Technical Memo

To: Ian & Julie Humphrey
From: Tom Henderson (Crang Civil), with input from Marcel Bear (Bear Enterprises Ltd)
cc: Rebecca Sanders (Barker & Associates)
Date: August 18, 2025
Re: Civil Engineering Infrastructure Summary Memo

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1. Introduction

This memo provides a high-level summary of the civil engineering infrastructure requirements for the proposed fast-tracked consent at 1080 State Highway 16, Waimauku. The application seeks a fast-track application to develop approximately 200 hectares of Rural Production land into an estimated 1500 to 2020 residential lots, a neighbourhood centre, light industrial areas, and associated infrastructure per Figure 1. In addition, a solar farm is proposed on the rural balance lot. For our reporting, we have used 1800 residential lots for design flows.

Crang Consulting Ltd have evaluated the site's suitability for urban development from a servicing and infrastructure perspective, including roading, stormwater, wastewater, water supply, and utilities. We have concluded that the development can be adequately serviced, provided an appropriate water source is found.

Figure 1: Masterplan of Residential & Commercial Area. Solar Farm not shown for clarity. (From B&A 18/08/2025)

2. Roading and Earthworks

The site is currently an operational livestock farm and is accessed via gravel farm tracks. It features rolling terrain with a Ridgeline Protection Overlay, which restricts significant earthworks on visually sensitive ridgelines.

A concept design solution is provided in Appendix A. The design complies with Auckland Transport's Technical Design Manual using the following design strategies.

- **Design Strategy:**
    - Two new intersections with SH16 provide access to the development.
    - Most roads are below 8% grade, with a few roads reaching the 12.5% maximum grade.
    - Where road gradients exceed 8%, accessible pedestrian paths will be routed through adjacent reserves.
    - Earthworks are minimized near natural wetlands in accordance with the National Environmental Standard for Freshwater (NES-F 2020).
    - Retaining walls up to 3m will be required along road and lot boundaries to provide level platforms where possible. Some lots will need to remain sloped to prevent excessive wall heights.

3. Stormwater Management

There are multiple existing streams and natural wetlands onsite which drain to the Kaipara River. The site is located mid-catchment, therefore requires detention to achieve hydraulic neutrality.

The overall development will utilise water sensitive design principles in accordance with Auckland Council's GD04 and Stormwater Code of Practice. Appendix A includes a concept stormwater plan.

- **Design Objectives:**
    - Avoid altering the hydrological function of natural wetlands and streams. Enhance stream ecology and quality where possible.
    - Match pre-development and post-development runoff rates for 50%, 10%, and 1% AEP events.
    - Provide stormwater treatment for high contaminant generating activities. Treatment will be as close to the source as possible.
- **Treatment Strategy:**
    - Constructed wetlands will provide detention for the full development and treatment for the majority of the development. The remaining high contaminant generating areas will be treated by raingarden, swale or proprietary treatment devices.
    - Lots that do not drain to constructed wetlands will require on-site tanks to protect the natural receiving environment and provide detention.

    - Lots discharging to natural wetlands will require 24-hour detention of the 90th percentile rainfall event. Similar to SMAF2 requirements.

- **Environmental Considerations:** Riparian buffers and fish passage improvements are proposed to enhance ecosystem health.

4. Wastewater Servicing

Watercare have provided preliminary wastewater servicing advice as part of the pre-application process. At present, Watercare's position is that there is no capacity to service this development within the public wastewater network and is not included in trunk infrastructure sizing. Therefore, the site will need to be serviced by private wastewater infrastructure.

- **Onsite collection of Wastewater:**
    - The sloping terrain lends to a Low Pressure Sewer (LPS) network or Septic Tank Effluent Pump (STEP) sewer being the most effective wastewater reticulation for the development. These systems are well suited to sloping sites as they use private pumps on each lot to move wastewater uphill or across uneven ground. Other benefits include:
        - Reduced infrastructure cost,
        - Pipes installed at shallower depths, hence reducing earthworks during installation or maintenance of pipes,
        - Reduced infiltration rates,
        - Reduced risk of overflows.
    - Some areas of the development may be suitable for gravity sewer reticulation, including the industrial or countryside living areas.
    - Wastewater will be directed to the Northwest corner of the development to a private Wastewater Treatment Plant.

- **Onsite Treatment and Disposal:**
    - A private treatment plant is proposed in the northwest corner of the site. Treatment design will be put out to tender to identify the best solution that achieves the required treatment outcomes. Preliminary concepts include a membrane bioreactor (MBR) and UV disinfection from Apex Water, and an AdvanTex secondary treatment with UV disinfection from Innoflow.
    - Treated effluent discharge options include discharge to stream (pending detailed design, consultation and regulatory approvals), or to land on the landowner's residual farm for irrigation. Discharge to land will require a large area for the dispersal field.

- **Demand Calculations:** Wastewater flows have been calculated using Watercare's Code of Practice. The estimated average daily dry weather wastewater volume is 1137m^3/day, with peak design flows estimated at 88.13 L/s.

5. Water Supply

Water Source:

Watercare have provided preliminary potable water servicing advice as part of the pre-application process. At present, Watercare's position is that there is no capacity to service this development within the public potable water network. Therefore, the site will need to be serviced by private infrastructure.

CMW Geoscience have prepared a memo outlining their preliminary investigation into the availability of groundwater aquifers to provide a reliable water supply to the development. Their memo identifies two aquifers that are potentially located beneath the site. These are the Kaipara Sand Aquifer and the Kumeu-Hobsonville Aquifer.

Further investigations will occur following this initial fast-track application to determine the suitability of either aquifer. Testing requires installing test pumping wells and monitoring wells, and requires step-drawdown aquifer pumping tests, and constant rate aquifer pumping tests. The results of these investigations will feed into the design for an onsite water treatment plant.

Reticulation:

Bear Enterprises Ltd prepared a preliminary water supply assessment and reticulation design for the proposed development (Appendix C). This report was written prior to receiving Watercare's advice that Watercare cannot provide any water from their public water network. A portion of the report includes investigating a supply point off the Kumeu/Riverhead water main, approximately 10 km away from the site. This part of Bear Enterprise's report is no longer valid following Watercare's advice. The core of Bear Enterprises original report will however remain relevant.

Once groundwater testing confirms a suitable onsite potable water source is available, and a location of the water treatment plant is defined, Bear Enterprise will update the water source and infrastructure requirements to suit. The revised solution will include pumping the treated water from the onsite potable water treatment plant, up to the reservoir on the top of the hill.

- **Design Features:**
    - An onsite potable water source and treatment plant will be required.
    - Water will be pumped from the water treatment plant to a local reservoir.
    - A local 2,028 m^3 reservoir and booster pump will provide storage and pressure management throughout the development.
    - The internal network includes a 300 mm trunk main to a 200 mm ring main, 100–150 mm distribution mains, and a 50mm ridermain.
- **Performance:** The network meets Watercare's standards for pressure (25–80 m), head loss (0.01 to 3.8 m/km), velocity (0.01 to 0.54 m/s), and fire flow (25–50 L/s).

6. Utilities

Power, telecommunications and gas are available along SH16 to supply the development. Network upgrades will be required to meet the increased demand.

7. Conclusion

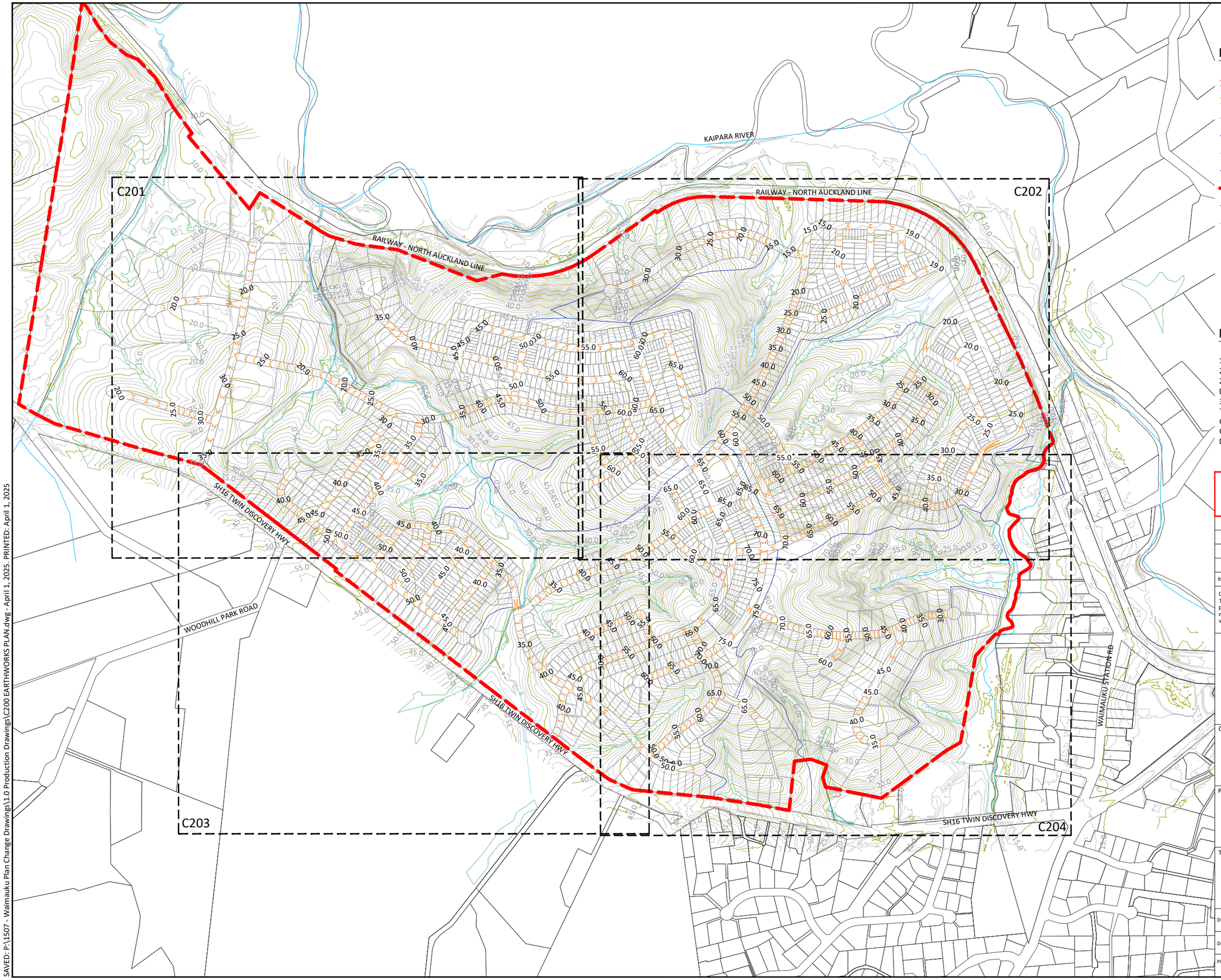
The fast-tracked proposal is technically feasible from a civil engineering infrastructure standpoint, provided an appropriate water source is found. All other essential infrastructure—roading, stormwater, wastewater, and utilities—can be provided in accordance with Auckland Council, Auckland Transport and Watercare standards. The development is supportable subject to finding an appropriate water source, final design and regulatory approvals.

8. Supporting Documentation

- **Appendix A:** Civil Engineering Drawings (C200–C214)
- **Appendix B:** Water and Wastewater Demand Calculations
- **Appendix C:** Water Design Report (Bear Enterprises)

APPENDIX A:

ENGINEERING PLANS



LEGEND

- PROPOSED CONTOURS
- EXISTING CONTOURS
- NATURAL INLAND WETLANDS
- PERMANENT STREAMS
- INTERMITENT STREAMS
- CYCLING LINKS
- SITE EXTENT
- EX BOUNDARIES
- PR BOUNDARIES

NOTES

1. COORDINATE DATUM IS NZGD2000 MT EDEN 2000. VERTICAL DATUM IS NZVD2016.
2. EG SURFACE IS AUCKLAND NORTH LiDAR 1m DEM (2016-2018).
3. THE PURPOSE OF THE EARTHWORKS PLANS IS TO ENSURE ROADS CAN BE DESIGNED WITHIN AT GRADE CONSTRAINS. LEVELS ARE CONCEPT ONLY. NO EARTHWORKS ON LOTS HAS BEEN DESIGNED.

FOR INFORMATION

REVISION	CHANGES	CHECKED	DATE
A	FOR INFORMATION	TH	25/03/25

CRANGCIVIL CONSULTING ENGINEERS
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CLIENT
IAN & JULIE HUMPHREY

PROJECT
WAIMAUKU PLAN CHANGE

TITLE
EARTHWORKS PLAN

DRAWN	UE	SCALE A1	NTS
DESIGNED	TH	A3	NTS
PROJECT No	1507	DRAWING No	C200
REVISION	A		

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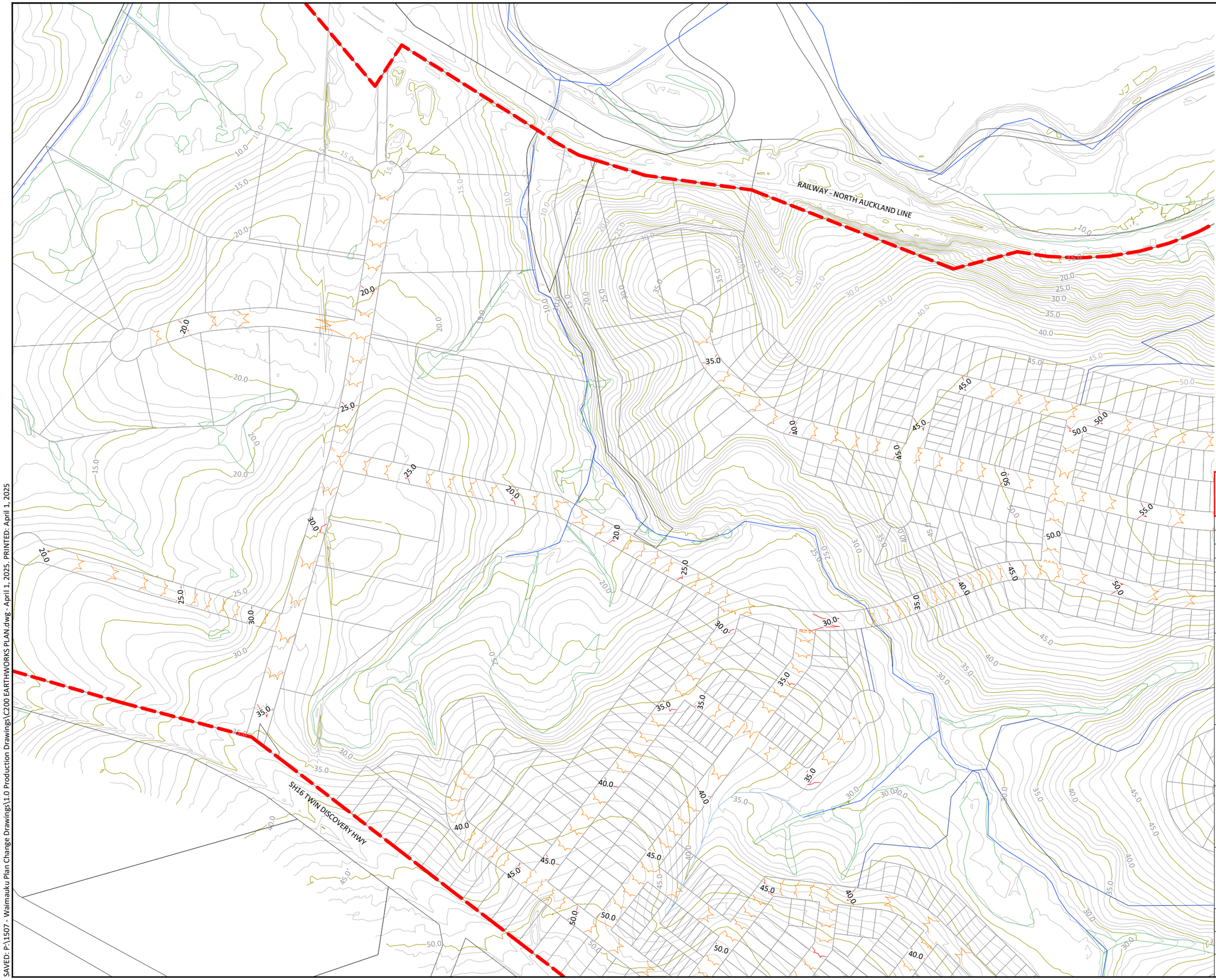

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TITLE

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RAILWAY - NORTH AUCKLAND LINE

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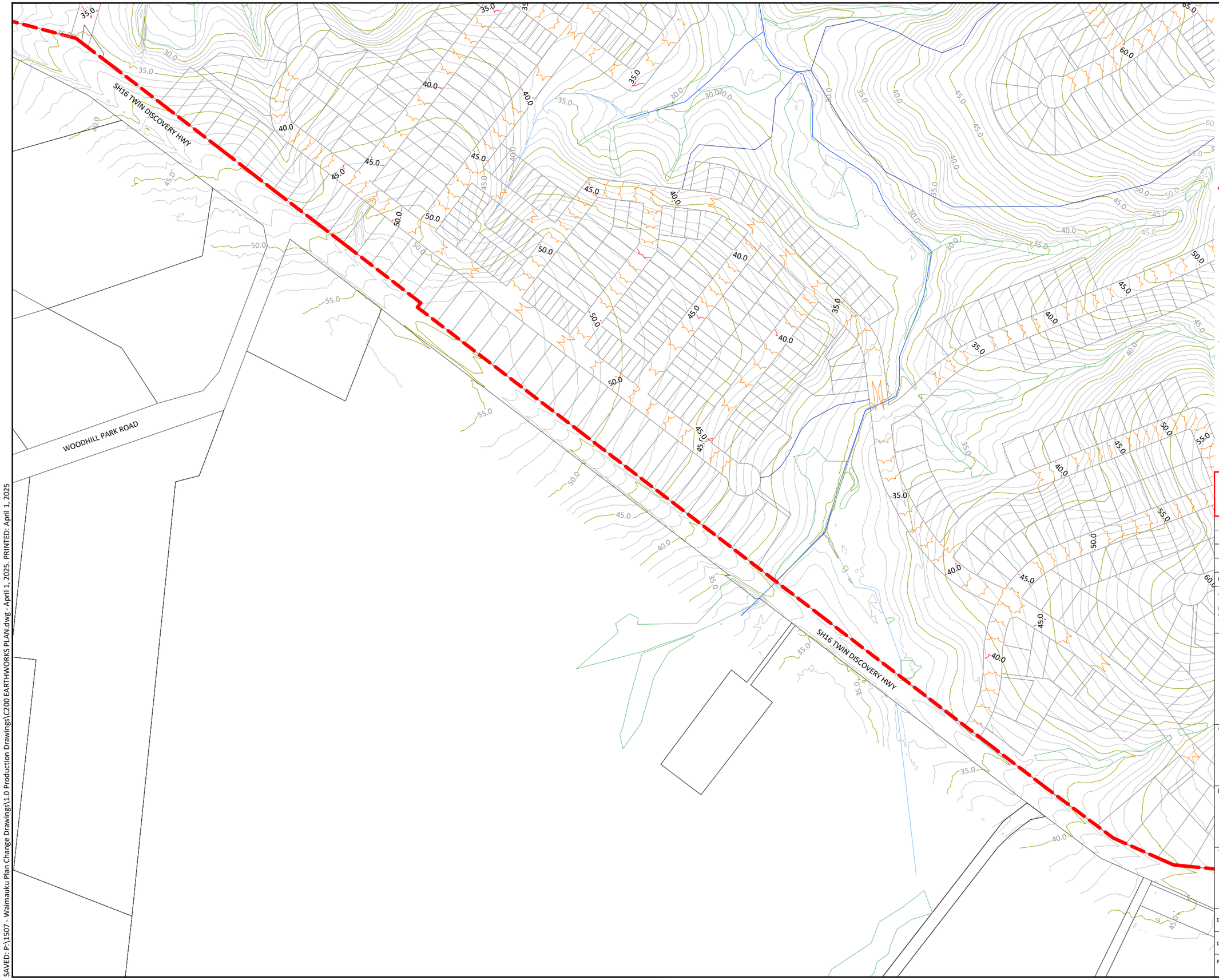

LEGEND

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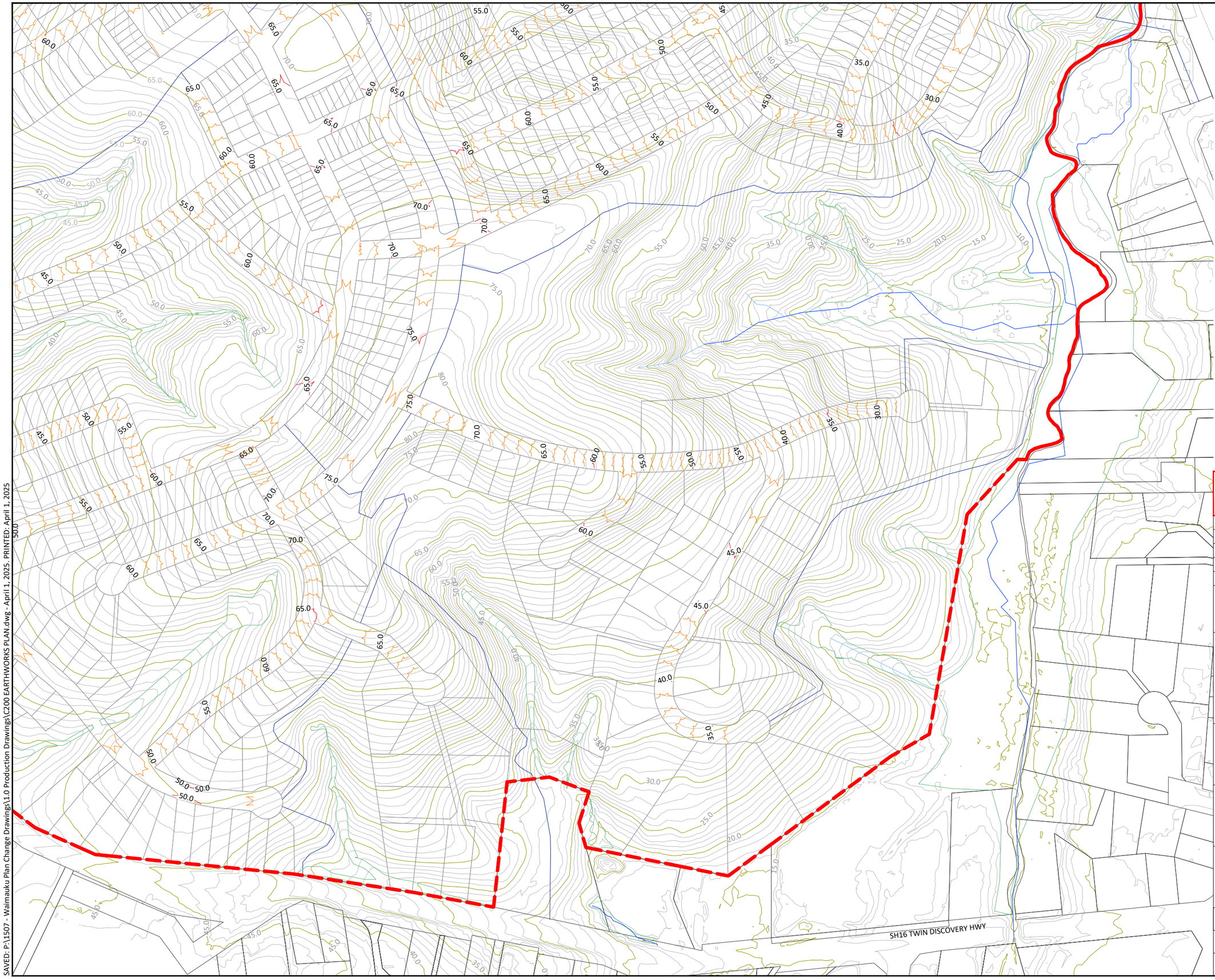

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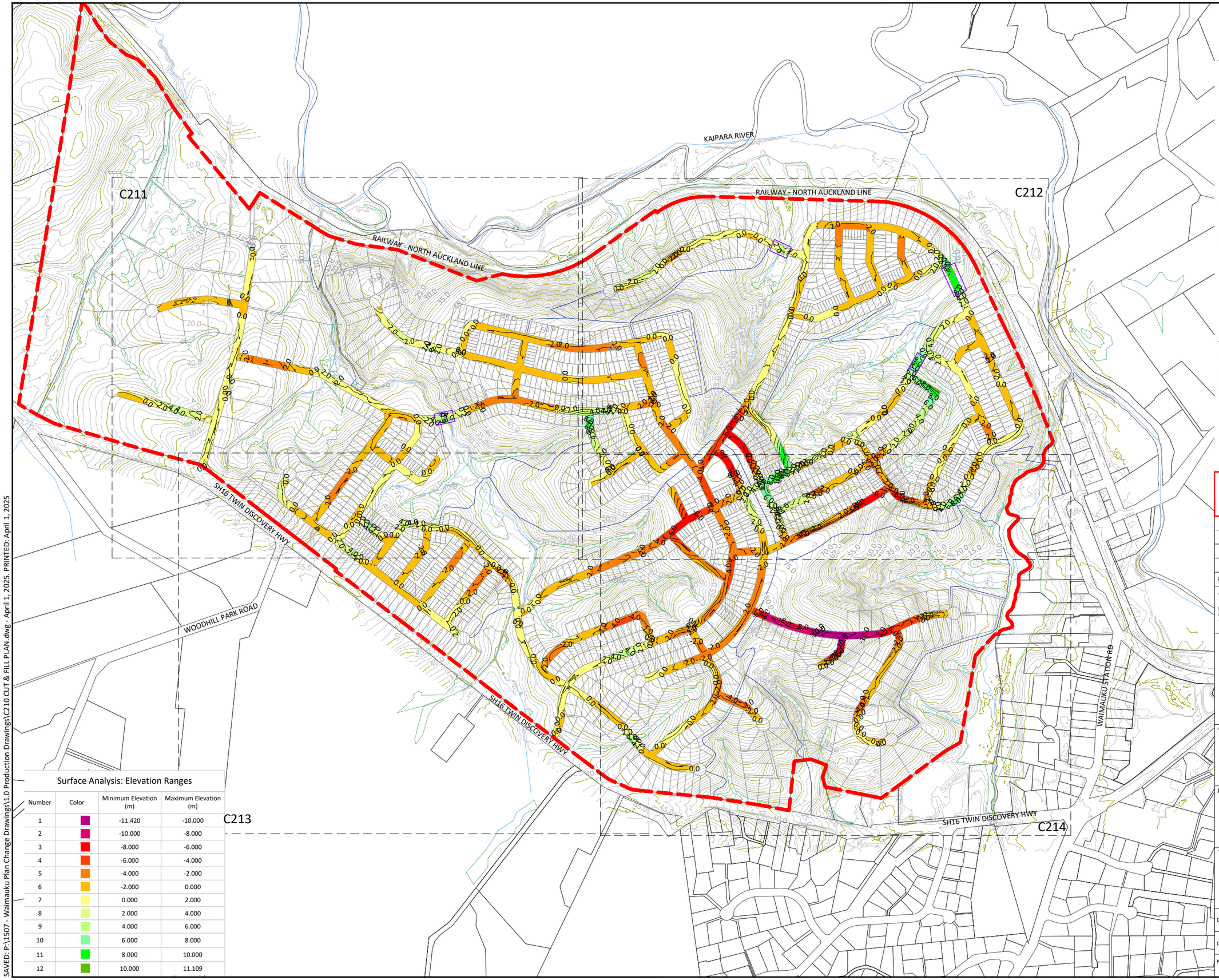

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- INDICATIVE PROPOSED WETLAND LOCATION

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FOR INFORMATION

Surface Analysis: Elevation Ranges

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2		-10.000	-8.000
3		-8.000	-6.000
4		-6.000	-4.000
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11		8.000	10.000
12		10.000	11.109

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WAIMAUKU PLAN CHANGE

TITLE

CUT & FILL PLAN

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PROJECT No 1507	DRAWING No C210	REVISION	A

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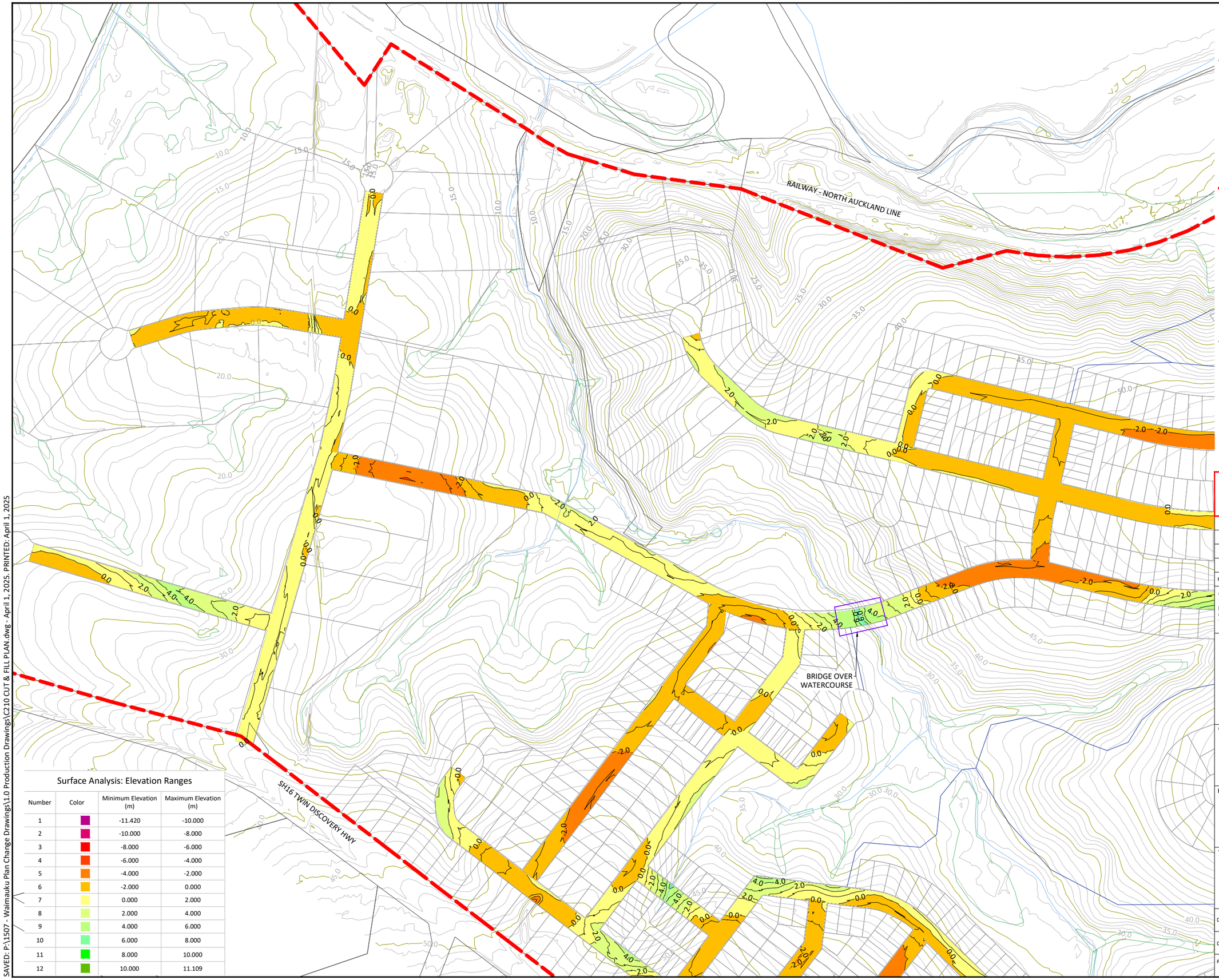

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CUT & FILL PLAN SHEET 1

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RAILWAY - NORTH AUCKLAND LINE

BRIDGE OVER WATERCOURSE

BRIDGE OVER WATERCOURSE

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WAIMAUKU PLAN CHANGE

TITLE

CUT & FILL PLAN SHEET 2

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PROJECT No 1507	DRAWING No C212	REVISION A	

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SH16 TWIN DISCOVERY HWY

WOODHILL PARK ROAD

SH16 TWIN DISCOVERY HWY

LEGEND

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CUT & FILL PLAN SHEET 3

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PROJECT No	DRAWING No	REVISION	
1507	C213	A	

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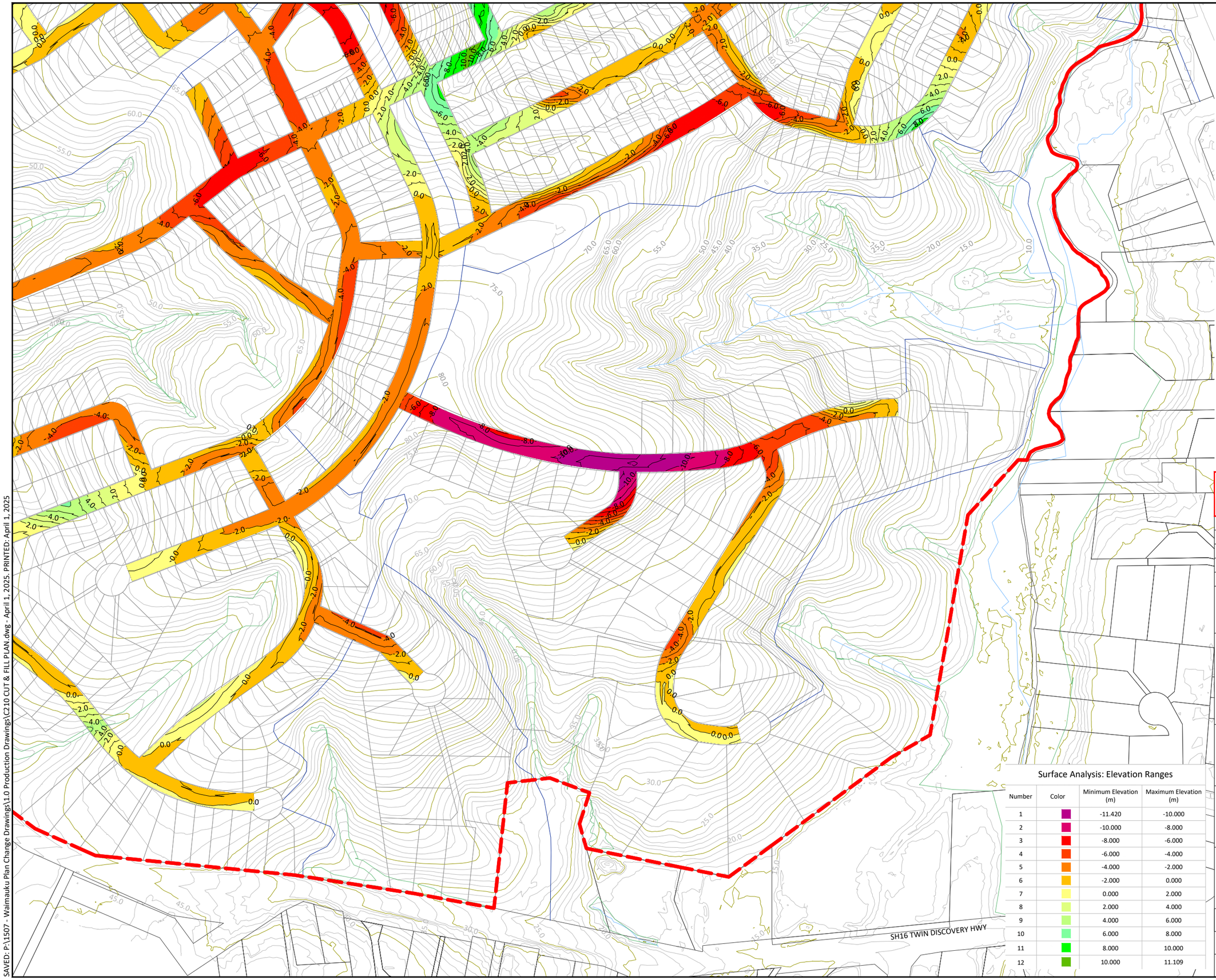

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DESIGNED	TH	A3	1:3000
PROJECT No 1507	DRAWING No C214	REVISION	A

SAVED: P:\1507 - Waimauku Plan Change Drawings\1.0 Production Drawings\C210 CUT & FILL PLAN.dwg - April 1, 2025. PRINTED: April 1, 2025

KAIPARA RIVER

RAILWAY - NORTH AUCKLAND LINE

RAILWAY - NORTH AUCKLAND LINE

SH16 TWIN DISCOVERY HWY

WOODHILL PARK ROAD

SH16 TWIN DISCOVERY HWY

SH16 TWIN DISCOVERY HWY

WAIMAUKU STATION RD

LEGEND

- PROPOSED CONTOURS
- EXISTING CONTOURS
- NATURAL INLAND WETLANDS
- PERMANENT STREAMS
- INTERMITENT STREAMS
- CYCLING LINKS
- SITE EXTENT
- EX BOUNDARIES
- PR BOUNDARIES
- INDICATIVE PROPOSED WETLAND LOCATION

NOTES

1. COORDINATE DATUM IS NZGD2000 MT EDEN 2000. VERTICAL DATUM IS NZVD2016.
2. EG SURFACE IS AUCKLAND NORTH LiDAR 1m DEM (2016-2018).

FOR INFORMATION

REVISION	CHANGES	CHECKED	DATE
A	FOR INFORMATION	TH	25/03/25

CRANGCIVIL
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CLIENT

IAN & JULIE HUMPHREY

PROJECT

WAIMAUKU PLAN CHANGE

TITLE

DRAINAGE PLAN

DRAWN	UE	SCALE A1	NTS
DESIGNED	TH	SCALE A3	NTS
PROJECT No 1507	DRAWING No C400	REVISION A	

SAVED: P:\1507 - Waimauku Plan Change Drawings\1.0 Production Drawings\C400 DRAINAGE PLAN.dwg - April 1, 2025. PRINTED: April 1, 2025

APPENDIX B:

WATER AND WASTEWATER DEMAND CALCULATIONS

Waimauku

Author: TH

Wastewater Design Flow (Watercare COP)

version: 0

Level 1 network assessment using Watercare Code of Practice Section 5.3.5.1.2

date: **24/03/2025**

	PRE DEVELOPMENT SITE DISCHARGE		POST DEVELOPMENT SITE DISCHARGE		NET CHANGE IN DESIGN FLOW		
Residential	Calculating discharge		Calculating discharge		Calculating discharge		
Number of lots	0	m2	1800	m2	1800	m2	
Occupants per building	3	people	3	people	3	people	
No. of People	0.0		5400.0		5400.0		
Design Flow	180.0	L/p/d	180.0	L/p/d	180.0	L/p/d	
ADWF	0.000	L/s	11.250	L/s	11.250	L/s	
Normal PDWF	3		3		3		
Self Clensing Flow	0.00	L/s	33.75	L/s	33.75	L/s	
PWWF	6.7		6.7		6.7		
Peak Design Flow	0.00	L/s	75.38	L/s	75.38	L/s	
Wet Retail	Calculating discharge		Calculating discharge		Calculating discharge		
Net Floor Area	0	m2	1395	m2	1395	m2	*Note 2
Design Flow	15.0	L/m2/d	15.0	L/m2/d	15.0	L/m2/d	
ADWF	0.000	L/s	0.242	L/s	0.242	L/s	
Normal PDWF	2		2		2		
Self Clensing Flow	0.00	L/s	0.48	L/s	0.48	L/s	
PWWF	6.7		6.7		6.7		
Peak Design Flow	0.00	L/s	1.62	L/s	1.62	L/s	
Dry Industry (Light use)	Calculating discharge		Calculating discharge		Calculating discharge		
Net Floor Area	0	m2	31900	m2	31900	m2	*Note 1 & 2
Design Flow	4.5	L/m2/d	4.5	L/m2/d	4.5	L/m2/d	
ADWF	0.000	L/s	1.661	L/s	1.661	L/s	
Normal PDWF	5		5		5		
Self Clensing Flow	0.00	L/s	8.31	L/s	8.31	L/s	
PWWF	6.7		6.7		6.7		
Peak Design Flow	0.00	L/s	11.13	L/s	11.13	L/s	
Average Daily Dry Weather Volume	**0.0**	m3/day	**1136.5**	m3/day	**1136.5**	m3/day	
Average Dry Weather Flow	**0.00**	L/s	**13.15**	L/s	**13.15**	L/s	
Self Cleansing Flow	**0.00**	L/s	**42.54**	L/s	**42.54**	L/s	
Peak Design Flow	**0.00**	L/s	**88.13**	L/s	**88.13**	L/s	

Note 1: The area is the usable area within the industrial lot. Some of the lot is an existing wetland and we have assumed it will not be modified.

Note 2: Assumed the retail and industrial floor areas are 50% of the lots

Waimauku

Author: TH
version: 0
date: **24/03/2025**

Wastewater Design Flow (TP58)

Network assessment using TP58: Onsite Wastewater Systems

	PRE DEVELOPMENT SITE DISCHARGE		POST DEVELOPMENT SITE DISCHARGE		NET CHANGE IN DESIGN FLOW		
Residential	Calculating discharge		Calculating discharge		Calculating discharge		
Number of lots	0	m2	1800	m2	1800	m2	
Peak Occupants per building	5	people	5	people	5	people	
No. of People	0.0		9000.0		9000.0		
Design Flow	180.0	L/p/d	200.0	L/p/d	200.0	L/p/d	
ADWF	0.000	L/s	20.833	L/s	20.833	L/s	
Design Daily Flow	0	m3/d	1800	m3/d	1800	m3/d	
Wet Retail	Calculating discharge		Calculating discharge		Calculating discharge		
Net Floor Area	0	m2	1395	m2	1395	m2	*Note 2
Design Flow	15.0	L/m2/d	15.0	L/m2/d	15.0	L/m2/d	
ADWF	0.000	L/s	0.242	L/s	0.242	L/s	
Design Daily Flow	0	m3/d	21	m3/d	21	m3/d	
Dry Industry (Light use)	Calculating discharge		Calculating discharge		Calculating discharge		
Net Floor Area	0	m2	31900	m2	31900	m2	*Note 1 & 2
Design Flow	4.5	L/m2/d	4.5	L/m2/d	4.5	L/m2/d	
ADWF	0.000	L/s	1.661	L/s	1.661	L/s	
Design Daily Flow	0	m3/d	144	m3/d	144	m3/d	
Design Daily Wastewater Volume	**0.0**	m3/day	**1964.5**	m3/day	**1964.5**	m3/day	

Note 1: The area is the usable area within the industrial lot. Some of the lot is an existing wetland and we have assumed it will not be modified.

Note 2: Estimated using Watercare's CoP not TP58 as there is not enough detail at this stage to use TP58.

Waimauku

Author: TH
version: 0
date: **24/03/2025**

Water Demand Calculations (site only)

Watercare Code of Practice Section 6.3.5.6

	PRE DEVELOPMENT WATER DEMAND		POST DEVELOPMENT WATER DEMAND		NET CHANGE IN WATER DEMAND		
Residential	Calculating discharge		Calculating discharge		Calculating discharge		
Number of lots	0	lots	1800	lots	1800	lots	
Ocupants per building	3	people/lot	3	people/lot	3	people/lot	
No. of People	0.0		5400.0		5400.0		
Design Flow	220.0	L/p/d	220.0	L/p/d	220.0	L/p/d	
Average Daily Demand	0	L/d	1188000	L/d	1188000	L/d	
Wet Retail	Calculating discharge		Calculating discharge		Calculating discharge		
Net Floor Area	0	m2	2790	m2	2790	m2	
Design Flow	15.0	L/m2/d	15.0	L/m2/d	15.0	L/m2/d	
Average Daily Demand	0	L/d	41850	L/d	41850	L/d	
Dry Industry (Light use)	Calculating discharge		Calculating discharge		Calculating discharge		
Net Floor Area	0	m2	63800	m2	63800	m2	*Note 1
Design Flow	4.5	L/m2/d	4.5	L/m2/d	4.5	L/m2/d	
Average Daily Demand	0	L/d	287100	L/d	287100	L/d	
Average Daily Demand	**0**	L/d	**1516950**	L/d	**1516950**	L/d	
	0.00	L/s	**17.56**	L/s	**17.56**	L/s	
Peak Factor (PF)			1.788	Interpolated between 2,000 & 10,000 people	1.788	Interpolated between 2,000 & 10,000 people	
Peak Day Demand			2711548	L/d	2711548	L/d	
Peak hourly demand	with Peak F	2.5	282453	L/h	282453	L/h	
			78.46	L/s	78.46	L/s	
Dwelling Unit Equivalent (DUE)			2517	DUE's	2517	DUE's	

Note 1: The area is the usable area within the industrial lot. Some of the lot is an existing wetland and we have assumed it will not be modified.

APPENDIX C:

WATER DESIGN REPORT – BEAR ENTERPRISES

1080 State Highway 16

Reweti, Waimauku

Fast track referral application

Water Supply Assessment

Report prepared for

Crang Consulting Ltd

by

Bear Enterprises Ltd

29 July 2025

CONTENTS

Revision 2 – Updated masterplan, Figure 1

FINAL

29 July 2025

Prepared by: Marcel Bear, BE(Civil)Hons, CPEng.

SUMMARY

Water reticulation has been designed to support the fast track referral application for a development at 1080 State Highway 16, Reweti Waimauku (the development). A preliminary layout of the development consists of an estimated 1500 to 2020 dwelling unit equivalents (DUEs) plus commercial and industrial areas, which would be serviced from the existing Kumeu/Riverhead water main supplying the Riverhead Reservoir. The water main is some 10 km from the development.

A connecting pipeline between the Kumeu/Riverhead water main and the development has been designed, in addition to a network layout to service the development. Modelling was used to demonstrate compliance with the Watercare Code of Practice requirements. The proposed network sizing is shown on Figure 5.

.

INTRODUCTION

In March 2025 Crang Consulting Limited commissioned Bear Enterprises Limited to prepare a design of the water supply for the development.

ASSESSMENT OBJECTIVE AND SCOPE

The objective of this design is to confirm the pipe sizing and layout to provide sufficient supply throughout the development to Watercare Code of Practice (CoP) requirements.

The scope for this design includes the following tasks:

- Establishing the water demands considering the Watercare demand standards
- Sizing the supply pipeline between the existing Kumeu/Riverhead water main and the development site
- Designing a reticulation layout and sizing to service the development.
- Developing a model to confirm the reticulation performance
- Demonstrating the proposed reticulation will comply with the CoP

LEVEL DATUM

The level datum used is NZVD2016.

DEVELOPMENT AND EXISTING RETICULATION

The Development is shown on Figure 1.

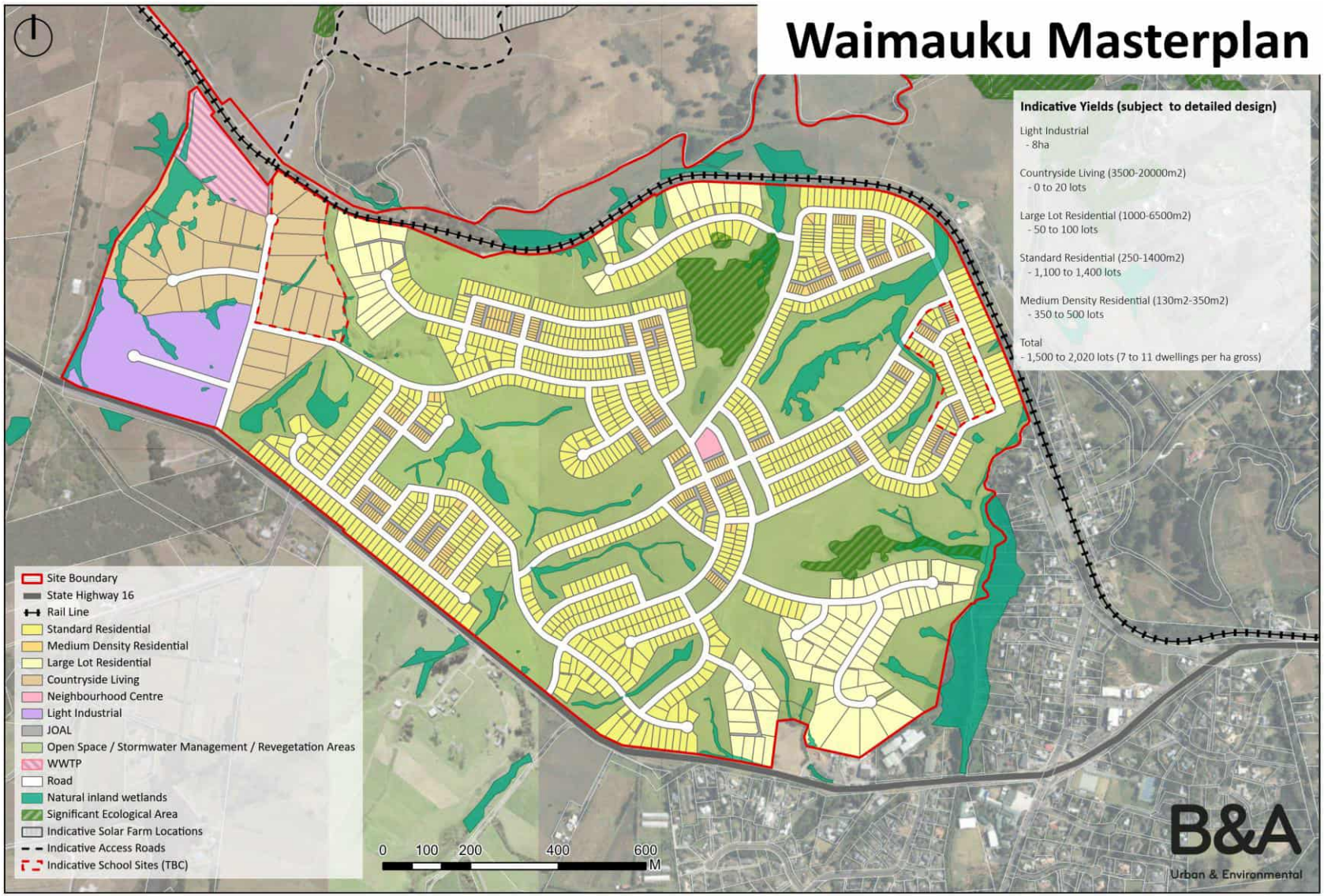

FIGURE 1 – THE DEVELOPMENT

EXISTING RETICULATION

The nearest reticulation of sufficient size to service the development is the Kumeu/Riverhead watermain which presently services Kumeu. This along with two possible pipe route options are shown in Figure 2.

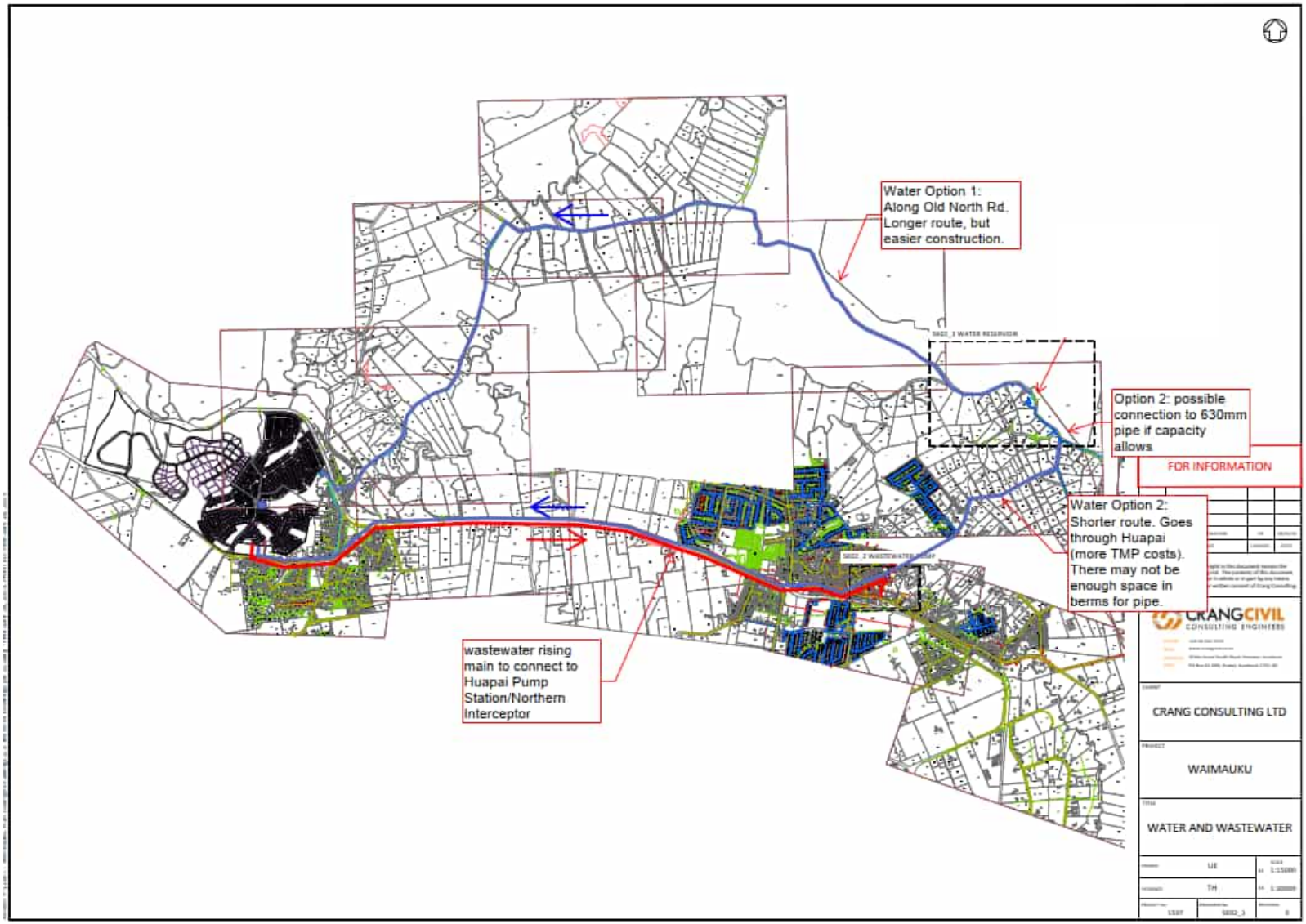

FIGURE 2 EXISTING ADJACENT RETICULATION

DEMANDS

DEVELOPMENT DEMANDS

The development demands used in the analysis are based on the factors given in Appendix B – CoP flows. The resulting demands are summarised in Table 1, assuming 1800 DUE are developed.

Table 1 Development Demands

Typology	Unit [c]	Amount	ADD m3/d	PDD l/s	PHD l/s
Residential	DUE	1,800	1,188.0	20.6	51.5
Commercial [a]	Net m^2	2,790	41.8	0.7	1.8
Industrial [b]	Net m^2	63,800	63.8	1.1	2.7
Total			1,293.6	22.4	56.0

DUE – Dwelling Unit Equivalent
ADD – Average Day Demand
PDD – Peak Day Demand
PHD – Peak Hour Demand
[a] – Commercial development assumed to be Wet Retail
[b] – Industrial water use assumed to be Light Use
[c] – Areas given are net floor area, ie 80% of gross floor area as suggested in the CoP

FIREFLOW DEMANDS

The fireflow is based on providing FW2 (25 l/s) in the residential area and FW3 (50 l/s) in the commercial and industrial areas. No allowance has been made for providing sprinkler flows.

ANALYSIS ASSUMPTIONS

The following assumptions have been made in undertaking this analysis:

- The development consists of 1800 DUE plus commercial and industrial areas as detailed in Appendix B
- The Kumeu/Riverhead water main will be the source for the development
- The supply from the Kumeu/Riverhead water main will gravitate to a proposed local reservoir in the development
- A local pumpstation will boost pressures throughout the development
- The reticulation in the development will consist of a single supply zone
- No allowance has been made to supply areas outside the development from the local reservoir/pumpstation
- The development will not be sprinkler protected and the fireflow demand will be as described in the Demands section
- The friction factor in the pipelines is Colebrooke White k_s=0.06mm

SUPPLY BOUNDARY CONDITION

For the purposes of the design of the supply pipeline to the development it is assumed the hydraulic grade line will be the reservoir floor level, 98 m (NZVD 2016). Watercare have confirmed the levels of the Riverhead Reservoir. See Appendix A for confirmation from Watercare.

WATER SUPPLY DESIGN

SUPPLY PIPELINE DESIGN

Two route options have been identified for the pipe from the existing Kumeu/Riverhead water main to the development, shown in Figure 2. The proposed local reservoir will be situated as shown in Figure 5 with a floor level of 75m RL and a top water level of 78m. This gives a driving head of 98-78=20m. The supply pipeline sizing is shown in Table 2, assuming the peak day flow is delivered (22.4 l/s).

TABLE 2 SUPPLY PIPELINE OPTIONS

Option	Length m	Hydraulic Grade m/km	Proposed size mm Internal diameter	Note
1	9870	2.02	210	Peak day demand 22.4 l/s
2	8910	2.24	205	Peak day demand 22.4 l/s

The above analysis shows the pipe sizing is insensitive to the route chosen, as the lengths are similar. For the purposes of design is it assumed a pipe of at least 210mm inside diameter will be adopted, eg a Polyethylene pipe such as a PE 100 PN 12.5 250 OD pipe (212 mm ID) would suffice.

Long sections of the supply pipeline routes were examined (Figure 3, Figure 4). A preliminary assessment concludes both options are feasible from a hydraulic perspective. The initial 600 m of Option 1 would need to be constructed in a maximum of 10m cut to ensure the pipe remained below the hydraulic grade. This conclusion is based on the hydraulic grade being at the floor of the Riverhead reservoir, ie is conservative.

FIGURE 3 OPTION 1 PIPELINE LONGSECTION

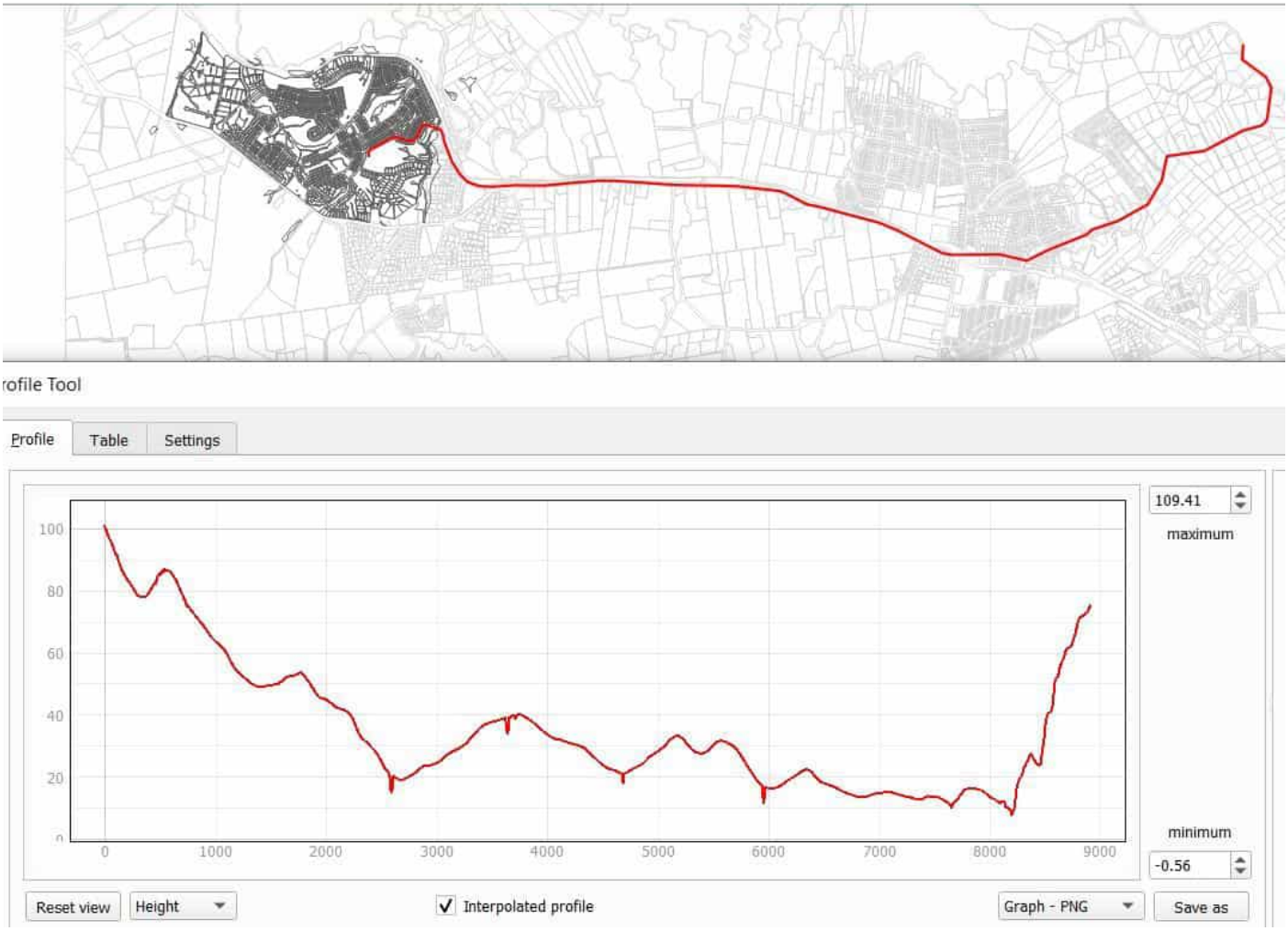

FIGURE 4 OPTION 2 PIPELINE LONGSECTION

LOCAL RETICULATION DESIGN

The proposed reticulation layout to supply the development is shown in Figure 5. The reticulation consists of:

- A 300mm ID pipe from the reservoir/pumpstation to
- A 200mm ID ring main around the development
- 150 mm ID connecting mains
- 100 mm ID mains along all streets
- 50 mm ID Rider mains (not shown for clarity or modelled as they do not influence results)

LOCAL RESERVOIR SIZING

The reservoir sizing is based on the following parameters:

- 24 hours of average day demand available for emergency[1]
- Dead storage of 5%
- Fireflow volume as per SNZ PAS 4509, for FW3 fireflow (180 m^3)
- Diurnal flow balancing volume[2] of 25%

The resulting reservoir volume is calculated below.

- 24 hours of average demand — 1,294 m^3
- Diurnal balancing + dead storage — 25+5=30%
- Available volume — 100-30=70% for average day resilience (1,294 m^3)
- Live storage=1,294/70% — 1,848 m^3
- Plus fireflow storage — 180 m^3
- **Total reservoir volume** — **2,028 m^3**

LOCAL PUMP DUTY POINT

The supply would be pumped from the local reservoir with a pump discharge HGL of 100m, ie approximately 25m boost assuming the reservoir water level is at the floor. This gives a preliminary boost pump duty of 56 l/s at 25 m boost for peak hour flow. The fireflow duty would be 87 l/s at 25 m boost to supply the commercial fireflow. These duties are well within commonly available pump sets.

[1] Section 3.3 (d) of Watercare Design principles for Transmission Water and Wastewater Pipeline Systems. DP-07. V 1.1 September 2020
[2] Recommended in Ch 18.2 of Twort's Water Supply, Sixth Edition.

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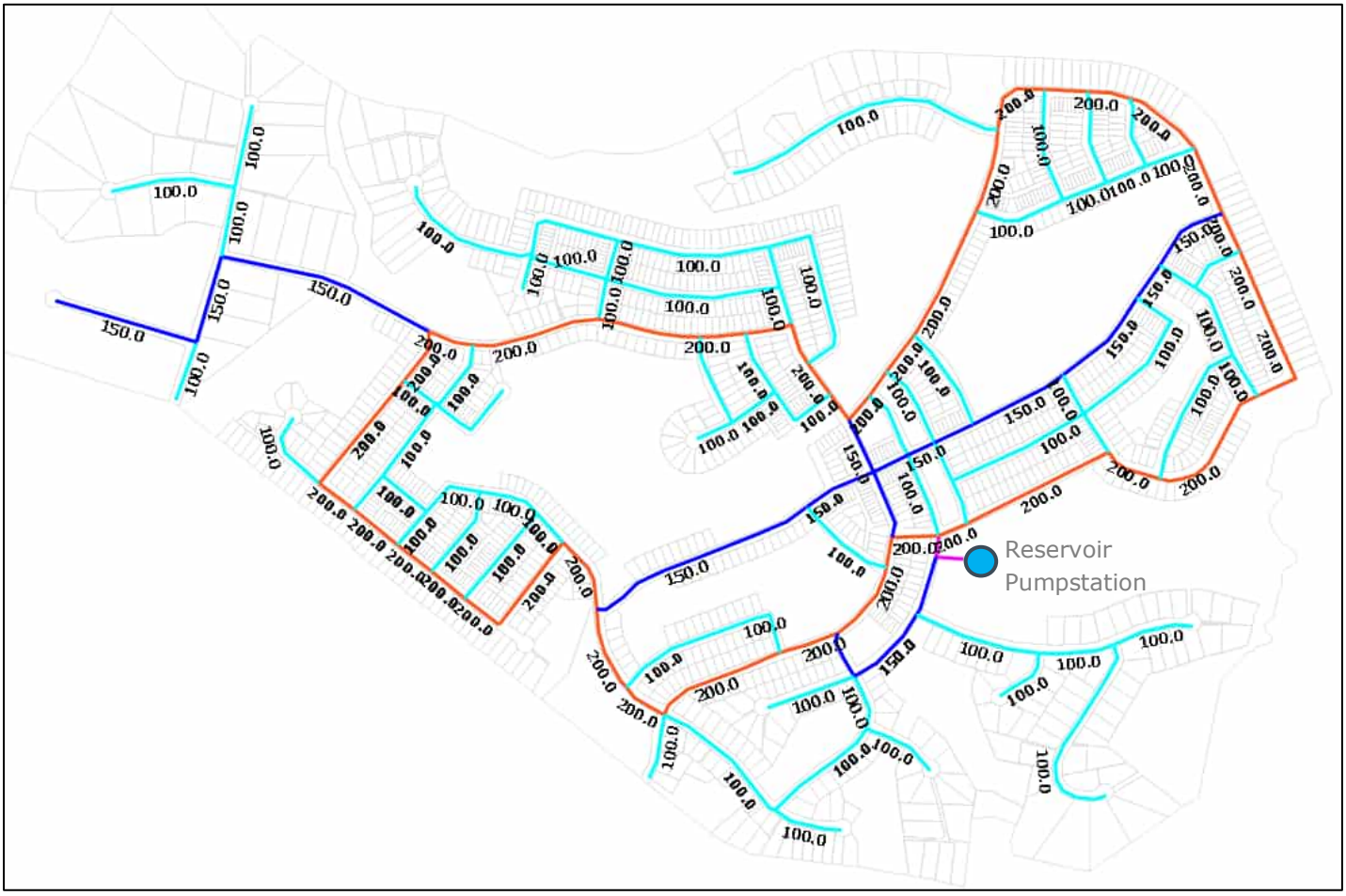


FIGURE 5 PROPOSED PIPE LAYOUT

NETWORK PERFORMANCE

The proposed network would generally conform to the CoP standards for minimum pressure, headloss and velocity, as shown in Table 3 and the result plots in Appendix C.

TABLE 3 RESULTS SUMMARY

Parameter. Standard	Result/Standard compliant
Minimum pressure, m. Over 25 m required	24 to 84 m/**Yes**
Maximum pressure, m. Under 80 m required	24 to 85 m/**Yes**
Maximum headloss, m/km **Less than 5 m/km, pipes <=150NB** **Less than 3 m/km, pipes > 150NB**	0.01 to 3.8 m/km/**Yes**
Maximum velocity m/s, Under 2 m/s required	0.01 to 0.54 m/s - **Yes**
Residential Available fireflow l/s **25 l/s for residential 50 l/s Commercial/Industrial**	From 60 l/s to over 150 l/s /**Yes**

There is scope to increase the minimum pressure along the ridges and reduce the maximum pressure at the low points with zoning. This can be considered in the following design stages.

SUMMARY AND RECOMMENDATIONS

A design of the water supply infrastructure for the development at 1080 State Highway 16, Reweti has been carried out. The development is assumed to be 1,800 lots plus commercial and light industrial areas.

The development demands were derived from the Watercare CoP, which resulted in 56 l/s peak hour demand and FW2 (25 l/s) fireflow demand in the residential area and FW3 (50 l/s) fireflow demand in the commercial and industrial areas.

Watercare advised the supply HGL of 98 m HGL (NZVD 2016) at the assumed supply point of the inlet pipeline of the Riverhead reservoir. Two route options were established for a supply pipeline from the Kumeu/Riverhead water main to a proposed local reservoir in the development. This pipe was sized at 210 mm ID and could gravitate the peak day demand without pumping, provided the pipe was installed below the Riverhead reservoir floor level.

The proposed development reticulation consists of

- A 2,028 m^3 local reservoir
- A local boost pumpstation supplying into a single zone
- A 300mm ID pipe from the reservoir/pumpstation to
- A 200mm ID ring main around the development
- 150 mm ID connecting mains
- 100 mm ID mains along all streets
- 50 mm ID rider mains

Modelling has shown the proposed network would provide pressure, velocity, headloss and fireflow generally within CoP limits. There is scope to reduce the pressure range to suit the topography of the land by zoning the reticulation.

On the basis of the modelling and analysis presented herein, it is **concluded** the proposed layout will adequately service the development.

It is **recommended** the reticulation as shown in Figure 5 is taken forward to the next stage of design to service the development.

APPENDIX A SUPPLY BOUNDARY CONDITION

Email from Watercare confirming the Riverhead Reservoir levels.

From: Laksri Siriwardena s 9(2)(a)
Sent: Monday, March 24, 2025 9:04:45 AM
To: Marcel Bear
Cc: Edzard Verseput s 9(2)(a) ; MWhitaker (Michelle) s 9(2)(a)
Subject: RE: Waimauku PPC - Huapai (Riverhead) reservoir details

Hi Marcel,

Good morning,

Apologies for the delayed response; last week was quite busy. I hope you had a great weekend. Below, you'll find my responses to your questions, highlighted in **red** for your reference.

- Confirmation that I have the correct name for the Reservoir (Huapai) : Riverhead Reservoir
- Floor Level, Top Water Level and Volume of the existing reservoir. (NZVD2016 datum) : BWL: 98 m, TWL: 105 m, and Capacity of the reservoir: 4.6 ML
- Confirmation that the 470 CLS is the inlet pipe and the 630 CLS is the outlet pipe: 470 CLS is the inlet, while 630 CLS is the outlet

If you have any questions, please do not hesitate to contact me.

Cheers!

Thank you so much!

Ngā mihi (kind regards),

Laksri Siriwardena (She/her)

Planning Engineer – Water Networks

MSc Water Resources Engineering and Management, MENZ

Watercare Services Limited

APPENDIX B DESIGN STANDARDS

The design standards used in the assessment are based on the Water and Wastewater Code of Practice (CoP) for Land Development and Subdivision v2.4, dated June 2021, and are as follows:

- Pressure : 25 – 80 m
- Maximum Headloss:
  - For pipe diameter ≤ 150mm : ≤ 5m/km
  - For pipe diameter > 150mm : ≤ 3m/km
- Velocity : 0.5 – 2.0 m/s
- Fireflow : As per SNZ PAS 4509, 2008

Water Demand

The water demand design flows are:

- Average Daily Demand
  - Residential : 220 litres per person per day
  - Commercial : Wet retail, 15 litres per day per net m^2
  - Industrial : Light use, 4.5 litres per day per net m^2
- Occupancy Rate
  - Residential : 3 people per dwelling

- Peak Day Demand (PDD) Peak Factor : 1.5 (for populations over 10,000)
- Peak Hour Demand (PHD) Peak Factor : 2.5

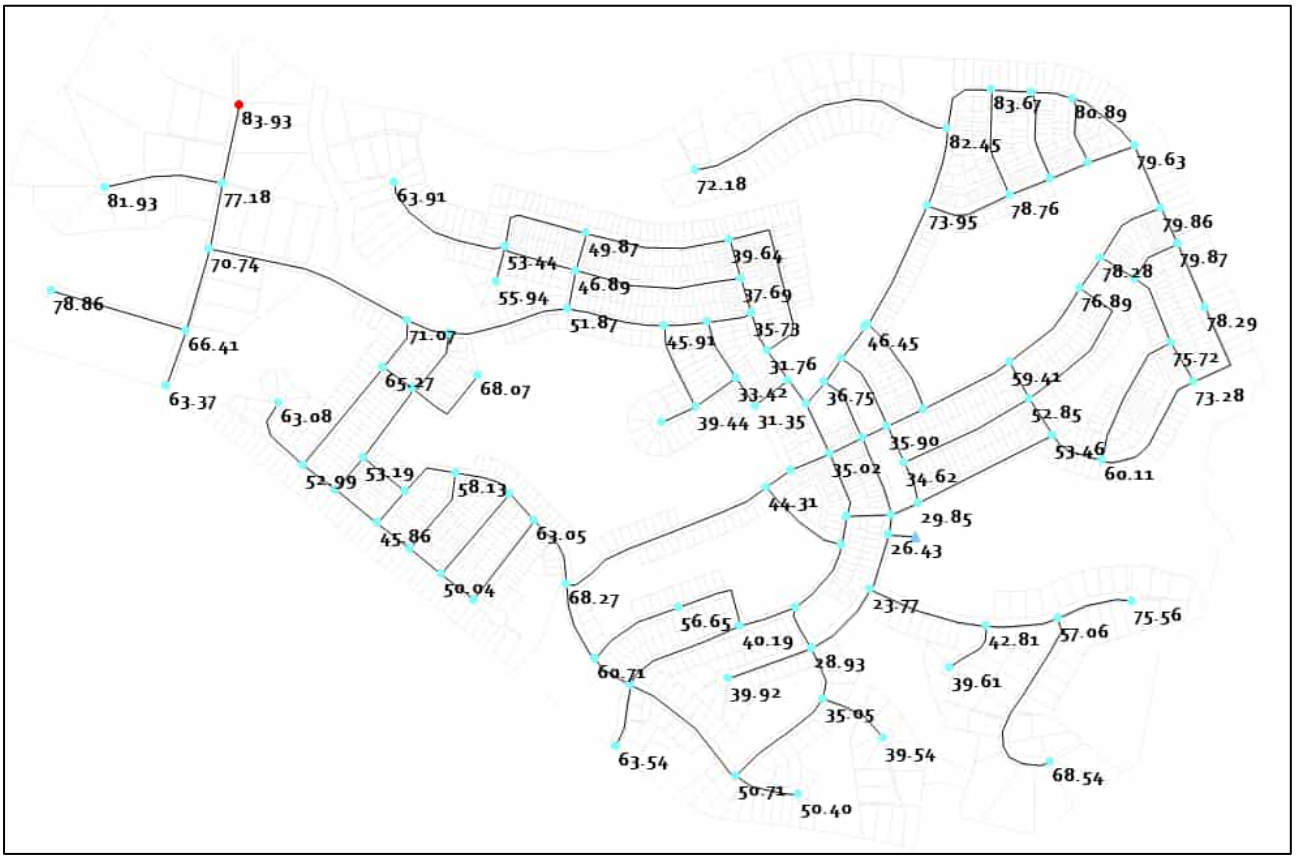
A PDD Peak Factor of 1.5 was used because it is assumed the development would form part of a network that supplies over 10,000 people.

Fireflow Demands

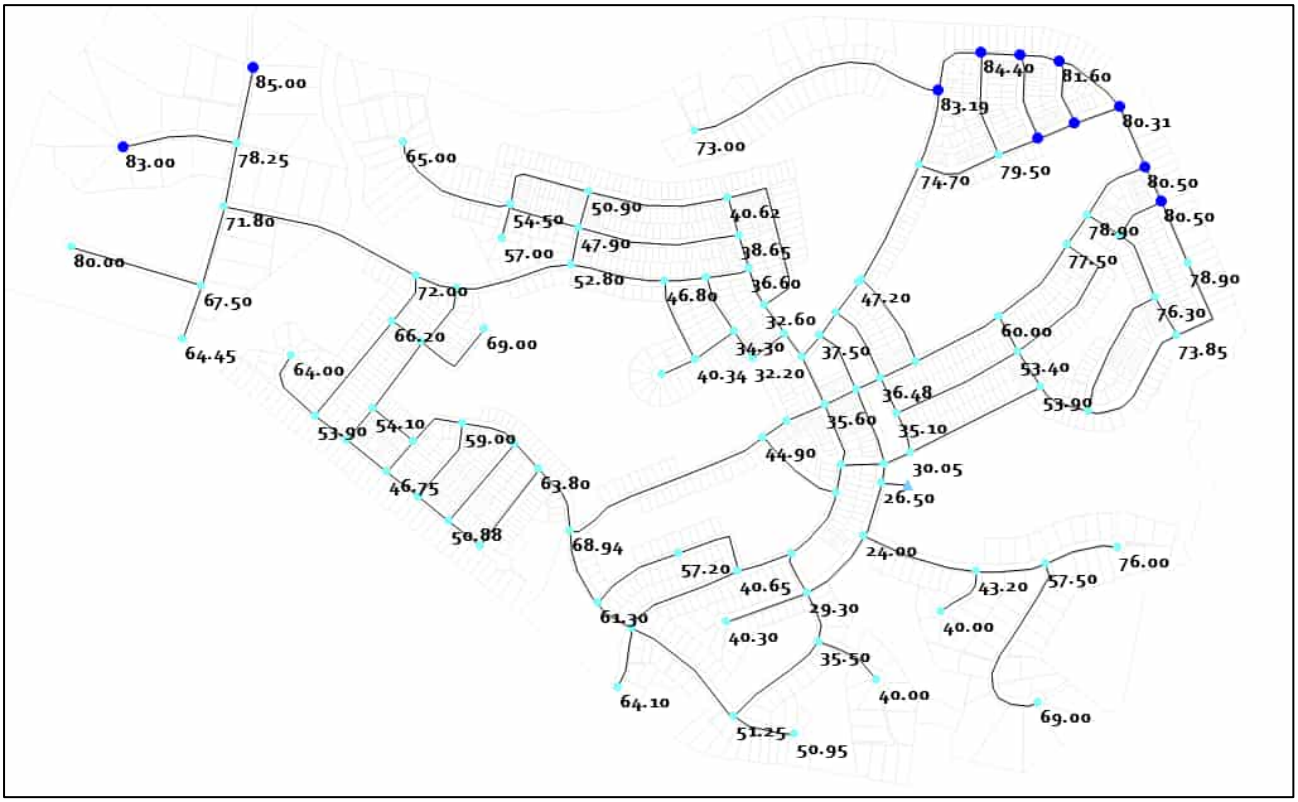
Based on SNZ PAS 4509:2008.

- Residential: FW2, 25 l/s
- Industrial, Commercial: FW3, 50 l/s

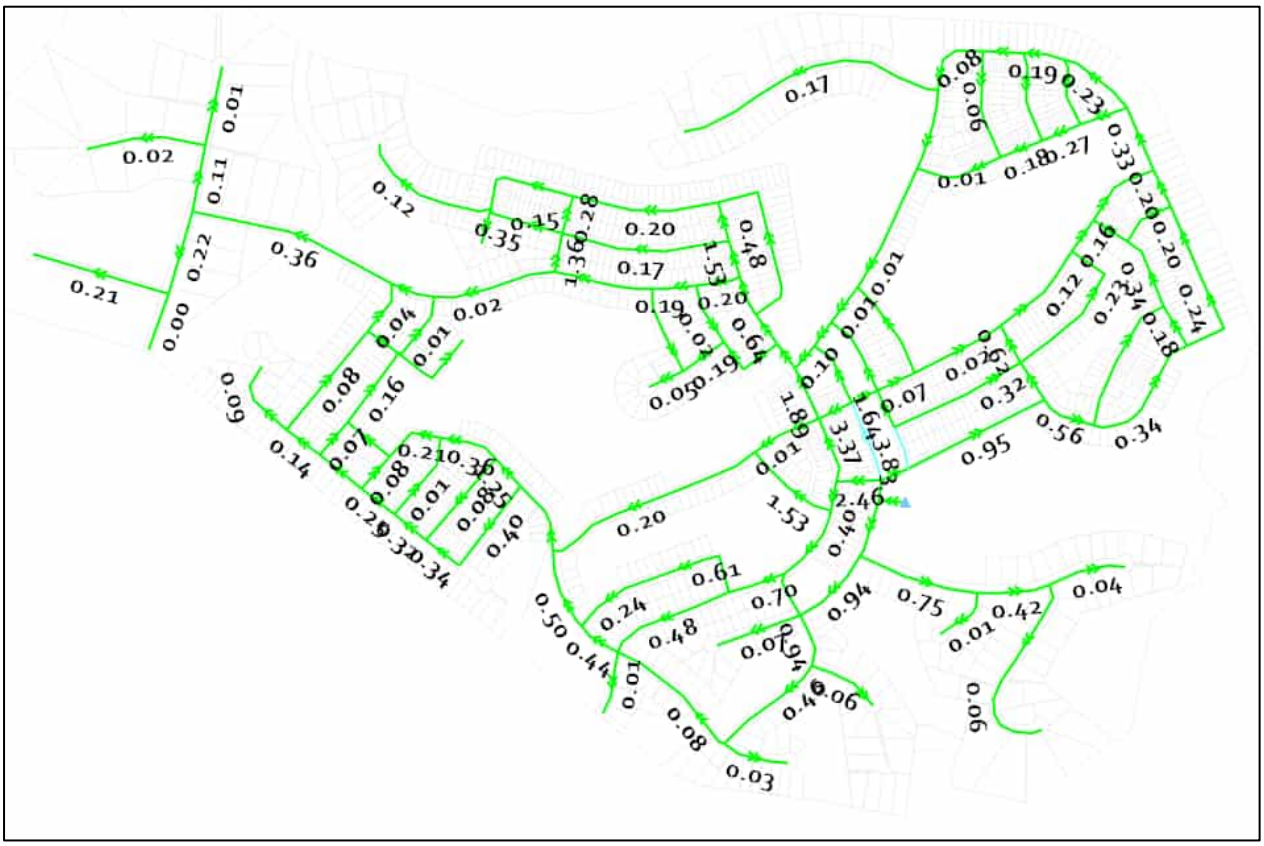
APPENDIX C NETWORK PERFORMANCE



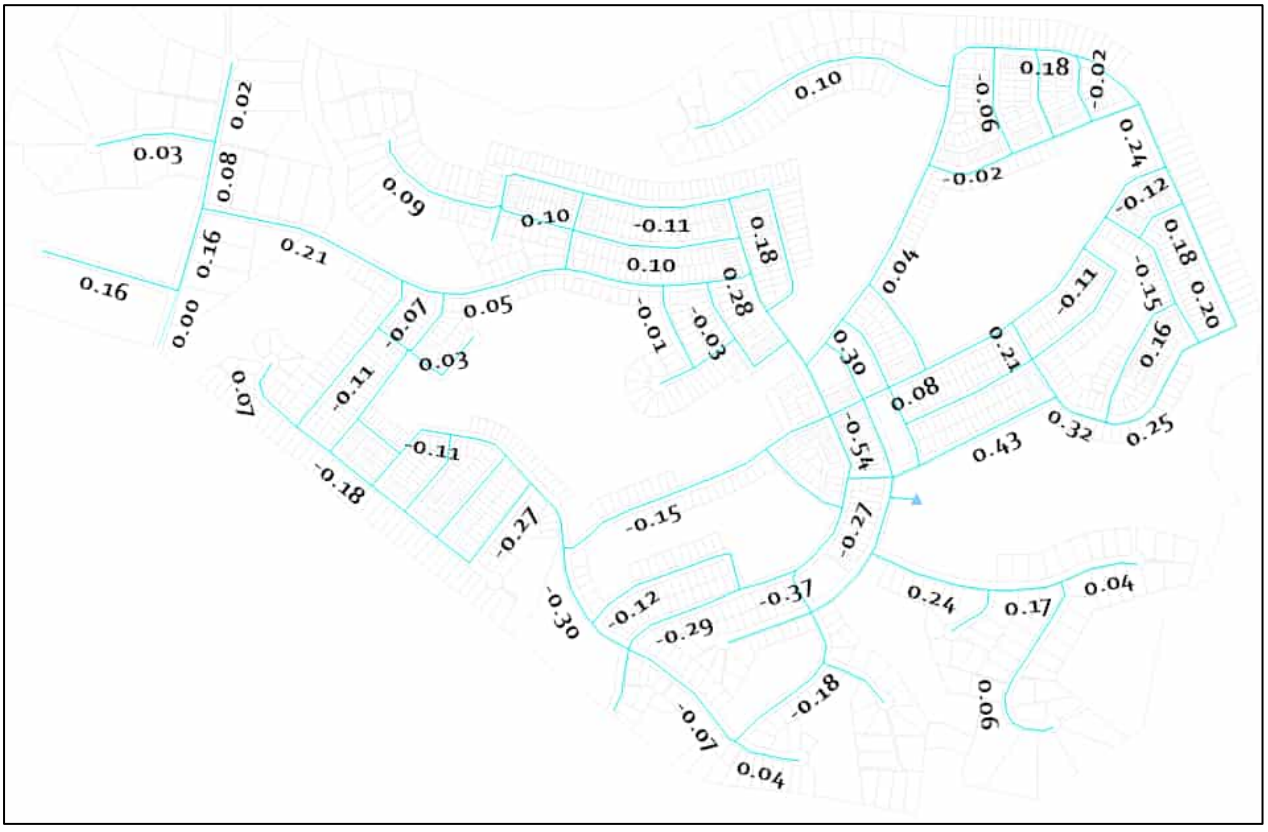
Minimum Pressure (m)



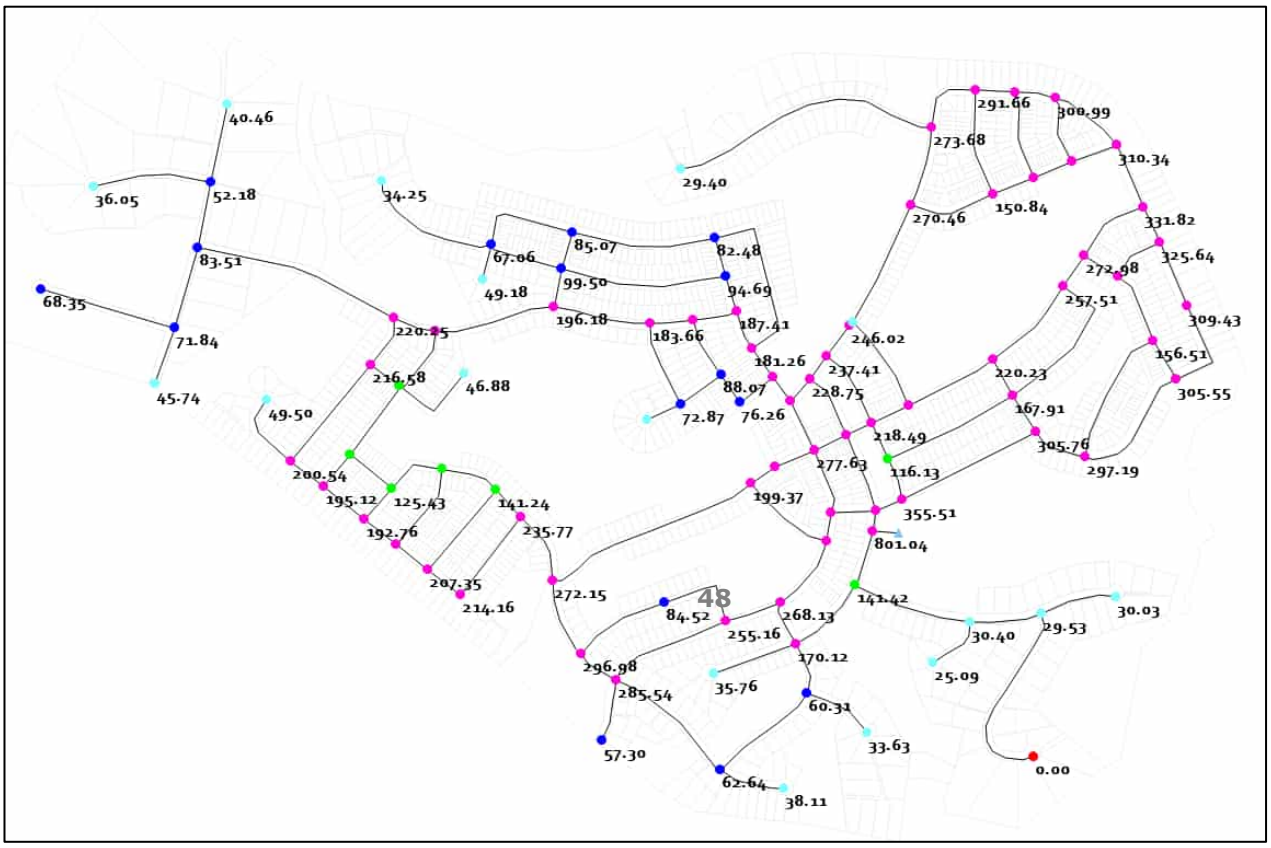
Maximum pressure (m)



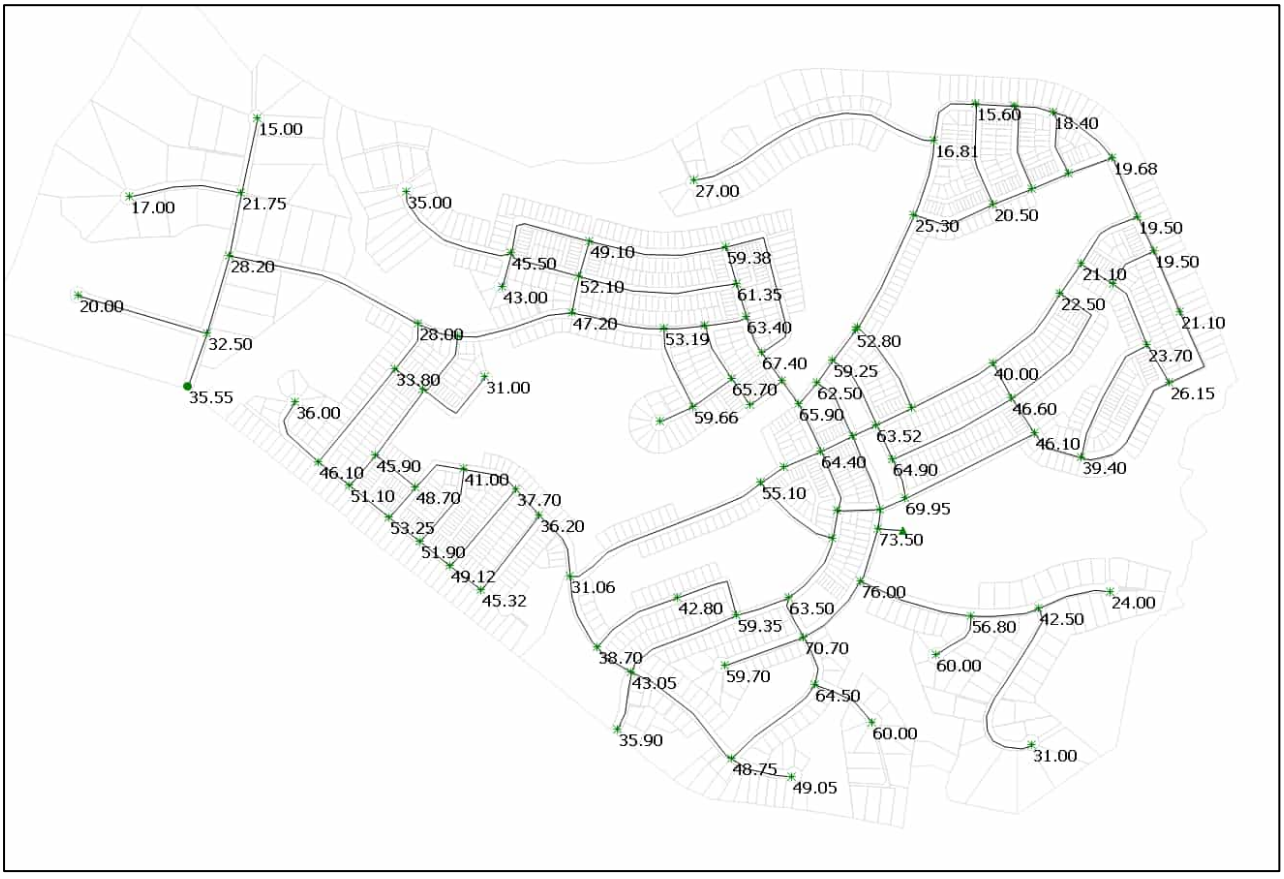
Maximum headloss (m/km)



Maximum velocity (m/s)



Available fireflow l/s



Node elevation RL m (NZVD 2016)