INFRASTRUCTURE REVIEW

2

APPENDICES

EXPRESSION OF INTEREST

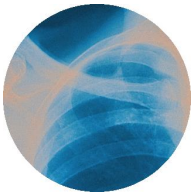
JUNE 2016

WATERFALL PARK

Holmes Consulting Group

REPORT

STRUCTURAL AND CIVIL ENGINEERS



WATERFALL PARK INFRASTRUCTURE REPORT

PREPARED FOR

WINTON PARTNERS

114649.00

15 JUNE 2016

HolmesConsultingGroup

REPORT

STRUCTURAL AND CIVIL ENGINEERS

Waterfall Park Infrastructure Report

Prepared For:

Winton Partners

Date: 15 June 2016

Project No: 114649.00

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Prepared By:

Andrea Jarvis

PROJECT DIRECTOR

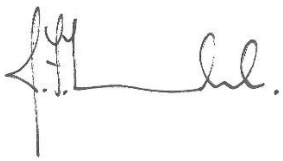
Holmes Consulting Group LP

www.holmesgroup.com

Queenstown

T: +64 (03) 441 3055

Reviewed By:



John Trowsdale

PROJECT DIRECTOR

REPORT ISSUE REGISTER

DATE	REV. NO.	REASON FOR ISSUE
10/06/16	1	Draft for Client Comment
15/06/16	2	For issue to QLDC

INTRODUCTION

Holmes Consulting Group LP have been engaged by Winton Partners to review the feasibility of servicing the development, including identification of any required upgrades to the wider infrastructure networks, proposed under the Waterfall Park SHA, having regard to previous infrastructure reports carried out relating to part of the site[1].

We have reviewed existing reports from CFMA, Rationale and T&T and provide comment on the assessments undertaken; and undertaken a desk study to identify servicing provisions for existing facilities within the land.

Waterfall Park SHA

Waterfall Park is a special housing area (SHA) development of 140 lots proposed to the north of Lake Hayes, south of Millbrook, in the Queenstown Lakes District. The wider site is approximately 60 Ha in area, with Mill Creek passing through the lower lying portions of the site.

Previous Infrastructure reports

CFMA's report covered a proposed 150 lot residential development within the 45 Ha block at the southern end of the Waterfall Park site. Modelling of the water and wastewater networks by Tonkin & Taylor Ltd (T&T) and Rationale Ltd (Rationale) respectively was also based on 150 residential lots within this block.
This assessment acknowledges the reduced lot yield of 140 lots and for a lower density than that considered by CFMA, as the site now comprises 60 Ha instead of 45 Ha. This means that the CFMA, T&T and Rationale assessments are conservative, all considering demands in excess of that generated by Waterfall Park.

SCOPE OF WORK

The scope of work for this project included the following:

1. Review existing reports from CFMA, Rationale and T&T and provide comment on the assessments undertaken.

2. Undertake a desk study to identify servicing provisions for existing facilities within the land.

3. Report on the feasibility of servicing the development, to support an SHA application.

4. Report on required upgrades to the wider infrastructure networks.

[1] Prepared by Clark Fortune McDonald & Associates (CFMA) in February 2015, Tonkin & Taylor dated November 2015 and Rationale dated November 2015

LIMITATIONS

Findings presented as a part of this project are for the sole use of Winton Partners and Queenstown Lakes District Council in their 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.

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

As noted above, the existing reports have assessed a 150 lot residential SHA, which represents a slightly higher yield than the 140 lots proposed under this application. This application takes in the area identified in the QLDC District Plan as Waterfall Park Resort, an established visitor facility.

As per QLDC's Land Development and Subdivision Code of Practice, a population basis of 3 people per lot has been assumed, equating to a population of 420 people.

A desk study of the online (eDocs) records for the Waterfall Park facility suggests that the visitor facility is serviced via on-site wastewater disposal. The water supply source appears from ORC records to be from a bore on site, and it is likely that stormwater is discharged to ground or to Mill Creek. The existing farm houses at the centre of the site are also likely to discharge to on-site wastewater systems.

WASTEWATER

The demands on the wastewater network have been assessed by Rationale based on 450 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 45.9 Ha of catchment has been applied for wet weather/infiltration effects.

The combined site as a whole is 60 Ha. The proposal shows 38.8 Ha (approximately 65% of the site) will be retained for farm use in perpetuity, and over half of the Waterfall Park Resort land as remaining in recreational or otherwise vegetated coverage. Therefore the infiltration loading assumed by Rationale is considered very conservative.

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.

Based on the population of 420 noted above, the average dry weather flow based on the Land Development and Subdivision Code of Practice is approximately 1.2 l/s, with a peak wet weather flow of 6.1 l/s. This is significantly lower than the 8.5 l/s assumed by Rationale.

Rationale's modelling report concluded that the existing infrastructure has adequate capacity for the formerly proposed 150 lot subdivision, with the exception of Lake Hayes Pump Station 1 (PS1), the rising main from this pump station and portions of the network between PS1 and Lake Hayes Pump Station 2 (PS2).

PS1 currently has a duty pump capacity of 2.6 l/s. The current day maximum flow is 5 l/s, and future day maximum inflow (without this development) is assessed as 6 l/s. Due to this current shortfall in capacity, PS1 is due for upgrade, even if the proposed development were not to proceed. The additional 6.1 l/s from this development makes this upgrade more critical and increases the scale of the upgrade required.

Upgrades to this pump station are therefore required to service the existing catchment, and therefore by definition to also service this development. Pump upgrades and either emergency storage or an emergency standby generator will be required to meet the requirements of the QLDC infrastructure code.

The rising main from this pump station is currently 100 mm PVC. Rationale recommend this is upgraded to 150 mm diameter, however this is based on a required duty pump capacity of 16 l/s. As the flows calculated by Rationale are conservative and apply the infiltration factor to a larger catchment than necessary, it is possible that this rising main upgrade will not be required at this stage. It is recommended that further modelling is undertaken to confirm this.

Two overflows within the gravity network between PS1 and PS2 are identified in the Rationale report. The volumes of these overflows are 38.5 m3 and 0.7 m3 respectively, based on the situation as modelled. The reduced demand flows described above are expected to reduce these overflows, and potentially eliminate them. It is recommended that further modelling is undertaken to confirm this, however it is noted that 150 mm PVC sewer lines laid to minimum falls as per NZS4404:2010 requirements can cater for 13.05 l/s of flow.

It is therefore concluded that the required upgrades to the wastewater infrastructure to support this development are those associated with PS1 (which largely are required by the catchment already); that is, the pump upgrades and either emergency storage or generation. The rising main upgrade may be required, however this is likely to be for future proofing reasons for the wider catchment.

It is also noted that the layout of the proposed development, with dispersed lots to the north, potentially lends itself to a pressure sewer solution in this area. This could then also be extended to the existing visitor facility. This would have two main benefits;

firstly that infiltration would be further reduced in this area, and secondly that the existing on-site wastewater system could be eliminated. On-site wastewater systems in this area have been identified as contributing to the nutrient load experienced by Mill Creek and Lake Hayes. Removing these, and reducing the extent of farming in this area is likely to have a net positive effect on Mill Creek and Lake Hayes from a water quality point of view.

WATER SUPPLY

As per the wastewater modelling, the water supply modelling has been carried out based on 150 residential lots. The resulting total population of 450 people with an average day demand of 700 l/person/day (as per clause 6.3.5.6 of QLDC's Land Development and Subdivision Code of Practice) has been considered.

T&T have modelled this domestic demand, in addition to considering the fire flow requirements. They have assumed a fire hazard category of FW2 for the previously proposed residential lots, and also assessed whether an FW3 supply can be provided to the previously proposed retail centre.

T&T have assumed that Lake Hayes Estate will be supplied by the Shotover Country water supply bores, and therefore conclude that adequate flows and pressures are available to service the development from the Lake Hayes Water Scheme. This will require a 150 mm internal diameter main as an extension to the network along Arrowtown-Lake Hayes Road (a distance of approximately 300 m), connecting to an internal reticulation network within the development. To provide fire flows to the care facilities precinct, this 150 mm ID main will need to extend through to the area within the site. If these facilities are sprinklered, it may be possible to decrease the size of the internal main for part of its length.

Due to the maximum elevation difference between the Lake Hayes reservoir and the development of 95 m, a pressure reducing valve within the development will be required to limit pressures to the maximum allowable 900 kPa.

Other than the water main extension described above, no upgrades to the wider water network are required to support the development.

STORMWATER DEMANDS

Stormwater runoff generated has not been modelled, or assessed by CFMA in their original infrastructure report. General comments indicate that the intention is to control the discharge of stormwater to Mill Creek within the site, which eventually discharges into Lake Hayes. Discharges within the Lake Hayes catchment generally require specific design, and consideration by Otago Regional Council (ORC) to determine whether a resource consent is required. It is likely that any discharges to Mill Creek will require both treatment to remove potential contaminants and

attenuation/detention to limit outflows to the pre-development flows. CFMA proposes detention ponds at the southern end of the site to capture and treat stormwater before discharging into Mill Creek. Design and approval of these detention ponds will be negotiated with both QLDC and ORC to meet all relevant rules and policies.

The site is currently in pasture, with an associated stormwater run-off coefficient of 0.3. Although the final site coverage is unable to be determined at this stage, 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. This has been applied to the development area of 14.2 Ha; the area to remain as pasture has not been considered.

As per QLDC's Land Development and Subdivision Code of Practice, a return interval of 20 years has been chosen. A duration of 10 minutes (considered conservative) has been adopted for the post-development flows, and 20 minutes for the pre-development flows. From NIWA's HIRDS database, this translates to rainfall intensities of 36 mm/hour (post-development) and 27.3 mm/hour (pre-development).

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

$Q = CIA/360$

Q (pre-development) = 0.3*27.3*14.2/360 = 0.323 m3/s

Q (post-development) = 0.65*36*14.2/360 = 0.923 m3/s

The volume of storage required will require specific design, however this will likely be provided within a constructed wetland or pond system. Roadside swales instead of piped infrastructure is theoretically possible, as is on-site soakage to ground for each lot, but not considered feasible for this development due to the small lot sizes and reduced road reserve widths.

CONCLUSIONS

The proposed development is able to be serviced by the surrounding water supply and wastewater networks, subject to upgrades to Lake Hayes Wastewater Pump Station 1 (which are required in any event, albeit to a slightly lesser degree, to cater for the demand associated with existing development in the catchment), and installation of a new water main from the intersection of Speargrass Flat Road and Arrowtown-Lake Hayes Road through to the development.

The specific upgrades required are as follows:

- Upgrade the pumps within PS1 to provide minimum duty pump capacity of 12.1 l/s. The pumps are currently able to cater for 2.6 l/s, and without this development, 6 l/s to cater for future demands is required. The costs associated with this would therefore be split between QLDC and the developer, with approximately 65 % of the required additional capacity attributed to this development.

- Provide either emergency storage or a standby generator for PS1. Due to the proximity to Lake Hayes and the probability of high groundwater at this location, it is recommended that a standby generator, appropriately screened to reduce visual impact, would be a more cost effective solution at this site.

- Install a new 150 mm ID water main along Arrowtown-Lake Hayes Road, with a length of approximately 300 m.

The internal infrastructure for the site will require detailed design, and should include stormwater treatment and attenuation, and extension of the 150 mm ID water main through to the central precinct.