

SERVICES ASSESSMENT REPORT

**Homestead Bay Residential
June 2017**



CLARK FORTUNE MCDONALD & ASSOCIATES
REGISTERED LAND SURVEYORS, LAND DEVELOPMENT & PLANNING CONSULTANTS

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1 INTRODUCTION

Clark Fortune McDonald & Associates (CFM) has been engaged to assess servicing options for a proposed rezoning on land located at Homestead Bay between Jacks Point and Lake Wakatipu.

The proposal seeks to re-zone land from rural general to residential activities.

The site is legally described as Lots 6, 7 DP 504891 & Lot & 8 D.P.443832. The total site area comprises approx. 200 ha and is contained in CT's 760709, 760710 & 555575 respectively.

The site has frontage to Kingston Road (SH6) and from Maori Jack Road.



This report is preliminary and for the planning map hearings for the QLDC District Plan Review only. Further information and detailed engineering design will be required if development proceeds.

The report considers infrastructure demands based on the proposed residential activities.

2 SCOPE OF WORK

The scope of work includes examination of existing QLDC as-built records, confirmation of capacity of existing services to determine the adequacy of the existing infrastructure, and recommendation of infrastructure servicing options.

3 DESIGN STANDARDS

Site development standards include, but are not limited to, the following:

- QLDC Land Development and Subdivision Code of Practice adopted June 2015.
- NZS4404:2010
- Drinking-Water Standards for New Zealand 2005.
- NZS PAS 4509:2008, New Zealand Fire Service Fire-fighting Water Supplies Code of Practice.
- Water for Otago, Otago Regional Council regional water plan.
- Document for New Zealand Building Code Surface Water - Clause E1 / Verification Method 1.

4 PROPOSED REZONING

The change in zone proposes residential activities over the site in separate activity areas. The basis of the preliminary design considers a possible 715 dwelling equivalents (DE).

The following report examines the feasibility of connecting into the existing QLDC infrastructure or the establishment of new stand-alone infrastructure to service the residential demand.

The demand figures above are used in assessing demands for wastewater and water supply in the following sections of the services report.

5 WASTEWATER

5.1 Design flows – Homestead Bay Residential activities

Demand based on anticipated activities has been determined in accordance with the development standards:

Refer QLDC Infrastructure code.

No of residential units/DE:	715
Average dry weather flow:	250 l / person / day.
Dry weather diurnal peak factor:	2.5.
Infiltration factor:	2.
Occupancy:	3 person / du.

Dry weather average daily flow: **536 m³ / day.**

Peak hour flow: **31.0 l / sec.**

5.2 Proposed Servicing for the Homestead Bay Residential activities

Low Environmental Impact prepared a report for wastewater options in May 2017. This report investigated 130 of the proposed 715 DE's proposed for this zone.

The report considered 4 different options each of which were considered feasible.

It is the our expectation that each of the options are still viable for the added demand by scaling up the system to cater for the added demands. It is likely that the additional dwellings will result in a better per lot cost for some of the options.

There is also considered enough suitable land available for on site disposal options within the development area for the fully developed scenario.

5.3 Required upgrades

If the option to connect to QLDC infrastructure was chosen, any effects on the QLDC's wider infrastructure being the Shotover Waste Water Treatment Plant will be mitigated by the imposition of headworks fees at the time of connection to Council's service.

Upgrades to the Shotover Waste Water Treatment Plant are currently under construction.

6 STORMWATER

The development of the site area will increase stormwater runoff and introduce contaminants into the receiving aquatic environment.

6.1 Stormwater Catchment Management Plan (SCMP)

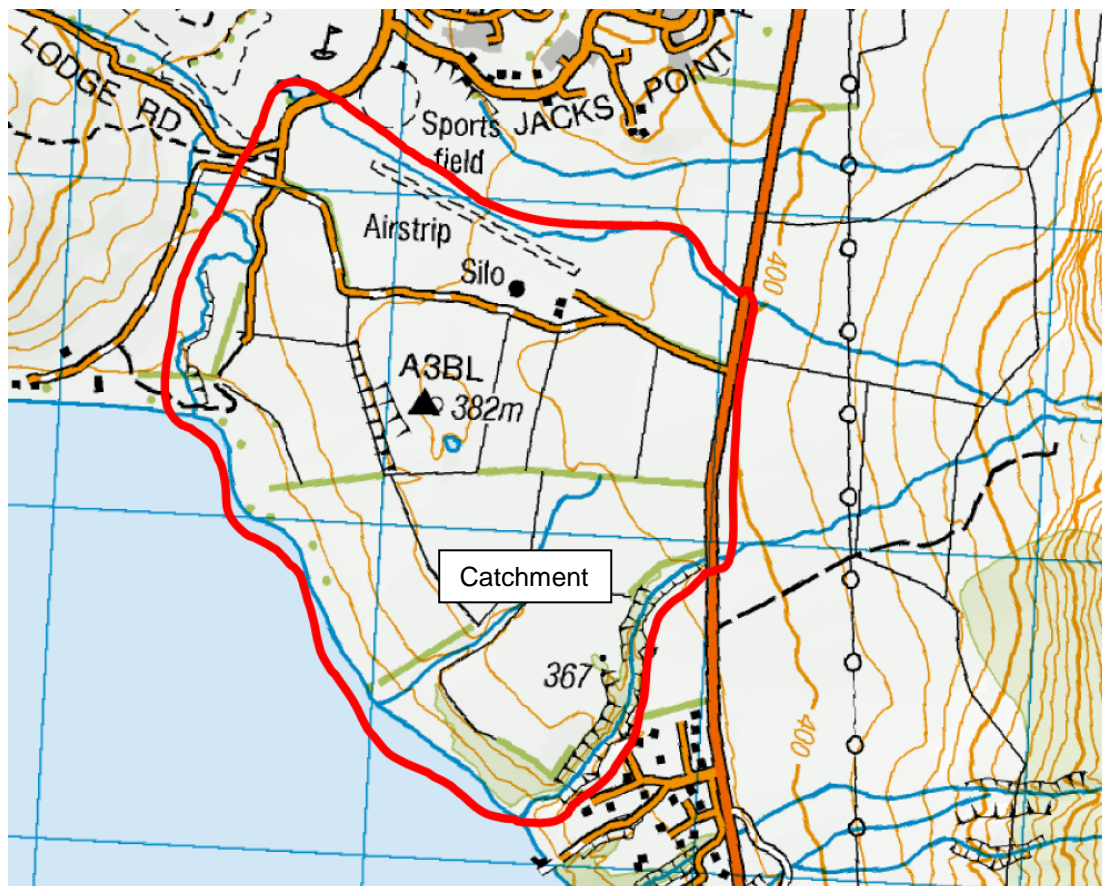
It is proposed that the Homestead Bay residential area prepare and submit to QLDC a SCMP to be approved by QLDC prior to development of the site.

6.2 Stormwater Catchments

The topography of the development area is predominantly of gentle slopes. The site aspect is south westerly facing and falling towards Lake Wakatipu.

The development area sits between two sharply incised gullies that take stormwater run-off from the flanks of the Remarkables. The north western gully contains the discharge from Jacks Point to the north. The Southern gully is a natural boundary of the site and separates the development area from Lakeside Estates.

The total catchment or study area is approx. 240ha on the western side of SH6. Previous stormwater reporting peer reviewed by Flood Sense Ltd in October 2016 demonstrates that the Highway acts as a cut-off channel preventing flows from the Remarkables crossing the road.



The run-off from the development area will ultimately discharge to Lake Wakatipu so no downstream land is affected by the discharge from the development area.

6.3 Existing Reticulation

There is no existing storm water reticulation to service the property.

6.4 Hydrological analysis

Runoff will need to be considered based on the proposed re-zoning plan. The development area is 71 ha and presently consists mainly of pasture. The soil drainage is moderate and the development area is quite flat, so a slope correction of -0.05 would appropriately be applied to the runoff coefficient for each surface type. Runoff coefficients have been obtained from Approved Document for New Zealand Building Code, Surface Water, Clause E1. Rainfall intensity has been determined from NIWA HIRDS V3 (<http://hirds.niwa.co.nz/>).

Given that the discharge of stormwater ultimately is direct to Lake Wakatipu it is anticipated that the stormwater catchment management will be relatively straight forward.

6.5 Runoff quality

Stormwater can contain a number of contaminants which may adversely affect the receiving environment. Studies in New Zealand and abroad have identified urban development as a major contributor to the declining quality of aquatic environments. It is estimated that upwards of 40% of the contaminant content of this runoff can be attributed to run-off from roads.

At this site stormwater will be generated by run-off from the following:

- Roofs of residential buildings;
- Urban roadways;
- Footpaths; and
- Other hard-standing areas.

Based on available information it is expected that stormwater from the above named developed surfaces could contain the following contaminants:

- Suspended solids;
- Oxygen demanding substances;
- Pathogens; and
- Dissolved contaminants.

The dissolved stormwater contaminants of concern at this site can cause an aquatic risk to the ecology of the receiving environment. The parameters of concern are as follows:

(1) Hydrocarbons and Oils

These are associated with vehicle use, although there is potential for spillages of hydrocarbon products to occur. They may be in solution or absorbed into sediments. Routine stormwater discharges are likely to have low concentrations ranging between 1 and 5g/m³ total hydrocarbons over each storm event.

(2) Toxic Metals

A variety of persistent trace-metal compounds are carried in stormwater in both solid and dissolved forms. The most commonly measured metals of concern are zinc, copper, and chromium (mostly associated with vehicles and roads).

(3) Nutrients

Fertiliser application and animal waste associated with the current agricultural use of the site have the potential to generate high levels of nutrients such as phosphorus and nitrogen within stormwater runoff. High nutrient levels are not anticipated within the post-development stormwater runoff as, agricultural activities, such as grazing in particular, will cease.

6.5.1 Expected Contaminant Levels

Ranges of contaminant levels are provided by both the Auckland Regional Council (TP 10 and 53) and NIWA (Williamson 1993). This data can be used to predict the likely contaminant loading levels associated with changes in land use. Contaminant levels anticipated for this development have been estimated from TP10 and are included in Table 1 below.

Table 1 – Estimated Contaminant Loading Ranges for Land Use Types (kg/ha/year)

Land Use	Total Susp. Solids	Total Phosph.	Total Nitrogen	BOD	Lead (median)	Zinc	Copper
Road	281-723	0.59-1.5	1.3-1.5	20-33	0.49-1.10	0.18-0.45	0.03-0.09
Residential	60-340	0.46-0.64	3.4-4.7	12-20	0.03-0.09	0.07-0.20	0.09-0.27
Pasture	103-583	0.01-0.25	1.2-7.1	NA	0.004-0.015	0.02-0.17	0.02-0.04
Grass	80-588	0.01-0.25	1.2-7.1	NA	0.03-0.10	0.02-0.17	0.02-0.04

6.5.2 Construction-Stage Stormwater

Construction stage stormwater has the greatest potential to cause discharge of sediment laden runoff to the receiving environment. We would suggest that the applicant provide details of the proposed stormwater management plan as part of the engineering design phase of the project.

The detention ponds will be designed generally in accordance with Auckland Regional Council TP10. Each pond will have a fore-bay and will be suitably vegetated. The detention ponds will provide stormwater treatment before it is discharged to ground. The primary contaminant removal mechanism of all pond systems is settling or sedimentation.

6.6 Stormwater Management Objectives

The following draft overall objectives should be recognised while assessing stormwater management options for the development area:

- Primary protection for 25 year ARI storms;
- Secondary protection (overland flowpaths) for 100 year ARI storms;
- Regulatory Compliance;
- Avoidance of increases in downstream peak flows resulting from the increase in developed surface areas;
- Sustainable management of the effects of the proposed development;
- Minimisation of pollution of receiving waterways through the reduction of stormwater contaminants from roadways;
- Erosion protection in the stormwater discharge zone;
- Construction and maintenance costs.

6.7 Stormwater Management Approaches

This Section of the report introduces options available for stormwater management, in particular traditional design (big pipe), Low Impact Design (LID) or Sustainable Urban Drainage (SUD) approaches.

6.7.1 Traditional Approaches (Big Pipe)

The traditional approach to stormwater management has been to direct all runoff from residential allotments and roadways to a pipe network which discharges to the nearest receiving water body, with minimal effort made to replicate the pre-development hydrological regime.

Arguably the big pipe approach has one advantage over LID and SUD approaches: lower construction and maintenance costs.

6.7.2 LID / SUD Approaches

Some LID options are presented below. These have been sourced from the *Low Impact Design Manual* for the Auckland Region TP124 (Shaver et al. 2000), the *On-Site Stormwater Management Guideline* (NZWERF, 2004) and *Waterways, Wetlands and Drainage Guide* (CCC, 2003).

- Clustering and alternative allotment configuration. Fewer, smaller allotments, with more open space. This approach is less economic for the Developer and is also at odds with some of the principals of modern urban design.
- Reduction in setbacks. Reduction in the front setback reduces the length of driveway required. Correspondingly, the total amount of impervious area within the development is reduced. This approach presents some compliance issues with QLDC District Plan rules.
- Reduction in developed surfaces. This approach applies mainly to transport related aspects of residential developments such as reduced carriageway widths, use of grassed swales as opposed to kerb & channel, and alternative turning head design.
- Vegetated filter strips and swales. Stormwater from roadways is directed through a densely vegetated strip, and then into a road-side swale. Swales are generally used for conveyance of stormwater however they do have contaminant removal properties such as sediment removal efficiency of 20 – 40% (Waterways, Wetlands and

Drainage Guide, CCC 2003). Stormwater velocity is reduced so this approach is beneficial in reducing peak flows.

- Infiltration Trench. Infiltration trenches can be constructed in place of swales if natural soils are sufficiently free draining. This is applicable to sites with limited available open space. Infiltration trenches also have the ability to store stormwater. Infiltration trenches can reduce peak flows however they present maintenance issues.
- Infiltration Basin. The suitability of this option is reliant upon free draining natural soils, adequate depth to groundwater, and sufficient open space to construct.
- Soakage chambers. These allow direct discharge of stormwater to groundwater or free drainage soils. Soakage chambers require clean, pre-treated stormwater.
- Permeable paving. This option allows stormwater to permeate directly into pavement layers, and is applicable for low traffic areas with low ground water levels and free draining non-cohesive soils. Construction and maintenance costs for this option are high.
- Detention Ponds. These are used to reduce peak discharges to pre-development levels. They allow for settlement of suspended solids by vegetation. They require sufficient open space to construct.

6.8 Management Options

Many options are available to avoid, remedy or mitigate the adverse effects associated with residential development on receiving environments.

For the current project the recommended stormwater management strategy is to provide an integrated treatment train approach to water management, which is premised on providing control at the catchment wide level, the allotment level, and the extent feasible in conveyance followed by end of pipe controls. This combination of controls provides a satisfactory means of meeting the criteria for water quality, volume of discharge, erosion and flood control (if required).

Table 2 – Recommendations

	Recommendations	Remarks
Collection	Combinations of LID/SUD measures, kerb & channel, swales, open channels and pipes.	<p>(1) Where allotment density allows direct roadway runoff to grass swales (primary treatment) – also for secondary overland flow during flood events.</p> <p>(2) Where natural soils allow incorporate infiltration measures.</p> <p>(3) Kerb & channel & pipework to provide primary protection.</p>
Treatment	Combinations of swales, detention ponds and end of pipe structures (gross pollution traps and filters).	<p>(1) Pipework to discharge to detention / infiltration ponds.</p> <p>(2) End of pipe structures and fore bay bunds to provide pre-treatment of stormwater</p>

		before infiltration to ground water.
Disposal	Use attenuation prior to discharging to watercourses.	<ul style="list-style-type: none"> (1) Sufficient space is available to construct detention ponds. (2) Where natural soils allow incorporate infiltration ponds. (3) Post development discharge not to exceed pre-development levels.

6.9 Stormwater Concept Design

Runoff from undeveloped areas shall be directed around the developed areas via grass swales, and then discharged to ground. This will replicate the pre development runoff scenario for the undeveloped areas. The developed areas will be serviced using a hybrid LID/SUD/Big Pipe design. This will incorporate a combination of grass swales, kerbs, pipework and detention areas.

The development area can be broken into smaller sub-catchments: Separate pipe networks are then proposed - one for each catchment. Each network will discharge to the stream, gully or directly to the Shotover River. Secondary overflow paths will be provided for in swales or road ways. Overflows will discharge to the same locations as the pre-development scenario.

7 WATER SUPPLY

7.1 Water supply design

To assess the demand and supply requirements for the proposed Homestead Bay residential area the following aspects have been considered:

- Water demands
- Water availability
- Existing infrastructure
- Storage requirements
- Irrigation requirements

7.2 Design flows – Homestead Bay Residential – QLDC

Demand based on the anticipated activities for the Homestead Bay Residential area have been determined in accordance with the development standards:

Refer QLDC code of practice 6.3.5.6.

No of residential units:	715.
Average daily demand:	350 l / person / day.
Occupancy:	3.0 person / du.
Peak Day factor:	6.6.

Average Daily demand: **751 m³ / day.**

Peak day demand: (16 hour pumping) **86.0 l / sec.**

QLDC Code of practice also allows for a lower demand when supported by metering data approved by QLDC. Shotover Country has completed a 12 month metering trial on 50 randomly selected houses. The trial results indicate that an acceptable demand is 350l/p/day.

7.3 Required Fire fighting demand

The design of the new water infrastructure will need to meet the requirements of SNZ PAS 4509 – NZ Fire Service Firefighting Water Supplies Code of Practice.

7.3.1 Residential fire fighting demand – reticulated supply - non sprinklered

Water supply classification:	FW2.
Required water flow within 135m:	12.5 l / sec
Additional water flow within 270m:	12.5 l / sec.
Max No. of hydrants to provide flow:	2.
Minimum pressure	100kPa.
Minimum static storage requirement	45m ³

7.4 Existing Infrastructure

There is a 250mm NB PE water pipe laid in Maori Jack Road from the intersection of the Lodge Road heading towards Lake Wakatipu approx. 600m.

This pipe could be connected to the Coneburn Water supply system and extended to service the development area. Currently however it is not connected to any scheme.

Further analysis would need to be undertaken of the Coneburn system to determine what upgrades might be required.

7.5 Concept Design

Under development currently on site is a new 300mm water bore adjoining Lake Wakatipu. Test pumping and aquifer analysis of the new bore is set to commence from 15th June. Preliminary bores and testing indicate excellent quantity of water at secure depths.

On conclusion of the aquifer analysis design for a communal water supply can be completed to supply potable water to the residential demand.

It is anticipated that an “on-demand” system similar to that at Shotover Country can be developed.

We note that the existing 300mm Shotover Country bore services approx. 950 dwellings and this residential scenario is similar in scale and nature.

The new system would also include a water treatment plant that will treat the water at the source and be pumped to areas of development and to a high level water reservoir that will buffer peak flows and provide static fire fighting reserve.

From the reservoir internal reticulation within the development would be sized accordingly but is anticipated that mains of 200mmØ would be required if arranged in ring formations where possible.

It is proposed that a new reservoir could be established on the Jacks Point hill to the west of the development at a suitable elevation to service the development. The applicant is able to provide the land necessary for the establishment of a reservoir and is able to provide the access required.

The new tank elevation will be very similar to the existing Coneburn water reservoir. There may be opportunities to link the reservoirs to provide security of supply and redundancy in the network.



Sizing of the reservoir should also be carefully considered as this could help eliminate peaks in the demand. This would then allow for a lower peak flow of water to be taken from the new system.

All new infrastructure constructed for this development could be vested in Council ownership.

QLDC may choose to pump the water further afield to meet the demands of other developments in the District.

The further design and modelling of the infrastructure would need to be undertaken closely with the QLDC to confirm availability of supply. It is anticipated that QLDC water modelling consultants will be needed to carry out this modelling at the next phase of design.

7.6 Required upgrades

At this stage, it is not considered likely that connection will be made to existing QLDC infrastructure. Therefore no upgrades of QLDC assets are anticipated. Similarly if a new scheme is established for this development, all costs of establishing the new infrastructure would be borne by the applicant.

8 POWER, TELECOMMUNICATIONS AND GAS

Aurora Energy has high voltage 33kVa network running south on the eastern side of SH6 Kingston Road. There is an existing High voltage underground connection that feeds into the south end of Jacks Point and the existing activities in the Homestead Bay area.

We understand that Powernet are in the process of extending network as far as Hanley Farms approx. 2km away to the north.

We consider that either network could supply suitable underground electrical supply to the proposed development. Below is a screen shot from Aurora's GIS showing the existing electrical infrastructure.



Chorus fibre optic telecommunications cables exist in State Highway 6. It is anticipated that connection to the network can be made and that the new development would be serviced with fibre to the door.

All infrastructure is underground. All necessary mains will be extended to service the development area as development proceeds. Confirmation from the network owners will be obtained at each stage of development prior to proceeding.

It is not anticipated that there will be any supply or capacity issues for these services and connection will be made available from existing infrastructure at the time of development in accordance with the relevant service provider's specifications.

9 CONCLUSION

The proposed re-zoning of the Homestead Bay Residential Area is not considered to have any impacts on the infrastructure network. Infrastructure already exists that can be augmented as required to cater for additional demand or new infrastructure can be developed to service the residential activity proposed.

The infrastructure will be constructed and paid for the by the applicant as the development proceeds. It is anticipated that new infrastructure required would be constructed at little or no cost to QLDC. It is possible that the construction of new infrastructure required for this development could also have a wider network or community benefit by augmenting or providing additional security to existing infrastructure.

Stormwater would be managed for the development on site and is not expected to have any effects on existing infrastructure.

Other non-Council infrastructure and network utilities exist and have capacity to supply this development. Should additional capacity to accommodate the cumulative demand of the residential on the non Council infrastructure be required, it can readily be provided.