

25

37.5

m

Date

07/02/2020

Drawn

TV

Checked

JP

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JP

File

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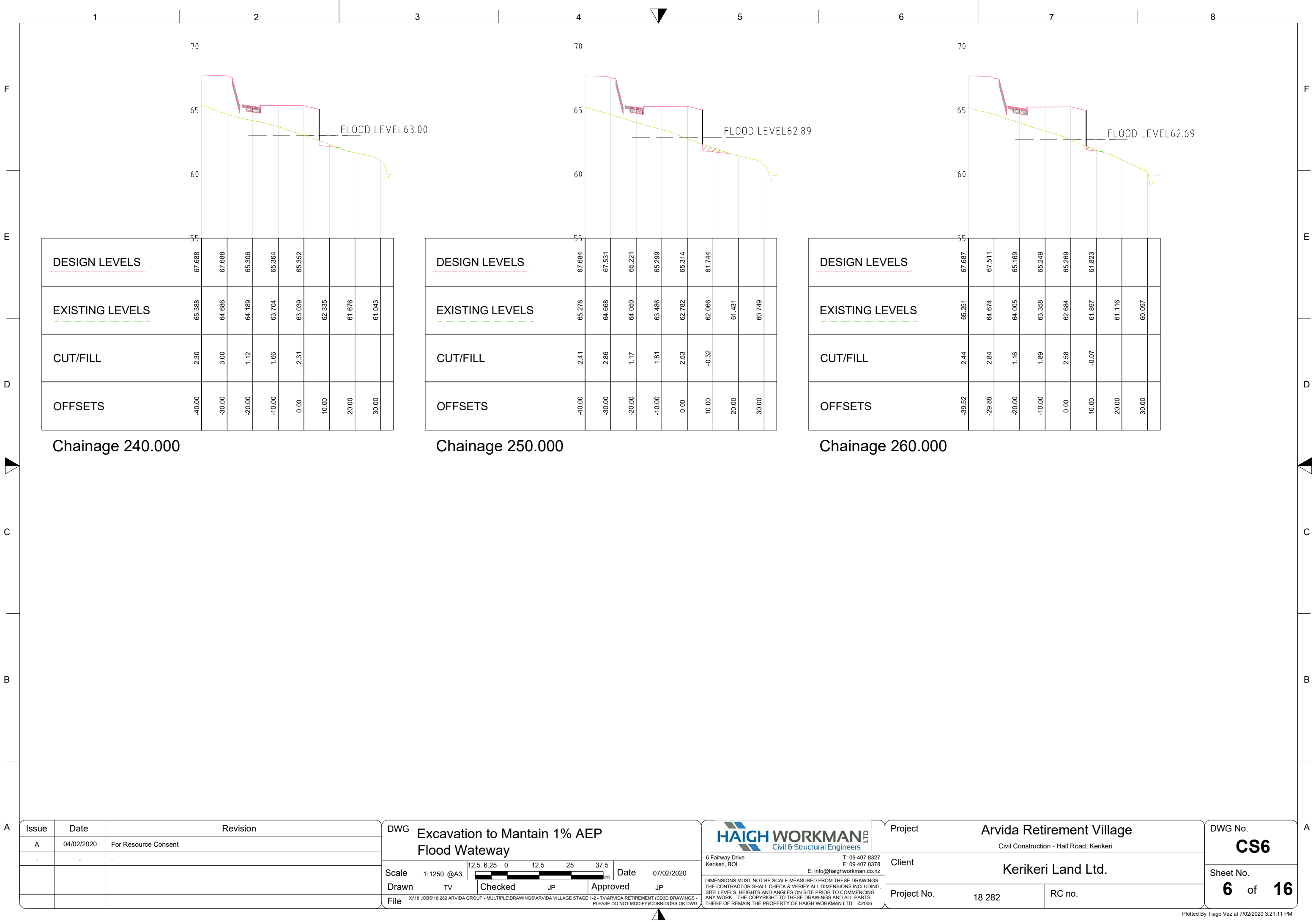
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Client	Kerikeri Land Ltd.	
Project No.	18 282	RC no.

DWG No.

CS5

Sheet No.

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DESIGN LEVELS	67.688	67.688	65.306	65.364	65.352			
EXISTING LEVELS	65.388	64.686	64.189	63.704	63.039	62.335	61.676	61.043
CUT/FILL	2.30	3.00	1.12	1.66	2.31			
OFFSETS	-40.00	-30.00	-20.00	-10.00	0.00	10.00	20.00	30.00

Chainage 240.000

DESIGN LEVELS	67.684	67.531	65.221	65.299	65.314	61.744		
EXISTING LEVELS	65.278	64.668	64.050	63.486	62.782	62.066	61.431	60.749
CUT/FILL	2.41	2.86	1.17	1.81	2.53	-0.32		
OFFSETS	-40.00	-30.00	-20.00	-10.00	0.00	10.00	20.00	30.00

Chainage 250.000

DESIGN LEVELS	67.687	67.511	65.169	65.249	65.269	61.823		
EXISTING LEVELS	65.251	64.674	64.005	63.358	62.684	61.897	61.116	60.097
CUT/FILL	2.44	2.84	1.16	1.89	2.58	-0.07		
OFFSETS	-39.52	-29.88	-20.00	-10.00	0.00	10.00	20.00	30.00

Chainage 260.000

Issue	Date	Revision
A	04/02/2020	For Resource Consent

DWG	Excavation to Mantain 1% AEP Flood Watway		
Scale	1:1250 @A3	<div><div></div><div>12.5</div><div>6.25</div><div>0</div><div>12.5</div><div>25</div><div>37.5</div></div> m	Date 07/02/2020
Drawn	TV	Checked JP	Approved JP
File	X:\118 JOBS\18 282 ARVIDA GROUP - MULTIPLE\DRAWINGS\ARVIDA VILLAGE STAGE 1-2 - TV\ARVIDA RETIREMENT (CD)3D DRAWINGS - PLEASE DO NOT MODIFY\CORRIDORS OK.DWG		

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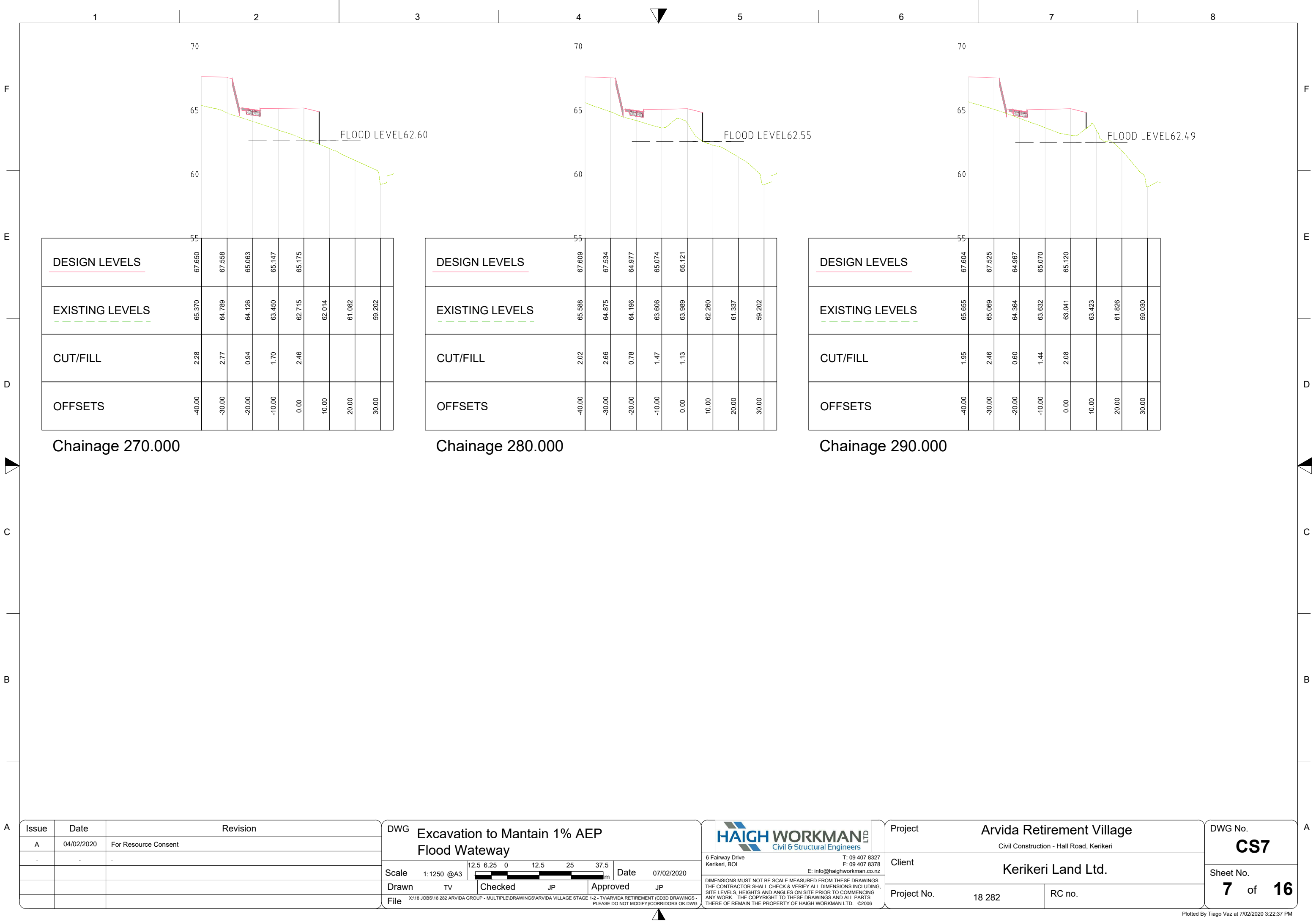
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Client	Kerikeri Land Ltd.	
Project No.	18 282	RC no.

DWG No.	CS6
Sheet No.	6 of 16



DESIGN LEVELS	67.650	67.558	65.063	65.147	65.175			
EXISTING LEVELS	65.370	64.789	64.126	63.450	62.715	62.014	61.082	59.202
CUT/FILL	2.28	2.77	0.94	1.70	2.46			
OFFSETS	-40.00	-30.00	-20.00	-10.00	0.00	10.00	20.00	30.00


Chainage 270.000

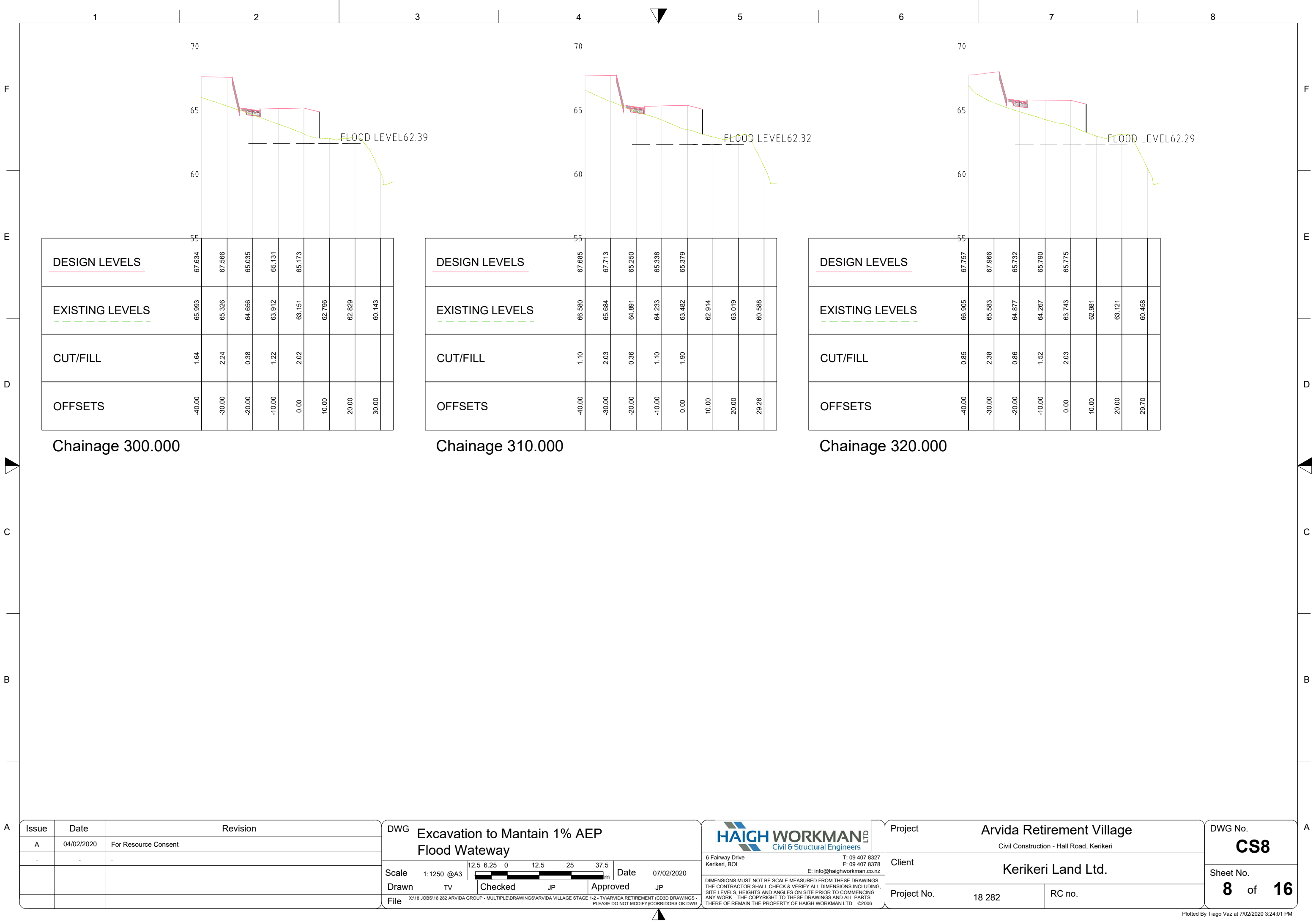
DESIGN LEVELS	67.609	67.534	64.977	65.074	65.121			
EXISTING LEVELS	65.588	64.875	64.196	63.606	63.989	62.260	61.337	59.202
CUT/FILL	2.02	2.66	0.78	1.47	1.13			
OFFSETS	-40.00	-30.00	-20.00	-10.00	0.00	10.00	20.00	30.00

Chainage 280.000

DESIGN LEVELS	67.604	67.525	64.967	65.070	65.120			
EXISTING LEVELS	65.655	65.069	64.364	63.632	63.041	63.423	61.826	59.030
CUT/FILL	1.95	2.46	0.60	1.44	2.08			
OFFSETS	-40.00	-30.00	-20.00	-10.00	0.00	10.00	20.00	30.00

Chainage 290.000

Issue		Date		Revision		DWG			Excavation to Mantain 1% AEP Flood Watway						Project			Arvida Retirement Village			DWG No.				
A		04/02/2020		For Resource Consent								6 Fairway Drive Kerikeri, BOI			Client			Civil Construction - Hall Road, Kerikeri			CS7				
						Scale			1:1250 @A3			Date			07/02/2020			Kerikeri Land Ltd.			Sheet No.				
						Drawn			TV			Checked			JP			Approved			JP			7 of 16	
						File			X:\118 JOBS\18 282 ARVIDA GROUP - MULTIPLE\DRAWINGS\ARVIDA VILLAGE STAGE 1-2 - TV\ARVIDA RETIREMENT (CD3D DRAWINGS - PLEASE DO NOT MODIFY)\CORRIDORS OK.DWG			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. ©2006			Project No.			18 282			RC no.				



Issue	Date	Revision
A	04/02/2020	For Resource Consent

DWG

Excavation to Mantain 1% AEP  
Flood Watway

Scale

1:1250 @A3

12.5

6.25

0

12.5

25

37.5

m

Date

07/02/2020

Drawn

TV

Checked

JP

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File

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Client	Kerikeri Land Ltd.	
Project No.	18 282	RC no.

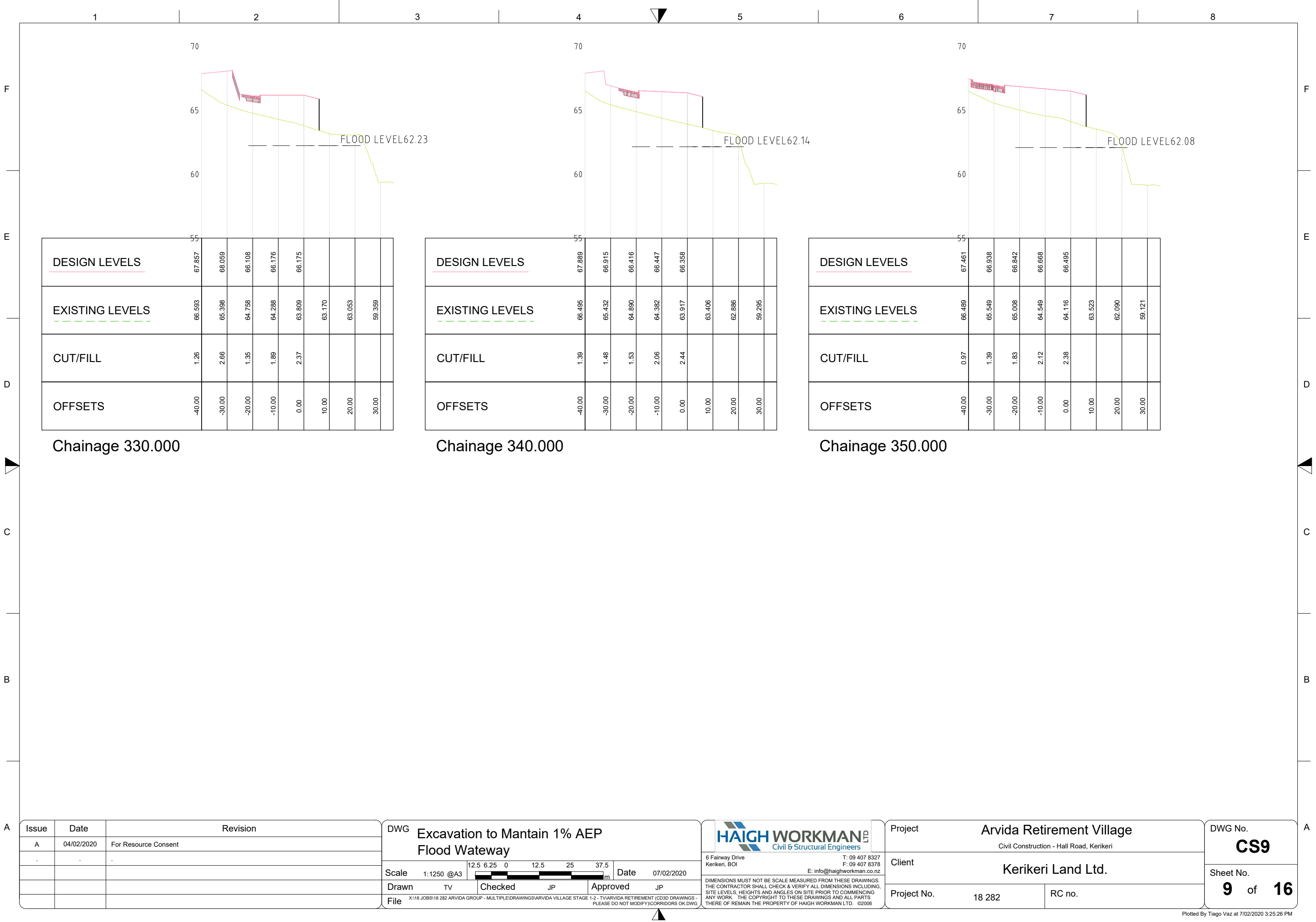
DWG No.

CS8

Sheet No.

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DESIGN LEVELS	67.857	68.059	66.108	66.176	66.175			
EXISTING LEVELS	66.593	65.398	64.758	64.288	63.809	63.170	63.053	59.359
CUT/FILL	1.26	2.66	1.35	1.89	2.37			
OFFSETS	-40.00	-30.00	-20.00	-10.00	0.00	10.00	20.00	30.00

Chainage 330.000

DESIGN LEVELS	67.889	66.915	66.416	66.447	66.358			
EXISTING LEVELS	66.495	65.432	64.890	64.382	63.917	63.406	62.886	59.295
CUT/FILL	1.39	1.48	1.53	2.06	2.44			
OFFSETS	-40.00	-30.00	-20.00	-10.00	0.00	10.00	20.00	30.00

Chainage 340.000

DESIGN LEVELS	67.461	66.938	66.842	66.668	66.495			
EXISTING LEVELS	66.489	65.549	65.008	64.549	64.116	63.523	62.090	59.121
CUT/FILL	0.97	1.39	1.83	2.12	2.38			
OFFSETS	-40.00	-30.00	-20.00	-10.00	0.00	10.00	20.00	30.00

Chainage 350.000

Issue	Date	Revision
A	04/02/2020	For Resource Consent

DWG	Excavation to Mantain 1% AEP Flood Watway		
Scale	1:1250 @A3	<div><div></div><div>12.5 6.25 0 12.5 25 37.5 m</div></div>	Date 07/02/2020
Drawn	TV	Checked JP	Approved JP
File	X:\118 JOBS\118 282 ARVIDA GROUP - MULTIPLE\DRAWINGS\ARVIDA VILLAGE STAGE 1-2 - TV\ARVIDA RETIREMENT (CD3D DRAWINGS - PLEASE DO NOT MODIFY)\CORRIDORS OK.DWG		

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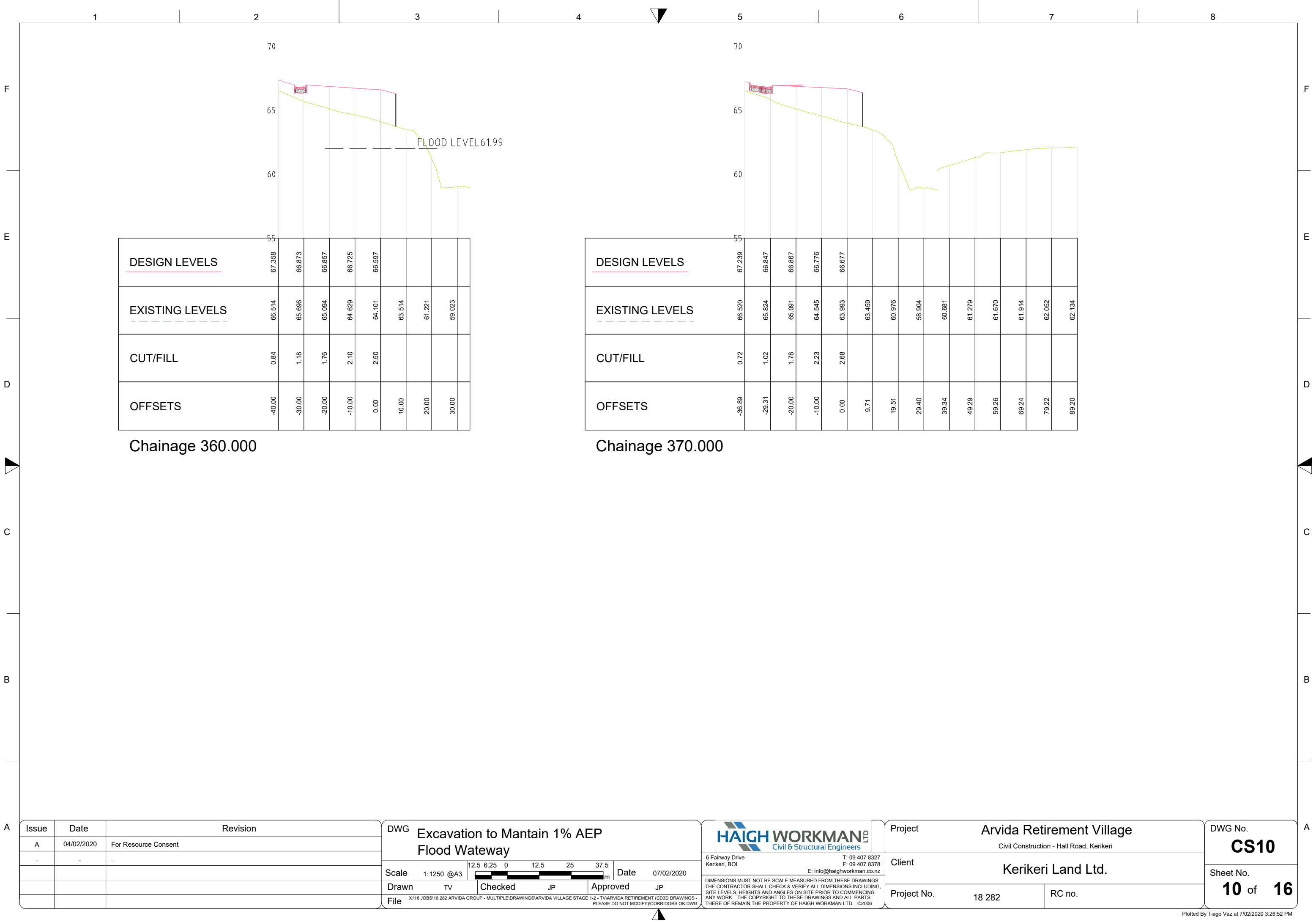
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Client	Kerikeri Land Ltd.	
Project No.	18 282	RC no.

DWG No.	CS9
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DESIGN LEVELS	67.358	66.873	66.857	66.725	66.597			
EXISTING LEVELS	66.514	65.696	65.094	64.629	64.101	63.514	61.221	59.023
CUT/FILL	0.84	1.18	1.76	2.10	2.50			
OFFSETS	-40.00	-30.00	-20.00	-10.00	0.00	10.00	20.00	30.00

Chainage 360.000

DESIGN LEVELS	67.239	66.847	66.867	66.776	66.677			
EXISTING LEVELS	66.520	65.824	65.091	64.545	63.993	63.459	60.976	58.904
CUT/FILL	0.72	1.02	1.78	2.23	2.68			
OFFSETS	-36.89	-29.31	-20.00	-10.00	0.00	9.71	19.51	29.40

Chainage 370.000

Issue	Date	Revision
A	04/02/2020	For Resource Consent

DWG	Excavation to Mantain 1% AEP Flood Watway		
Scale	1:1250 @A3	12.5 6.25 0 12.5 25 37.5 m	Date 07/02/2020
Drawn	TV	Checked JP	Approved JP
File	X:\118 JOBS\118 282 ARVIDA GROUP - MULTIPLE\DRAWINGS\ARVIDA VILLAGE STAGE 1-2 - TV\ARVIDA RETIREMENT (CD3D DRAWINGS - PLEASE DO NOT MODIFY)\CORRIDORS OK.DWG		

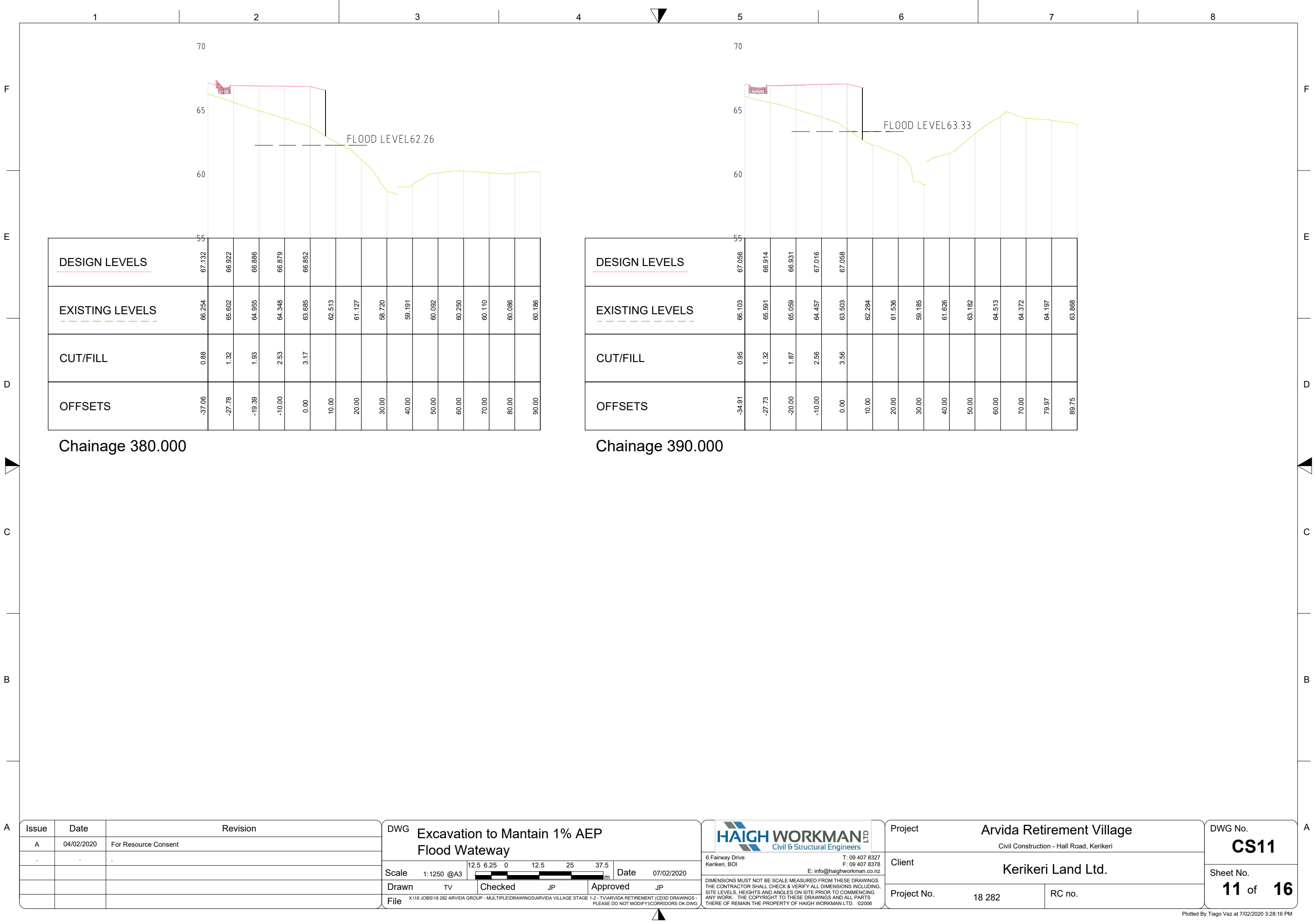
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Client	Kerikeri Land Ltd.	
Project No.	18 282	RC no.

DWG No.	CS10
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DESIGN LEVELS

EXISTING LEVELS

CUT/FILL

OFFSETS

Chainage 380.000

DESIGN LEVELS

EXISTING LEVELS

CUT/FILL

OFFSETS

Chainage 390.000

Issue	Date	Revision
A	04/02/2020	For Resource Consent

DWG

Excavation to Mantain 1% AEP  
Flood Watway

Scale

1:1250 @A3

12.5

6.25

0

12.5

25

37.5

m

Date

07/02/2020

Drawn

TV

Checked

JP

Approved

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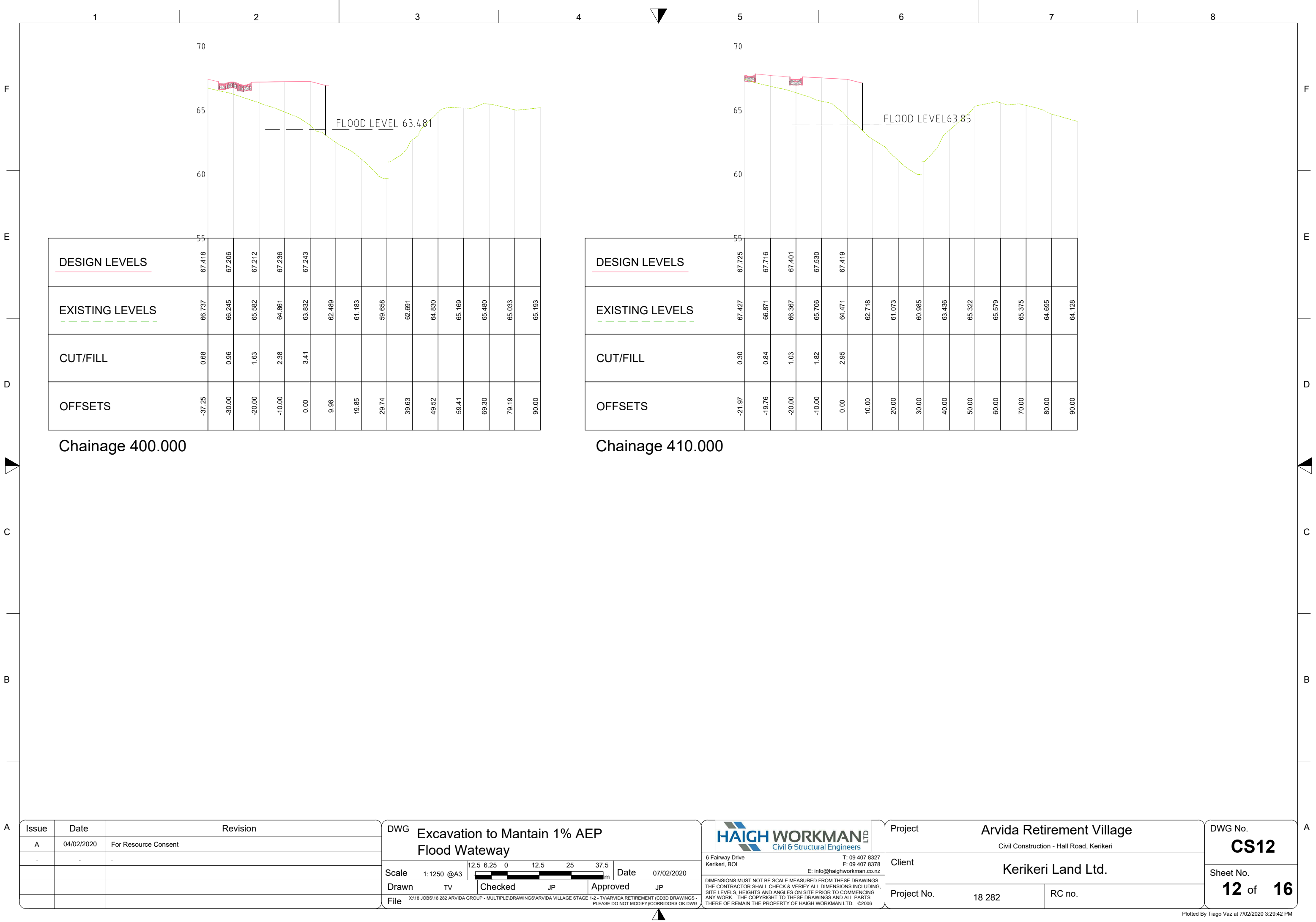
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Project No.	18 282	RC no.

DWG No.	CS11
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Issue	Date	Revision
A	04/02/2020	For Resource Consent

DWG

Excavation to Mantain 1% AEP  
Flood Watway

Scale

1:1250 @A3

12.5

6.25

0

12.5

25

37.5

m

Date

07/02/2020

Drawn

TV

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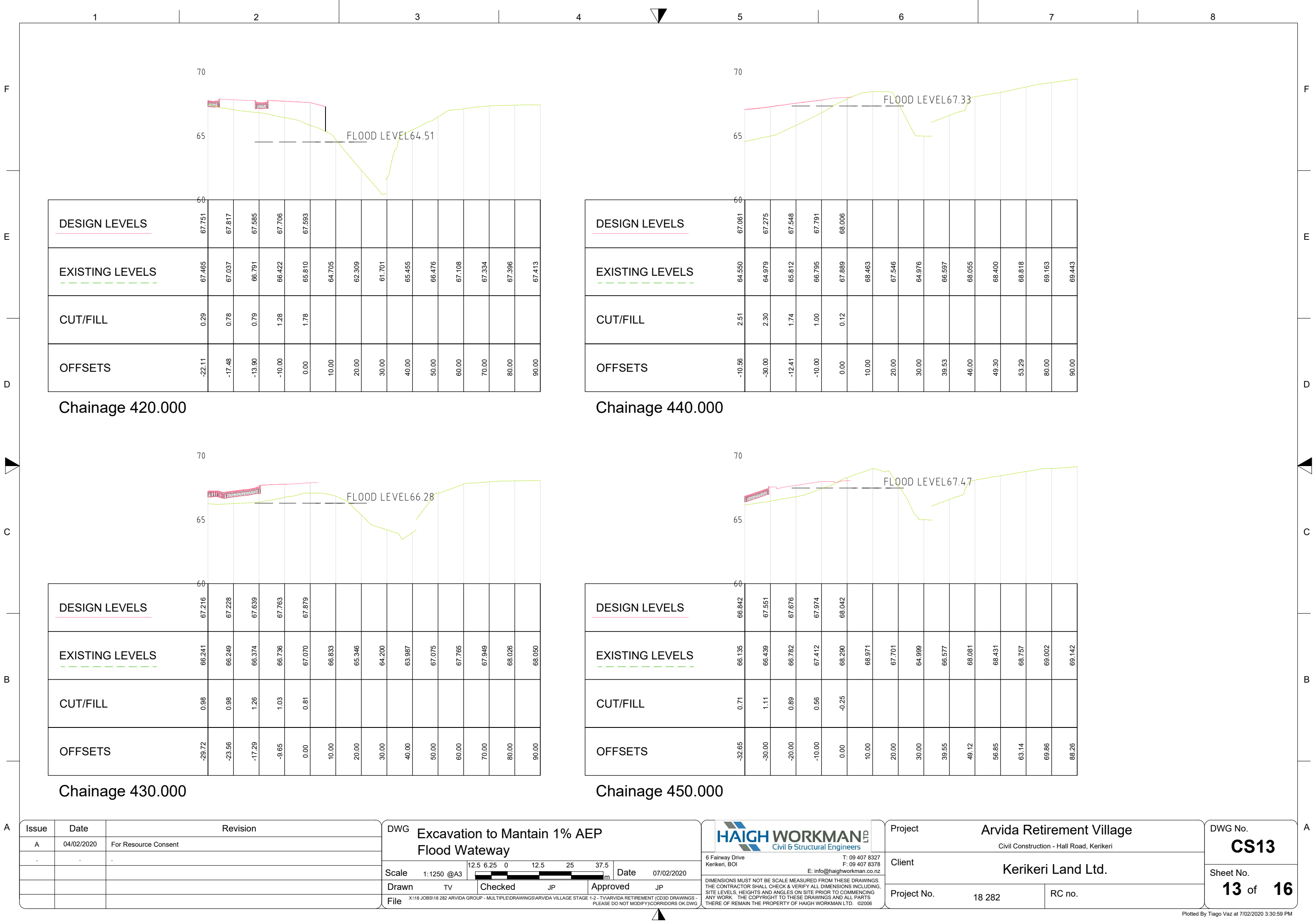
DWG No.

CS12

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Issue	Date	Revision
A	04/02/2020	For Resource Consent

DWG

Excavation to Mantain 1% AEP  
Flood Watway

Scale

1:1250 @A3

12.5

6.25

0

12.5

25

37.5

Date

07/02/2020

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Project No.	18 282	RC no.

DWG No.

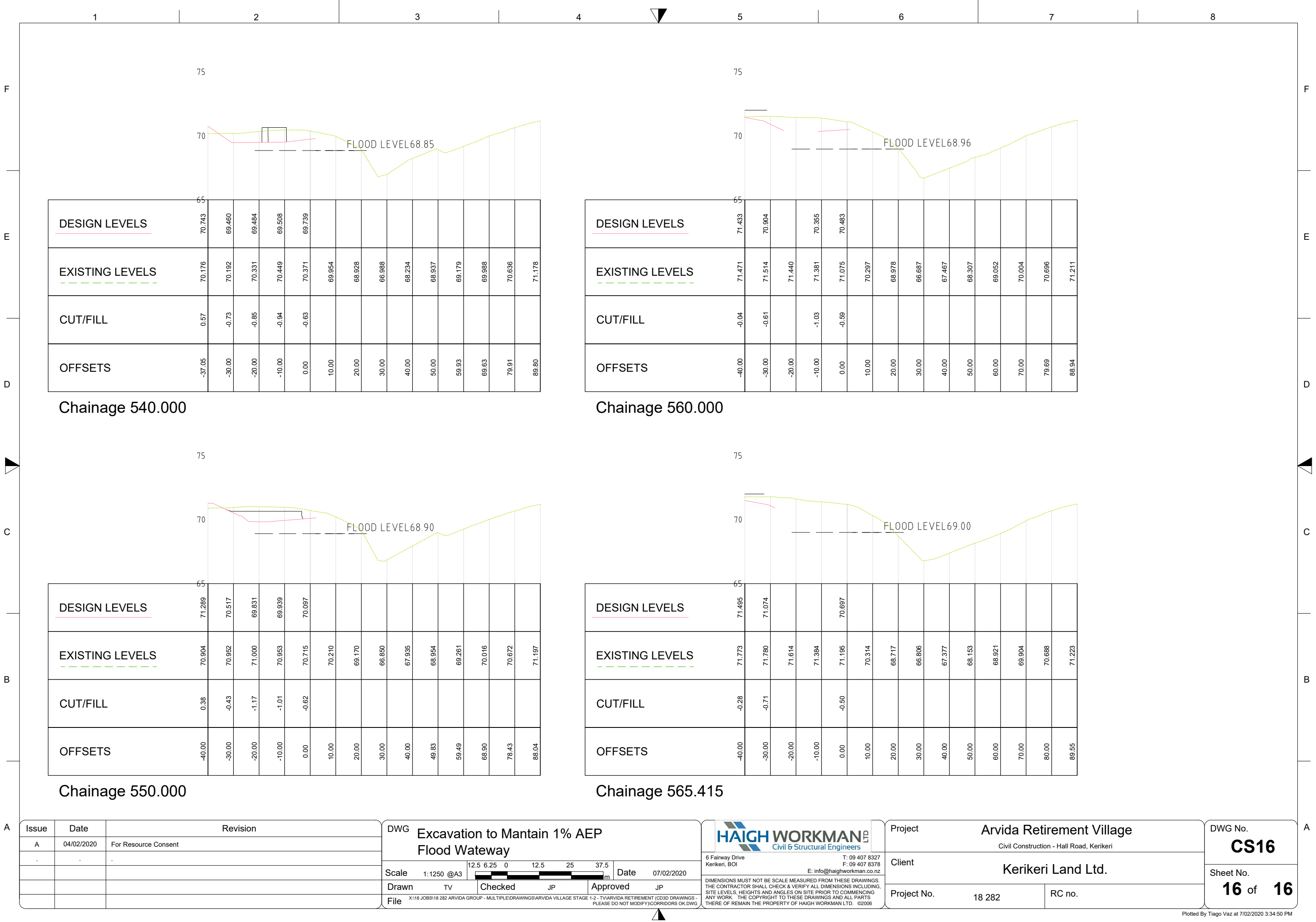
CS13

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Issue	Date	Revision
A	04/02/2020	For Resource Consent

DWG

Excavation to Mantain 1% AEP  
Flood Wateway

Scale

1:1250 @A3

12.5

6.25

0

12.5

25

37.5

m

Date

07/02/2020

Drawn

TV

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JP

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Project No.	18 282	RC no.

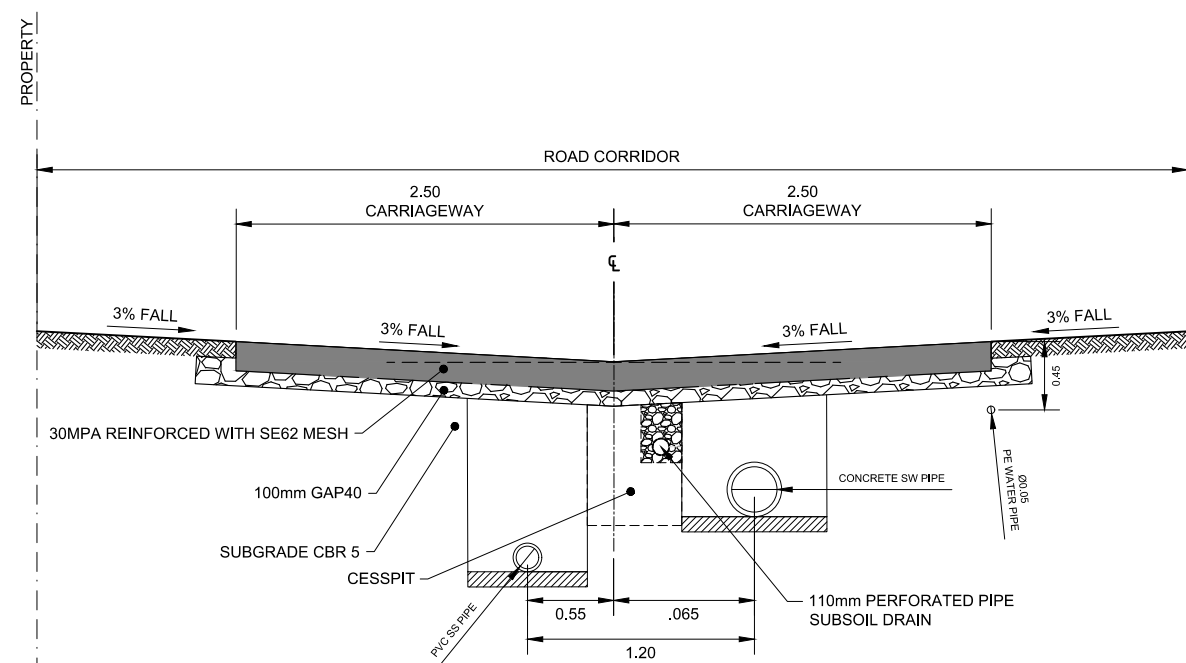
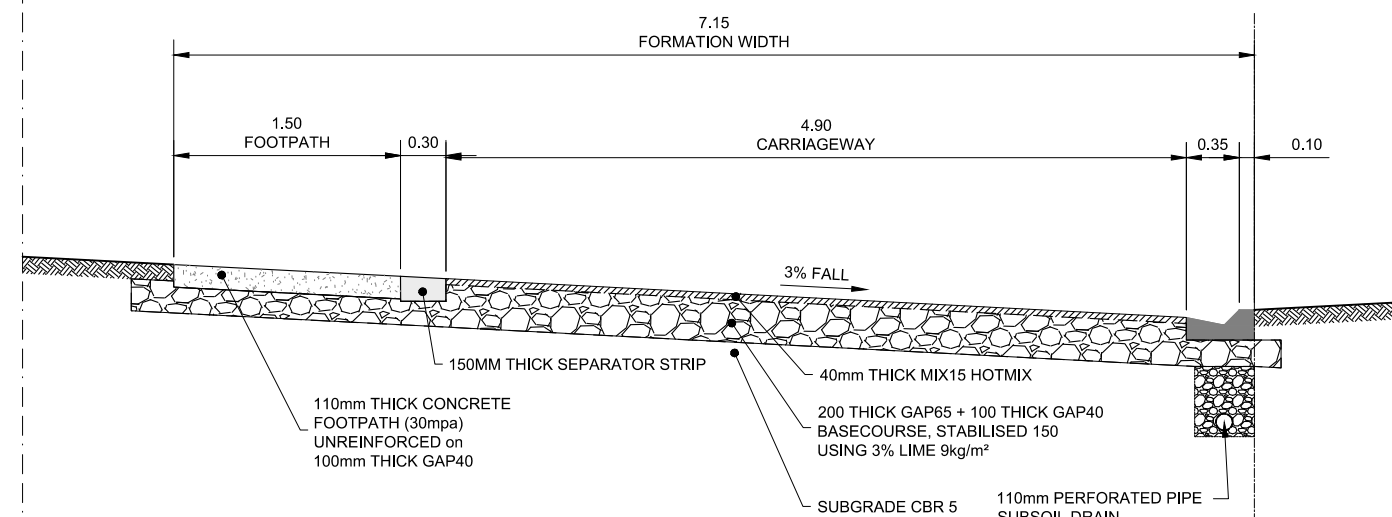
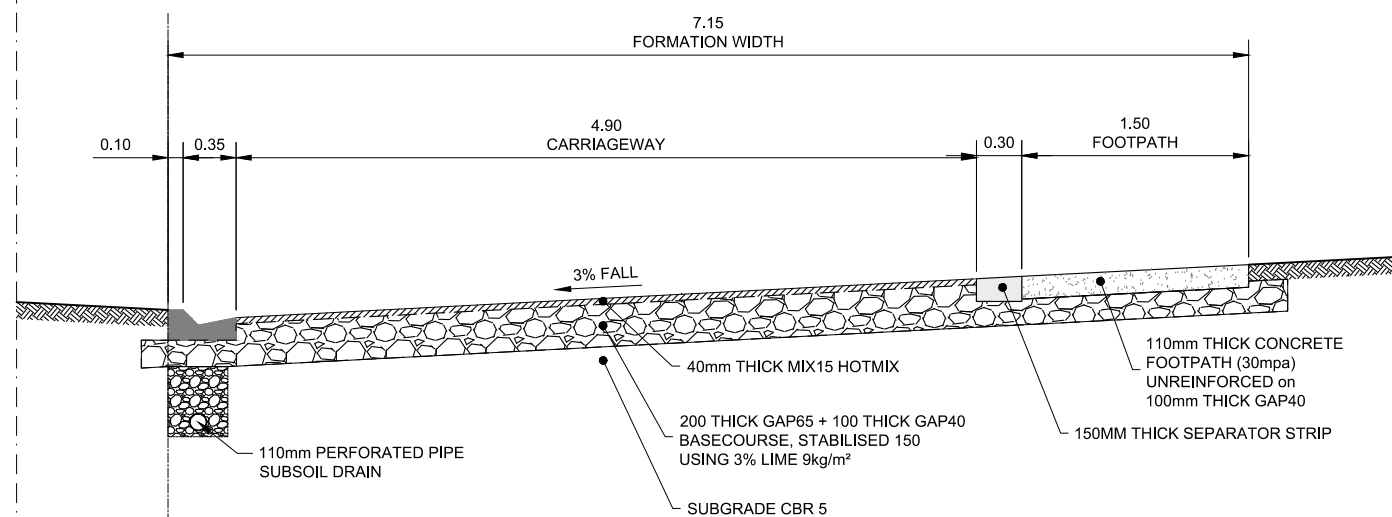
DWG No.

CS16

Sheet No.

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Issue	Date	Revision
A	04/02/2020	FOR RESOURCE CONSENT

DWG		Typical Road Cross Sections	
Scale	1:50 @A3		Date 18/10/2019
Drawn	TV	Checked JP	Approved JP
File	X:\118 JOBS\118 282 ARVIDA GROUP - MULTIPLE\DRAWINGS\ARVIDA VILLAGE STAGE 1-2 - TV\ARVIDA RETIREMENT (MASTER PLAN CD3 DRAWINGS)\CORRIDORS (ST.1).OK.DWG		

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7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842	Project	Arvida Retirement Village		
			Civil Construction - Hall Road, Kerikeri	
		Client	Kerikeri Land Ltd.	
	Project No.	18 282	RC no.	

DWG No.  
**DE1**

Sheet No.  
**1** of **4**

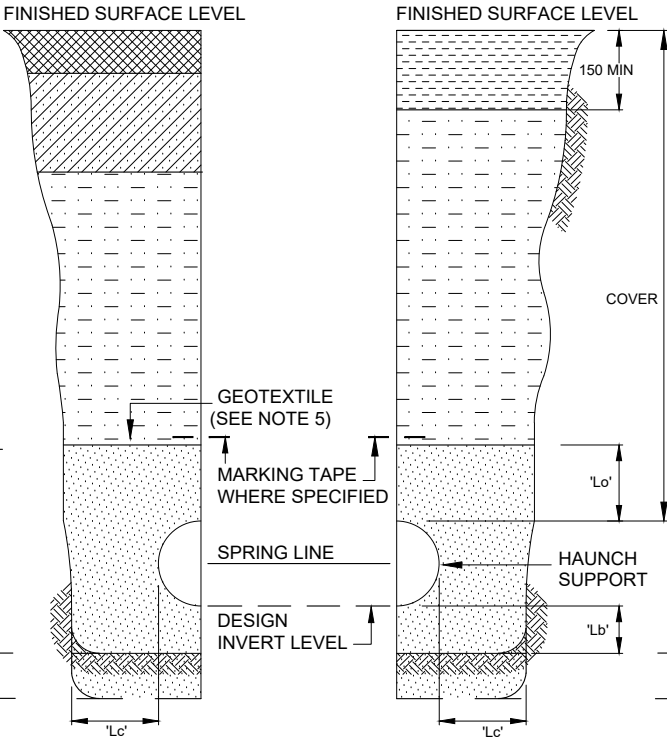
MATERIAL		ZONE	
ROAD SURFACE	NON ROAD SURFACES		
ROAD SURFACE LAYER	TO MATCH EXISTING	SURFACE COURSE	
TO MATCH EXISTING ROAD BASE OR TO TERRITORIAL AUTHORITY REQUIREMENTS	TRENCH FILL MATERIALS TO BE SIMILAR WITH SNZ HB 2002 APPENDIX L OR TO TERRITORIAL AUTHORITY REQUIREMENTS	ROAD BASE	
TRENCH FILL MATERIALS TO BE SIMILAR WITH SNZ HB 2002 APPENDIX L OR TO TERRITORIAL AUTHORITY REQUIREMENTS	OR	TRENCH FILL (AS SPECIFIED IN DESIGN DRAWINGS)	
OR	INORGANIC FILL MATERIAL WITH 75 MAXIMUM STONE SIZE		
EMBEDMENT MATERIAL IN ACCORDANCE WITH DESIGN DRAWINGS AND TERRITORIAL AUTHORITY (SEE NOTE 4)		OVERLAY	EMBEDMENT
		SIDE SUPPORT	
		BEDDING	
		BEDDING MAY BE OMITTED IF TRENCH BASE IS GRANULAR SAND OR GRAVEL OF SUITABLE GRADING	

VEHICULAR LOADING

'Lo' - 100 mm MIN. NON TRAFFICABLE  
'Lb' - 300 mm MIN. TRAFFICABLE  
- REFER TO CM - 002

NOTE:

- ALL DIMENSIONS IN MILLIMETRES.
- SPECIFY SPECIAL BEDDING TO SUIT THE CONDITIONS IF THE TRENCH FLOOR HAS:
  - IRREGULAR OUTCROPS OF ROCK OR
  - BEEN DISTURBED BY UNCONTROLLED GROUND WATER.
- COMPACT AND EVENLY GRADE FINISHED TRENCH FLOOR.
- EMBEDMENT, TRENCH FILL AND COMPACTION TO MEET THE REQUIREMENT OF DESIGN DRAWINGS OR SPECIFICATIONS.
- USE GEOTEXTILE FILTER FABRIC WHERE SPECIFIED.
- SIDES OF EXCAVATION TO BE KEPT VERTICAL TO AT LEAST 150 ABOVE THE PIPE.



SPRING LINE TRENCH CLEARANCE

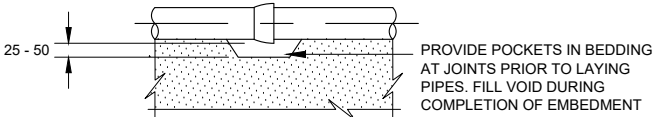
NOMINAL DIAMETER DN	MINIMUM CLEARANCE 'Lc'
≤150	100
>150 - ≤300	150
>300 - ≤450	200
>450 - ≤900	300
>900 - ≤1500	350

TRENCH WIDTH TO BE SUFFICIENT TO SAFELY LAY PIPE AND COMPACT THE SIDE SUPPORT ZONE

ZONE		MATERIAL
TOPSOIL OR PAVEMENT		ORIGINAL OR IMPORTED MATERIAL TO MATCH EXISTING
TRENCH FILL (AS SPECIFIED IN DESIGN DRAWINGS)		INORGANIC FILL MATERIAL WITH 75 MAXIMUM STONE SIZE
EMBEDMENT	OVERLAY	EMBEDMENT MATERIAL IN ACCORDANCE WITH DESIGN DRAWINGS AND TERRITORIAL AUTHORITY (SEE NOTE 4)
	SIDE SUPPORT	
	BEDDING	
OVER-EXCAVATION		BEDDING MAY BE OMITTED IF TRENCH BASE IS GRANULAR SAND OR GRAVEL OF SUITABLE GRADING

NO VEHICULAR LOADING

INCLUDES LOCATIONS WHERE OCCASIONAL VEHICLE LOADING OCCURS SUCH AS RESERVES AND FOOTWAYS



PIPE JOINT BEDDING POCKETS

FOR JOINT PROJECTIONS (SOCKETS, FLANGES, AND SO ON)

Issue	Date	Revision
A	04/02/2020	FOR RESOURCE CONSENT

DWG		Services and Trenching Detailed	
		NZS 4404:2010 CM-001	
Scale	N. T. S.	Date	18/10/2019
Drawn	TV	Checked	JP
Approved	JP		
File	X:\118 JOBS\118 282 ARVIDA GROUP - MULTIPLE\DRAWINGS\ARVIDA VILLAGE STAGE 1-2 - TV\ARVIDA RETIREMENT (MASTER PLAN CD30 DRAWINGS)\CORRIDORS (ST.1) OK.DWG		

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Civil & Structural Engineers

6 Fairway Drive  
Kerikeri, BOI

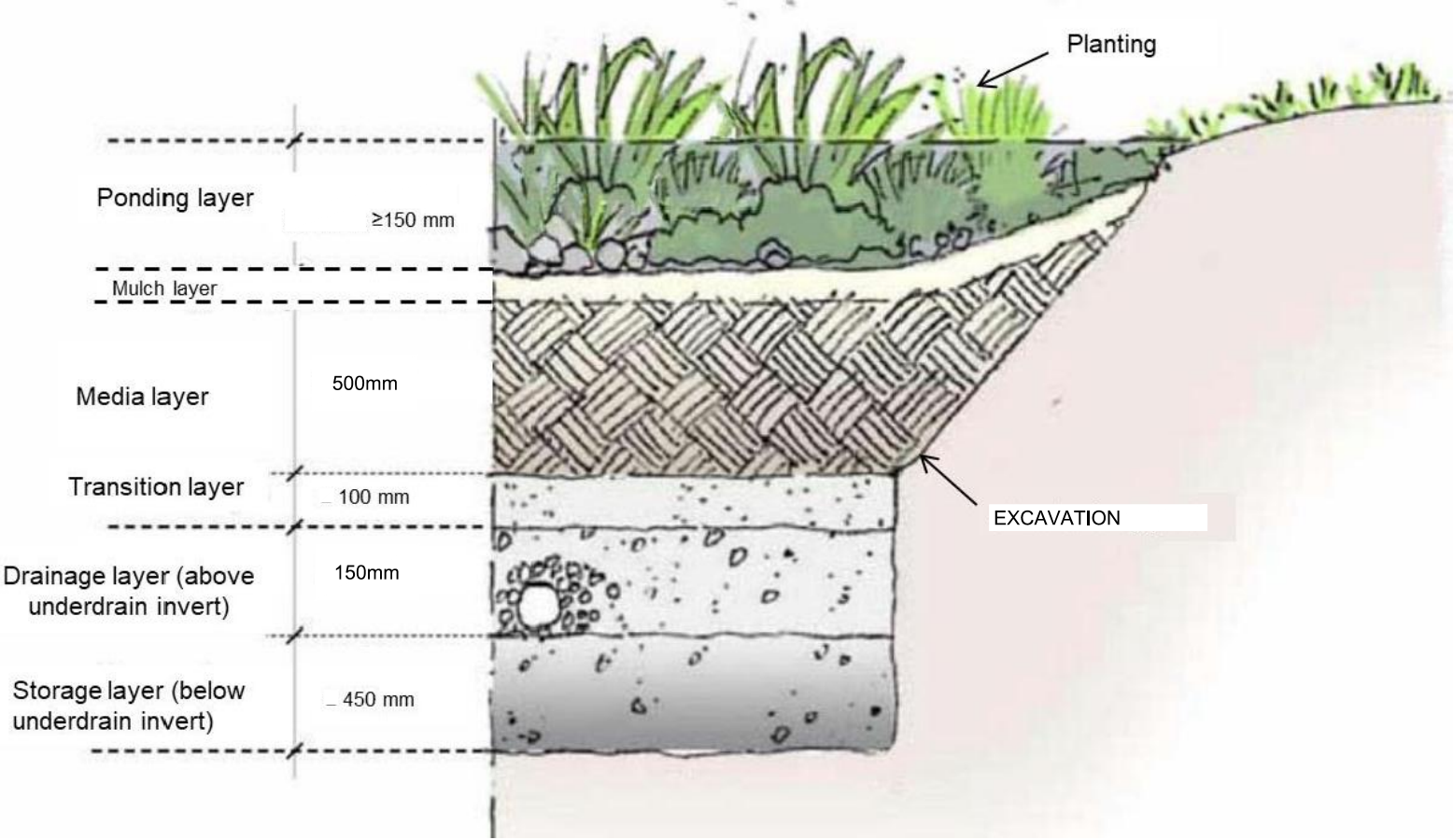
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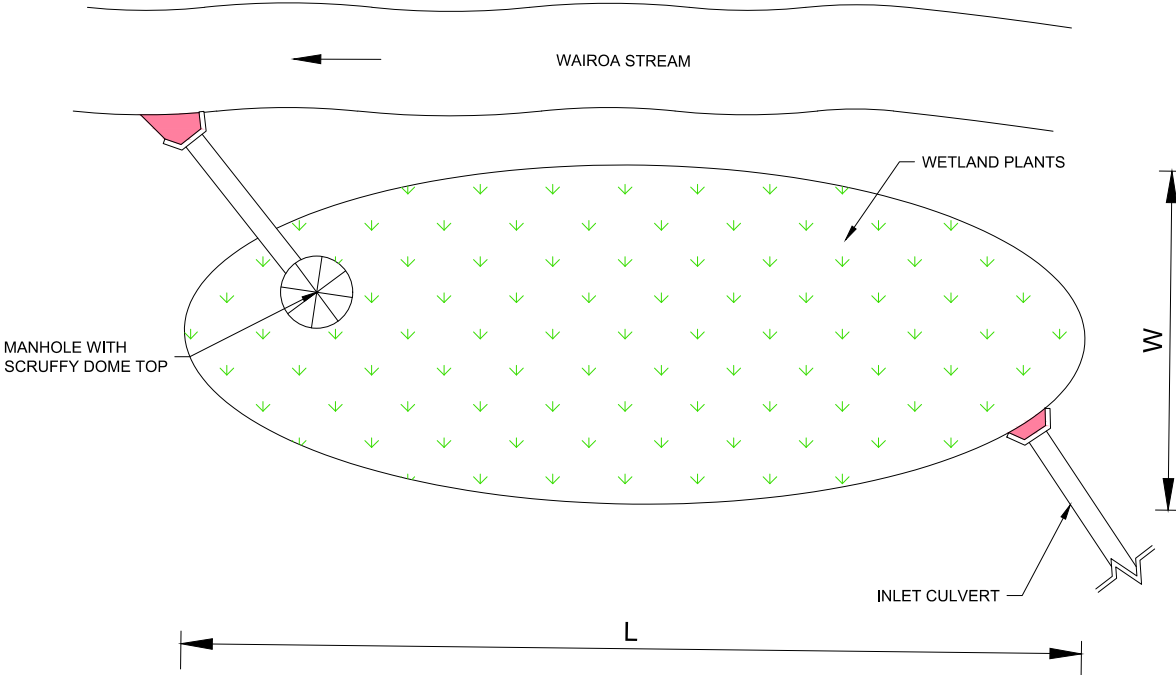
Project	Arvida Retirement Village	
	Civil Construction - Hall Road, Kerikeri	
Client	Kerikeri Land Ltd.	
Project No.	18 282	RC no.

DWG No.	DE2
Sheet No.	2 of 4

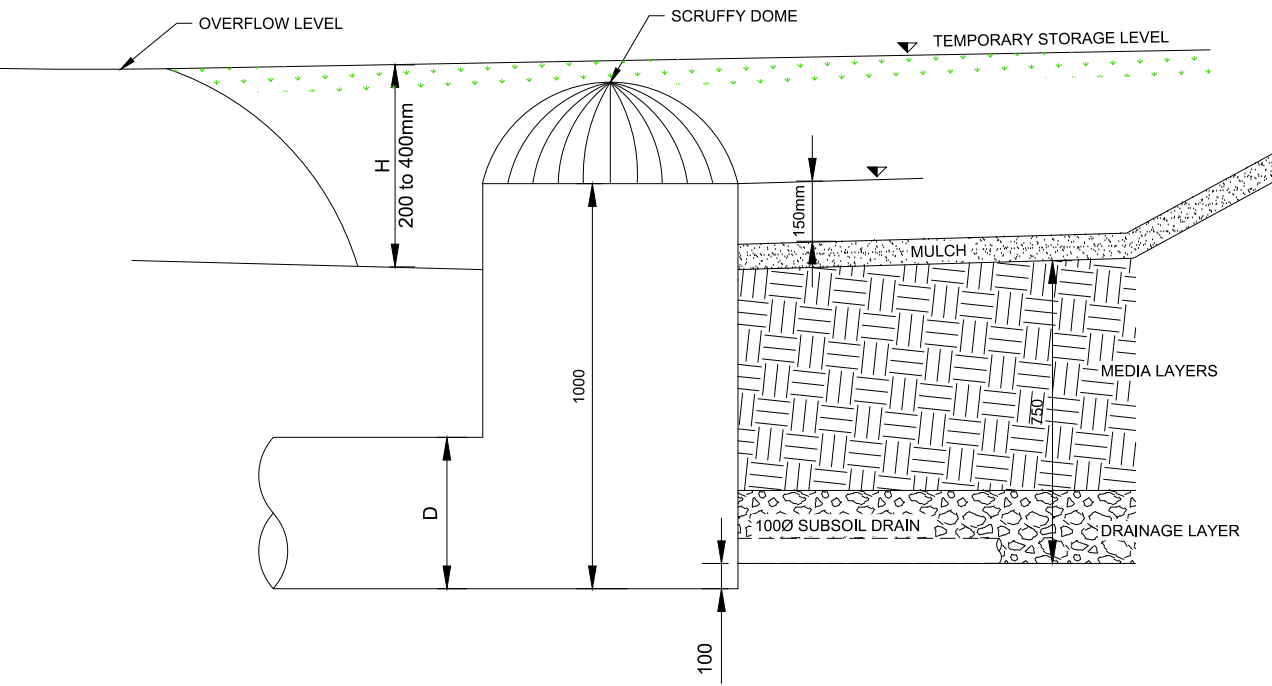
TYPICAL DETAIL (REFER GD01 SECTION C3)



BIORETENTION WETLAND PLAN



OUTLET



POND	W	L	AREA	OUTLET(D)	TEMP STORAGE(H)
1	4m	15m	57m²	300mm	200mm
2	10m	45m	428m²	525mm	400mm
3	10m	45m	428m²	525mm	400mm
4	6m	25m	142m²	375mm	300mm
5	6m	25m	142m²	375mm	300mm

Issue	Date	Revision
A	04/02/2020	FOR RESOURCE CONSENT

DWG Bioretention Wetland Detail

Scale NTG # ### 0 # ## #

Date 18/10/2019

Drawn TV Checked JP Approved JP

File X:\118 JOBS\118 282 ARVIDA GROUP - MULTIPLE\DRAWINGS\ARVIDA VILLAGE STAGE 1-2 - TV\ARVIDA RETIREMENT (MASTER PLAN C3D DRAWINGS)\CORRIDORS (ST.1) OK.DWG

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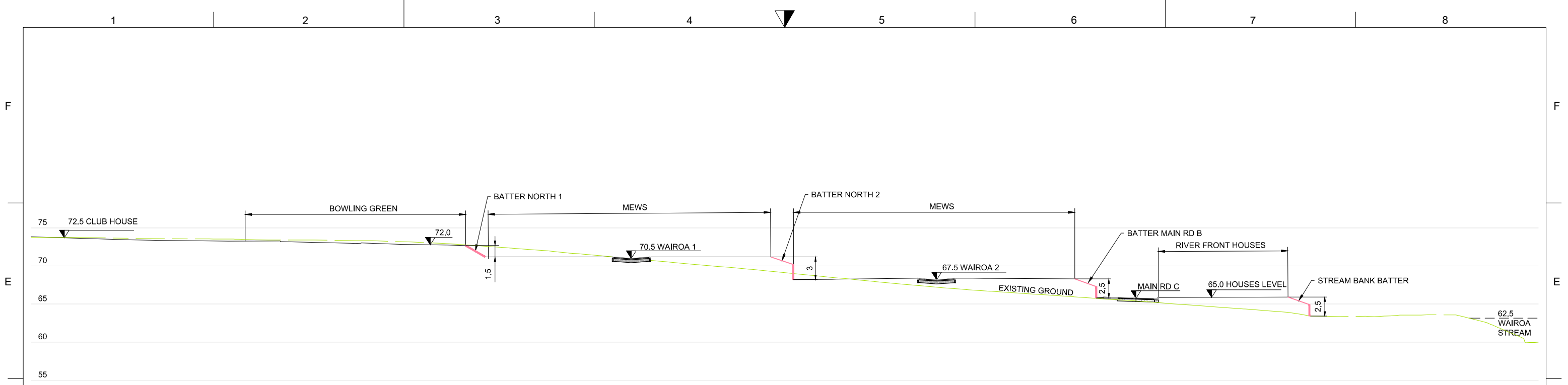
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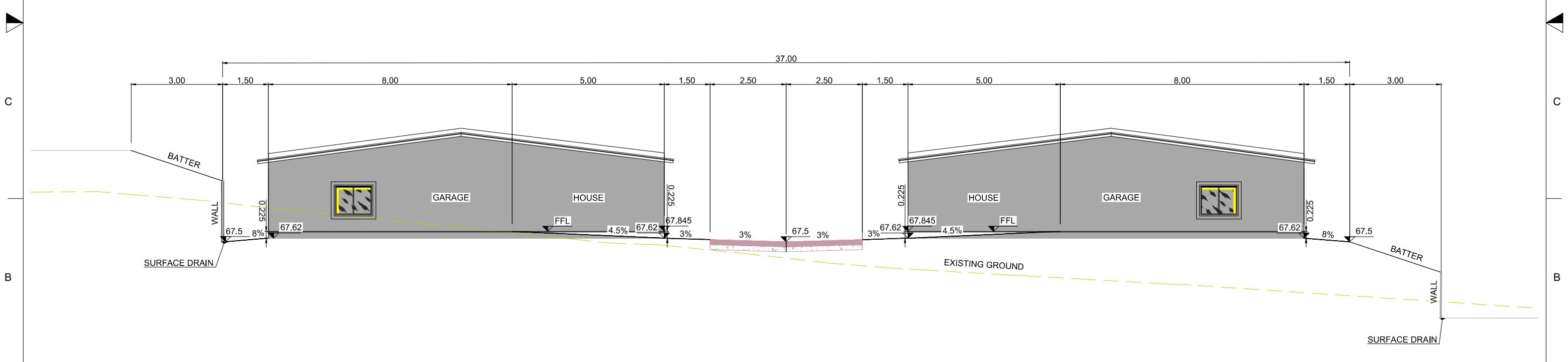
Project	Arvida Retirement Village	
	Civil Construction - Hall Road, Kerikeri	
Client	Kerikeri Land Ltd.	
Project No.	18 282	RC no.

DWG No. DE3

Sheet No. 3 of 4



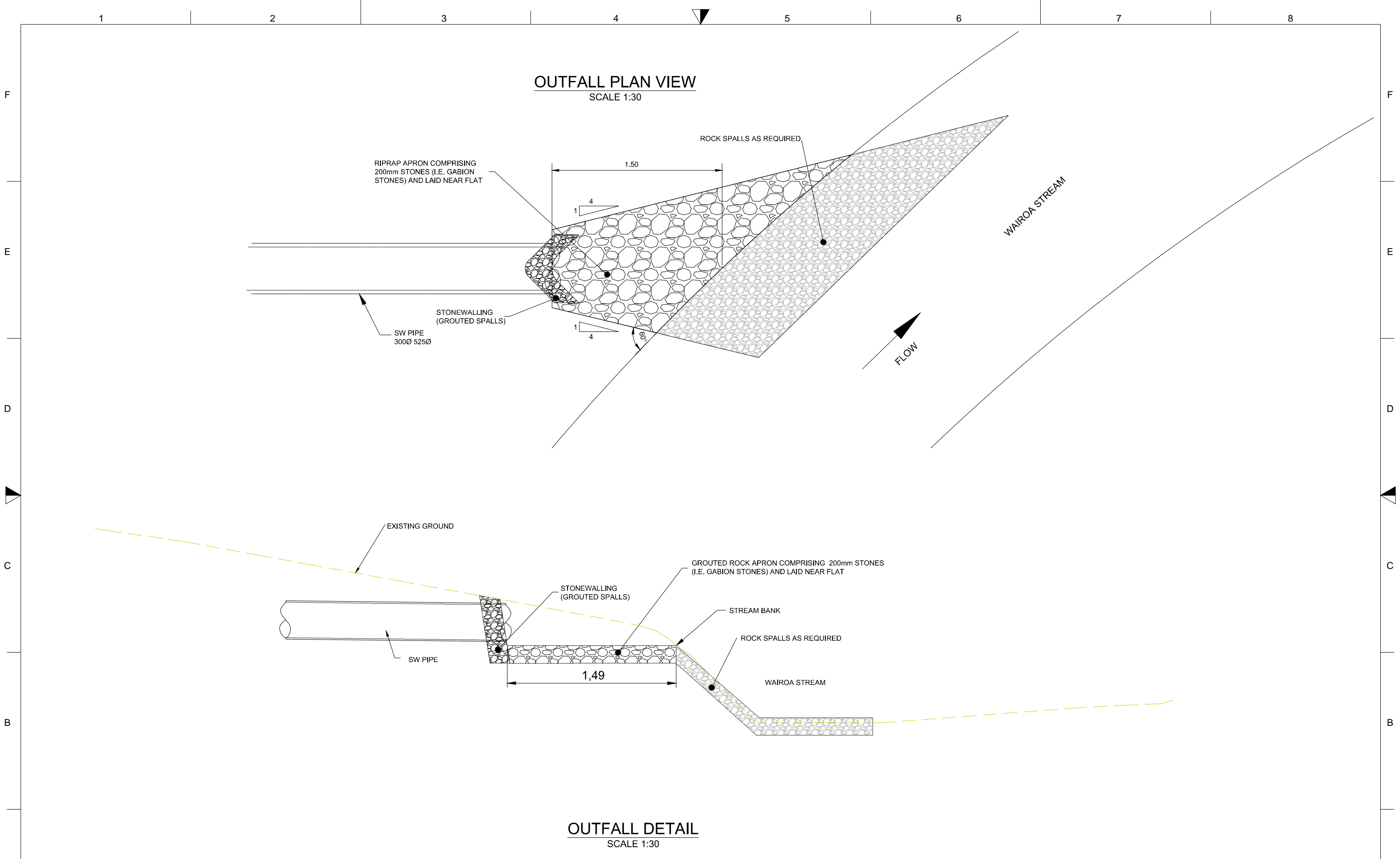
TYPICAL CROSS SECTION THROUGH NORTHERN TERRACES  
Scale 1:500 H



TYPICAL MEW/TERRACE  
Scale 1:125 H

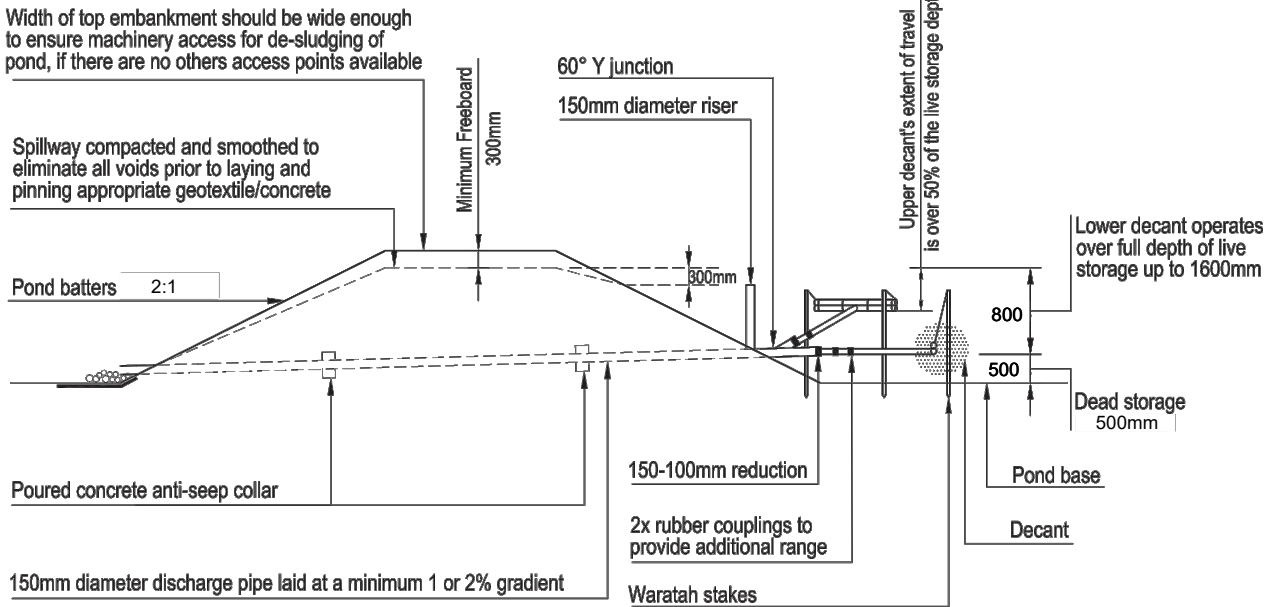
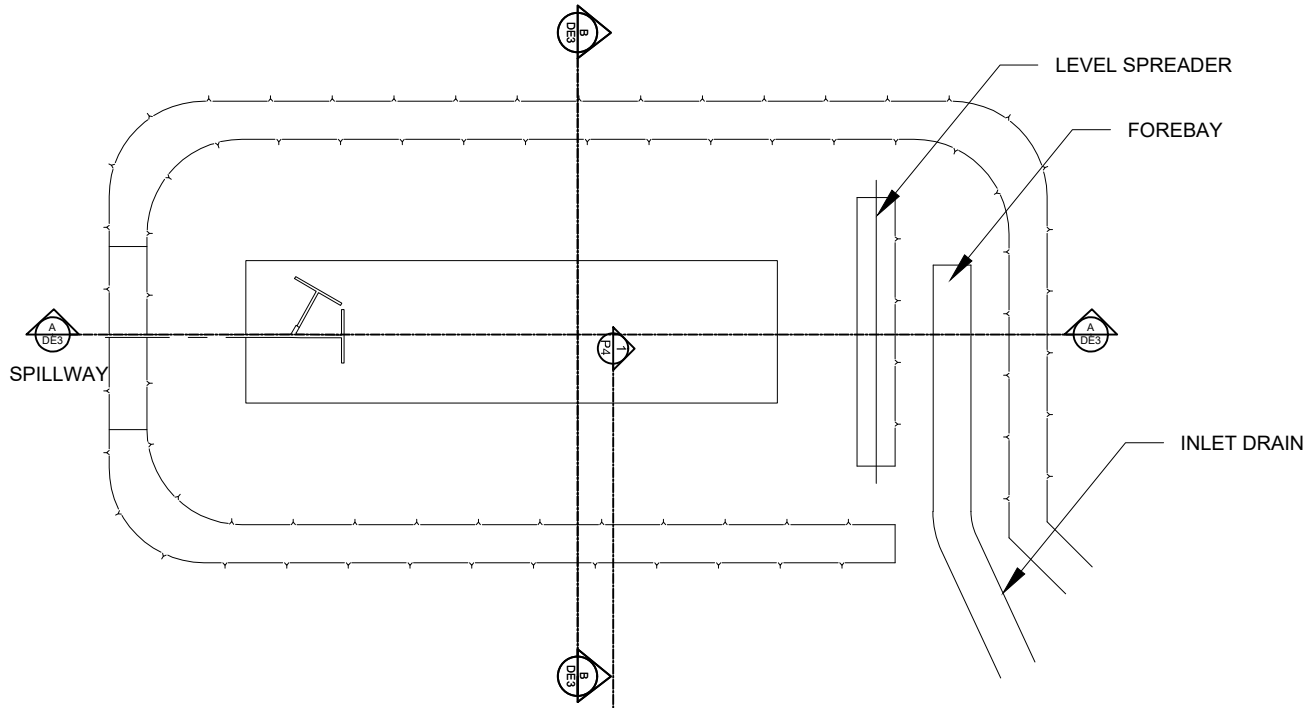
A	Issue	Date	Revision	DWG Typical Terrace			<div>HAIGH WORKMAN Civil &amp; Structural Engineers</div> <div>6 Fairway Drive Kerikeri, BOI T: 09 407 8327 F: 09 407 8378 E: info@haighworkman.co.nz</div> <div>DIMENSIONS MUST NOT BE SCALE MEASURED FROM THESE DRAWINGS. THE CONTRACTOR SHALL CHECK &amp; VERIFY 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. ©2006</div>	Project Arvida Retirement Village Civil Construction - Hall Road, Kerikeri		DWG No. DE4	
	A	04/02/2020	For Resource Consent					Client Kerikeri Land Ltd.		Sheet No. 4 of 7	
				Scale AS SHOWN	Date	18/10/2019		Project No. 18 282		RC no.	
				Drawn TV	Checked JP	Approved JP		File X:\18 JOBS\18 282 ARVIDA GROUP - MULTIPLE\DRAWINGS\ARVIDA VILLAGE STAGE 1-2 - TV\ARVIDA RETIREMENT (MASTER PLAN CD30 DRAWINGS)\CORRIDORS (ST.1) OK.DWG			



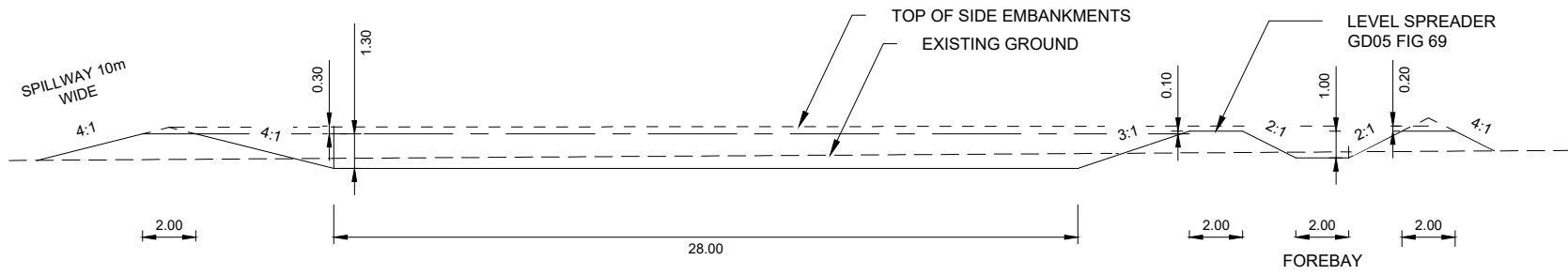


A	Issue	Date	Revision	DWG Typical Stormwater Outfall Setions and Detail			<div>HAIGH WORKMAN Civil &amp; Structural Engineers</div> <div>6 Fairway Drive Kerikeri, BOI T: 09 407 8327 F: 09 407 8378 E: info@haighworkman.co.nz</div> <div>DIMENSIONS MUST NOT BE SCALE MEASURED FROM THESE DRAWINGS. THE CONTRACTOR SHALL CHECK &amp; 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. 2006</div>		Project Arvida Retirement Village Civil Construction - Hall Road, Kerikeri		DWG No. <b>DE5</b>	A
	A	04/02/2020	For Resource Consent	<div>Scale 1:30</div> <div><div>0.30.1500.30.60.9</div><div>m</div></div> <div>Date 18/10/2019</div>	Client Kerikeri Land Ltd.	Sheet No. <b>5 of 7</b>						
					Project No. 18 282	RC no.						
					File X:\18 JOBS\18 282 ARVIDA GROUP - MULTIPLE\DRAWINGS\ARVIDA VILLAGE STAGE 1-2 - TV\ARVIDA RETIREMENT (MASTER PLAN CD30 DRAWINGS)\CORRIDORS (ST.1) OK.DWG							
					Drawn TV	Checked JP	Approved JP					

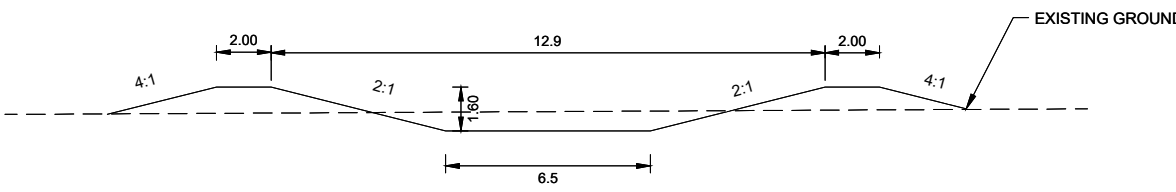
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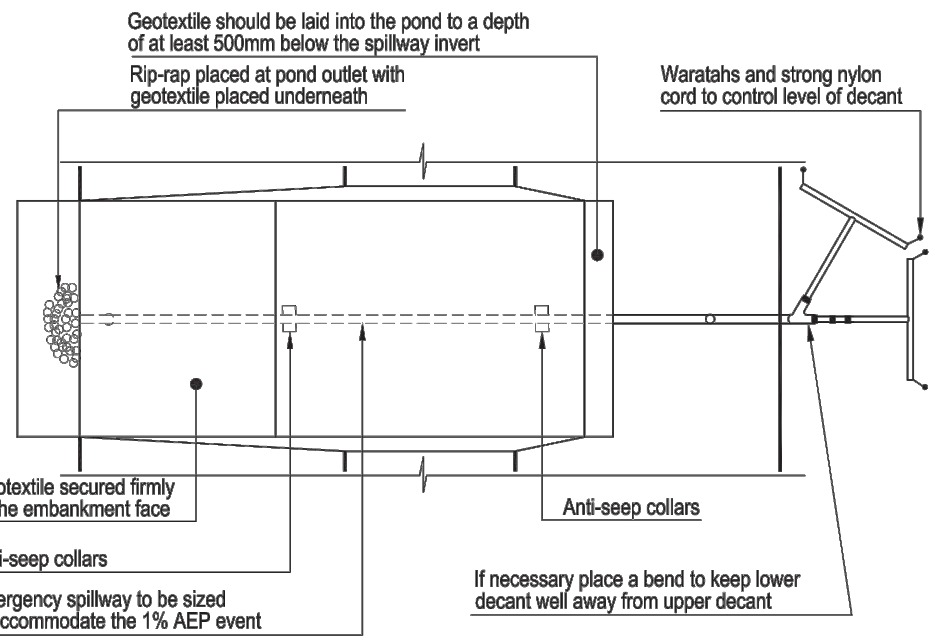
Cross - section



SECTION A-A



SECTION B-B



SEDIMENT RETENTION POND - OUTLET DETAIL

Issue	Date	Revision	DWG Erosion & Sendiment Control Details			Project Arvida Retirement Village		DWG No. DE6	
A	04/02/2020	For Resource Consent				Civil Construction - Hall Road, Kerikeri			
						Client Kerikeri Land Ltd.		Sheet No. 6 of 7	
						Project No. 18 282		RC no.	

Scale	NTS	Date	18/10/2019
Drawn	TV	Checked	JP
Approved	JP		
File	X:\118 JOBS\18 282 ARVIDA GROUP - MULTIPLE\DRAWINGS\ARVIDA VILLAGE STAGE 1-2 - TV\ARVIDA RETIREMENT (MASTER PLAN CD30 DRAWINGS)\CORRIDORS (ST.1) OK.DWG		

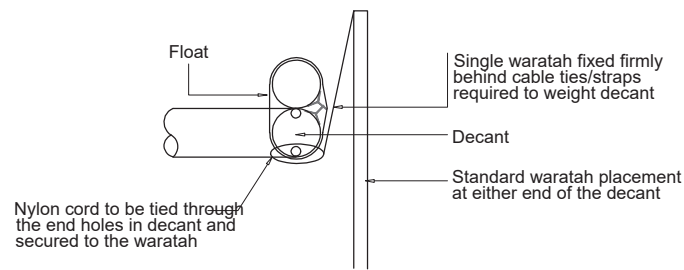
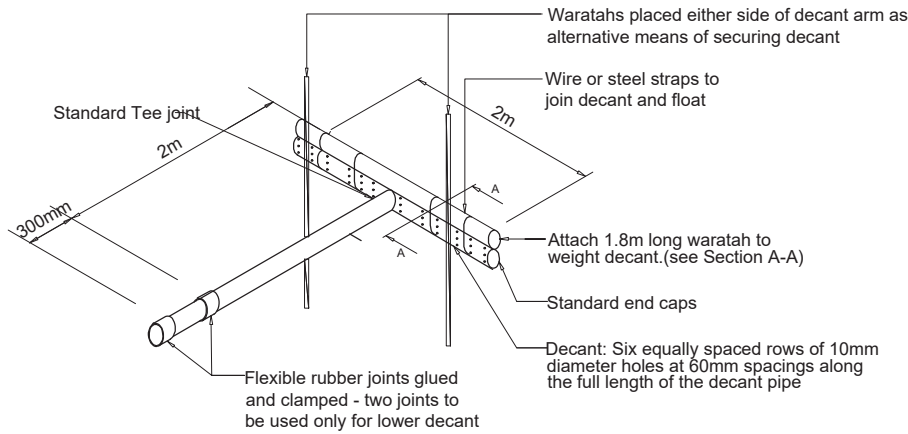
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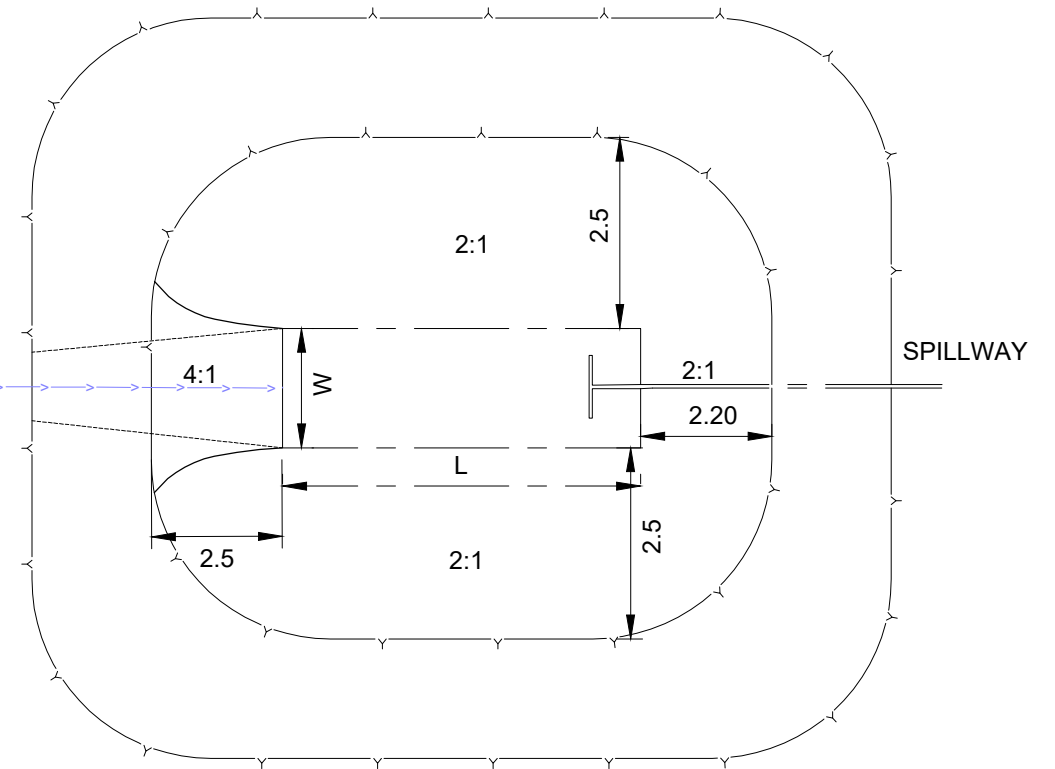
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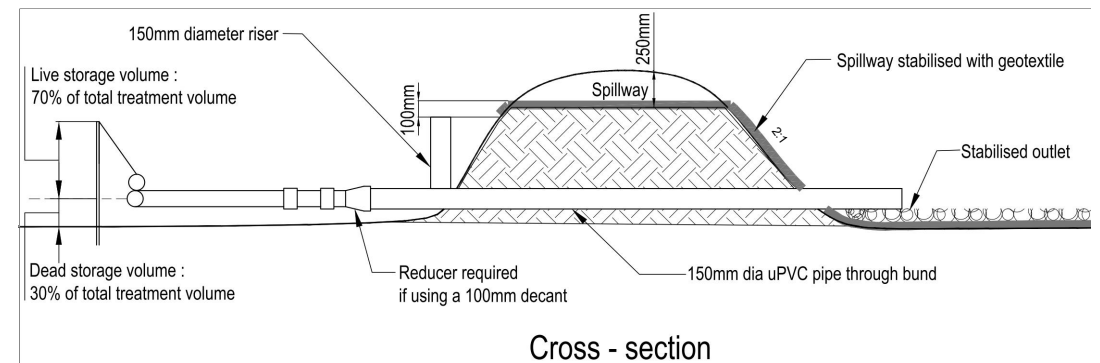
**'T' BAR DETAIL**

STORMWATER

RUNOFF



**DECANTING EARTH BUND  
(REFER GD05 F1.2)**



**Cross - section**

**DECANTING EARTH BUND CROSS-SECTION  
GD05 FIG.79**

Issue	Date	Revision
A	04/02/2020	For Resource Consent

DWG	<b>Erosion &amp; Sediment Control Details</b>		
Scale	NTS	Date	18/10/2019
Drawn	TV	Checked	JP
Approved	JP		
File	X:\118 JOBS\118 282 ARVIDA GROUP - MULTIPLE\DRAWINGS\ARVIDA VILLAGE STAGE 1-2 - TV\ARVIDA RETIREMENT (MASTER PLAN CD30 DRAWINGS)\CORRIDORS (ST.1) OK.DWG		

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Project	<b>Arvida Retirement Village</b> Civil Construction - Hall Road, Kerikeri	
Client	<b>Kerikeri Land Ltd.</b>	
Project No.	18 282	RC no.

DWG No.	<b>DE7</b>
Sheet No.	<b>7 of 7</b>