Aurecon New Zealand Limited
Level 2, Iwikau Building
93 Cambridge Terrace
Christchurch 8013
New Zealand

T +64 3 366 0821
F +64 3 379 6955
E christchurch@aurecongroup.com
W aurecongroup.com

aurecon

To	**Kelly LaValley, Chris Bacon**	From	**Innes Duncan/Derek Watson**
Copy	**Jason Trist**	Reference	**509177[Rev3]**
Date	**2022-01-11**	Pages (including this page)	**4**
Subject	**Bellgrove Sewer Rising Main Optimisation**		

1 Introduction

Aurecon have undertaken an optimisation assessment of the pressurised wastewater reticulation for the wider Bellgrove development area and are proposing a reconfiguration of the rising mains that will provide mutual benefit for works sequencing, the ultimate constructed solution and long term operational efficiency and associated maintenance cost of the rising main network.

2 Background

Due to the capacity in the existing council wastewater reticulation, and negative grades due to the lay of the land, both North and South Bellgrove Developments will require new wastewater pump stations (WWPS) and rising mains to service the lots.

Waimakariri District Council (WDC) have conducted preliminary wastewater modelling and have provided a Wastewater Structure Plan (WSP, refer to Attachment A).

WDC have indicated that the existing Northbrook Rd WWPS does not have the capacity to receive the proposed total wastewater flow from the planned Rangiora East development areas and therefore new rising mains will be required to discharge directly to the existing Southbrook Wastewater Treatment Plant (WWTP). This is approximately 3.6km from the Bellgrove North site on Kippenberger Ave.

3 Current WSP Rising Main Configuration Proposal

The current WSP proposal is that catchment RA07 drains to new WWPS #1 and that catchment RA08 drains to a new WWPS #2. Rising mains from these new WWPS are to join at the intersection of what would be the continuation of Devlin Ave and Northbrook Rd, and then a new combined flow rising main runs approximately 2.7km to the existing Wastewater Treatment Plant at Southbrook. The below table summarises the current proposal. Note that flow build-ups vary slightly from WDC values due to slightly higher lot densities being used and known Bellgrove North, stage 1 lot numbers being adopted. The parcel around the link road from Bellgrove North to Cold Stream Road (CSR) has also been included in the flow build up.

Table 1 - Current WDC RM Reticulation Proposal (refer Figure 1)

Rising Main	Catchments Serviced	No. Lots	PWWF (L/s)
#1	RA07, CSR	730	31.4
#2	RA08	445	20.0
Shared	RA07, CSR & RA08	1175	51.4

The structure plan states that RA05 (which includes a portion of Bellgrove North) and RA06 can connect into the existing gravity network(s) on MacPhail Ave and Devlin Ave. This current gravity allocation is estimated to be 30.2L/s (PWWF) and we understand that allowance has been made in the remaining capacity of the Northbrook WWPS to receive these flows long term.

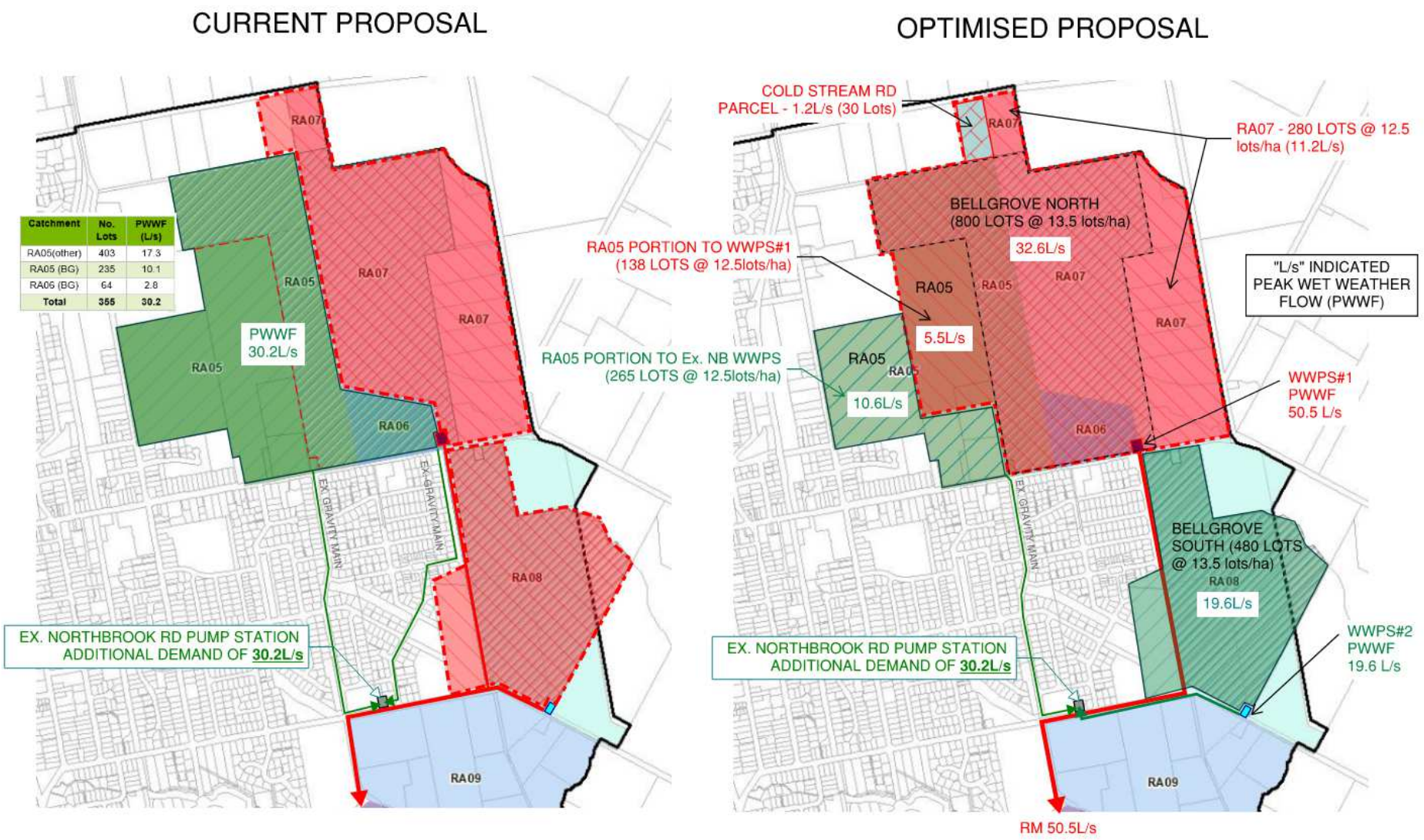

Figure 1 - Current and Optimised Rising Main Reticulation Proposals

Aurecon New Zealand Limited
Level 2, Iwikau Building
93 Cambridge Terrace
Christchurch 8013
New Zealand

T +64 3 366 0821
F +64 3 379 6955
E christchurch@aurecongroup.com
W aurecongroup.com

3.1 Discussion - Current Rising Main Proposal

The proposed design surface for Bellgrove North (Stage 1) is planned to be higher than the existing ground level, however it will still be too low to provide sufficient pipe grade and cover to utilise the existing gravity connections highlighted by WDC (MacPhail and Devlin Ave).

WWPS #1 is therefore required to service the entire Bellgrove North development (shown in red on the Optimised Proposal on figure 1 below). This includes the section of RA07 as previously shown, but now has been increased to cover all of RA06 and a large portion of RA05. WWPS#1 would also need to service the remaining portion of RA07 indicated for future development to the east. By directing this area to the new pump station there will be less wastewater flow discharging to the existing Northbrook WWPS than currently allocated in the WSP.

As discussed above, the current proposal is to join RM#1 and RM#2 into a shared RM at the corner of Northbrook Rd and Devlin Ave (extended). This introduces a need to coordinate the discharge from both pump stations, so that they transition smoothly into the joint rising main. This configuration introduces complexity around staging and the interaction between the three different sized rising mains.

4 Optimised WSP Rising Main Configuration Proposal

As topography requires WWPS #1 to service a larger portion of RA05 and all of the RA06 and RA07 catchments, there will be a reduction in flows to the existing Northbrook WWPS. With this additional capacity it is proposed that WWPS#2 be located to capture all of the RA08 catchment and pump it directly to the Northbrook WWPS as the ultimate solution – see Figure 1. This would result in a dedicated rising main for new WWPS #1, that runs from Kippenberger Ave to the treatment plant, and a second dedicated rising main running from WWPS #2 to the existing Northbrook WWPS. This proposal has the following advantages:

1) Rising mains will be separate allowing self-cleansing velocities to be achieved more readily. This avoids or extends the rising main maintenance period when compared to the combined flow rising main that would require both pumps to be running to achieve a self-cleansing velocity.

2) Simplifies design and operation of WWPS #1 & WWPS #2. Simple systems are easier to operate and have less maintenance and potential for complications. A combined rising main pump performance at each WWPS will need to consider two operation duty points (both WWPS operating, one WWPS operating). It will be unlikely that a pump can be selected for optimal operation at these two duty points. This will increase pump wear, maintenance and shorten pump life.

3) Site topography requires WWPS#1 to service a larger catchment and therefore if the current shared rising main configuration was implemented, there would be an increase in the PWWF which would require a larger rising main (from current 280OD proposal) resulting in additional costs to both the developer and WDC. This would also make self-cleansing requirements difficult to achieve in the earlier stages of development.

Discharging WWPS#2 flows directly to the Northbrook WWPS will increase the PWWF demand by around 20L/s. However, WWPS#1 servicing a larger catchment will reduce the PWWF demand on the Northbrook WWPS by around 14L/s. In order to offset this 6L/s increase and maintain the current Northbrook WWPS allocation of 30.2L/s; additional catchment from RA05 (140 lots) is proposed to discharge into WWPS#1 via Bellgrove North gravity reticulation (as shown in Figure 1).

5 Recommendation

It is recommended that a dedicated rising main is installed for the new WWPS #1, that runs from Kippenberger Ave to the treatment plant, and a second dedicated rising main running from WWPS #2 to the existing Northbrook WWPS. This configuration simplifies the design, operation, and maintenance of the two pumping stations and associated rising mains.

In order to not exceed the remaining capacity of the Northbrook WWPS, a connection and allowance should be made for a portion of the future RA05 discharge along the western edge of road 1 of the Bellgrove development. This allowance will be included in the cost-share agreement for the WWPS#1 cost.

Attachment A – WDC Wastewater Structure Plan