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Otaihanga Retirement Village, Paraparaumu

Infrastructure Design Report

Summerset Villages (Paraparaumu) Limited

Document Control

Client:	**Summerset Villages (Paraparaumu) Limited**
Site Location:	**Otaihanga Retirement Village – 65 & 73 Ratanui Road, Paraparaumu**
Legal Description:	**Lot 4 DP 58017, Certificate of Title 29D/823 (65 Ratanui Road)**
	Lot 3 DP 497389, Certificate of Title 734643 (73 Ratanui Road)
CKL Reference:	**A25556**
Office of Origin:	**Auckland**

Authors: **Ash Vodnala** **Senior Engineer**

[redacted]

_____ **Date: 19.10.2026**

Authorised By: **Nikhil Prakash** **Engineering Manager**

[redacted]

_____ **Date: 20.10.2026**

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1. Executive Summary

This report assesses the civil infrastructure required to service the proposed care retirement village at 65 and 73 Ratanui Road, Paraparaumu. The proposed design demonstrates that the development can be serviced with internal roads, stormwater management, wastewater and water-supply infrastructure, subject to the design development and confirmations identified in this report.

The proposed infrastructure has been developed to support a five-stage construction programme comprising 257 villas, a care facility and associated amenities, while responding to key site constraints including the existing drainage corridor, flood-prone areas, groundwater conditions and connections to existing public networks. The proposed approach includes site regrading and earthworks to establish building platforms and road corridors, a private internal road network connected to Ratanui Road, integrated stormwater treatment and attenuation systems, private wastewater reticulation connected to the public network via a centralised pump station, and a reticulated water-supply system capable of meeting both potable and firefighting demands.

Overall, the proposed design demonstrates that the proposed development can be appropriately serviced while managing environmental effects, maintaining infrastructure performance, and providing flexibility for refinement during detailed design and engineering approval.

2. Introduction

This infrastructure report describes the civil engineering design for the proposed retirement village at 65 and 73 Ratanui Road, Paraparaumu. It accompanies the substantive Fast-track application for the necessary resource consents. It outlines the existing setting, proposed earthworks and roads, drainage, water supply and construction staging, and should be read alongside the current masterplan and engineering plans and specialist assessments. Geotechnical and other specialist findings will be incorporated when the final reports for the current proposal are available.

The current design basis is the proposed masterplan and CKL's resource consent engineering plans. Geotechnical investigations inform the description of existing ground conditions.

This memorandum is based on the current design. Detailed dimensions, specifications and final asset schedules will be established through the subsequent engineering design, within the design envelope and performance outcomes assessed in the consent application.

Based on the investigations and proposed design, the report concludes that the proposed development can be appropriately serviced and that the associated civil engineering effects can

be managed through the proposed design measures, staging approach and subsequent detailed design process.

2.1. Statement of Experience

This Report has been prepared by Ash Vodnala who is employed as a Senior Civil Engineer by CKL NZ Ltd, an Engineering Consultancy. Mr Vodnala is based in Auckland. They provide expert advice on civil and land development engineering.

They hold the qualifications of Bachelor of Engineering Technology (Civil) and has experience overseeing the design and construction of civil infrastructure for various retirement village developments. His involvement has included earthworks, roading and three waters infrastructure, coordination with other design disciplines, and construction administration and quality assurance to assess compliance with approved designs and specifications.

2.2. Code of Conduct

While this is not a matter before the Environment Court, Mr Vodnala has read the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note 2023 ('Code'), and has complied with that Code in the preparation of this report.

The data, information, facts and assumptions Mr Vodnala has considered as part of this report are set out in this report. The reasons for the conclusions of the report are also set out in this report. Unless stated otherwise, this report is within Mr Vodnala's expertise, and they have not omitted to consider material facts known to them that might alter or detract from the opinions expressed.

3. Site Background

3.1. Existing Site

The site comprises 73 Ratanui Road and part of 65 Ratanui Road, approximately 12.7 ha in the area considered by earlier site investigations. The final application boundary and legal description should be checked against the survey and land documentation. Ratanui Road forms the southern road frontage. The site has historically been used mainly for pastoral purposes and includes existing buildings, tracks, fencing, ponds and dune landforms.

Ground levels are undulating, with sandy hummocks and low lying areas. An existing open drain runs generally east–west through the site and divides the northern and southern parts of the proposed development. Existing ponds and localised low areas are associated with surface water and flooding. The drain and adjoining low ground are material constraints for earthworks, access, flood conveyance and the proposed stormwater system. The site location is shown in Figure 1 below.



FIGURE 1: SITE LOCATION PLAN (SOURCE: GIS)

3.2. Site Geology

The site lies within the Kāpiti coastal plain and comprises undulating dune landforms with lower-lying interdune areas. Ground conditions generally consist of loose silty sand within the upper 1–3 m, underlain by medium dense to dense dune sands, with localised interbedded silt and clay at depth. Organic silt and peat may occur beneath the existing pond and waterway areas, while undocumented fill may be present around existing and historical farm structures.

Groundwater levels vary across the site, with monitoring indicating average levels of approximately RL 1.8 m in the north and RL 4.3 m in the south. Groundwater may be encountered during pond construction and deeper infrastructure excavations, requiring appropriate excavation support and dewatering measures.

Liquefaction and associated lateral spreading are key considerations for the proposed development. Earthworks, retaining walls and infrastructure design will incorporate the relevant geotechnical recommendations for ground improvement, edge stability and settlement management. The site is considered suitable for development subject to these measures, with geotechnical observation and certification during earthworks.

Refer to Engeo's Geotechnical Investigation Report for further details on ground conditions, groundwater, geotechnical hazards and design and construction recommendations.

3.3. Site Contamination

Investigations have identified localised elevated arsenic in shallow soils associated with treated timber storage and elevated zinc in surface soils within a historical vehicle storage area, west of the shed at 73 Ratanui Road. Based on the limited extent and assessed risks, site soils are considered suitable for the proposed land use, and remedial works are not required.

Earthworks will be managed in accordance with a Site Management Plan addressing sediment discharges to surface water, soil testing requirements and appropriate handling and disposal of excavated material. Site soils are suitable for retention and reuse on-site, with reuse preferred where practicable.

Some tested soils exceed cleanfill acceptance criteria and therefore cannot be assumed suitable for disposal as cleanfill. Any surplus material requiring off-site disposal will be assessed against the receiving facility's acceptance criteria, with additional testing undertaken where necessary. Procedures for managing unexpected contamination will also be included in the Site Management Plan.

Refer to Engeo's Detailed Site Investigation Report for further details on contamination findings and earthworks management recommendations.

4. Proposed Development

The current masterplan proposes a comprehensive retirement village comprising independent living accommodation, a care facility, village amenities and associated supporting infrastructure. The plan set includes an internal road network, pedestrian connections, parking areas, landscaped open space and integrated stormwater management areas. The masterplan schedule records a site area of approximately 127,025 m² and a total building footprint of approximately 34,512 m².

The proposed development is supported by a comprehensive civil infrastructure framework designed to service the completed village and accommodate staged delivery. Key infrastructure elements include earthworks to create building platforms and development levels, an internal private road network connected to Ratanui Road, two road crossings of the existing drainage corridor, stormwater reticulation and management devices, wastewater reticulation and pumping infrastructure, water supply reticulation, and utility service corridors.

The stormwater strategy incorporates piped drainage, bioretention devices, wetlands, drainage corridor enhancement works and overland flow management measures, including a soakage/storage area along the western boundary. Wastewater is proposed to be serviced by a private gravity network draining to a centralised wastewater pump station, which will discharge to the existing public wastewater network. Water supply will be provided from the existing public reticulation in Ratanui Road via a new internal reticulation network designed to meet both domestic and firefighting demands.

The location and design of these infrastructure components have been informed by the site's topography, existing drainage corridor, flood-prone areas, groundwater conditions and utility connection requirements. The infrastructure has been integrated with the proposed masterplan to support efficient staging, minimise construction constraints and ensure each stage of the development can operate independently as it is completed. The proposed staging approach and the infrastructure required to service each stage are described in the following sections.

4.1. Development Staging

The village is proposed to be constructed in five stages, comprising 257 villas in total, together with the main building and amenities. The principal infrastructure required for each stage, including vehicle access, internal roads, stormwater, wastewater and water supply, is outlined below. The proposed staging is indicative and may be refined as the development progresses, provided the overall construction methodology and proposed mitigation measures remain consistent with those assessed, and any associated environmental effects are appropriately managed. Each stage will be provided with operational access and services before occupation.

Stage 1 – 31 ILUs

Stage 1 will establish the site entrance and the main boulevard entrance from Ratanui Road. Stormwater from this stage will discharge through the southern bioretention device and wetland to the existing drain which intersects the site. The drain will be regraded and widened as part of the initial stage to provide the required receiving corridor.

Two new internal roads are proposed to cross the existing drainage corridor that bisects the site. These crossings will be formed by culverts designed to maintain the hydraulic function of the drain while providing connectivity between the northern and southern portions of the village. The communal wastewater pump station is proposed immediately north of the western drain crossing and will ultimately service the entire development. As the pump station forms the primary wastewater servicing infrastructure for all stages, it will be constructed and commissioned as part of Stage 1. The culverts associated with both drain crossings will also be installed during the early works, allowing the remaining crossing works in later stages to be largely limited to road formation and surfacing.

Stage 2 – 59 ILUs, care facility and amenities

Stage 2 will extend development along the western boundary and include 59 villas, the main care facility and a substantial portion of the village amenities. Vehicle access to the main building will be provided via Road 4, connecting from the main access road. Road 4 and its associated water supply and drainage connections will be constructed before the main building is occupied. A transformer will also be installed to supply Stage 2 and a significant portion of the remaining development. The western soakage pond will be constructed during Stage 2 to receive overland flow from neighbouring properties.

Stage 3 – 57 ILUs

Stages 3 will comprise primarily residential villas, cottages and townhouses and their associated roads, drainage and utility extensions. The permanent services required for each stage will connect to the infrastructure established in the earlier stages.

Stage 4 – 54 ILUs

Stage 4 will comprise 54 independent living units and associated roads, drainage, utility services and landscape works. Infrastructure will connect to the reticulation networks established during the earlier stages of development.

Stage 5 – 57 ILUs

Stage 5 will complete the retirement village with the final 57 independent living units. Separate construction access to this stage will be maintained from Ratanui Road throughout its construction. As the drain widening and culverts at both road crossings will be completed during the early works, the remaining crossing works for this stage will principally involve the road formation and surfacing.

5. Earthworks and Erosion & Sediment Control

5.1. Earthworks Approach and Objectives

Earthworks have been developed to support the staged construction of the proposed retirement village while responding to the site's physical, environmental and geotechnical constraints. The principal objectives of the earthworks strategy are to:

- Facilitate the staged delivery of the development, enabling infrastructure and building platforms to be constructed progressively while minimising the extent of exposed earthworks areas at any one time;
- Maximise the reuse of suitable site-won materials and minimise the requirement for off-site disposal and imported fill where practicable;
- Establish development platforms, road corridors, drainage infrastructure and stormwater management areas that integrate with the proposed masterplan;
- Respond to geotechnical conditions and recommendations relating to ground improvement, settlement, slope stability, groundwater and seismic performance;
- Achieve ecological and environmental outcomes through the integration of stormwater management features, drainage corridor enhancements and progressive site stabilisation; and
- Minimise erosion and sediment effects through the implementation of staging, construction sequencing and erosion and sediment controls in accordance with the Greater Wellington Regional Council Erosion and Sediment Control Guide for Land Disturbing Activities in the Wellington Region.

The proposed earthworks methodology has been developed having regard to these objectives and forms the basis of the earthworks, erosion and sediment control, roading and servicing strategy described in the following sections.

Earthworks will, where practicable, be programmed to avoid the winter period when the risk of erosion and sediment discharge is generally elevated. Should winter earthworks be required, these will be undertaken in accordance with a Winter Earthworks Management Plan prepared prior to commencement of works. The plan will outline staging, monitoring, contingency measures and any additional erosion and sediment controls required for winter construction. To further reduce risk, it is proposed that the maximum exposed earthworks area during winter be limited to 3,000 m² at any one time, unless otherwise approved through the certified Winter Earthworks Management Plan. Progressive stabilisation of completed areas will be undertaken throughout the construction period.

Earthworks are proposed across the site to form the village building platforms, internal roads, drainage corridors and stormwater management areas. The bulk earthworks will be undertaken in two separate phases, as shown on the earthworks staging plan in Figure 2. These bulk earthworks phases are distinct from the five development stages described in Section 4.1. The current overall cut and fill plan (drawing A25556-2100) estimates approximately 43,736 m³ of cut and 118,599 m³ of fill, giving a net fill requirement of approximately 74,863 m³. This confirms that the current design requires imported fill after allowing for reuse of suitable site-won cut. The stated cut and fill volumes are solid measures, and the net balance should not be treated as a final construction import quantity.

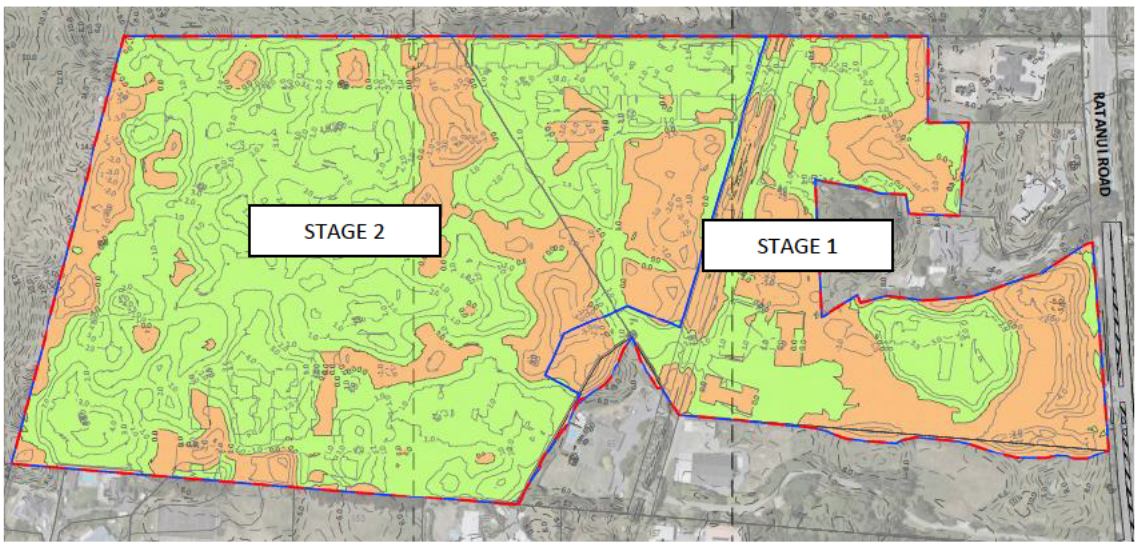


FIGURE 2: EARTHWORKS STAGING PLAN

The proposed earthworks volumes compare an assumed existing subgrade surface (existing ground less an average 250 mm of topsoil) with an assumed proposed subgrade surface (finished ground less 350 mm). Detailed design will refine road gradients, platform levels, drainage cover, batter and retaining interfaces, and the location and capacity of site-won cut reuse. The refined model will also account for variable topsoil depths, unsuitable or

contaminated soils, any ground improvement, material suitability, bulking and compaction, and the requirements of the final geotechnical advice.

Earthworks will be undertaken in accordance with the requirements of the relevant archaeological authority and any associated conditions. These requirements may include archaeological monitoring of specified works, procedures for the management of archaeological material, and implementation of an Accidental Discovery Protocol. If archaeological material, kōiwi, artefacts or other cultural material are encountered during construction, works in the affected area will cease and the approved Accidental Discovery Protocol will be followed. Refer to the archaeological assessment and management plan prepared by Clough & Associates for further details regarding monitoring requirements and management procedures.

The total estimated earthworks volumes and areas associated with the works are presented in Tables 1a and 1b below.

TABLE 1A: ESTIMATED EARTHWORKS AREAS AND VOLUMES – STAGE 01

AREA (Ha)	Stage 01
Works Area (Ha)	3.3864
VOLUMES (m^3)	
TOPSOIL	
Topsoil Stripped @ 250mm	8466
BULK CUT TO FILL	
Cut	22469
Fill	18369
Balance (Cut)	*4100*

TABLE 1B: ESTIMATED EARTHWORKS AREAS AND VOLUMES – STAGE 02

AREA (Ha)	Stage 02
Works Area (Ha)	8.9981
VOLUMES (m^3)	
TOPSOIL	
Topsoil Stripped @ 250mm	22495
BULK CUT TO FILL	
Cut	21267
Fill	100230
Balance (Fill)	*78963*

Site Preparation and Material Reuse

Site preparation will include removal of vegetation, redundant site features and existing structures where they fall within the proposed works, followed by topsoil stripping and inspection of the exposed subgrade. Excavated sand will be assessed for suitability for reuse as engineered fill; placement may require moisture conditioning and appropriate compaction control. Areas of soft, organic, disturbed or otherwise unsuitable material will be identified during investigation and construction and treated in accordance with the final geotechnical design. The extent of stripping and unsuitable material removal remains to be confirmed.

The suitability of excavated material for reuse or off-site disposal will also be informed by the final contamination assessment. Any affected material will be managed under the approved soil management requirements. The proposed fill balance does not assume that all material excavated from the site can necessarily be reused as engineered fill.

Ground Improvement and Seismic Performance

The proposed buildings, roads, retaining structures and buried services will be designed and constructed in accordance with the ground conditions, seismic performance criteria and recommendations established by Engeo Limited (Engeo). Ground improvement will be implemented where required by the geotechnical assessment, including localised undercut and replacement, engineered granular layers beneath building platforms, and measures to address differential settlement and lateral spreading, particularly near the existing drain and proposed stormwater areas.

The extent, depth, material specifications and verification requirements for ground improvement will follow Engeo's Geotechnical Investigation Report and will be incorporated into the detailed earthworks and infrastructure design. The earthworks model and import allowance will account for these measures without double counting bulk fill. Geotechnical observation, testing and certification will verify that the completed works achieve the required performance criteria.

Retaining Walls and Batters

Finished levels have been developed to provide suitable gradients for residents and drainage while managing the transition to adjoining land and existing water features. Height differences will be accommodated by batters, retaining walls or a combination of the two where space allows. The proposed locations and indicative heights will be shown on the coordinated earthworks and retaining plans. Boundary treatments, drain and pond banks, wall foundations and any works extending onto neighbouring land require confirmation against the final survey, land arrangements and Engeo's stability and seismic advice.

TABLE 2: RETAINING WALL SUMMARY

Wall	Full alignment length (m)	Maximum height shown (m)
RW 1	42.65	0.96
RW 2	174.60	1.88
RW 2B	35.65	1.22
RW 3	106.36	2.06
RW 3B	28.29	2.80
RW 4	363.21	2.43
RW 5	59.84	1.69
RW 6	289.93	1.35

Drain and Pond Interfaces

The initial works include regrading and widening of the existing drain. Earthworks will also form the proposed stormwater devices and their inlet and outlet interfaces. Potential construction effects associated with sediment discharge, temporary changes to drainage, groundwater and the stability of drain and pond margins will be managed through appropriate sequencing, erosion and sediment controls, temporary drainage and dewatering measures. The final geotechnical assessment will confirm any required ground improvements, seepage controls or setbacks. With these measures in place, any adverse effects associated with the drain and pond works can be appropriately mitigated.

5.2. Erosion & Sediment Control

5.2.1. General

An erosion and sediment control plan has been developed for the proposed extent and sequence of land disturbance. The principal controls are to keep clean runoff clear of disturbed ground, limit exposed areas, convey dirty water to appropriately sized treatment devices and stabilise completed surfaces progressively. The existing drain, ponds and downstream receiving environment require particular protection during earthworks and service crossings.

5.2.2. Proposed Controls

The proposed erosion and sediment control toolbox implemented for all stages/phases of earthworks associated with this consent are as follows:

- Sediment Retention Ponds and Decanting Earth Bunds
  Sediment retention ponds (SRPs) and decanting earth bunds (DEBs) will be used as the primary sediment controls for the site to treat and remove suspended sediment from runoff from the earthworks area.

SRPs comprising a sediment forebay and main pond will be constructed to provide treatment of sediment laden water during the earthworks period and prior to discharging to the natural environment.

The ponds shall be constructed and operational prior to the commencement of bulk earthworks and protected from sediment runoff using appropriately placed silt fences during its construction. The SRPs have been designed in accordance with best practice in with the Erosion and Sediment Control Guideline for Land Disturbing Activities in the Wellington Region. Temporary perimeter fencing shall be installed around all SRPs to control unauthorised access.

A DEB is an impoundment area formed by a temporary bund to provide an area where ponding can occur and sediment can settle before runoff is discharged from site. DEBs can be used for areas up to 3,000m^2. DEBs will be utilised on site for areas from which it is not possible for runoff to be diverted to the sediment retention ponds. DEBs will be sized for 2% of the contributing catchment area (i.e. 20m^3 per 1,000m^2 catchment) and will be installed for soil disturbing activities, including the use of T-bar and pulley systems to raise the decants prior to/during rainfall.

A summary of the SRP design is provided in Table 3 below and design calculations for the SRPs and design details included in the Appendix B.

TABLE 3: SRP DESIGN SUMMARY

SRP	CATCHMENT AREA (Ha)	DIMENSIONS (L x W x D m)	DESIGN VOLUME (m^3)
01	2.6	61.9 x 16.8 x 1.65	780
02	5.0	81.6 x 21.7 x 1.65	1500
03	3.7	71.7 x 19.3 x 1.65	1100

- Chemical Treatment
  The proposed SRPs and DEBs shall be treated by PAC (or similar) flocculant via a rainfall activated dosing system to provide a high level of sediment removal from the expected runoff prior to discharge.

- Silt Fences/Filter Socks
  Silt fences will be installed around the site perimeter to control sediment discharges from the site and will also be installed around the SRP formation/working areas. Mulch-filled filter socks will be used where required, particularly at the site access point.

- Super Silt Fences
  Super silt fences will be installed adjacent to existing streams and riparian margins that are to be retained. Utilising the more robust super silt fencing along stream/riparian edges will ensure that sediment laden water is not able to enter the existing

watercourses. Super silt fences will be retained in place until satisfactory site stabilisation is achieved on surrounding areas.

- Stabilised Construction Access
  A stabilised construction access as per the Erosion and Sediment Control Guideline for Land Disturbing Activities in the Wellington Region, will be installed as a primary access point to the site. The position will be confirmed onsite with the Contractor at the time of works. Facilities to enable wash down of vehicles i.e. water blaster as a minimum, will be used to ensure vehicles' tyres are cleaned down prior to exiting the site onto the adjacent roads to ensure sediment is not transported offsite. The dirty water from the wash down areas will be graded back to within the subject site and directed to a SRP or DEB for sediment control.

- Clean and Dirty water diversion bunds
  Clean water diversion drains/bunds will be installed around the upslope perimeter of the proposed earthworks area to direct clean water from upslope away from working areas. Where necessary due to gradients >2%, these will be lined with a suitable geotechnical cloth to ensure no transportation of sediment via erosion of the bund face occurs.
  Dirty water diversion drains will be installed around the downslope perimeter of the device catchment and within the site as required to direct sediment laden runoff to the sediment retention ponds and to ensure the catchments to each device are as per the consent and designs.

- Contour Drains
  Within the main earthworks areas, temporary excavated channels or ridges, or a combination of both, shall be constructed as required along the contour within the earthworks area to slow and de-energise surface flow that is draining down disturbed slopes. This will reduce the erosive power of runoff and aid in the diversion of sediment laden water to the SRPs. Contour drains shall be installed as required prior to inclement weather.

- Retention of Existing Vegetated Areas
  Where possible and where the construction methodology allows, existing vegetation will be maintained over the site to minimise the amount of bare earth exposed at any one time or to provide a buffer/filtration strip to the runoff from upper catchments.

- Site Stabilisation

Site stabilisation will reduce the time bare earth is exposed to erosive forces and ability for generation of sediment laden runoff. Perimeter controls will remain in place until adequate stabilisation is achieved over the site and satisfies both the Engineer and the Council monitoring officers. Once the subgrade levels are achieved, rapid site stabilisation will be undertaken and shall comprise:

- Re-topsoiling in conjunction with grass seeding to establish grass cover over completed earthworks areas.
- Where necessary, areas will be rapidly stabilised by applying straw mulch in conjunction with topsoiling and grass seeding.
- Placement of aggregates as roading and drainage progresses.

The proposed erosion and sediment control measures have been developed in accordance with the principles and recommendations of the Greater Wellington Regional Council Erosion and Sediment Control Guide for Land Disturbing Activities in the Wellington Region and represent a best-practice approach to managing erosion and sediment effects associated with the proposed works. The erosion and sediment control strategy incorporates a combination of treatment devices, diversion controls, progressive stabilisation, staged construction and ongoing monitoring to minimise sediment discharges to the receiving environment. Having regard to the scale, duration and nature of the proposed earthworks, the controls are considered appropriate to manage the potential effects of construction activities and achieve a high standard of environmental protection throughout the development works.

Refer Engineering drawings in Appendix A and calculations in Appendix B for further details.

5.3. Earthworks/Civil Works and Erosion & Sediment Control Methodology

The proposed erosion and sediment control strategy has been developed to support the staged earthworks programme and ensure runoff from all active construction areas is appropriately managed throughout the development. Three sediment retention ponds (SRP1, SRP2 and SRP3) are proposed as the primary treatment devices, servicing catchments of approximately 2.6 ha, 5.0 ha and 3.7 ha respectively. Dirty water diversion drains will direct runoff from disturbed areas to the appropriate treatment device, while clean water diversion bunds will prevent runoff from undisturbed catchments entering earthworks areas. Two decanting earth bunds are also proposed within the southern catchment where site topography prevents runoff from draining to SRP1. Additional controls including stabilised construction entrances, stockpile protection, perimeter controls and progressive stabilisation will be implemented throughout construction. The proposed methodology aligns with the staged development approach and incorporates erosion and sediment control measures consistent with industry best practice and the recommendations of the Greater Wellington Regional Council Erosion and Sediment Control Guide for Land Disturbing Activities in the Wellington Region.

5.3.1. Stage 01 - Southern Catchment and Existing Drain Widening

SRP 1 will be established in the proposed southern wetland area to treat sediment-laden runoff from a substantial portion of the Stage 1 earthworks south of the drain. Two DEBs will serve the parts of this work area that fall away from the entrance road high point and do not drain to SRP 1. Dirty water channels and diversion bunds will be adjusted as the road and platform grades are formed. Drain widening and regrading works will be undertaken with flows temporarily diverted through a diversion channel sized to convey the 1-in-20-year event. These works will be scheduled for the summer months, when the intermittent stream is expected to be dry or have very low flows. Drain works, road crossing culverts and the permanent southern bioretention and wetland works will be sequenced so that runoff from exposed ground continues to receive treatment during the changeover.

5.3.2. Stage 02 - Western and Northern Works

SRP 2 is proposed within the proposed northern wetland footprint to treat runoff from the Stage 2 bulk earthworks while the western part of the village is developed. The temporary pond will remain operational until its disturbed catchment is stabilised, or another effective treatment arrangement is in place. It can then be decommissioned to allow the permanent northern wetland and its discharge arrangement to be completed. The western soakage pond and its role in receiving neighbouring overland flow will be coordinated with this sequence.

5.3.3. Stages 3 and 4 Northern Catchment

SRP 3 will serve the remaining northern earthworks catchment during Stages 3 and 4. Its contributing area and the dirty water diversions will be updated as the internal roads, villa platforms and permanent drainage network are constructed and stabilised. SRP 2 will only be decommissioned when runoff from areas still under construction can be safely managed by SRP 3, another approved control or the completed permanent system.

5.3.4. Stage 05 – Southeastern Catchment

A reduced or relocated SRP 1 will remain available to treat runoff from the Stage 5 works south of the drain. Its revised location and size will respond to the finished Stage 1 contours and the constructed southern wetland. The transition from the initial SRP 1 arrangement to the Stage 5 arrangement will maintain sediment treatment while the wetland is completed and brought into operation. Stage 5 access and drainage works will be sequenced to keep clean runoff separate from active earthworks.

The earthworks staging and ESC plans will set out the catchment boundaries, pond and bund capacities, outlets, diversion changes and criteria for converting or removing each temporary device. The construction programme may require relocation or resizing as contours change, while maintaining treatment for the active catchments. The preliminary SRP catchment areas and volumes shown on the current drawings will be checked for each stage, including the smaller Stage 5 SRP 1 arrangement.

5.4. Monitoring and Maintenance

Monitoring of the erosion and sediment control measures will typically be undertaken by the Contractor's site project manager/ foreman with compliance monitoring undertaken by the Council Site Environmental Monitoring Advisor (EMA). It is expected that monitoring will also be undertaken by the Consultant engineer. Monitoring and maintenance will typically include:

- Inspection of all perimeter controls including the silt fences followed by removal of any sediment accumulations and repair to silt fences where required.
- Inspection of the SRPs and DEBs to check operating levels/ volumes and rainfall activated flocculation systems followed by removal of sediment accumulations (from both the forebay and main pond) to maintain operating volumes as well as any required maintenance to the flocculation system. Check emergency overflow spillways to ensure there are no impediments and protective lining is adequate
- Inspection of the SRP/DEB discharge points to assess any discharges/ accumulations of sediment and discolouration of water.
- Review of weather forecasts to programme/stage the works around any forecast inclement weather i.e. minimise area of stripping/excavation and subsequent basecourse preparation where poor weather is forecast, and make the site safe prior to rain including the installation of temporary contour drains.

It is expected that the Contractor will generally undertake inspections of the erosion and sediment controls as part of operation of the site with increased monitoring undertaken prior to any inclement weather.

Where monitoring identifies the need for any further controls, coordination of such works will be undertaken between the Contractor and Consultant engineer in liaison with the Council Site Representative/EMA to ensure that sufficient controls are being implemented throughout the earthworks/site works operation.

5.5. Earthworks Risk Assessment

Due to the site's large catchments, sandy dune soils and proximity to riparian margins, there is a risk of sediment loss from the site that has the potential to discharge into the receiving environment even with the implementation of sediment controls during earthworks. This will be directly influenced by characteristics of the respective earthworks areas, including catchment lengths, slopes, treatment device efficiencies and works duration. Table 4 identifies the principal earthworks risks and the specific avoidance, mitigation, monitoring and contingency measures that will be implemented to manage those risks. With these measures in place, any residual adverse effects from erosion and sediment discharges are expected to be appropriately mitigated.

TABLE 4 – EARTHWORKS RISKS AND MITIGATION

Factor	Risk	Mitigation
Proximity to riparian margin	Sediment laden runoff enters existing watercourses and ultimately the estuarine environment, impacting on aquatic flora and fauna; large storm event breaches site works	Install robust super silt fences along riparian margins and maintain vegetated buffer strips where practicable. Regularly inspect and monitor discharge points for evidence of sediment-laden runoff or visible sediment plumes. If a sediment plume is observed, immediately investigate and isolate the source, implement additional erosion and sediment controls as necessary, and monitor downstream conditions.
Poor erosion and sediment controls and lack of maintenance	Poor implementation or under performance of erosion and sediment controls may contribute to increased sediment yield or non-control of runoff; poor management of PAC dosing systems leading to over or under dosing or discharge of high PAC rates to receiving environment	Undertake regular monitoring and maintenance on a daily basis/prior to forecast inclement weather to ensure all controls are in place and operating efficiently. Rectify issues promptly. Check PAC dosing system regularly and particularly following rainfall, monitor SRP storage volume clarity and undertake testing to review dosage rates.
Steep slopes	Greater risk of erosion or instability during rainfall inundating or overloading sediment controls	Line steeper channels with geotextile where >2% and use check-dams, install intermediary controls such as contour drains and drop-out pits to break up slopes and reduce flowpath lengths.

Catchment length	Increased flowpath length creates greater opportunity for erosion and sediment transport due to higher flows and greater energy within.	Reduce catchment lengths in larger areas through use of contour drains or temporary bunds during inclement weather to break up catchments, create localised impoundment areas/drop out pits to drop sediment loads prior to reaching the SRPs/DEBs and cut off runoff.
Works duration	Increased construction period may raise net sediment yield where earthworks areas are exposed for longer than anticipated	Maximise productivity to minimise time sites are open. Progressively stabilise completed earthworks areas with either topsoil/grass or rapidly stabilise where necessary with straw mulch and hydroseeding.

6. Construction Management Plan

6.1. General

Construction will be undertaken in stages, generally following the development staging described in Section 4. Before works commence, the appointed Contractor will prepare a site-specific Construction Management Plan (CMP) confirming the programme, work areas, temporary facilities and procedures for managing construction effects. The CMP will be coordinated with the erosion and sediment control measures described in Section 5 and updated as the works progress.

6.2. Construction Access and Traffic Management

Construction vehicles will access the site from Ratanui Road using designated entrances. Haul routes will generally follow the proposed internal road corridors. A Construction Traffic Management Plan will confirm access arrangements, vehicle routes, delivery movements and any temporary traffic controls required for works within or near Ratanui Road. Safe access for existing road users, pedestrians and emergency vehicles will be maintained.

6.3. Construction Hours, Noise and Dust Management

Construction hours will comply with the applicable consent conditions. The Contractor will manage noise and vibration through the selection and maintenance of plant, the location of stationary equipment and the scheduling of higher-impact activities. Exposed ground and haul routes will be monitored for dust, with water application, speed controls or other measures used as required to prevent dust leaving the site.

6.4. Site Establishment, Material Storage and Deliveries

The Contractor will identify areas for site offices, parking, equipment, stockpiles and deliveries within the active construction area. Materials and stockpiles will be located away from the existing drain, overland flow routes and neighbouring properties where practicable, and protected from erosion or uncontrolled runoff. Deliveries and imported fill will be programmed to limit queuing on Ratanui Road.

6.5. Excavation, Dewatering and Temporary Works

Excavations for the wastewater pump station, emergency storage, drainage networks, culverts and stormwater management areas may require temporary support and groundwater control. The Contractor will develop excavation, shoring and dewatering methods with regard to the geotechnical conditions and nearby infrastructure. Any water removed from excavations will be managed and treated as required before discharge. Temporary diversions will maintain flows through the existing drain during the drain widening and culvert works, as described in Section 5.3.1.

6.6. Protection of Existing Services and Adjacent Properties

Existing services will be identified and verified before excavation in their vicinity. The Contractor will protect services that remain operational and coordinate any required diversions or connections with the relevant network operators. Construction methods near site boundaries will consider ground movement, vibration, drainage and access effects on adjacent properties. Pre-construction condition surveys and monitoring will be undertaken where warranted.

6.7. Monitoring, Communication and Complaints Management

The Contractor will undertake regular inspections of construction controls and keep records of maintenance, incidents and corrective actions. The CMP will identify responsibility for monitoring, Council liaison and communication with neighbouring properties. A contact point and complaints register will be maintained so that concerns can be investigated and addressed promptly.

7. Roading

7.1. Existing Site Characteristics

The village has road frontage to Ratanui Road, which provides the connection to the surrounding public road network. The existing site is characterised by undulating dune terrain and an open drain crossing the proposed internal road network. The proposed access points and internal road arrangement are shown on the road layout overview and detailed plans (drawings A25556-3000–3002). Existing traffic conditions, frontage geometry, sight distance requirements and the effects of traffic generated by the village have been addressed in the Stantec New Zealand (Stantec) Integrated transport assessment.

7.2. Site Access and Internal Roads

The road layout provides a main village entrance from Ratanui Road. Road 1 forms the principal internal route across the site, linking the entrance to the central village areas and connecting with Roads 2–5, which provide access to the residential precincts and the main building. Road 4 provides access to the main building from Road 1. The road network includes two crossings of the existing drain; the proposed culverts are intended to be installed during the early works so the subsequent stages can connect across the drain. The access points, road alignments, pedestrian connections and parking interfaces are illustrated on drawings A25556-3000–3002. Vehicle tracking, emergency and service access, and the detailed entrance arrangements have been assessed within the transport assessment and coordinated masterplan drawings.

7.3. Ratanui Road Upgrade

The village access to Ratanui Road will be designed with the associated crossing, pedestrian and road safety treatments required by the transport assessment and the road controlling authority. The road layouts (drawings A25556-3000–3002) show the internal road network and its interface with Ratanui Road. The extent and configuration of the frontage improvements,

including kerb and channel works, pedestrian facilities, road widening, line marking and associated road safety treatments, have been outlined in Stantec's integrated transport assessment, with the final layout to be confirmed through the detailed design process.

7.4. Road Geometry and Surface Drainage

The proposed long sections (drawings A25556-3100–3101) show the vertical alignment of Roads 1–5 and their relationship to existing ground. The road profiles have generally been designed with a target minimum longitudinal grade of 0.5% to support constructable grading, reduce the risk of surface-water ponding and, critically, provide sufficient cover for stormwater and other underground services. Road low points, gradients, pipe cover and outfall levels will be checked together as the surface and drainage design is refined.

Typical cross sections on drawings A25556-3200–3201 show a 6.5 m carriageway for the main portion of Road 1 and for Road 3, and 5.5 m carriageways for Roads 2, 4 and 5 and other sections of Road 1. Accessways are typically 4.5 m wide, with a typical accessway cross section also provided in the plans. The sections show nominal 2% crossfall, with kerb and channel or nib kerb arrangements appropriate to the road and footpaths where indicated. The wider Road 1 section drains towards kerbs on both sides; other sections generally use a single crossfall. Footpath widths and gradients will be checked against the agreed accessibility and client requirements.

Overall, the proposed access arrangements and internal road network provide a practical framework for servicing the retirement village and accommodating residents, visitors, service vehicles and emergency access requirements. The roading layout has been integrated with the proposed earthworks, stormwater infrastructure and development staging to provide access and servicing throughout the construction and operational life of the development. Detailed road geometry, access design and any frontage improvements required within Ratanui Road will be confirmed through the detailed design process and informed by the findings of the transport assessment.

8. Stormwater

8.1. Site and Constraints

The existing site comprises undulating dune land with numerous low-lying depressions. Runoff currently ponds and infiltrates in these areas, while other parts of the site drain to the intermittent channel that bisects the development and ultimately connects to Mazengarb Stream. The existing channel is shown on the KCDC GIS Three Waters Services Map in Figure 3. There is no formal site-wide piped stormwater network. Two overland flow paths enter from neighbouring land near the western and southwestern boundaries, where existing depressions provide storage and infiltration. The development levels and drainage design must accommodate these external flows as well as the channel through the site.



FIGURE 3: KCDC GIS THREE WATERS SERVICES MAP

8.2. Stormwater Servicing Approach

A number of stormwater management approaches were considered during development of the proposed design. Key objectives included maintaining pre-development hydrological performance where practicable, achieving water-quality treatment, providing flood attenuation, accommodating external overland flows and integrating stormwater infrastructure with the proposed masterplan and site constraints.

The adopted approach comprises piped reticulation draining to bioretention devices and wetlands, supported by overland flow paths and storage areas integrated within the site layout. This approach was selected as it provides treatment, attenuation and flood-management benefits while integrating efficiently with the proposed earthworks and landscape design.

Alternative measures such as widespread rainwater harvesting, distributed rain gardens and infiltration-only systems were also considered, but not considered necessary as primary stormwater management devices due to the scale of the development, the need to accommodate external catchment flows, variable infiltration performance identified across the site, and the requirement for centralised treatment and attenuation facilities.

The adopted stormwater management system is described below and should be read in conjunction with the CKL Stormwater Management Report and associated flood modelling assessments.

8.3. Proposed Stormwater System

The proposed village will have a privately owned piped network for primary drainage, with the roads and designated overland flow routes providing secondary conveyance when the pipe capacity is exceeded. Roofs, roads and other paved areas will drain to the relevant northern or southern stormwater management area. Each area combines bioretention for treatment and runoff retention with downstream wetland storage for extended detention and attenuation. Controlled outlets discharge to the existing channel. Stormwater outlet calculations are provided in Appendix C. The indicative drainage layout is shown on drawings A25556-4000–4002, with the proposed pipe long sections on drawings A25556-4100–4101.

The southern bioretention and wetland, regrading of the central channel and culverts for both road crossings are required in the initial works to service Stage 1. The northern stormwater management area will be in place before the contributing stages are occupied. The western boundary storage and soakage area is required with Stage 2 to accommodate overland flow from neighbouring properties. Temporary drainage and erosion and sediment controls will remain operational until the corresponding permanent devices and conveyance paths are available. The proposed finished contours are shown on drawings A25556-2001–2002.

The pipe routes, diameters, gradients and invert levels shown on the civil drawings are indicative. Network sizing and levels will be refined together with the finished surface, device and outlet design. Road low points, secondary flow paths, building floor levels and both channel crossings will be checked against the updated hydraulic model.

8.4. Proposed Stormwater Management

The stormwater management system combines water quality treatment, runoff retention, extended detention and flood attenuation. Bioretention devices will treat runoff and provide infiltration to contribute to retention of the first 15 mm of rainfall from connected impervious areas. The northern and southern wetlands will provide extended detention of runoff associated with one-third of the two-year ARI rainfall event, equivalent to approximately 23.3 mm of rainfall including the adopted climate change allowance, with controlled release over 24 hours. The wetlands will also attenuate larger storm events before discharging to the existing drain. Device sizing, levels and outlet arrangements are set out in the CKL Stormwater Management Plan.

Flood modelling has informed the proposed ground levels, wetland storage, outlet arrangements and provision for external overland flows. For the 1% annual exceedance probability event including climate change, the SMP reports that modelled flood-level increases are generally less than 10 mm, with reductions around the modified western boundary storage areas. Localised exceptions, particularly along the eastern boundary, are identified in the SMP and assessed in the separate Flood Risk Assessment and boundary flood memorandum. The western storage and soakage area will accommodate runoff entering from neighbouring land and maintain the flood-storage function of the existing depressions.

The proposed approach aligns with the stormwater management objectives of the KCDC Land Development Minimum Requirements 2022 through integrated treatment, infiltration, attenuation and management of primary and secondary flows. The SMP identifies a primary piped network designed for the ten-year event including climate change, supported by secondary overland flow paths to safely convey flows during larger storm events.

9. Wastewater

The wastewater servicing assessment has been undertaken in accordance with the Kāpiti Coast District Council (KCDC) Land Development Minimum Requirements (LDMR), NZS 4404:2010, and WSA 04 – Sewage Pumping Station Code.

9.1. General

9.1.1. Reference Documents

Reference has been made to:

- "65 and 73 Ratanui Road Development Impact Assessment", prepared by HAL Consulting Ltd (HAL) in July 2024. This report summarises the constraints of the existing public wastewater network. It utilises the existing hydraulic model of the Paraparaumu and Waikanae wastewater network to assess the impact of the proposed development.

9.1.2. Existing On-Site Wastewater

The existing sheds on 73 Ratanui Road are not expected to have wastewater generating fixtures or on-site effluent disposal system. However, any on-site treatment and disposal systems shall be decommissioned.

9.1.3. Existing Public Wastewater

As shown on Figure 4, an existing public gravity wastewater network is located within Ratanui Road to the southeast of the site.

There is an existing 100mm Ø PVC connection to a public manhole (ID: KWWN004403) which provides the current wastewater connection point for 73 Ratanui Road.

There is also a private lateral connection serving 81 Ratanui Road. This connection is shown outside the boundary of the subject site on KCDC GIS. However, it has been suggested that portions of this private pipe has been installed partially within 73 Ratanui Road. This connection shall be located at detailed design and relocated if necessary.

From the proposed connection point, wastewater flows west via gravity before discharging to the Ratanui Pump Station (PSP0004). PSP0004 subsequently pumps wastewater toward the Paraparaumu Wastewater Treatment Plant.

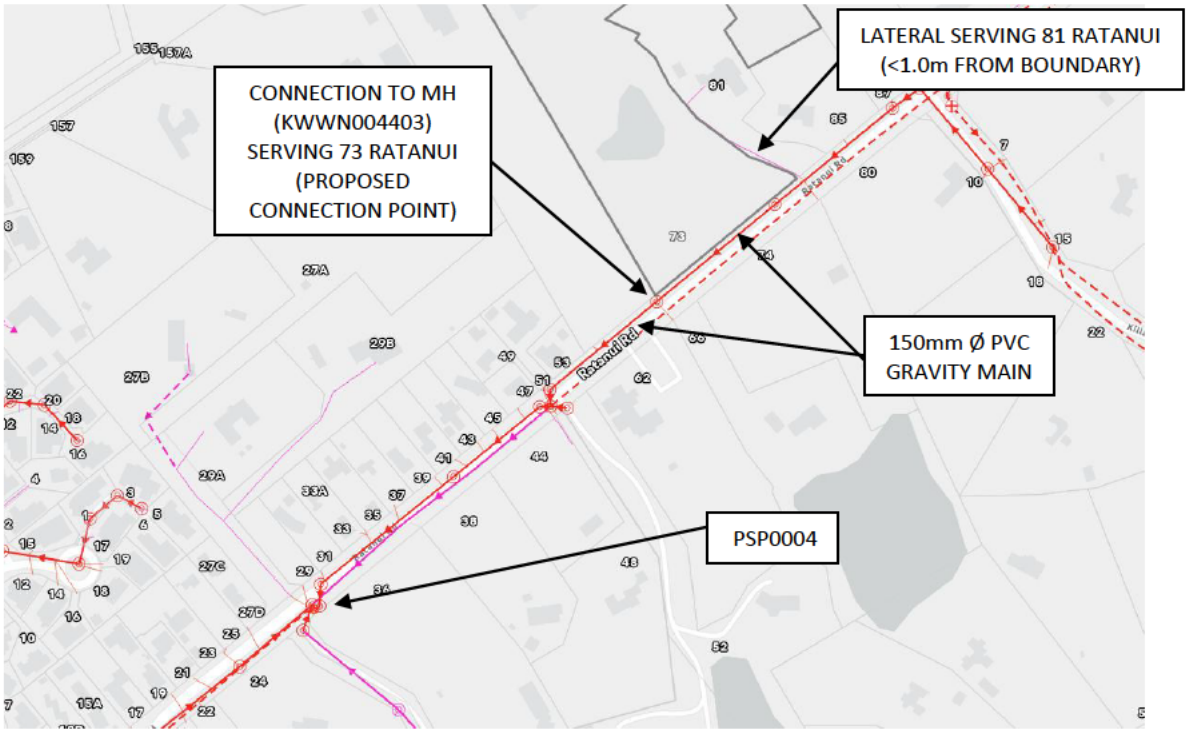


FIGURE 4: EXISTING PUBLIC WASTEWATER RETICULATION (KCDC 3WATERS GIS)

9.1.4. Public Reticulation Capacity – Modelling

The HAL Development Impact Assessment was prepared for KCDC to determine the existing constraints on the wastewater network and demonstrate the effect of the proposed development. The modelling utilised the existing hydraulic model of the Paraparaumu and Waikanae wastewater network and then compared pre- and post-development peak wet weather flow (PWWF) conditions during a 5 year ARI design storm. The modelling allowed for the upgrade of a section of downstream pipe from 225mm to 300mm Ø, which occurred in 2024.

The modelling identified the following key outcomes:

- A development PWWF of approximately 5.9 L/s was adopted, based on an earlier development masterplan.
- The capacity of the pumps within PSP0004 was modelled as 35 L/s, compared with a total downstream PWWF of 42.4 L/s under the post-development scenario. Therefore, PSP0004 is predicted to operate above its nominal pumping capacity during peak conditions. However, storage available within and upstream of the pump station attenuates the peak flow.
- Minor surcharging occurs within the downstream public network under the pre-development scenario, primarily as a result of backing up from PSP0004. The addition of development flows increases the extent of downstream surcharging. However, no uncontrolled wastewater overflows were predicted and the overall risk of overflow was assessed as low.

HAL concluded that, based on a development PWWF of 5.9 L/s, the downstream wastewater network has sufficient capacity to accommodate the proposed development.

The modelled downstream surcharge within the pipe based on the post-development flows to PSP0004 during a 5 year ARI design storm is shown in Figure 5.

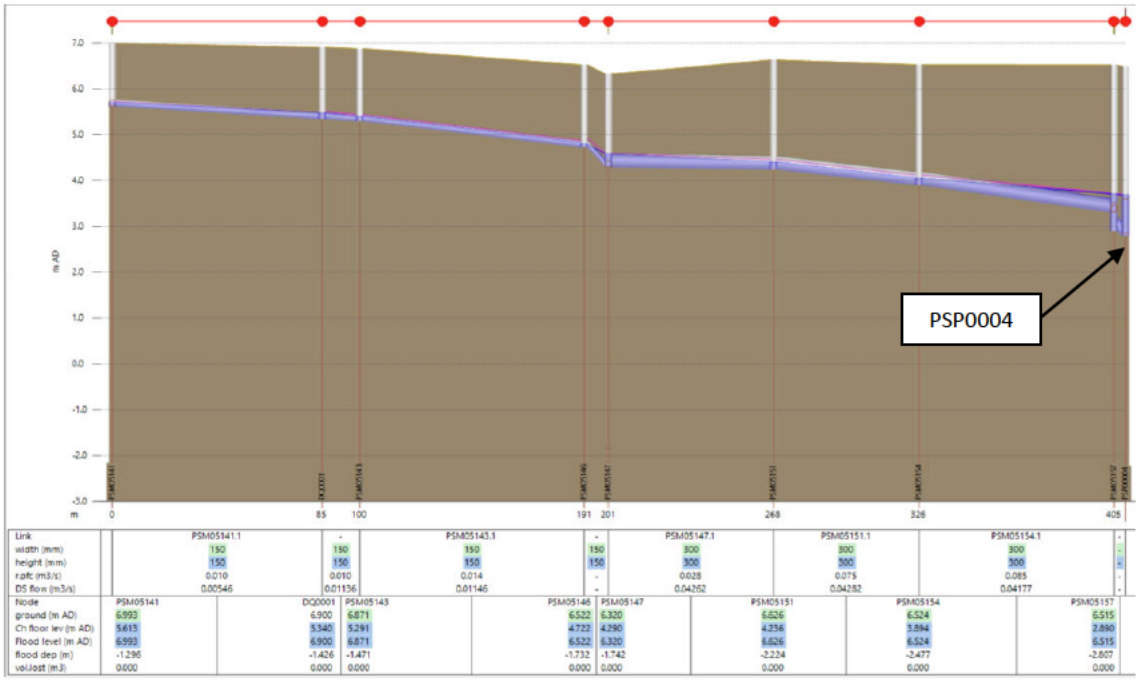


FIGURE 5: MODELLED POST-DEVELOPMENT SURCHARGE WITHIN DOWNSTREAM WASTEWATER NETWORK (HAL DEVELOPMENT IMPACT ASSESSMENT, 2024)

The peak flow hydrograph at PSP0004 is also shown in Figure 6. The graph demonstrates a brief exceedance in pump station capacity during the PWWF event. However, as summarised within the HAL report, this exceedance will be attenuated within the existing network storage, no uncontrolled wastewater overflows were predicted, and the overall risk of overflow was assessed as low. Therefore, the minor surcharging is considered acceptable.

This conclusion was supported by KCDC, who met with CKL on the 10th of September 2026. They confirmed that they would be accepting of any flow rates less than or equal to the modelled PWWF of 5.9 L/s. Flows greater than this would require additional modelling prior to detailed design to confirm surcharge levels remain within tolerable levels.

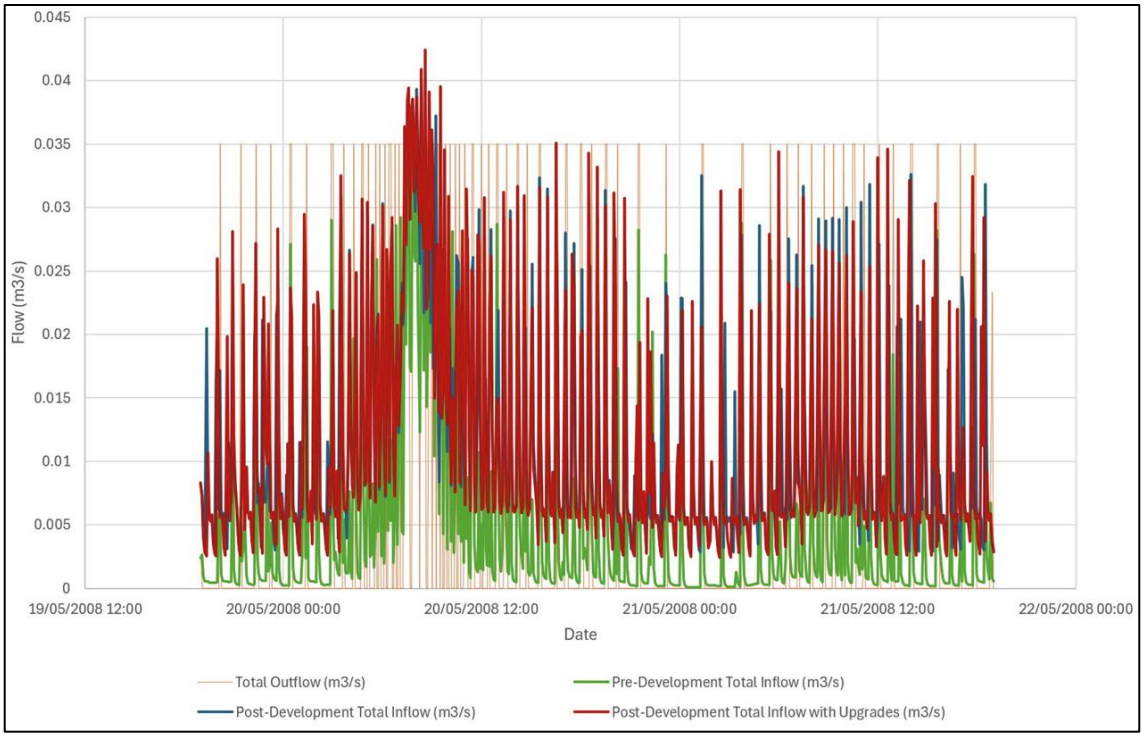


FIGURE 6: PSP0004: MODELLED PRE AND POST DEVELOPMENT INFLOW/OUTFLOW (HAL DEVELOPMENT IMPACT ASSESSMENT, 2024)

9.1.5. Wastewater Demand

The development comprises five stages. For servicing purposes, the site can generally be divided into northern and southern wastewater catchments separated by the central stormwater corridor:

- Northern Catchment: Stages 2, 3 and 4.
- Southern Catchment: Stages 1 and 5.

Wastewater demand has been calculated using:

- residential occupancy of 1.3 persons per dwelling
- care unit/serviced apartment occupancy of 1.0 person per unit
- wastewater generation of 263 L/person/day for residents in villas (75% of water consumption assumption)
- wastewater generation of 180 L/person/day for residents in care units
- wastewater generation of 50 L/person/day for staff
- dry-weather diurnal peak factor of 2.5
- wet-weather factor of 2.0 for gravity reticulation

An additional average allowance of 40 person equivalent (PE) has been included within Stage 2 to allow for staff working at the care centre. It has also been assumed that there will be an average of 45 visitors to the site, split between the five stages, as guided by the HAL design flow assumptions (and the water supply assessment described in Section 10.1). These assumptions

are considered conservative. Higher staff or visitor occurrences may occur, but any increase in flow is considered to be marginal compared to the total wastewater demand and will be encompassed by the assumed peak factor.

Table 5 summarises the average dry weather flow (ADWF) and peak flows from the development based on a fully reticulated gravity network.

TABLE 5: WASTEWATER DEMAND ASSESSMENT (ASSUMING FULL GRAVITY NETWORK).

Stage	Residential dwellings	Care / serviced units	Staff / Visitors	Population Equivalent (PE)	ADWF (m^3/day)	PWWF (L/s)
Stage 1	30	–	9	48	10.7	0.6
Stage 2	59	90	49	216	38.8	2.2
Stage 3	57	–	9	83	19.9	1.2
Stage 4	54	–	9	79	18.9	1.1
Stage 5	57	–	9	83	19.9	1.2
Total	**257**	**90**	**85**	**509**	**108**	**6.26**

The resulting total design flows for the full gravity system are:

- ADWF: 108 m^3/day, equivalent to approximately 1.25 L/s.
- PDWF: approximately 3.13 L/s.
- PWWF: approximately 6.26 L/s.

Refer to Appendix D for wastewater demand calculations.

9.1.6. Key Constraints

Ground investigations indicate predominantly fine sandy soils, generally loose to medium dense at shallower depths, with groundwater encountered at approximately 2.1 m to 5.0 m below existing ground level.

Existing and proposed ground levels generally fall toward the central stormwater corridor. In particular, the southern catchment falls away from the existing public wastewater infrastructure in Ratanui Road. Consequently, servicing the entire development directly to the public network by gravity is not practicable.

A road and culvert crossing is also required across the central stormwater corridor between Stages 1 and 2. Wastewater infrastructure will be routed to avoid this culvert crossing.

Given the sandy soils and groundwater conditions, temporary shoring and dewatering are expected to be important construction considerations for the deeper gravity sewers and pump station excavation.

The response to these constraints is provided in the options below.

9.2. Wastewater Servicing Options

Various servicing options have been investigated for wastewater reticulation. These options range from a fully gravity-fed network with a centralised pump station through to partial or full low-pressure sewer systems.

The preferred option comprises a DN150 gravity network draining all stages to a single centralised pump station, with pumped discharge to the existing public wastewater network. This provides the most conventional arrangement and minimises the number of mechanical assets. The principal disadvantage is the depth of the gravity reticulation and wet well, which will increase excavation, dewatering and temporary works requirements.

Alternative arrangements include splitting the development between two pump stations, using low-pressure sewer for Stages 1 and 5 while retaining gravity servicing for Stages 2–4, or adopting a full low-pressure sewer network. These alternatives reduce reticulation depths and associated groundwater-related construction risks, but introduce additional mechanical, electrical and telemetry infrastructure and increased long-term maintenance requirements. KCDC has also indicated a preference against low-pressure sewer systems due to maintenance considerations, although these remain technically viable for a privately operated development with dedicated maintenance arrangements.

All servicing options are considered technically feasible, with each presenting different implications in terms of construction complexity, operational requirements and long-term maintenance. However, the single centralised WWPS and full gravity network provides the most conventional and operationally straightforward arrangement, notwithstanding the greater construction complexity associated with deeper infrastructure.

For the purpose of demonstrating wastewater servicing feasibility, the single centralised WWPS and full gravity network has been developed to resource consent design level.

The alternative servicing options remain technically viable. As such, it is recommended that sufficient flexibility be retained through the consenting process to enable the final wastewater servicing arrangement to be confirmed during detailed design. As each option would service the same development and discharge to the same public wastewater network, selection of the final servicing arrangement is not expected to alter the wastewater effects assessed in this report, provided the final design remains within the assessed design flows and complies with the KCDC LDMR, NZS 4404:2010 and WSA 04.

9.3. Proposed System – Centralised WWPS and Gravity Network

The following sections describe the proposed design developed to demonstrate the feasibility of the centralised pump station option (Option A).

Stages 1–5 would drain via DN150 uPVC SN16 gravity wastewater mains to a centralised wastewater pump station located near the edge of Stage 2.

The pump station would discharge via a rising main toward a new receiving manhole near the southeast corner of the development. Wastewater would then flow by gravity to the existing Council network in Ratanui Road.

Due to the depth of the gravity reticulation and central pump station, trench shoring and groundwater control/dewatering are expected to be required for portions of the works. The final construction methodology will be developed following detailed geotechnical assessment and contractor input.

The internal wastewater infrastructure is proposed to remain in private ownership, with ongoing responsibility for operation and maintenance retained by the village owner/operator. A dedicated operation and maintenance regime will be established for the wastewater system.

9.3.1. Lot Connections

Each dwelling/unit will be provided with a DN100 uPVC wastewater connection to the proposed private gravity network.

Connections will generally comprise either:

- a ‘wye’ connection to the private gravity wastewater main; or
- direct connection to a wastewater manhole.

Each connection will incorporate an accessible inspection point in accordance with KCDC-WW- 002.

9.3.2. Wastewater Pump Station

A resource consent-level pump station design has been prepared in accordance with the KCDC LDMR and WSA 04.

The proposed design has been developed to demonstrate hydraulic and storage feasibility for resource consent purposes. Final structural design, buoyancy assessment, pump supplier confirmation, electrical design, telemetry, controls, surge assessment and final operating set points will be completed during detailed design and engineering approval or building consent stage.

9.3.3. Adopted Design Flows

The wastewater demand assessment adopts the flows shown in Section 9.1.5. Refer to Appendix D for the supporting wastewater demand calculations.

9.3.4. Design Pumping Rate

The current demand assessment results in a development PWWF of approximately 6.26 L/s, slightly exceeding the 5.9 L/s flow assessed by HAL. This results in a temporary inflow-to-outflow deficit of approximately 0.36 L/s.

The centralised pump station option has therefore been designed to limit the normal discharge rate to approximately 5.9 L/s, with the temporary difference between incoming PWWF and the pump discharge rate attenuated within the proposed storage system.

The proposed design assumes this peak deficit could persist for a conservative period of 3 hours, resulting in approximately 3.8 m³ of additional detention storage. This assumes a constant PWWF flow of 3 hours in the worst case. Realistically, peak events will not follow a constant peak flow pattern, so this is conservative.

The pump station will comprise two pumps in a duty/standby configuration. Due to the limitation on outflow, the second pump may operate only if there is a fault with the duty pump, or at the maximum storage / critical overflow level (RL 3.53m), to prevent discharge exceeding 5.9 L/s during most conditions. If wastewater levels exceed the maximum storage / critical overflow level then both pumps may be triggered to prevent overflow.

An indicative Flygt MP 3127 HT 3~ 252 Pump has been assessed. The calculated operational duty point (based on a new pipe friction factor) is approximately:

- 5.9 L/s at 27.2 m TDH.

The final pump selection and control method will ensure that the normal discharge rate does not exceed the agreed discharge limit. Alternatively, additional modelling can be carried out to confirm that surcharging within the downstream network remains below an acceptable level.

9.3.5. Wet-Well Design and Operating Levels

The proposed wet well has an internal diameter of 2.1 m and an operating depth of 0.40 m between the duty pump start and stop levels.

The resulting active operating volume is approximately 1.4 m³. The calculated maximum pump start frequency is approximately 4.1 starts/hour, with an indicative dry-weather pump run duration of approximately 5.0 minutes.

The indicative operating levels are shown in Table 6.

TABLE 6: PUMP STATION WETWELL - INDICATIVE DESIGN OPERATING LEVELS

Parameter	Indicative Level [NZVD2016]
Wet-well lid	RL 6.44 m
Incoming sewer invert	RL 2.37 m
Allowable surcharge / critical overflow level	RL 2.87 m
Duty pump start	RL 0.22 m
Standby pump on in event of duty pump failure	RL 0.32 m
Standby pump on = critical overflow level	RL 3.53 m
High-level alarm	RL 0.42 m
Duty pump stop	RL -0.18 m
Pump minimum submergence level	RL -0.28 m
Wet-well invert	RL -0.45 m
Wet-well foundation level	RL -0.85 m

The resulting indicative excavation depth from wet-well lid to foundation level is approximately 6.9 m, subject to refinement at detailed design stage. The critical level dictating depth is the allowable surcharge level within the upstream network (assumed to be 500mm) as well as the assumed 600mm cover below the culvert crossing invert.

9.3.6. Emergency Storage

KCDC's LDMR requires private pump stations to provide emergency storage equivalent to 24 hours of ADWF above the pump start level, together with the rising-main volume, with a further 12 hours of storage where detention is required. For this development, provision of the full 36-hour storage volume is not considered necessary or proportionate, given that the pump station will remain privately owned and will be subject to a comprehensive, dedicated maintenance and response contract.

A minimum of 24 hours of emergency storage has therefore been adopted for the proposed design. Based on this, the total emergency storage requirement has been calculated as:

- 24 hour ADWF required = 108 m^3
- Detention volume required = 3.8m^3 (3 hours of PWWF flow deficit (peak inflow - duty flow))
- Volume of rising main = 1.3 m^3

- Total = 113 m³

The storage assessment is shown on the attached engineering plans. This generally comprises:

- Approximately 8.5 m³ within the wet well
- Two 2.5 m diameter dedicated emergency storage chambers:
  - Chamber 1: approximately 9.0 m long;
  - Chamber 2: approximately 12.5 m long;
  - combined chamber volume approximately 105.5 m³.

The workbook therefore calculates a nominal total available storage of approximately 114 m³, compared with a calculated requirement of approximately 113 m³.

Refer to Appendix D for the emergency storage calculations.

9.3.7. Rising Main

The resource consent design for the rising main comprises approximately 307 m of 90 mm OD PE100 PN16 SDR11 pipe, with an internal diameter of approximately 73.5 mm.

At the 5.9 L/s design pumping rate:

- Flow velocity is approximately 1.39 m/s
- Calculated friction headloss is approximately 20.4 m
- Minor losses are approximately 0.59 m
- Total dynamic head is approximately 26.54 m
- Estimated operating pressure is approximately 260 kpa
- Rising-main volume is approximately 1.30 m³
- Rising-main detention time at ADWF is approximately 0.29 hours.

The final rising main alignment, pressure class, surge/transient performance and fittings will be confirmed during detailed design.

9.3.8. Pump Station Set Points and Parameters

The proposed WWPS set points and key parameters are summarised above and shown on the engineering drawings (5000 – 5200).

Final pump selection, control philosophy, set points, emergency-storage arrangement, structural design, buoyancy, telemetry and electrical design will be confirmed during detailed design.

9.4. Trade Waste

Wastewater from individual villas is expected to comprise conventional domestic sewage. However, the proposed retirement village will include non-residential activities within the main care and community building, including commercial kitchens, laundries, hairdresser facilities, pool/spa backwash, maintenance areas and care-related activities. Wastewater from these

activities may constitute trade waste under the Kāpiti Coast District Council Trade Waste Bylaw 2019.

The commercial kitchen is the most likely source due to fats, oils, grease, food solids and detergents, and is expected to require grease interception or other approved pre-treatment before discharge to the private wastewater network. Healthcare wastes (such as needles, syringes, instruments, swabs, dressings, bandages and infectious/hazardous wastes) from the care centre shall not be discharged to the wastewater system. The waste management operations for the care centre will ensure that appropriate collection and disposal of these items is carried out.

For a discharge to be treated as permitted under the Bylaw, it must comply with the Schedule 1 limits, including (but not limited to):

- less than 5 m^3/day trade waste flow
- less than 2.0 L/s instantaneous flow
- temperature not exceeding 40°C
- pH between 6.0 and 10.0
- no free or floating oil or grease
- biodegradable emulsified oil/fat/grease not exceeding 500 g/m^3
- Non-faecal gross solids maximum dimension which must not exceed 15 mm
- suspended solids not exceeding 2,000 g/m^3
- BOD_5 not exceeding 1,000 g/m^3, where applicable.

Where these limits are exceeded, KCDC may require a controlled or conditional trade waste consent and impose additional pre-treatment, monitoring or discharge conditions.

At this stage, a separate public trade waste sewer connection is not anticipated. Trade waste can be pre-treated within the development before joining the common private wastewater network and proposed pump station. Detailed design should provide for suitable inspection, sampling and maintenance access, and the final trade waste classification, pre-treatment and monitoring requirements should be confirmed with KCDC during engineering approval.

9.5. Wastewater – Summary

Overall, the proposed private wastewater system provides a practicable means of servicing the development and connecting to the existing public network. The centralised pump station and gravity network demonstrates servicing feasibility, while retaining flexibility to adopt an alternative arrangement (e.g. low-pressure sewer incorporation) at detailed design.

Irrespective of the final arrangement, the system will be designed so that the normal discharge to the downstream public network does not exceed the 5.9 L/s flow assessed through the existing KCDC hydraulic model, unless additional modelling is provided to demonstrate that the downstream network can accommodate the increase in flow. The detailed wastewater design

will be subject to KCDC Engineering Approval prior to construction and connection to the public network.

The proposed system has been designed in accordance with KCDC LDMR. Approval is sought (at engineering approval stage) for the departure from standard relating to the reduced emergency storage requirement (from 36 hours to 24 hours), as discussed in Section 9.3.6.

10. Water Supply

10.1 General

The proposed water supply system will be designed in accordance with NZS 4404:2010 Section 6 – Water Supply, as modified by Schedule 6 of the KCDC LDMR. Where there is any conflict between NZS 4404:2010 and the KCDC requirements, the KCDC requirements take precedence.

The proposed reticulation will provide potable water supply to the retirement village and will be designed to meet both normal potable demand and firefighting requirements. Pipe sizing will be based on the flows required to satisfy these demands, with firefighting flows and pressures assessed in accordance with SNZ PAS 4509:2008. KCDC requires design pressures at the point of supply to generally be between 250 kPa and 900 kPa.

The proposed internal reticulation generally comprises:

- a 150 mm diameter water main;
- 50 mm rider mains; and
- individual service connections to the village units.

10.1.1. Reference Documents

Reference has been made to:

- "Water modelling assessment for the development at 65-73 Ratanui Road, Paraparaumu" by Stantec New Zealand (Stantec) in October 2024. This report summarises an assessment of the water supply available at the connection point to the development.
- "Summerset Retirement Village – Water Supply Hydraulic Modelling Assessment" by CKL. This memorandum documents the water-supply demand assessment and internal hydraulic modelling undertaken for the proposed development.

10.2 Existing Reticulation Network

An existing 375 mm diameter asbestos cement (AC) Council water main has been installed within Ratanui Road as part of local transport upgrade works. This main is proposed to provide the point of connection for the development. Prior to detailed design, pressure testing of this main shall be provided to verify residual pressures against the modelling described below.

10.3 Hydraulic Modelling

Stantec has undertaken hydraulic modelling of the existing public water supply network to assess its ability to service the proposed retirement village. The results are documented in their "Water modelling assessment for the development at 65-73 Ratanui Road, Paraparaumu" dated the 10th of October 2024 (project file 310101208).

The modelling indicates that the public network is capable of supplying both normal potable demand and the assessed firefighting demand without the need for booster pumping or additional bulk water storage within the development.

CKL has subsequently undertaken an updated water-demand assessment and hydraulic modelling of the proposed private internal reticulation network using EPANET. The assessment incorporates the current masterplan, updated population and occupancy assumptions, proposed pipe sizes, boundary backflow prevention arrangements and associated hydraulic losses. The model adopts the public-network pressure conditions established by Stantec for both 2023 and 2053 scenarios. This assessment is attached in Appendix F.

The updated assessment calculates an ultimate domestic demand of approximately 139 m^3/day, corresponding to an average flow of 1.61 L/s and a peak daily demand (PDD) of 4.03 L/s. The adopted simultaneous firefighting demand is approximately 44.4 L/s, comprising 60% of PDD, 25 L/s hydrant demand and a preliminary 17 L/s sprinkler allowance.

A preliminary peak-summer irrigation demand of 100 m^3/day has also been adopted, equivalent to approximately 3.5 L/s over an 8-hour overnight period. Irrigation is proposed to operate during off-peak periods and has therefore been excluded from the simultaneous PDD and firefighting assessments.

The CKL modelling confirms that the proposed internal network maintains adequate residual pressure (in accordance with SNZ PAS 4509:2008 and KCDC LDMR) under all assessed PDD and firefighting scenarios. Together, the Stantec and CKL assessments demonstrate that the existing public network and proposed private reticulation can adequately service the development.

No significant hydraulic capacity constraints have been identified, and booster pumping or additional bulk water storage is not anticipated to be required. Confirmation of final demands and requirements will be completed at detailed design.

10.4 Proposed Reticulation Network

It is proposed to connect the new 150 mm diameter internal water main to the existing 375 mm diameter Council main at the development entrance.

The internal reticulation will extend throughout the development to provide potable water supply and fire hydrant coverage. Rider mains and individual connections will branch from the principal internal main as required to service the proposed units.

A dedicated main shall be provided to the main care centre building to provide for firefighting sprinkler flow. It is estimated that this will be approximately DN150.

A separate reticulation pipe shall also be provided for irrigation supply.

The internal network model (as discussed in Appendix G) will be revised during detailed design to confirm that appropriate pressure and flow can be maintained throughout the development under the relevant operating conditions, including:

- peak domestic demand; and
- simultaneous firefighting demand.

The design will maintain pressures within the KCDC requirements and provide the required firefighting flow and residual pressure in accordance with SNZ PAS 4509:2008.

10.5 Service Connections

KCDC requires standard water supply service laterals to be 20 mm internal diameter and generally laid perpendicular to the water main and road frontage.

Individual water supply connections will be provided from the private internal reticulation to each applicable village unit/property. A bulk meter shall be installed at the connection to the public networks.

10.6 Backflow Prevention

The boundary arrangement follows the Summerset standard philosophy of separate DN150 potable/hydrant and low-risk sprinkler branches. The potable/hydrant branch is protected by a DN150 reduced pressure zone backflow device (RPZ) due to the high-risk classification for the site activities (e.g. medical care, wastewater pumping station). The dedicated fire-sprinkler branch is protected by a DN150 double check valve (DCV). Irrigation is separately protected downstream of the potable system. The indicative arrangement and location of the devices are shown on the attached plans.

10.7 Fire Hydrants, Sprinklers and Valves

Fire hydrants will be positioned throughout the development to provide the required firefighting coverage in accordance with NZS 4404:2010, the KCDC LDMR and SNZ PAS 4509:2008.

The current external fire-flow allowance is approximately 25 L/s from hydrants as per FW2 fire rating. The building sprinkler requirement remains subject to confirmation, with available information indicating an allowance between approximately 17 L/s and 25 L/s. The final sprinkler demand will be confirmed by the fire engineer and incorporated into the detailed water supply design.

Valves will be provided throughout the network to allow appropriate isolation and maintenance of the reticulation.

The final location and spacing of hydrants and valves will be confirmed as part of detailed design and coordinated with access, roading and other underground services.

10.8 Water Supply – Summary

Overall, the proposed development can be adequately serviced for potable water and firefighting from the existing 375 mm Council main in Ratanui Road. The CKL modelling confirms that the proposed internal network maintains adequate residual pressure (in accordance with SNZ PAS 4509:2008 and KCDC LDMR) under all assessed PDD and firefighting scenarios. Together, the Stantec and CKL assessments demonstrate that the existing public network and proposed private reticulation can adequately service the development. This servicing conclusion will be confirmed through the pending pressure testing, final fire-engineering demand and detailed hydraulic assessment of the internal reticulation. Subject to those confirmations and detailed design in accordance with the KCDC LDMR, NZS 4404:2010 and SNZ PAS 4509:2008, the water-supply system can provide the required flows and pressures without giving rise to unacceptable effects on the public network.

11. Utilities

Power and telecommunications services will be coordinated within the proposed private road and service areas. The design has allowed space for these services and identified crossings with the proposed stormwater and wastewater infrastructure. Consultation has been undertaken with Electra Networks regarding electricity supply, and Chorus and One NZ regarding telecommunications infrastructure. The relevant providers have confirmed that services are available in the vicinity of the development and can be extended to service the proposed village, subject to final connection arrangements and detailed design coordination.

12. Summary

CKL's assessment demonstrates that the proposed comprehensive care retirement village at 65 and 73 Ratanui Road, Paraparaumu can be appropriately serviced by the proposed civil infrastructure. The coordinated earthworks, road access, stormwater management, wastewater and water supply systems provide a practicable servicing solution for all five development stages, with the infrastructure required for each stage established before occupation.

The earthworks and infrastructure design respond to the site's topography, groundwater conditions, geotechnical requirements and existing drainage corridor. The proposed stormwater system provides treatment, retention, detention and controlled discharge, while accommodating external overland flows and maintaining flood conveyance through the site. The private wastewater network and centralised pump station provide servicing for the completed village, with storage and discharge controls to manage flows entering the public network. Hydraulic modelling demonstrates that the proposed water supply network can meet the assessed potable and firefighting demands.

Construction effects will be managed through the two bulk earthworks phases, progressive stabilisation, erosion and sediment controls, temporary drainage arrangements and site-specific construction management procedures. These measures will manage sediment, dust, noise, groundwater and excavation effects and protect neighbouring properties, existing services and the receiving environment. Dedicated operation and maintenance arrangements will maintain the performance of the private infrastructure throughout the village's operational life.

Overall, the proposed civil infrastructure provides an appropriate basis for the development, and the associated construction and operational effects on neighbouring land, the existing drain and public networks are considered acceptable.

13. Limitations

This report has been prepared solely for the benefit of our client, in accordance with the particular brief, and in support of a Fast-track consent application to be considered by an Expert Consenting Panel. It may not be relied upon in other contexts for any other purpose without the express approval of CKL. Neither CKL nor any employee or sub-consultant accepts any responsibility with respect to its use, either in full or in part, by any other person or entity. This disclaimer shall apply notwithstanding that the report may be made available to other persons including Council for an application for permission, approval or to fulfil a legal requirement.

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APPENDIX A

Engineering Drawings

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APPENDIX B

E&SC Calculations

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Appendix C

Stormwater Outlet Calculations

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APPENDIX D

Wastewater – Calculations

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APPENDIX E

Wastewater – HAL Development Impact Assessment

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APPENDIX F

Water Supply – Stantec Hydraulic Modelling Assessment

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APPENDIX G

Water Supply – CKL Hydraulic Modelling Assessment

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APPENDIX H

Water Supply – Water Demand Calculations