TECHNICAL MEMO

Subject:	**Engineering, Flooding & Infrastructure Kauri Road Whenuapai, Auckland**	Date:	**21/11/2022**
		Memo No:	**44314-ME-C-EG01**
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Memo

1.0 Introduction

A mixture of light industrial and residential subdivision is proposed at 150-152 Brigham Creek Road, 2-10 Kauri Road and 12-18 Kauri Road in Whenuapai, Auckland. This memo summarises the anticipated content of the upcoming engineering and infrastructure report for the proposed development.

The memo is not to replace the engineering report but to provide the expected information in the upcoming engineering report. The content of this memo shall support an application to the Minster for the Environment to have this project referred to an Expert Consenting Panel under the Covid-19 Recovery (Fast-Track Consenting) Act 2020. It is noted that bulk earthworks are progressing under LUC 601332020.

The purpose of this memo is to provide a design brief and the assessment of the earthworks, the flood hazard risk, the infrastructure network connections, and the proposed methods of mitigating the stormwater runoff from the proposed development, in compliance with Auckland Council requirements.

2.0 Site Description

The proposed development will extend over the properties being Lot 6 DP 64526, Lot 4 DP 64526 and ALLOT 525 SO 30573 Waipareira, and LOT 5 DP 64526, ALLOT 481 SO 36839 Waipareira. These properties have a combined area of 145,499m^2.

The subject site is relatively flat with gentle slope towards the south and east of the property for most of the site except for land adjacent to Brigham Creek Road and Kauri Road where the maximum slopes to the roads are 7% and 14% respectively.

A wetland was identified within 150-152 Brigham Creek Road at the south of the site. The wetland drains to a narrow overland flow path which is classified as an intermittent stream. The exiting culvert under Brigham Creek Road conveys the water from this stream and discharges it at the southern section of 155-157 Brigham Creek Road. An existing artificial pond at the upstream of the wetland is proposed to be removed.

Multiple overland flow paths within the subject site cross the southern, eastern, and northern boundaries before discharging to Waiarohia Stream eventually. The site location is shown in Figure 1 below.

Figure 1: Site Location

3.0 Proposed Development

The proposed subdivision is a mixture of light industrial and residential development. The proposal is to create 9 Industrial lots, 273 residential lots, a recreation reserve and two drainage reserves as shown in Figure 2.

Seven public roads a multiple of private accessways are proposed to service the subject development. One of these roads will be a collector road from a future signalised intersection with Brigham Creek Road while the remainder will be local roads. The design of this intersection has been applied for under a separate resource consent application. Two pedestrian paths will link the proposed roads and Kauri Road. Drainage infrastructure and utility services are proposed to service each lot and the proposed roads.

Figure 2: Proposal

4.0 Earthworks

4.1 Proposed Earthworks

The construction of the Bulk earthworks is progressing under the consent LUC 60332020.

Further earthworks are proposed to form the proposed roads and to reshape the lots to the final level as part of this resource consent application. The construction of the earthworks will be carried out in accordance with Auckland Council standards. The proposed earthworks consist of an area of 14.5ha with volumes of approximate 55,580m^3 and 59,260m^3 for cut and fill respectively.

4.2 Sediment and Erosion Control

Erosion and sediment controls will be provided and constructed in accordance with GD05, to minimise effects to downstream environment. These controls shall be reviewed, adjusted, and maintained as the work progresses.

The completed surface will be progressively stabilised to reduce the exposed areas. Detailed sediments and erosion control plans will be included in the engineering report.

5.0 Roading

The proposed public roads consist of 2 lane carriageways, parking bays, footpath with berms to accommodate the landscaping, raingardens and common service trenches. Separate cycleways are

proposed on both sides of the collector road.

No vehicle crossings are proposed from Kauri Road for this development. The existing vehicle crossings from Kauri Road to the subject properties will be removed.

The development will be accessed from the intersection with Brigham Creek Road, which was proposed under a separate consent application.

The road shoulder on Kauri Road and along the eastern boundary of the subject site will be upgraded. New kerb and channel, a 1.8m wide footpath and berms will be part of the upgrade. Pedestrian links from the proposed road within the subject development to Kauri Road are proposed.

Multiple commonly owned access lots (COAL) are proposed to service the development.

Two bus stops are proposed on each side of Kauri Road as per the Traffic Engineer's recommendations. Detailed road design will be included in the resource consent application.

6.0 Wastewater Network

6.1 Existing wastewater

An existing 315mm uPVC gravity public wastewater pipeline that runs through the roundabouts on Brigham Creek Road east, adjacent to Upper Harbour Motorway, is connected to an existing public wastewater pump station. This pump station is located to the upstream of a large box culvert under Brigham Creek Road.

6.2 Proposed Wastewater and Consultation

New wastewater reticulation is proposed to service this development and provide a connection for the future development in neighbouring property to the north of the subject site. A few options were considered to enable the extension of the wastewater network to the proposed development.

Consultation with Watercare confirmed that the existing Brigham Creek Road pump station should have adequate capacity to accommodate the discharge from the proposed development at the time of the construction. However, due to the existing pump station being within the 100-year flood plain with a high flow velocity in Waiarohia Stream, an option for a pipe bridge over this stream has been ruled out. Furthermore, the steam bed level is below the existing 315mm uPVC pipeline, meaning a gravity pipeline which could be thrusted under the stream to the pump station is not an option.

Given the limited cover of the existing box culvert under Brigham Creek Road and the large number of existing underground services within Brigham Creek Road, several options have been identified to service the proposed development. A detailed investigation/hydro-survey to locate the existing services within Brigham Creek Road is currently being undertaken. The best practicable option will be determined when the results of this investigation are in hand.

6.3 Proposed Options

Option 1: **New Pump station and Rising Wastewater Main Under the Stream Bed**

This option consists of the construction of a new pump station within the development and a rising main thrusted under the stream bed as shown in Figure 3. This option appears to be practical as it will avoid clashing with the existing culvert and underground services.

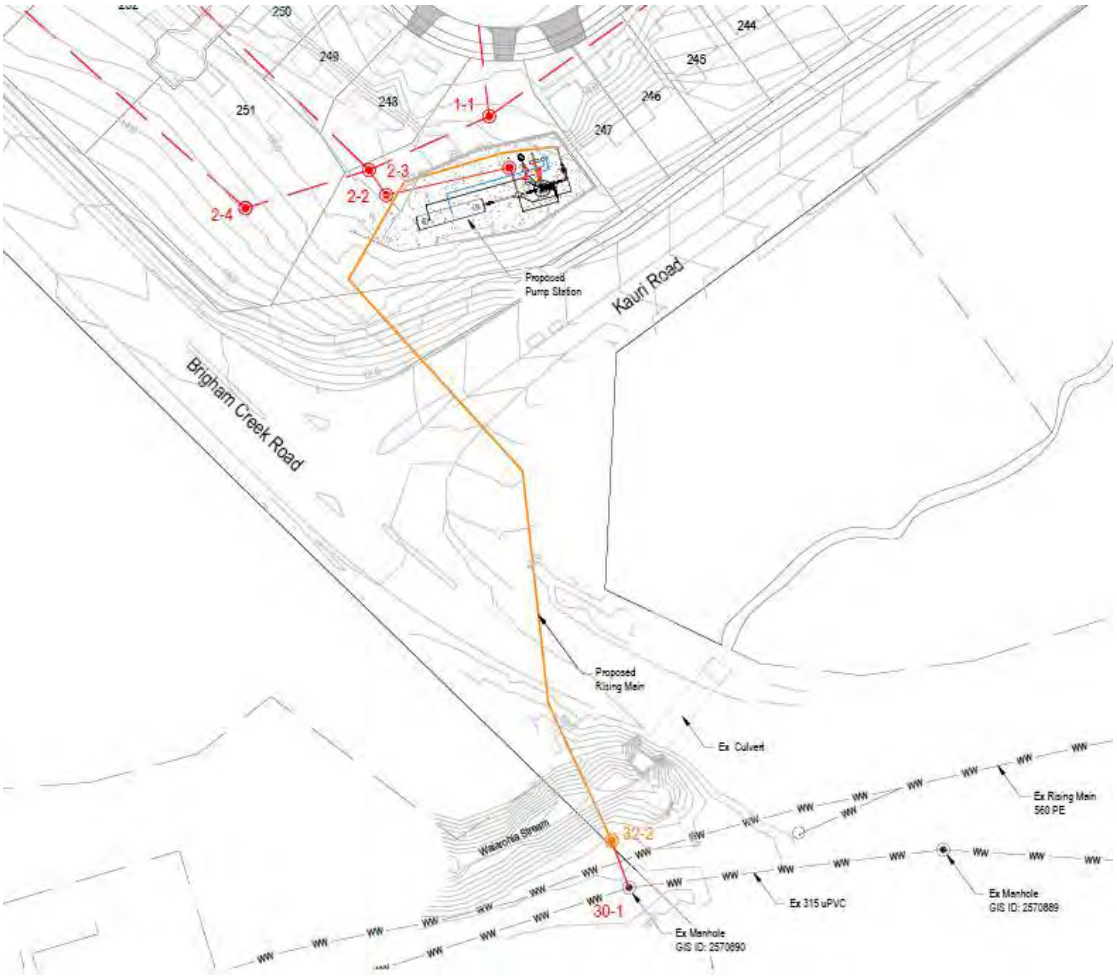

Figure 3: Proposed Wastewater Discharge Option 1

Option 2: **New Pump station and Rising Wastewater Main Above the Box Culvert**

This option consists of the construction of a new pump station within the development and a rising main above the existing box culvert as shown in Figure 4.

This option has more flexibility on gradient and direction changes compared with a gravity line. However a detailed investigation is required to locate all underground services within the pipe route, so that the minimum pipe cover and gradient can be met while avoiding the clash with the existing services.

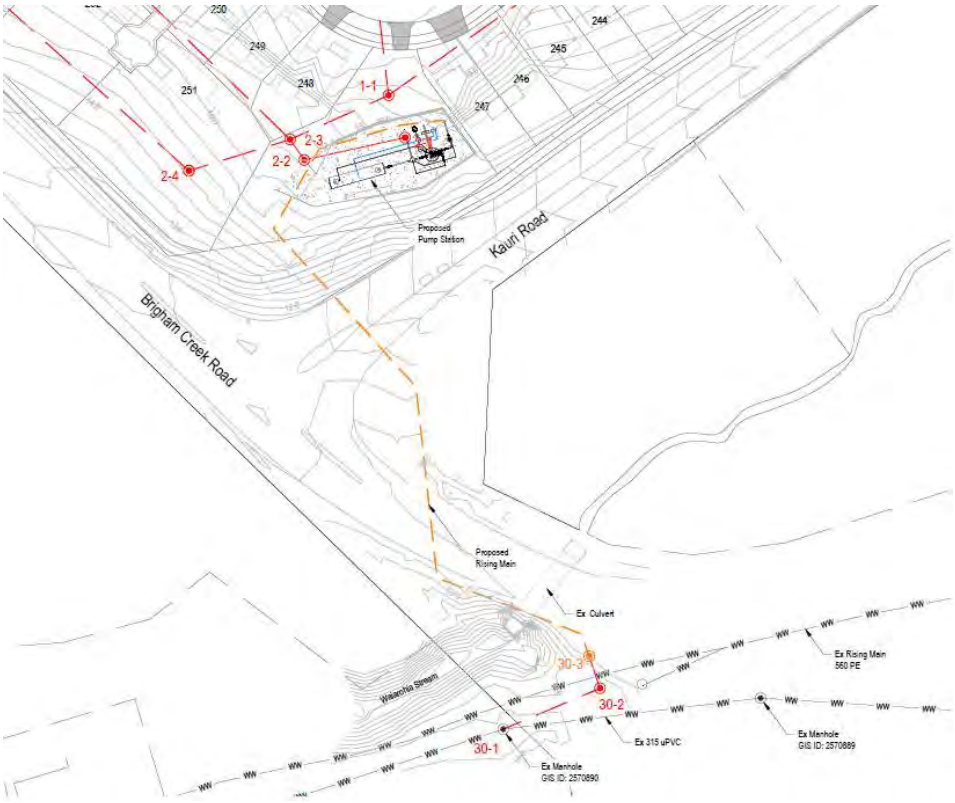

Figure 4: Proposed Wastewater Discharge Option 2

Option 3: **A gravity pipe from the existing 315mm uPVC wastewater pipeline to the proposed development.**

Option 3 consists of extending a gravity pipe with associated manholes, from the existing 315mm pipeline to service the development as shown in Figure 5. This option will not require a new pump station and appears to be the best option from lifelong cost perspective.

However, it may be constrained by the existing underground services. Therefore, this option will be subject to an optimal outcome of the detailed investigation results. Further investigation will be required to determine a clear route to meet Auckland Council Engineering Standards.

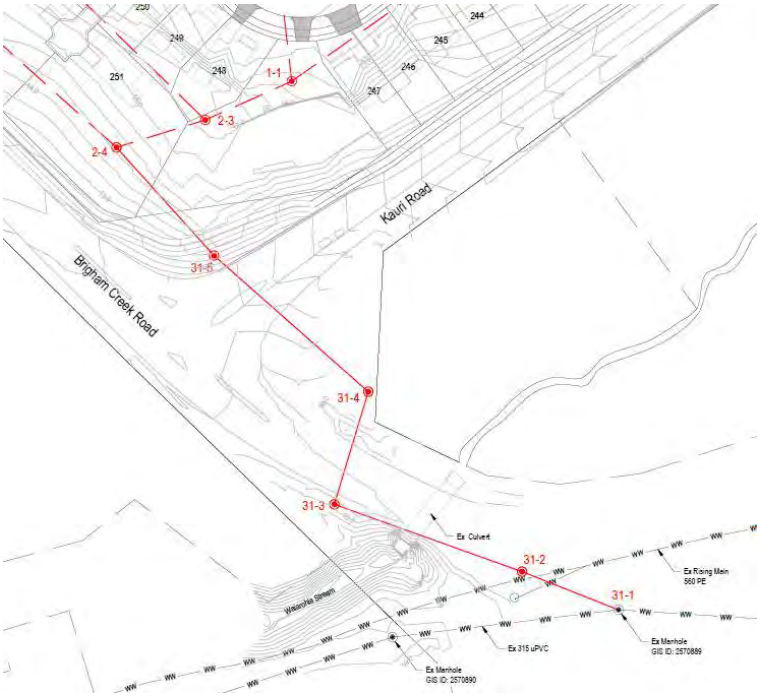

Figure 5: Proposed Wastewater Discharge Option 3

Option 4: **A new pump station as in options 1 and 2 connected to a pump station across Brigham Creek Road**

This option would only be used in the event of all above options are proved not practical. It consists of a fall-back option of pumping the wastewater flow to the proposed pump station in applicant's property across Brigham Creek Road as shown Figure 6.

Figure 6: Proposed Wastewater Discharge Option 4

The above options demonstrate that the proposed development can be serviced with a wastewater reticulation.

7.0 Flood Assessment

Flood assessment was carried out to assess the flood effects on the proposed development at 150-152 Brigham Creek Road, 2-10 Kauri Road and 12-18 Kauri Road, and vice-versa. Both predevelopment and post development situations are assessed for a 1% AEP storm event, using HEC RAS 2D software.

All culverts less than 1500mm in diameter were assumed fully blocked for the entire catchment. The overland flow from a catchment area of approximate 18.20ha will directly affect the subject properties. Additional sub-catchment areas on the southern side of Brigham Creek Road and to the south-west of the Royal New Zealand Air Force Golf Club (RNZAGC) have been included in the model. The impervious areas are considered at the Maximum Probable Development (MPD) scenario for the entire catchment. This allows to take into account the maximum impervious surface limits of the current zone or, if the land is zoned 'future urban' in the Auckland Unitary Plan, the probable level of development arising from zone changes.

The 1% AEP flood results for the predevelopment situation are summarised in Figure 7. The preliminary assessment for the post-development scenario with the preliminary flood depth results are shown in Figure 8.

The pre-development flood assessment results suggest that a portion of the overland flow will enter the subject properties from the RNZAGC to the west and north-west, with an encroachment on the western boundary of 150-152 Brigham Creek Road. The overland flow from RNZAGC with that generated by the subject properties will discharge to Brigham Creek Road (south-west), Kauri Road (east and south-east) and to the property at 20-26 Kauri Road (north) as shown in Figures 1 and 7.

The overland flow from RNZAGC will cross the north-western boundaries of 150-152 Brigham Creek Road and discharge to an existing artificial pond before discharging to an existing wetland at the south-western corner. This overland flow will pond in the wetland until it has reached a RL17.20m before discharging over Brigham Creek Road. The overland flow from the other properties will either discharge to the neighbouring property to north or to Kauri Road where it will pond before crossing the carriageway and discharging to Waiarohia Stream.

The overland flow in the post-development situation will be diverted though the proposed public roads and private driveways within the proposed development. The existing entry and exit points will not be altered. The proposed stormwater network will have the capacity to divert the increase in 1% AEP flow to Waiarohia Stream, to minimise the flooding effects over Brigham Creek Road and Kauri Road carriageways.

Based on the preliminary flood assessment results of the post development, the proposed development will not cause any detrimental effects to the existing overland flow paths or neighbouring properties.

The flood assessment for the post-development scenario is being finalised in compliance with Auckland Council requirements. Recommendations on any appropriate remedial works will be provided to mitigate any detrimental effects for the protection of the proposed development, neighbouring properties, and downstream environment. Predevelopment and preliminary post development flood depths are presented in Figures 7 and 8.

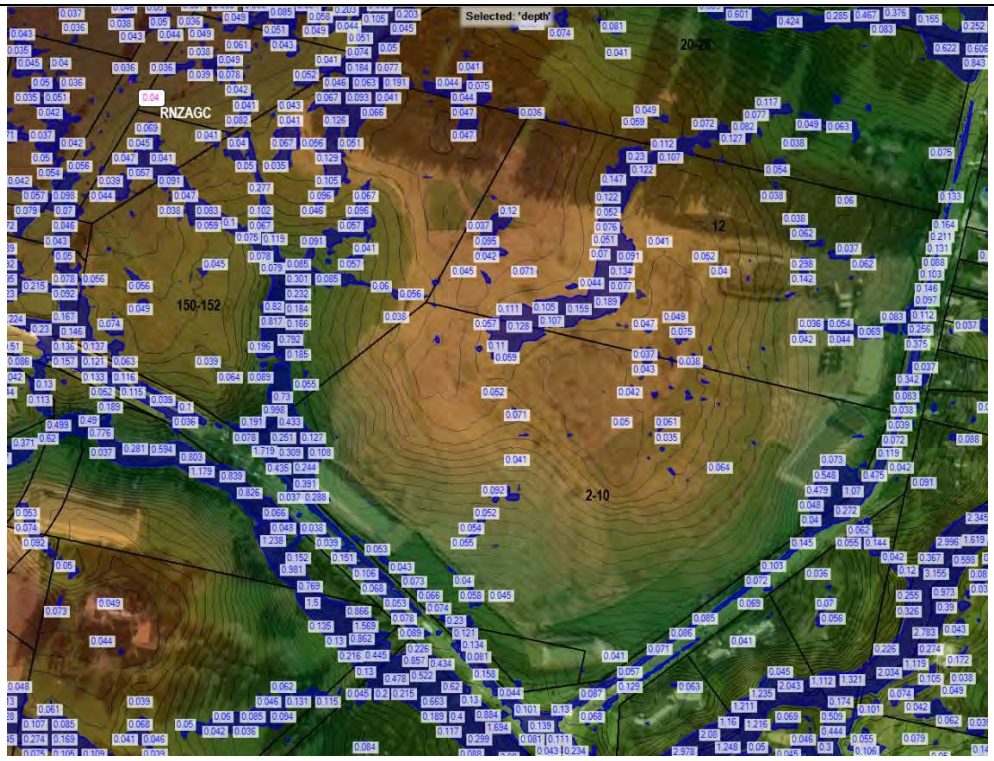

Figure 7: 1% AEP Pre-Development Flood Depths

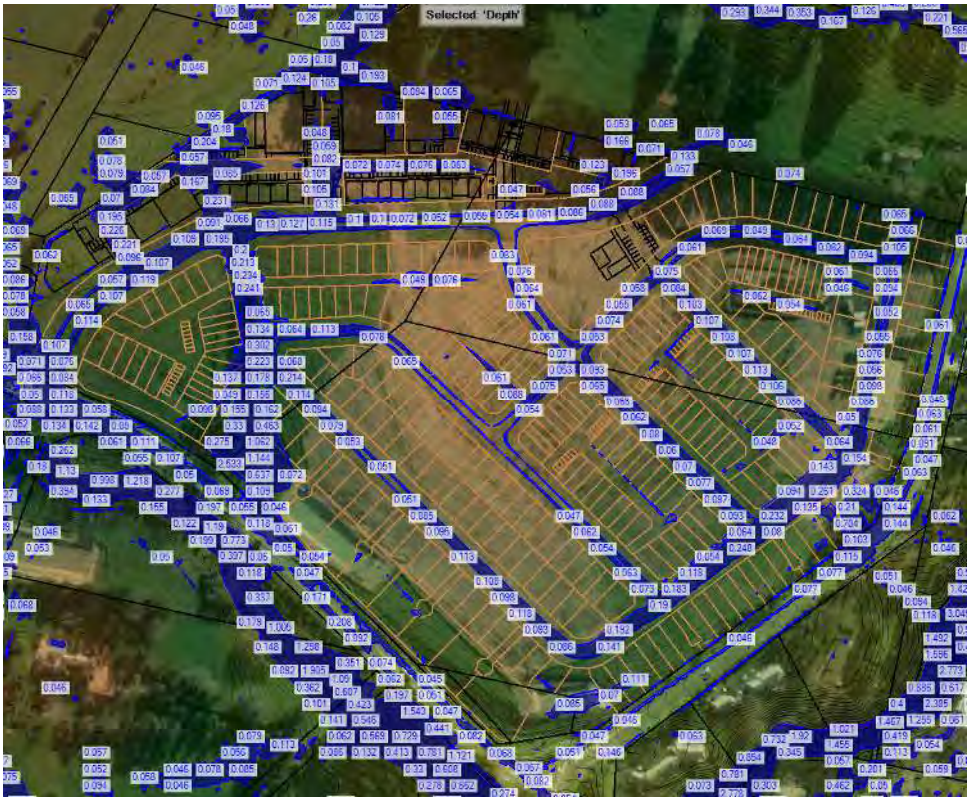

Figure 8: 1% AEP Post-Development Flood Depths

8.0 Stormwater Management

8.1 Existing Stormwater

There is no existing public stormwater reticulation within the site or neighbouring properties. The site is naturally draining to the existing gully and discharge to the Waiarohia Stream or its tributaries by crossing Kauri Road and Brigham Creek Road. A minor existing stream downstream of the existing wetland discharges to an existing culvert under Brigham Creek Road.

8.2 Proposed Stormwater

8.2.1 Stormwater Management Rules

The site is a greenfield development. The proposed stormwater management is proposed to comply with the Auckland Council NDC schedule 4 requirements, Unitary Plan Operative in Part (AUPO).

The proposed public stormwater pipelines shall accommodate the 10% AEP storm event for the Maximum Probable Development (MPD) Scenario. The maximum impervious area is not limited in the light industrial zone while 60% is recommended in the residential zone.

Retention for 5mm runoff depth from the impervious areas and detention for the difference between the pre-development and post-development runoff volumes from the 95th percentile 24 hours rainfall event minus the retention volume shall be provided.

Water quality systems shall be provided to treat the runoff from the impervious area.

The existing and proposed overland flow paths shall be managed to avoid any detrimental effects to the neighbouring properties and to the downstream environment.

8.2.2 Stormwater Network

New public stormwater networks are proposed to convey the 10% AEP flow from the proposed development. The flow from the industrial area with a small portion of the residential area of the subject site will be discharged to the existing wetland. Outlet structures are proposed to minimise the flow effects to the wetland. The flow from the remaining portion will be discharged to Waiarohia Stream through a proposed outlet structure in Esplanade Reserve adjacent to the eastern boundary of 11 Kauri Road.

Scruffy dome manhole inlets are proposed at the outlet of the minor stream and at the ponding area adjacent to Kauri Road, to collect the increased 100yr flow through the proposed reticulation before discharging to the Waiarohia Stream. This will minimise the flooding effects on Brigham Creek Road and Kauri Road carriageways. Energy dissipation at the outlet structures is proposed to minimise scouring.

8.2.3 Stormwater Mitigation

Bioretention (battered raingardens) are proposed for the roads with detention tanks for the commonly owned access lots, to provide the required detention for the difference between the pre-development and post-development runoff volumes from the 95^{h} percentile over 24 hours rainfall.

According to the soakage test results provided by CMW Geosicences, the infiltration rate of the soil is negligible in the subject site. Therefore, the required retention for the impervious area in the road reserve and the COALs, will be taken up by the detention volume.

Retention and Detention volumes shall be provided in stormwater tanks for individual lots. The detention and retention volumes shall be calculated in accordance with GD01 and the Auckland Council Unitary Plan.

8.2.4 Stormwater Treatment

Raingardens are proposed to provide the required treatment. For the accessways in the residential area where the impervious area is over $1000m^2$ or with carparks over 30, stormfilters or similar

devices will be provided to treat the runoff. Stormfilters with Gross pollutant traps or similar devices shall be provided for the industrial lots.

8.2.5 Stormwater Management Plan

The site falls in greenfield category under Auckland-wide Stormwater Network Discharge Consent (NDC). A specific stormwater management plan for the site will be provided separately.

Figure 9: Proposed Stormwater Layout

9.0 Water Supply

Auckland Council's Geomaps show an existing 150AC and an existing 315PE water mains within Brigham Creek Road. Watercare advised that the existing 150AC pipe will be abandoned. Therefore, the proposed pipelines will be extended from the existing 315PE at the proposed road intersection with Brigham Creek Road to service development.

An existing 150AC watermain along Kauri Road extends to the intersection of Kauri Road and Rata Road through neighbouring properties and connect to an existing 180 PE pipe at Rata Road intersection.

Two 250OD PE watermains are proposed at both sides of proposed Road 1 to service the development. These pipes will also provide the capacity for the future development in the neighbouring properties to the north, up to Rata Road.

A new 180PE watermain with fire hydrants is proposed to be installed at the western side of Kauri Road from the existing 315PE at the intersection of Brigham Creek Road and Kauri Road. The new 180PE watermain will temporarily connect back to the 150AC pipe at the north-eastern corner of the site. The existing 150AC pipe within the subject site will be removed after the new 180PE pipe is commissioning. It is assumed that the 180PE, will be extended further in the future during the development of neighbouring properties. The site layout with the proposed watermains is presented in

Figure 10.

Hydrants are proposed within the site at a maximum distance 135m as per SNZ PAS 4509:2008. A hydraulic model carried out by Watershed demonstrates the fire flow capacity of the proposed watermains. Furthermore, fire hazard assessment shall be carried out during the development of individual lots, in future in accordance with SNZ PAS 4509:2008.

Figure 10: Proposed Watermain Layout

10.0 Utilities & Services

Power and telephone services are currently located within Brigham Creek Road reserve in front of the subject site. The power and telephone services will be extended throughout the proposed development to service each Lot.

11.0 Summary

The proposal is consistent with the Auckland General Design Manual and Auckland Code of Practice for Land Development and Subdivision.

Public wastewater reticulations will be extended from the existing wastewater manholes to service the development.

Stormwater networks are proposed to convey the 10% AEP stormwater runoff from the proposed development. The runoff from the impervious area will be treated on site before discharging to the corresponding outlet structure.

Stormwater systems will be provided to mitigate stormwater runoff volume in compliance with the NDC schedule 4 requirements.

The overland flow paths are assessed and managed to minimise detrimental effects to the neighbouring properties and downstream environment. The existing flood hazard risks are not exacerbated.

Public watermains and the utility services are proposed to service the development.

12.0 Limitations

This Memo is prepared for the applicant, Neil Construction Limited, in relation to an application under the Covid-19 Recovery (Fast-track Consenting) Act 2020 for 150-152 Brigham Creek Road, 2-10 Kauri Road and 12-18 Kauri Road in Whenuapai, Auckland. The comments within this Memo are limited to the purpose stated. Cato Bolam accept no liability for the use of this report by any other person that that stated above, or use for any other purpose, and any such person who relies upon any matter contained in this Memo does so entirely at their own risk.

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