



REPORT

STRUCTURAL AND CIVIL ENGINEERS

ARROWTOWN SHA INFRASTRUCTURE

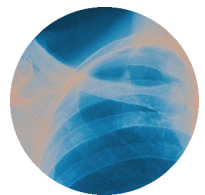
ASSESSMENT PEER REVIEW

PREPARED FOR

QUEENSTOWN LAKES DISTRICT COUNCIL

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Arrowtown SHA Infrastructure Assessment Peer Review

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Queenstown Lakes District Council

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INTRODUCTION

Holmes Consulting Group LP have been engaged by Queenstown Lakes District Council to complete a peer review of the infrastructure assessments carried out by Rationale Ltd for the Arrowtown Retirement Village.

SCOPE OF WORK

The scope of work for this project included the following:

1. Review existing reports from Rationale Ltd and provide comment on the assessments undertaken.
2. Provide comments on feasibility and practicality of upgrades proposed.

LIMITATIONS

Findings presented as a part of this project are for the sole use of Queenstown Lakes District Council in its evaluation of the subject properties. The findings are not intended for use by other parties, and may not contain sufficient information for the purposes of other parties or other uses.

Our assessments are based on a desk study only. Condition assessments of existing infrastructure have not been undertaken and it has been assumed that any deficiencies due to damaged or aged infrastructure will be addressed within existing renewals budgets.

Our professional services are performed using a degree of care and skill normally exercised, under similar circumstances, by reputable consultants practicing in this field at this time. No other warranty, expressed or implied, is made as to the professional advice presented in this report.

BASIS OF ASSESSMENT

Rationale have assessed the water supply and wastewater demands generated by the proposed development, based on 302 people housed in a combination of Villas, Apartments and Aged Care units.

The method by which the number of people has been calculated is not described in the infrastructure reports, however it is noted that by empirical measure, the number of people per unit in retirement villages is approximately 1.3 people per unit for a newly populated village, regardless of the number of rooms in each unit. This then drops over time and stabilises around 1.1 people per unit.



WASTEWATER DEMANDS

The demands on the wastewater network have been assessed by Rationale based on 302 people, at an average loading of 245 litres/person/day. This is based on the standard 735 litres/connection/day (3 people/connection) utilised in the Wakatipu dynamic wastewater model. The applied dry weather peaking factor is 2.1, and 11.4 Ha of catchment has been applied for wet weather/infiltration effects.

It is noted that clause 5.3.5.1 of QLDC's Land Development and Subdivision Code of Practice refers to average dry weather flows of 250 litres/person/day, a dry weather peaking factor of 2.5 and a dilution/infiltration factor of 2 for wet weather.

The site as a whole is 20.04 Ha. We do not have information regarding the layout of the site, and therefore cannot assess whether the 11.4 Ha of catchment for rainfall effects is appropriate, however 11.4 Ha represents approximately 56% of the site. This is thought to be an appropriate coverage density.

Although QLDC's Land Development and Subdivision Code of Practice recommends higher per person generation of wastewater, and different methods of applying peaking factors, the figures utilised by Rationale are as per the calibrated Wakatipu dynamic wastewater model. This model has been calibrated against flow data in January 2012 and June 2013, and it is therefore considered that the wastewater demands assessed by Rationale Ltd are appropriate for this site.

WATER SUPPLY DEMANDS

The demands on the water supply network have been assessed by Rationale based on 302 people, with an average water demand of 250 litres/person/day. An average day to peak day factor of 3.3 has been applied, giving a peak day load of 249.2 m³/day. It is noted that the table in the Rationale Ltd report appears to incorrectly identify this as l/d, however the average flows correctly reflect the volume loads.

Average flows over the peak day are assessed as 2.88 l/s, with peak demand of 5.77 l/s (based on a diurnal peaking factor of 2.0).

It is noted that clause 6.3.5.6 of QLDC's Land Development and Subdivision Code of Practice refers to daily consumption of 700 l/p/day, with 250 l/p/day only acceptable when supported by alternative modelling/metering data. Modelling or metering data has not been provided, however it is noted that the developer has a water take that could be used for irrigation to reduce potable water demands, and centralised landscaping and some centralised facilities are likely to result in efficiencies.

The 250 l/p/day rate is very close to the 245 l/p/day rate for wastewater, and does not allow for any significant non-potable uses.



It is therefore considered that the water demands used by Rationale for the purposes of this assessment are only valid assuming an alternative supply is utilised for landscaping purposes.

STORMWATER DEMANDS

Stormwater runoff generated has not been assessed, as no municipal stormwater network exists in the vicinity of the site, and it is not proposed to extend the existing schemes to service the site. The catchment area is 20.04 Ha.

The site is currently in pasture, with an associated stormwater run-off coefficient of 0.3. Although the final mix of development is unknown, it is estimated that a run-off coefficient of 0.65 (as defined in the New Zealand Building Code clause E1 for “Industrial, commercial, shopping areas and town house developments”) is appropriately conservative.

As per QLDC’s Land Development and Subdivision Code of Practice, a return interval of 20 years has been chosen. A duration of 20 minutes (considered conservative) has been adopted. From NIWA’s HIRDS database, this translates to a rainfall intensity of 27.6 mm/hour.

Based on the Rational Method, run-off rates for the pre-development and post-development situations are as follows:

$$Q = CIA/360$$

$$Q \text{ (pre-development)} = 0.3 \times 27.6 \times 20.04 / 360 = 0.461 \text{ m}^3/\text{s}$$

$$Q \text{ (post-development)} = 0.65 \times 27.6 \times 20.04 / 360 = 0.999 \text{ m}^3/\text{s}$$

This is likely to be a conservative estimate, assuming development of the entire site, however the volumes involved will likely require discharge to a water course, as the volumes required for on-site soakage are likely to be prohibitive.

WASTEWATER OPTIONS

Rationale assessed five options for the discharge of wastewater from the site in their initial feasibility report. These five options were further refined to two options in the modelling report we have been asked to review. Both of these options involve a stand-alone pump station on the subject site, connecting either to manhole SM14173 outside 100 Centennial Ave (option 3) or into the existing 300 mm main on Arrowtown-Lake Hayes Road at the junction with Hogan’s Gully Road (option 5).

A number of clarifications relating to these two options were also confirmed following investigations associated with the more detailed assessment. Of these clarifications, of specific relevance to QLDC is the uncertainty within the model of the current and



future configuration at the junction of sewer mains at the Stalker Road intersection (associated with Shotover Country). The model is currently configured with a dedicated main from the Arrowtown-Lake Hayes Road pump station through to the Shotover treatment plant. If this configuration is not correct, further investigations and modelling of the connections between Stalker Road and the treatment plant will be required. Any required upgrades associated with this are therefore not considered.

Option 3 requires a 1.2 km long rising main from the subject site to connect in to the Arrowtown wastewater scheme. The connection point is noted as a cleaning eye, as opposed to a manhole. Rationale recommend this connection point is upgraded to a manhole, should connection occur at this location. QLDC's GIS confirms this and we agree with this upgrade requirement. Modelling results demonstrate no significant issues between this connection location and the Norfolk Street pump station.

The Norfolk Street pump station does not currently meet the emergency storage requirements outlined in QLDC's infrastructure code. Although this code has been superseded by the Land Development and Subdivision Code of Practice, due to the lack of pumping station requirements in the new code, the infrastructure code requirements are assumed to remain relevant. The requirements of the infrastructure code are for either 8 hours' storage of average daily flows, or an emergency standby generator to be installed. The Norfolk Street pump station does not meet these requirements in the current situation, without any additional flows being introduced. Further, the pump station currently experiences inflows in excess of the outflows able to be generated by the current pump configuration. During these short term peaks, the existing storage volumes are utilised to buffer the flows. These storage volumes are sufficient to prevent overflows. The shortfall in storage is currently 106 m³, increasing by a further 24 m³ with the addition of this development.

The Norfolk Street pump station discharges into the same 300 mm rising main that it is proposed to connect in to with option 5. The Arrowtown-Lake Hayes Road pump station also experiences inflows exceeding outflows, but the situation is less critical both due to the quantum of the exceedance and the standby generator available at this location.

Rationale conclude that the wastewater network can support the proposed development through either option, although they note that Option 3, connecting to the Norfolk Street Pump Station will utilise almost all of the emergency storage available at this location. The rising main associated with Option 5 is longer (3.3 km) but the potential effects on the infrastructure are less critical. Rationale therefore recommend Option 5 for connection to the wastewater network.

However, as the rising main from the subject site to Arrowtown is shorter and easier to construct, it may be beneficial to investigate a cost sharing arrangement with the developer to support the upgrade of the Norfolk Street pump station.



WATER OPTIONS

Rationale assessed two main options for the water supply to the subject site. As two water supply schemes exist in the vicinity of the development, Rationale have assessed connection to the Lake Hayes Water Scheme, connecting to the water main within Hogan's Gully Road, or connection to the Arrowtown Scheme, connecting to the water main within McDonnell Road. Both 100 mm and 200 mm connections were considered for each scheme, and normal and fire flows considered.

The Lake Hayes Scheme (as modelled) is unable to provide a full on-demand water supply or fire flows. Connection to this scheme via either a 100 mm or 200 mm main would then require on-site tanks to provide both buffering and a static supply for fire fighting. This static supply would be 543 m³.

Connection to the Arrowtown Scheme via extension of the existing 200 mm main within McDonnell Road will provide an on-demand supply and fire flows up to FW3 demands. Fire flow demands are not met with a 100 mm connection to this main.

Modelling suggests that the Arrowtown scheme does not have sufficient storage to meet QLDC infrastructure code standards. The current shortfall is 186 m³, with an addition 543 m³ required for this development. The Arrowtown scheme is also known to be approaching the total pump capacity of the existing bores, and upgrades are likely to be required in the near future. Neither of these required upgrades are currently programmed in the Long Term Plan.

Upgrades to the Lake Hayes Estate/Shotover Country water supply scheme free up capacity on the Lake Hayes Scheme, and other than the lack of pressures to provide any more than a restricted supply, there is capacity for the development from the Lake Hayes Scheme.

Given the shortfall in storage on the Arrowtown Scheme, if this shortfall is considered to be critical and upgrades are required, a restricted supply to on-site tanks may become more economical for the developer.

Rationale recommend connection to the Arrowtown water scheme, via a 200 mm extension to the McDonnell Road main, however this is subject to agreement on how to resolve storage shortfalls in the scheme.

CONCLUSIONS

In general, we concur with the recommendations given by Rationale, however we note the potential to enter into an agreement with the developer to upgrade both the Norfolk Street sewage pump station to provide better resilience for the wider wastewater network. The storage shortfall associated with the Arrowtown Water Supply Scheme also has the potential to improve resilience for the whole community,



but this will possibly come at a slight cost premium for the developer over on-site storage and connection to the Lake Hayes Scheme.

The costs of these required connections and storage upgrades are not insignificant. The 1.2 km long, 200 mm diameter water main extension is likely to be in the order of \$350-400,000, with 543 m³ of storage likely to be approximately \$500,000. The wastewater connection (3.3 km of rising main plus an on-site pumping station for Option 5) is likely to be in the order of \$300-350,000. These costs would be borne by the developer, with no specific benefit outside of the subject site.