


TECHNICAL MEMORANDUM

INVESTIGATION	Resource Consent Application Review for Wakefield Estates Limited & Co	PROJECT	Otago Regional Council Consent Reviews
CLIENT	Otago Regional Council	PROJECT NO	C032635127
CLIENT CONTACT	Kirstyn Lindsay	PREPARED BY	Cameron Jasper
CLIENT WORK ORDER NO/ PURCHASE ORDER	RM20.005/PO011583	SIGNATURE	
		DATE	24 February 2020

1. Introduction

Pattle Delamore Partners Ltd (PDP) has been engaged by Otago Regional Council (ORC) to review potential impacts to groundwater related to a resource consent application from Wakefield Estates Limited, Rockburn Wines Limited, Pisa Holdings Limited, Mark II Limited, Stuart Douglas & Phillipa Mary Hawker, Albany Heights Limited, and Chard Farm Trustees Limited (the Applicants) to replace their existing permit to take surface water (via a diversion into a race) for various purposes including stock water (about 300 sheep and 90 cattle), irrigation (166 ha total including cherries, vineyard, and pasture), frost fighting, and domestic use (two worker facilities with lunchrooms). The Applicants currently share deemed permit 95789 (expiring 1/10/2021), which allows for the take of surface water from the Amisfield Burn up to about 167 L/s and 416,750 m³/month. The primary shareholder in deemed permit 95789 appears to currently be Pisa Holdings Limited with about 27% of the shares. The take is located in the upper reaches of and along the main stem of the Amisfield Burn (about 600 m upstream of the historic location associated with the original deemed permit 95789 due to flooding damage in 1999) and diverts water south (out of the Amisfield catchment into the Park Burn and Five Mile Creek catchments) via the 9 Mile Race connected to a combination of other races and several storage ponds operated by the Applicants.

The surface water take under permit 95789 from the main stem of the Amisfield Burn is a simple open channel diversion into an unlined water race with an overflow channel that routes surface water back to the Amisfield Burn. The 9 Mile Race is piped across the Park Burn as well as Sawyers Gully. A telemetered flow monitoring station is maintained along the race above where it is piped across the Park Burn. The 9 Mile Race diverts the Amisfield Burn water to the Branch Race and Wakefield Race (on the south side of the Park Burn), which allow for the water to be distributed amongst the shareholders storage ponds for various uses.

The Applicants have proposed a consent to replace deemed permit 95789 with maximum total rates of take from the Amisfield Burn at 120 L/s, 255,390 m³/month, and 1,257,818 m³/year and a duration of 35 years. The Applicants have proposed the maximum monthly and annual abstraction volumes above based on Aqualinc efficiency of use calculations with regards to the various irrigation, frost fighting, stock, and domestic requirements. Historically (based on the analyses of the 2015-2019 diversion records from the telemetered site noted above) the Applicants have taken up to about 157 L/s, 226,438 m³/month, and 1,808,577 m³/year. According to the records provided there are no instances where the maximum instantaneous rate of take exceeded the combined rate above. The average daily rate rarely exceeded 120 L/s and the Applicants expect

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that the proposed rate of 120 L/s can be met and that it better reflects their combined requirements and abstraction records.

The Applicants have stated that there are no designated aquifers within the area with the closest being the Lowburn Alluvial Ribbon Aquifer (within the Low Burn surface water catchment) about 6.5 km to the southwest of the permit 95789 point of take along the Amisfield Burn. According to the ORC database, there is a potentially affected draft/recommended aquifer (Pisa Groundwater Management Zone) flanking the western side of Lake Dunstan about 0.5 km downstream of the Applicant's takes along the Amisfield Burn. Although this groundwater management zone extent mostly corresponds to the extent of the Late Pleistocene river deposits (gravelly alluvium between Lake Dunstan and SH6) and Holocene river deposits (gravelly alluvium extending up the valleys of the lower foothills to the bedrock base of the Pisa Range metamorphic rocks flanked by glacial till deposits), it appears that ORC has primarily delineated this zone based on the topography of the land surface where the foothills extending from the Pisa Range transition into the lower flatter areas on the western side of Lake Dunstan and up the lower valley fill areas of Five Mile Creek, Park Burn, and Amisfield Burn.

Bores in the area appear to be primarily concentrated towards Lake Dunstan within the extent of the alluvium between SH6 and the lake. The hydrogeologic setting is such that any surface water flow within the Amisfield Burn that is lost to groundwater above (upgradient) and outside of the Pisa Groundwater Management Zone is expected to arrive as groundwater inflow on the northwest side of the zone. Additionally, surface water flow losses within the Pisa Groundwater Management Zone above the point of inflow into Lake Dunstan are expected to bolster the groundwater supply. According to LAWA, the Amisfield Burn surface water catchment is overallocated. It is also noted on the LAWA database that the Amisfield Burn is likely to naturally run dry due to losses to groundwater. The Applicant's take location from the Amisfield Burn appears to be just above and outside (0.5 km) of the Pisa Groundwater Management Zone, which has, according to ORC, 2,234,080 m³/year of groundwater available for allocation.

Mid-summer flow gaugings (with all surface water abstractions ceased 24 hours prior to the survey) on 15 January 2019 provided by the Applicant demonstrates that the Amisfield Burn gains within its upper reaches and then loses significantly to groundwater as it flows out of the hard rock (schist) Pisa Range over the gravelly alluvium towards the point of discharge into Lake Dunstan. According to the flow gauging survey and field observations provided by the Applicant, the Amisfield Burn in its natural setting will not always reach Lake Dunstan as described below. The flow gauging results show that the Amisfield Burn lost about a third of its flow (211 to 153 L/s) between the confluence with the Breakneck Creek (in the vicinity of the Applicants take) and the downstream site (about 2 km downstream above SH6). The relative rate of loss to groundwater then increased where about half of the flow was lost over about 600 m between the site above and below SH6 (153 to 72 L/s). Over the final stretch of Amisfield Burn all the remaining 72 L/s was lost to groundwater over about 700 m before reaching Lake Dunstan. The Applicant has noted the ORC flow monitoring on the upper reaches of the Amisfield Burn since 2013 indicating a mean annual flow of 162 L/s and a mean annual 7-day low flow of 65 L/s. Given the gauging survey and the ORC statistics on flow, it is likely that the Amisfield Burn in its natural setting is generally lost to groundwater prior to reaching Lake Dunstan.

Depth to groundwater information available through ORC suggests that bores in the vicinity of SH6 and the Amisfield Burn are generally about 30 m deep with groundwater at 20 m bgl. This is consistent with similar observations to the southwest where the Park Burn flows out of the Pisa Range. The Amisfield Burn in the vicinity of the Applicant's current take represents a combination of hard rock aquifer, snowmelt, and precipitation contributions outside of the groundwater management zone. It is expected that the existing take reduces natural groundwater recharge to the proposed Pisa Groundwater Management Zone and could therefore potentially impact groundwater levels at supply wells and surface water bodies, the overall

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groundwater resource and reduce the potential for contaminant dilution. A consideration of these potential effects is outlined below.

2.1 Effects on the overall groundwater resource

It is understood that surface water inflows from the Amisfield Burn, and other streams flowing towards Lake Dunstan, are included in ORC's calculation of allocation status for the proposed Pisa Groundwater Management Zone. ORC may therefore wish to consider accounting for the takes in the groundwater allocation block, in addition to surface water, to recognise the potential reduction in recharge. Specific effects on current groundwater resource users are considered in Section 2.3 of this memo. Given the amount sought by the Applicants (1,257,818 m³/year), the most conservative scenario is that all this proposed diversion of water would otherwise be lost to groundwater (recharged into the Pisa Groundwater Management Zone in the natural setting). This is less than the 2,234,080 m³/year of groundwater available for allocation according to ORC, so the effects on the overall groundwater resource are expected to be less than minor. However, we note that with the other deemed permits where replacements consents are sought that are currently being reviewed by ORC, the allocation limit could be exceeded. Although, as noted above, this is not a new abstraction. Given it is a proposed limit, further consideration should be given to how these permits should be best accounted for in the groundwater and surface water allocation blocks.

2.2 Effects on surface water bodies

The specific effects on surface water and ecology from the abstractions are being considered by others reviewing this application. From a groundwater perspective, reduced recharge to an aquifer can affect any connected wetlands or spring fed-streams via a reduction in groundwater levels. There are no wetlands identified by ORC as regionally significant wetlands in the potentially affected area. The closest significant wetland is the Bendigo Wetland, which is hydraulically connected to Lake Dunstan at the north of the lake. Inspection of aerial imagery does not indicate any obvious wetlands or spring-fed streams bordering the courses of the Amisfield Burn in the potentially affected area between the takes and Lake Dunstan. This is expected given the natural hydrogeologic setting where groundwater becomes relatively deep and disconnected from the Amisfield Burn. On this basis, adverse effects on connected surface water bodies as a result of reduced groundwater recharge are not expected to occur as a result of the proposed diversion. Ultimately, there will however, be a reduction in groundwater flow into Lake Dunstan/the Clutha River. There are no current allocation limits for these water bodies, although ORC have commenced a process to develop limits.

2.3 Effect on nearby bores

The Applicants have noted that the closest groundwater take consent is about 4.2 km to the southeast of the Amisfield Burn (permit 95789) take and stated that, based on the separation distance, that no adverse effects are expected. A review of bores on the ORC database shows that the closest potentially effected bores are about 5 km downstream in the vicinity of SH6 flanking each side of the Amisfield Burn. These bores are around 30 m deep (within the area of Late Pleistocene and Holocene gravelly river deposits at the land surface) with relatively deep groundwater levels up to about 20 m bgl. The bores transition to have slightly shallower depths with shallower depth to groundwater observations toward Lake Dunstan in the vicinity of the Amisfield Burn. This is most notably demonstrated by bore G41/0346 (15 m deep with a 3.5 m depth to groundwater) adjacent to Lake Dunstan and the Amisfield Burn point of discharge into the lake.

Given that the Amisfield Burn is interpreted to only reach the lake on occasion during higher flow events (likely stormwater dominated flows) and that mounding effects associated with these flows in the relatively permeable alluvium would only be expected to be temporary (on the order of hours to days), it is unlikely that

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these bores rely on direct mounding effects specific to flows from the Amisfield Burn. The constant head boundary effects from Lake Dunstan (with a likely direct hydraulic connection), as well as the other recharge to the overall groundwater resource within the Pisa Groundwater Management Zone together with this being an existing abstraction, mean that the levels in the supply bores are unlikely to be adversely affected.

Given the assessment above, adverse effects on neighbouring bores due to lowered groundwater levels or reduced capacity for contaminant dilution are not expected to occur as a result of the proposed take from the Amisfield Burn.

3.0 Conclusion

In conclusion our assessment of the proposed take indicates the following.

- ∴ The taking of surface water is expected to reduce groundwater recharge.
- ∴ It is considered that sufficient information has been provided for assessing the effects on groundwater.
- ∴ Based on the absence of potentially affected bores and connected surface water bodies, no residual flow specific to groundwater effects is considered necessary.
- ∴ No specific groundwater conditions are considered necessary.
- ∴ Given the recharge from Amisfield Burn has been provided for in ORC’s allocation calculations for the proposed Pisa Groundwater Management Zone, ORC may wish to consider accounting for the takes in the groundwater allocation for this area. Given it is a proposed limit, further consideration should be given to how these permits should be best accounted for in the groundwater and surface water allocation blocks.

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This memorandum has been prepared by PDP on the basis of information provided by Otago Regional Council and others (not directly contracted by PDP for the work), including the Applicant. PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the memorandum. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.