



Section 32 Evaluation Report

Millbrook Resort Zone

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Section 32 Evaluation Report: Millbrook Resort Zone

1. Strategic Context

Section 32(1)(a) of the Resource Management Act 1991 ('the Act') requires that a Section 32 evaluation report must examine the extent to which the proposed objectives are the most appropriate way to achieve the purpose of the Act.

The purpose of the Act requires an integrated planning approach and direction:

5 Purpose

- (1) *The purpose of this Act is to promote the sustainable management of natural and physical resources.*
- (2) *In this Act, sustainable management means managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well-being and for their health and safety while—*
 - (a) *sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and*
 - (b) *safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and*
 - (c) *avoiding, remedying, or mitigating any adverse effects of activities on the environment.*

2. Regional Planning Documents

The Regional Policy Statement 1998 ["RPS"] is currently under review itself, and may be further advanced in that process by the time the District Plan Review is notified. Amendments to this evaluation may be required to accommodate that change. The District Plan must *give effect to* the operative RPS and must *have regard to* any proposed RPS.

The operative RPS contains a number of objectives that are relevant to this review, including:

- 4.4.1 to 4.4.5 (Manawhenua Perspective)
- 5.4.1 to 5.4.5 (Land)
- 6.4.2 to 6.4.7, 6.57 (Water)
- 7.4.1 (Air)
- 9.4.1 to 9.4.3 (Built Environment)
- 10.4.1 (Biota)

Each objective has related policies which have also been considered.

The proposed plan change provisions are consistent with, and give effect to, the relevant operative RPS provisions.

A district plan is required to be not inconsistent with a regional plan

The Regional Plan – Water for Otago is relevant to this proposal. The following objectives in particular are identified:

- 5.3.4 to 5.3.6;
- 5.3.8, and
- 7.A.1 to 7.A.3.

There are a number of related policies which have also been considered.

The other notably relevant regional level document is the Regional Plan – Air for Otago. It is noted that the Objectives 6.1.1 and 6.1.2 are relevant, as are a number of related policies.

Overall, it is assessed that this plan change is not inconsistent with relevant regional plans.

3. Background and Resource Management Issues

The current format of the Millbrook Resort Zone (‘the Zone’) was decided under Environment Court decision C19/2000. On 11 October 2003 QLDC obtained an Environment Court order making the Millbrook Resort Zone of the proposed District Plan operative. It is therefore now more than 10 years old and in need of a review (as stipulated by the Act).

Tourism NZ’s working party on golf tourism has identified significant growth opportunities for high yielding golf tourism in NZ and particularly the Wakatipu. They have also identified a pending supply shortage for quality golf courses in the Queenstown Lakes area.

With the adjacent Dagleish Farm on Millbrook’s western boundary being offered for sale in 2014, Millbrook recognised the opportunity to expand its current 27-hole operation and, in November 2014, the Overseas Investment Office approved purchase of the 66 hectare block. The land is referred to in this report and the accompanying reports as the ‘Dagleish Farm’ (except in the Geological assessment where it is referred to as the ‘Macauley Block’).

Millbrook currently has 27-holes of golf but practically can only operate a single 18-hole course on any given day. By adding an additional 9-holes of golf there is a marginal increase in maintenance costs but a 100% increase in golf supply with two 18-hole courses able to be played simultaneously.

As part of the District Plan review process, Millbrook is working with QLDC to review and update the 15 year old provisions of the Millbrook Resort Zone. This review is necessary to address a number of district-wide changes and some anomalies that have arisen over time.

The review is able to include a possible extension of the zone over the adjoining Dagleish Farm to increase its golf offering to a 36-hole course. Dagleish Farm is the last remaining opportunity for Millbrook to develop a contiguous block of land with capacity for an additional 9-holes to take it to a 36-hole format. The land is uneconomic as a farming unit and unless developed, it is at risk of falling to wilding weed and rabbit infestation. The Millbrook proposal ensures that it will have a comprehensive on-going land management plan.

The Millbrook Resort Zone presently allows up to 450 dwellings. The 36-hole proposal does not seek to increase this ceiling, but golf development on its own has well known commercial risks including construction costs that are able to be subsidised by appropriate residential property development.

Millbrook has a proven track record as a responsible developer. It is a major contributor to the tourism industry and is one of the largest employers in the region with an annual pay roll in excess of \$8m. Indirectly, it is a significant contributor to the local construction and service sectors.

Millbrook and its consultants concluded that the scale and nature of the potential development meant that modifications to the plan would be the most appropriate method in which to enable the project. As the timing of this has coincided with the District Plan review, Millbrook has involved Council in the process and provided Council an opportunity to adopt its proposals.

The resource management issues addressed in this process have been identified through a combination of:

- QLDC’s monitoring report - The Effectiveness and Efficiency of the Resort Zone
- Observations from Millbrook staff and consultant team
- Consultation (the details of which are set out in the report: Millbrook Plan Review – Consultation Record)

- Commissioned reports (where relevant, names used from hereon in the rest of this report are in brackets):
 - o The Wharehuanui Landscape Study
 - o Landscape Assessment Report - Dalglish Farm – Millbrook - February 2015 (Landscape Assessment)
 - o Millbrook Proposed District Plan Change Preliminary & Detailed Site Investigation (Contaminated Sites Assessment)
 - o Assessment of Potential Pollution Impact of the Proposed Millbrook Resort Extension
 - o Financial and Economic Analysis of Development Options for Millbrook (Economic Assessment)
 - o Millbrook Resort Zone – Dalglish Farm Extension (Infrastructure and Flooding Hazard Assessment)
 - o Millbrook MacAuley Land: Appraisal of known and Inferred Hazards and Potentially Adverse Geotechnical Features at the Site (Geological Assessment)
 - o Dalglish Farm, Malaghans Road, Arrowtown – Historic Heritage Assessment (Heritage Assessment)
 - o Review of Ecological Values and Restoration Opportunities for Dalglish Farm (Ecological Assessment)

The key resource management issues are summarised as follows:

- The current Structure Plan aligns poorly with existing and consented development, leading to administrative inefficiencies
- There are various opportunities to remove unnecessary provisions in the Millbrook Resort Zone and aid the efficient administration of the Plan
- Millbrook has a proven record of responsible development (as evidenced in the quality of outcomes which is set out in QLDC’s monitoring report for the Resort Zone). The nature of the enterprise means that it is most likely that it will continue to exercise its influence over the entire zone. It is not considered necessary to unreasonably hinder the operation of the company by significant changes or added complexity to the zoning
- Developing Millbrook to 450 dwellings over the current extent of the Millbrook Structure Plan (as currently enabled by the Millbrook Resort Zone) may lead to an intensity of development that would detract from established amenity values
- The Dalglish Farm brings with it particular landscape and heritage challenges, and it is important that development responds to those sensitivities in a manner which avoids, remedies or mitigates adverse effects
- The Dalglish Farm has some ecological values worthy of protection and offers opportunities for restoration that contributes to the ecological values of the wider area
- Some neighbours have expressed concern about how the development could affect the amenity they currently enjoy from their current properties. Practicable measures to address these concerns need to be considered.

4. Purpose and Options

The proposed purpose of the Millbrook Resort Zone is ‘to provide for visitor resort of high quality’.

Strategic Directions

The following goals and objectives from the Strategic Directions chapter of the draft District Plan are relevant to this assessment:

Table 1 – Assessment Against the Goals and Objectives of the Strategic Directions Chapter

Goals and Objectives from the Strategic Directions Chapter	Assessment
<p><i>Goal 3.2.1: To develop a prosperous, resilient and sustainable economy</i></p> <p>Objective - To enable the development of innovative and sustainable enterprises that contribute to diversification of the District's economic base and create employment opportunities.</p>	<p>The economic assessment outlines the significant economic contribution an expansion of the Millbrook Resort could make.</p>
<p><i>Goal 3.2.3: A quality built environment taking into account the character of individual communities</i></p> <p>Objective - To protect the District's cultural heritage values and ensure development is sympathetic to them.</p>	<p>The landscape and heritage assessments have informed the development of provisions which are considered to implement this objective</p>
<p><i>Goal 3.2.4: The protection of our natural environment and ecosystems</i></p> <p>Objective - To promote development and activities that sustain or enhance the life supporting capacity of air, water, soil and ecosystems.</p> <p>Objective - To maintain or enhance the survival chances of rare, endangered, or vulnerable species of indigenous plant or animal communities.</p> <p>Objective - To preserve or enhance the natural character of the beds and margins of the District's lakes, rivers and wetlands.</p> <p>Objective - To maintain or enhance the water quality of our lakes, rivers and aquifers.</p>	<p>These objectives are achieved by policies on these matters and through the requirement to submit an ecological restoration and stormwater management plan for the Dagleish Farm. This is based on advice set out in the Ecological Assessment.</p> <p>It is further noted that Millbrook have a track record of reducing nutrient levels in Mill Creek through development, reducing stock numbers and carrying out riparian improvements. This approach can be carried through to the Dagleish Farm.</p>
<p><i>Goal 3.2.5: Our distinctive landscapes are protected from inappropriate development.</i></p> <p>Objective - To minimise the adverse landscape effects of subdivision, use or development in specified Visual Amenity Landscapes and Other Rural Landscapes.</p> <p>Objective - To direct new subdivision, use or development to occur in those areas that have potential to absorb change without detracting from</p>	<p>These objectives are achieved by a carefully laid out Structure Plan and various controls on the external appearance of buildings and associated development. These matters are further assessed in the Landscape Assessment.</p>

<p>landscape and visual amenity values.</p> <p>Objective - To recognise there is a finite capacity for residential activity in rural areas if the qualities of our landscape are to be maintained.</p> <p>Objective - To recognise that agricultural land use is fundamental to the character of our landscapes.</p>	
<p><i>Goal 3.2.7: - Council will act in accordance with the principles of the Treaty of Waitangi and in partnership with Ngai Tahu.</i></p> <p>Objective - Protect Ngai Tahu values, rights and interests, including taonga species and habitats, and wahi tupuna.</p> <p>Objective – Enable the expression of kaitiakitanga by providing for meaningful collaboration with Ngai Tahu in resource management decision making and implementation</p>	<p>Consultation has been undertaken with Ngai Tahu identified iwi representatives in the preparation of this change to the Plan. It is considered that this goal and objective have been achieved.</p>

The following section two various broad options considered to address the issues, and makes recommendations as to the most appropriate course of action in each case.

Broad Options considered with respect to existing Millbrook Resort Zone (see Table 1, below)

Option 1 is to retain the current provisions (objectives, policies and rules) as they stand (do nothing).

Option 2 (Recommended) provisions to be examined in light of the issues highlighted through monitoring. Would result in all provisions being critically assessed, with many of the current provisions likely to be retained and improved, and provisions to be structured and articulated in a clearer manner than the status quo. Requires a new format to be consistent with the rest of the new District Plan. Due to their different resource management issues and the practical issued raised by a staged review, it is also considered that the Millbrook Resort Zone is best separated from the other parts of the Resort Zone (Waterfall Park and Jacks Point).

Option 3 requires the provisions to be completely overhauled. Monitoring has not identified any significant shortcomings in the Millbrook Resort Zone, particularly with the development that has resulted. This option is therefore not considered necessary, with many provisions able to be carried over with little if any change (as per Option 2).

Broad Options considered with respect to the proposed expansion area ‘Dalgleish Farm’

Option 1 - No Change – This option would essentially mean that the project does not proceed and the Millbrook Zone does not extend beyond its current westward boundaries, with the Dalgleish Farm remaining part of the Rural Zone.

Option 2 (Recommended) –Extend the Zone to incorporate Dalgleish Farm in order to:

- 9 additional golf holes (to enable a total of 36 holes in the Zone)
- landscape and ecological protection areas
- Opportunity for 45 to 55 residential units

Option 3 – Extend the Millbrook Resort zoning along the lower slopes nearer Malghans Road, creating approximately 23 residential units, with no golf development.

Option 4 - "Rural Residential Development" across entire 'Dalgliesh Farm' site, creating approximately 19 lots. 9 lots read as an extension of Millbrook and 10 large rural residential lots are set within a reduced farm with no golf development, which may or may not be incorporated within the Millbrook Resort Zone.

Table 2 – Broad options considered with respect to the existing Millbrook Resort Zone

	Option 1: Status quo/ No change	Option 2: Comprehensive review – likely result in many existing provisions being retained and improved	Option 3: Comprehensive Review – overhaul existing provisions
Costs	<ul style="list-style-type: none"> • Would fail to fulfil Council’s statutory obligation to review the Plan every ten years. • Would not provide a thorough assessment of the operative Plan provisions. • Existing shortcomings and inefficiencies with respect to the Millbrook Resort Zone would not be addressed 	<ul style="list-style-type: none"> • Has costs associated with going through the District Plan Review process (but this is required by legislation). 	<ul style="list-style-type: none"> • Has costs associated with going through the District Plan Review process (but this is required by legislation). • May lead to unnecessary time and costs spent on assessing alternative provisions when the current provisions are not considered to be problematic
Benefits	<ul style="list-style-type: none"> • No costs resulting from the District Plan Review Process. 	<ul style="list-style-type: none"> • Enables provisions to be articulated in a format that is more legible, and provides greater clarity, than the status quo. • Would fulfil Council’s statutory obligation to review the Plan every ten years. • Allows for more efficient and effective District Plan provisions which appropriately manage new development and better reflect the existing development pattern 	<ul style="list-style-type: none"> • Enables provisions to be articulated in a format that is more legible, and provides greater clarity, than the status quo. • Would fulfil Council’s statutory obligation to review the Plan every ten years. • Allows for more efficient and effective District Plan provisions which appropriately manage new development and better reflects the existing development pattern
Ranking	3	1	2

Table 3 – Broad options considered with respect to the proposed expansion area ‘Dalgleish Farm’

	Option 1: Status quo/ No change	Option 2: Incorporate full residential and golf development within the Millbrook Resort Zone	Option 3: Incorporate lower slopes of the Dalgleish Farm within the Millbrook Resort Zone with no golf	Option 4: ‘Rural residential’ development across the entire site
Costs	<ul style="list-style-type: none"> Land would not be developed by Millbrook and associated community economic benefits from golf course expansion and residential construction would not be accrued. Assessed as the worst economic option (see the Economic Assessment). The future of the land would be uncertain, but it would be unlikely to be put to efficient use and weeds and pests may not be contained Opportunities for ecological and heritage enhancement would not be realised 	<ul style="list-style-type: none"> Some views would be altered (mostly for some adjoining neighbours), although landscape analysis does not indicate effects would be significant 	<ul style="list-style-type: none"> Would not allow the completion of 36 holes of golf Following from the point above, the project may not proceed in any form if it is not found to be economically viable No certainty that land in the upper slopes will be well managed and weeds and pests controlled due to the marginal productive value of that land. 	<ul style="list-style-type: none"> Would not allow the completion of 36 holes of golf Following from the point above, the project may not proceed in any form if it is not found to be economically viable Depending on how the land is managed (e.g. whether it remains within the Millbrook management structure) it is not certain that best practice in land management will be employed, and weeds and pests controlled. (It is observed that many ‘rural lifestyle’ lots in the Wakatipu Basin are not well managed in this respect.)
Benefits	<ul style="list-style-type: none"> Would affect the least landscape change (assuming wilding species do not proliferate) 	<ul style="list-style-type: none"> The completion of 36 holes of golf (via the 9 holes proposed in this land) would improve the tourism offer of Millbrook and the Wakatipu Basin, with associated economic and recreational benefits Assessed as the best economic outcome (see the Economic 	<ul style="list-style-type: none"> Assessed as the third best economic outcome (see the Economic Assessment). Ecological restoration would be limited to the lower slopes Provides the opportunity to further improve water quality in Mill Creek and Lake Hayes 	<ul style="list-style-type: none"> Assessed as the second best economic outcome (see the Economic Assessment). Opportunities for ecological protection and restoration, but less viable and unlikely to be particularly effective. Provides the opportunity to further

		<p>Assessment).</p> <ul style="list-style-type: none"> • Provides an opportunity for ecological restoration that would have wider benefits for the wider Basin • Provides the opportunity to further improve water quality in Mill Creek and Lake Hayes • Land management with control of weeds and pests 	<ul style="list-style-type: none"> • The land in the lower slopes should be well managed with weeds and pests controlled • Is expected to result in less change to the existing landscape values than Option 2. 	<p>improve water quality in Mill Creek and Lake Hayes</p> <ul style="list-style-type: none"> • May, depending on the layout of development and property boundaries, result in less change to the existing landscape values than Option 2.
Ranking	4	1	3	2

5. Scale and Significance Evaluation

The level of detailed analysis undertaken for the evaluation of the proposed objectives and provisions has been determined by an assessment of the scale and significance of the implementation of the proposed provisions in the chapter. In making this assessment, regard has been had to the following, namely whether the objectives and provisions:

- Have effects on matters of national importance.
- Adversely affect those with specific interests, e.g., Takata Whenua, neighbours
- Involve effects that have been considered implicitly or explicitly by higher order documents.
- Impose increased costs or restrictions on individuals, communities or businesses.

6. Evaluation of proposed Objectives S32 (1) (a)

Table 4 – Assessment against objectives

Objective	Appropriateness
<p>Objective 43.2.1:</p> <p>Visitor, residential and recreation activities developed in an integrated manner with particular regard for landscape, heritage, ecological, water and air quality values.</p>	<p>No shortcomings with the operative objective were raised in Council monitoring, so a small refinement only is considered necessary. This objective needs to be considered in conjunction with the overarching objectives of the Plan, particularly those in the Strategic Directions Chapter. The previous objective included the following:</p> <p><i>‘...minimal impact on adjoining neighbours and roads.’</i></p> <p>The objectives within the Strategic Directions chapter identify those values and places from which effects are especially important to consider. In order to align with the District Plan, it is considered appropriate to defer to those overarching objectives for direction on such matters. This wording is therefore not included.</p> <p>It was also considered that, in achieving the purpose of the Act, it is appropriate to use the phrase ‘particular regard’ rather than ‘regard’ as is currently the case in the Millbrook Resort Zone of the operative District Plan.</p>

7. Evaluation of the proposed provisions S32 (1) (b)

The below table considers whether the proposed provisions are the most appropriate way to achieve the relevant objectives. In doing so, it considers the costs and benefits of the proposed provisions. (See also Table 1- Broad options considered, in Section 4 above.)

Table 5 – Evaluation of proposed provisions

<i>Proposed provisions</i>	<i>Costs</i>	<i>Benefits</i>	<i>Other practical options considered</i>
<p>Policy 43.2.1.1 (requirement to develop in accordance with the Structure Plan)</p> <p>Rules: 43.4.8, 43.4.9, 43.4.10, 43.4.11, 43.4.12, 43.4.17, 43.4.18, 43.4.19, 43.4.21, 43,5.2.</p>	<ul style="list-style-type: none"> Reduces flexibility for the landowner as to where they can develop and what they can develop (although for some activities there is flexibility for an application to be considered on a discretionary basis) Can (and has in the past) lead to administrative inefficiencies if the Structure Plan does not promote development in the best locations. Maintaining a maximum number 450 residential units limits the potential for more intensive development, foregoing potential profit for the company 	<ul style="list-style-type: none"> Provides increased certainty that development will be well planned and managed in a way which accounts appropriately for the resource management issues listed in the objective. The structure plan locates development and sets out areas where mitigation is expected in order to mitigate adverse effects that could be experience from nearby properties. The rules prescribing activities and locations are worded differently from the current Plan. (The Millbrook Resort Zone currently prescribes what uses are allowed as opposed to what are not allowed). This format change aligns with the rest of the District Plan and is considered less likely to unintentionally preclude reasonable activities, such as agriculture in those activity areas that are not being developed. The range of uses enabled in each activity area is fairly narrow. This provides some certainty. It also allows for the activities to be located in certain areas in a manner which achieves the amenity levels anticipated in the different parts of the 	<ul style="list-style-type: none"> Minimal change to structure plan for existing part of Millbrook No structure plan Higher activity statuses for activities outside assigned activity area Increasing the maximum number of units allowed in the zone Removing the maximum number of units rule (and possibly applying another control such as minimum lot sizes) Removing the 5% total maximum site coverage rule

<i>Proposed provisions</i>	<i>Costs</i>	<i>Benefits</i>	<i>Other practical options considered</i>
		<p>Zone. For example, in the Landscape Protection Area, most buildings are non-complying. However farm buildings are provided for as a controlled activity in order to enable the movement of the woolshed to a more practical woolshed location nearer Malaghans Road, which is supported as a positive change in the landscape assessment.</p> <ul style="list-style-type: none"> • Generally the Structure Plan has been amended to reflect existing or consented development patterns which over time have varied considerably from what is anticipated by the Structure Plan anticipated. • The maximum number of 450 residential units gives some assurance (to those who reside in and near the zone) that established amenity levels will not be affected by intensification. The maximum site coverage rule for all buildings in the zone of 5% is also maintained. Coupled with this, the movement of residential activity area boundaries in some areas gives assurances that it is not anticipated that extra houses will be added in some locations where this may have been achievable. Maintaining the overall cap at 450 residential units (as is currently prescribed in the Plan) also maintains a similar level of infrastructure demand to that which has been anticipated and provided for (see the Infrastructure and Flooding Hazard Assessment for more details) 	

Proposed provisions	Costs	Benefits	Other practical options considered
<p>Policy 43.2.1.2 (requirement for buildings to account for landscape and heritage values)</p> <p>Rules: 43.4.1, 43.4.2, 43.4.3, 43.4.5, 43.4.7, 43.4.13</p>	<ul style="list-style-type: none"> • Costs associated with the resource consent process for most buildings 	<ul style="list-style-type: none"> • Establishes a range in activity statuses which is considered to align with the relative sensitivity of the different parts of the Structure Plan (particular with respect to landscape and heritage values). This ensures a high level of scrutiny to design in areas where it is important to protect values • Enables a method for buildings to be constructed as a permitted activity when considered comprehensively with a subdivision which includes proposed design controls. In practice this is how Council has consented development in Millbrook in recent years and it has proven to be an effective and efficient method. The wording seeks to confirm the continuation of this approach. • The application of permitted activities for buildings up to a certain scale associated with utilities or golf course development (as is currently the case in the operative Millbrook Resort Zone) and for structures in the Services Activities will remove unnecessary consents where such activities are anticipated 	<ul style="list-style-type: none"> • Permitted activity for all buildings • Restricted discretionary activity for all buildings • Controlled activity for all buildings • Combinations of the above
<p>Policies: 43.2.1.3 (ecological values), 43.2.1.6 (reduce nutrients into water ways)</p> <p>Rule: 43.5.11</p>	<ul style="list-style-type: none"> • May add to development costs 	<ul style="list-style-type: none"> • Policy 43.2.1.3 and its implementation via Rule 43.5.11 presents an opportunity to protect and enhance the ecological benefits of this site as discussed in the report, 'Review of Ecological Values and Restoration Opportunities for Dalgleish Farm'. 	<ul style="list-style-type: none"> • No requirement to undertake ecological restoration, to submit plans for improving water quality or to address concerns raised in consultation with respect to potential effects on amenity of existing neighbours

Proposed provisions	Costs	Benefits	Other practical options considered
		<ul style="list-style-type: none"> • Policy is a rollover of an existing policy which has been implemented with some success. Rule 12.5.1.11 will promote an integrated approach to stormwater management for the entire Dalgleish Block. • Rule 43.5.11 also seeks that Council consider and approve the details of mitigation to be undertaken to prevent unreasonable disturbance to the amenity enjoyed by neighbours from the proposed new golf holes. This method implements a range of objectives and policies from the Plan. 	
Policy 12.3.1.6 (Air Emissions) And Rule 43.5.12	<ul style="list-style-type: none"> • Could preclude the use of household fireplaces which are otherwise compliant with the Regional Air Plan, limiting individual choice 	<ul style="list-style-type: none"> • A similar rule has been applied under current zoning without apparently causing any particular concern. Provides an extra level of assurance above the Regional Plan. Has been amended to allow small outdoor fires on the basis that such fire places (such as for barbeques) when used occasionally are unlikely to contribute to air emissions if otherwise complying with regional rules and local bylaws. A note is proposed to be added to alert readers to other such regulations. 	<ul style="list-style-type: none"> • Remove provisions relating to air quality • Leave provisions relating to air quality unchanged from operative provisions
Policy 12.3.1.4 (Control of Aircraft landings and take-offs) Rules 12.4.1.14, 12.4.1.14	<ul style="list-style-type: none"> • Restricts flexibility of Millbrook to develop the resort as they wish and of landowners to land private aircraft where they wish (notwithstanding the need to otherwise comply with Civil Aviation Act laws and regulations) • Does not provide Millbrook certainty that 	<ul style="list-style-type: none"> • Provides some assurances to those in and around the zone as to where helicopters can land, which has safety and amenity benefits • Signals Millbrook's preferred future helicopter landing and takeoff area. Moving from the current location would enable the 	<ul style="list-style-type: none"> • Leave helipad location in its current location on the structure plan • Make all helicopter landings and take-offs discretionary, or non-complying, without an identified location on the structure plan.

<i>Proposed provisions</i>	<i>Costs</i>	<i>Benefits</i>	<i>Other practical options considered</i>
	<p>their proposal to move the helicopter pad away from the Village Activity Area will be approved (due to Restricted Discretionary Status)</p>	<p>development of the Village area and is understood to reduce potential conflict between golf and flight paths.</p> <ul style="list-style-type: none"> • Allows for a detailed assessment of effects on amenity and safety in due course should a detailed resource consent application be made, with Council having the ability to decline the application. 	

8. Efficiency and effectiveness of the provisions.

In electing the preferred options regard has been given to their potential effectiveness and efficiency.

Overall, it is considered that the revised Millbrook Resort Zone would:

- would be easier to read, aligning better with the rest of the District Plan
- would reduce the number of unnecessary consents
- be more streamlined, with less provisions and no assessment matters
- would more accurately reflect existing and consented development, and enable development considered to be appropriate. Again, this would reduce the number and breadth of consents required
- would achieve the purpose of the Act and the overarching objectives of the Plan through well managed and located development carried out in a responsible manner.

9. Assessment of benefits and costs

This assessment is based on a comprehensive range of reports. There is considered to be minimal risk of acting on uncertain or insufficient information.

The economic benefits arising from the expansion into the 'Dagleish Farm' and alternatives have been assessed. Readers are referred to the Economic Assessment.

The following is a brief summary of the identified costs and benefits identified as arising from the implementation of the provisions:

Table 6 – Assessment of costs and benefits

	Costs	Benefits
Environmental	Some temporary effects arising from construction can be anticipated – e.g. soil loss, carbon emissions	Improved land management including nutrient run off, weed and pest management Ecological benefits arising from planting, protection and improved riparian management
Economic		Significant wider economic benefits in terms of economic growth and employment as reported and quantified in the Economic Assessment.
Social		Increased recreation opportunities through 9 more holes of golf
Cultural effects	Heritage values, including the established building and vegetation layout of Dagleish Farm will be altered. Well-designed development will however mitigate such effects	Heritage values may be better protected and even enhanced through upgrading and continuing use of the woolshed on Dagleish Farm and, sympathetic alterations to the category 3 listed building on Dagleish Farm. Note – consultation has not identified any concern among takata whenua with respect to this proposal.

10. The risk of not acting.

The changes proposed would enable a number of benefits to Millbrook Country Club, the residents of the Millbrook Resort Zone and the community at large. The changes also reflect the current changing nature of the RMA with its drive to simplify and streamline. Not acting would constitute a missed opportunity to:

- Address anomalies and update zone provisions;
- Enhance golf tourism opportunities; and
- Provide for social, economic and cultural well-being

Wharehuanui Landscape Study



Prepared by Baxter Design Group
January 2015



Wharehuanui Landscape Study

DISCUSSION DOCUMENT



Prepared for
Millbrook Country Club Limited
By
Baxter Design Group

January 2015

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J	Ability to Absorb Change

1.0 Introduction

Population within the Queenstown Lakes District is projected to grow by 2.2 percent annually over the next 25 years.¹ Pressure to develop the District's resources will undoubtedly increase. Responding to these projections, the Queenstown Lakes District Council (QLDC) is currently undergoing a District Plan Review with the stated intent of delivering a more transparent and accessible District Plan which enables better integrated planning and better articulates a strategic direction for the District.²

The study in front of you was commissioned by Millbrook Country Club Limited (Millbrook) to better understand the specific and general landscape values of the surrounding landscape. This study identifies the qualities and values within a specific Study Area with particular regard to the landscape's biophysical, cultural and visual resources.

As part of the District Plan review, QLDC commissioned Read Landscapes to assess the landscape character of the Wakatipu Basin against its ability to absorb further change, with particular regard to the cumulative effects of development. Read's Landscape report focuses on the Wakatipu Basin comprehensively while the information contained within The Wharehuanui Landscape Study provides survey, analysis and recommendations for a smaller area within the Wakatipu Basin.

The Study Area is dubbed the 'Wharehuanui'. This study area is part of the wider Wakatipu Basin and generally contains the lands north of Lake Hayes, east of Hunters Road south of the slopes of Coronet Peak and west of Arrowtown.

The Wharehuanui area embodies many of the values that make the Wakatipu Basin a desirable place to live and visit. These values include access to open areas which offer broad views to distant and dramatic mountains. Elements within this area that embody the values of the Wakatipu include the presence of grazing animals within open pastoral lands, mature rows and patches of exotic trees, rural character buildings and landforms that display glacial formative processes.

Development of the Wakatipu Basin needs to be strategic, directed and specific to protect the values that give the District landscape resource its unique character. This study dissects the Study Area in terms of character and provides recommendations on how the landscape can best be managed so future development will not degrade and may enhance the landscape's values and quality.

¹ Statistics New Zealand http://www.stats.govt.nz/browse_for_stats/population/estimates_and_projections/projections-overview/subnat-pop-proj.aspx

² QLDC Council, 17 April 2014 Report for Agenda Item.

Figure 1 : The Wakatipu Basin as viewed from Coronet Peak



2.0 Executive Summary

Landscape is a resource. Progressive approaches to identifying and assessing this resource extend beyond the visual quality to include the biophysical and cultural values. As the Queenstown Lakes District is projected to steadily increase in population, the landscape, which is considered to be the District's most valuable resource, is experiencing pressure from residential development. QLDC is at present reviewing the District Plan and it is understood that the status quo assessment criteria for development will be amended to address the landscape more holistically.

This report assesses and evaluates a large portion of land within the Wakatipu Basin to identify the landscape's existing character and ability to absorb change. The Study Area takes in most of the land between Arrowtown, Hunter Road and Lake Hayes. This land is considered to contain three separate landscapes; the Mill Creek Catchment, the Wharehuanui Hills and the Speargrass Flats.

The line between the landscapes can often be obvious, such as the top of a ridge or base of a slope. Other times these landscapes can overlap as the land form, cover and/or use, gradually changes over distance.

The bulk of the Study Area contains a strong rural character, with mostly pastoral lands surrounding residential settlements which in turn reflect the rural character. The dramatic topographic features, such as the highest hills and escarpment faces embody a more natural character. Within the resort zones, pastures are often replaced by golfing activities which continue the openness of the landscape. Residential development is often set against slopes and within pockets where the visibility of the built form is best absorbed by the land form.

Continued change is anticipated within the Study Area and this study identifies areas in which the landscape can best absorb change. This study finds:

- The elevated plateaus near Mooney Road (the Wharehuanui Plateau) can visually contain development as viewed from most public places and has a high ability to absorb further appropriate change so long as it is sympathetic to the rural character.
- Further appropriate development can also be contained within the elevated foothills adjacent to the ONL slopes.
- Escarpment faces often offer a high level of visual absorption capacity and appropriate development can occur at the base of several escarpments. However the quality of some escarpments, especially those in the Speargrass Valley can be adversely effected by inappropriate development.
- The hummocks and plateaus west of Millbrook have been to date unaffected by residential development and have capacity to absorb some appropriate development.
- Much of the land south of Arrowtown along the Arrowtown – Lake Hayes Road is near its threshold to absorb change. Appropriate development within much of this land including the land north of Speargrass Flat Road should be discrete.
- Several areas are found to have a low ability to absorb change. These include the escarpment faces and hill slopes as well as an area of open space which breaks the spread of development between the Lake Hayes residential areas and Arrowtown.

The Wharehuanui Area has a high level of amenity, including historical, ecological and visual values. While this amenity translates to a desirable place to live, an increase in residential activity has the potential to diminish the landscape character and quality. Maintaining the value of the landscape resource requires a strategic, directed and holistic approach. This study provides a base understanding of these values and an evaluation of how and where change could occur.

3.0 Methodology

This report follows the assessment guidelines set out by The RMA Quality Planning Resource (RMA-QPR) for 'Area-based' landscape studies. The RMA-QPR is a website where content is contributed by a partnership of interested professional organisations. The Ministry of the Environment owns and funds the website while the New Zealand Planning Institute is responsible for the site's administration.

The RMA-QPR guidelines breaks the assessment of a landscape resource into the following three components:

- Landscape Description/Inventory,
- Landscape Characterisation,
- Landscape Evaluation.

The landscape description and inventory is a research component which collects existing data of biophysical and cultural layers. These layers include physical attributes such as geology and ecology as well and cultural attributes such as history, zoning and existing and consented development.

Initial data was collected for the study through repeated site visits and desktop analysis using Quickmaps, Google Earth, and QLDC Webmaps. Once a Study Area was identified other professional consultants were engaged. Ecological data was provided by the Davis Consulting Group. Royden Thomson provided geological information. John Edmonds and Associates provided planning advice. Heritage consultation was provided by Jackie Gillies & Associates. This information was collated and formed the base on which landscape characterization and evaluations studies could occur.

An analysis of the landscape's character follows the Description and Inventory stage. The Wharehuanui was determined to contain three landscapes which display different characteristics. Each of these landscapes were then broken up further into smaller landscape units. The qualities that make these more manageable units was assessed. This assessment formed the basis for discussion on each landscape's land form, land cover and land use.

Following on from the landscape characterisation study, each landscape unit was evaluated. This evaluation included identifying the issues and opportunities of each unit, potential landscape management strategies and an assessment of the lands ability to absorb change. The end result of this evaluations is graphically represented through a series of tables, plans and photos.

Figure 2: Initial desktop studies of the area using Quickmaps and Google Earth.





Part 1

Description and Inventory

4.0 Wharehuanui Study Area

The Wharehuanui Study Area is considered to be the area of land north of Slope Hill and Lake Hayes and south of the Coronet Peak Mountains and Arrowtown. The name 'Wharehuanui' appears on topographic maps within the Study Area and the name has been adopted for the whole of the Study Area.

Several site visits were undertaken to determine the boundaries between the landscapes of this area. The Wharehuanui is considered to be composed of three landscapes which are defined by physical boundaries such as topography, vegetation and human made features such as Arrowtown's urban edge.

This Study Area comprises several unique landscape features but does not contain any of the Outstanding Natural Landscapes (ONL) or Features of the District including the lakes, rivers or mountains. The Study Area encompasses the elevated hummocky lands that contain the Mooney Road area and the steep topography that exists on this feature's escarpments. The bulk of the Study Area is currently in pastoral or residential land use and contains all of the existing Millbrook Resort.

The line between landscapes is not always obvious. The values that make each landscape distinct can overlap for some distance.³ The Study Area's boundaries were determined through repeated site visits and assessment of the particular landscape qualities, be they visual or experiential.

Where a line is drawn on a map, it is accepted that the line is subject to interpretation and that often the exact boundary between landscapes can be obscure.

³ <http://www.qualityplanning.org.nz/index.php/planning-tools/land/landscape/landscape-assessment>

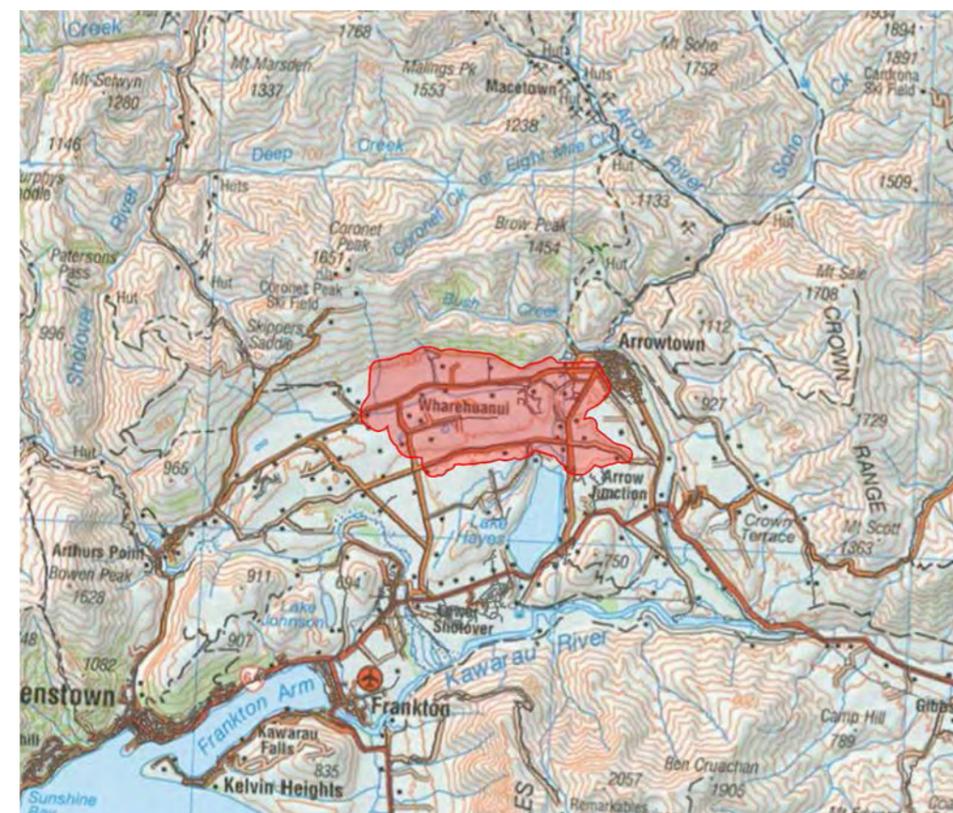


Figure 4: Location Plan - Scale - 1:100,000 @ A3

Figure 3: Aerial looking west across the Speargrass flats from above Hogs Gully.



The Eastern Boundary: To the east is the urban edge of Arrowtown. This urban landscape meets a rise in the land which runs perpendicular to McDonnell Road. This rise visually separates the land to the east from the land to the west and crosses The Hills Golf Course. The land east of this rise is considered to be more associated with the McDonnell Road area. The Study Area boundary generally follows the westernmost contour of this rise as it continues away from Arrowtown to the south into the area known as Hogans Gully.

The Southern Boundary: To the south an escarpment separates the Hogans Gully area from the upper terrace landscape of the Bendemeer Hills. This escarpment eventually meets the edge of Lake Hayes near the junction of Speargrass Flat Road and the Arrowtown – Lake Hayes Road. The level of domestication that has occurred north of Lake Hayes includes swathes of mature vegetation which visually separates the Study Area from the beaches and park-like lands which are directly associated with Lake Hayes.

Continuing west along Speargrass Flats Road the Study Area takes in the Speargrass north facing escarpment. Eventually the Study Area's boundary overlaps with the Hawthorn area to the southwest.

The Western Boundary: The Study Area takes in the western slopes of the hills running adjacent to Hunter Road. This landscape overlaps with the adjoining landscapes but Hunter Road and the watercourse that runs to the west of the road provide a logical separation of landscapes.

As the hills succeed to the flatter lands towards Malaghans Road and Millers Flat, the experiential qualities of the landscape best defines its boundaries. As users of Malaghans Road round a bend near Coronet Peak Station Road, they begin to experience a change in landscape character.

The Northern Boundary: To the north are the ONL slopes leading down from Coronet Peak. The base of these slopes clearly indicates a change in landscapes.

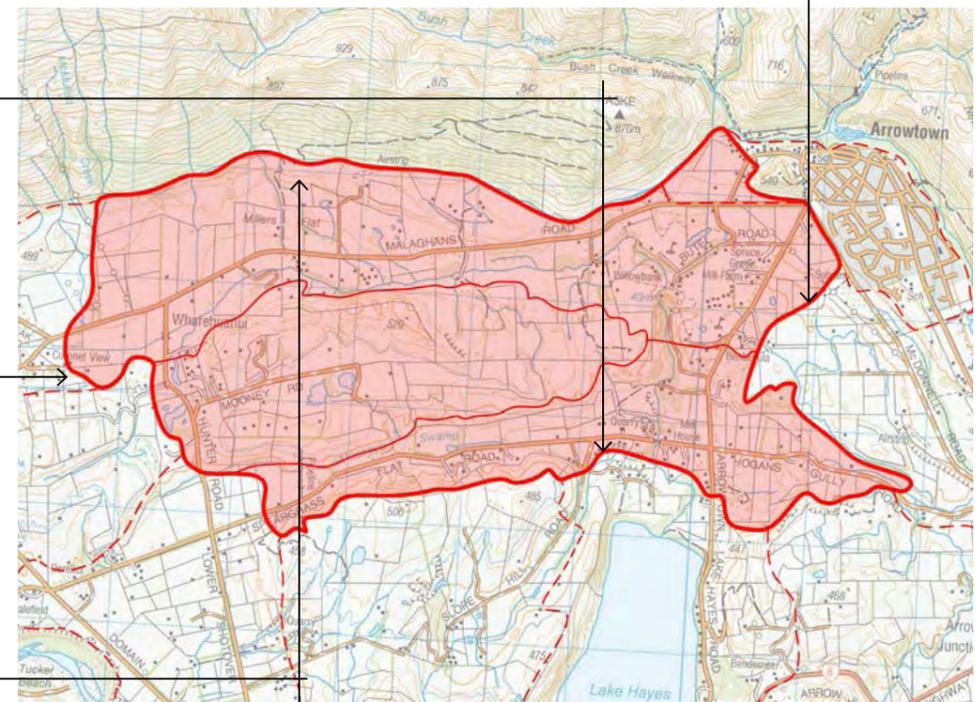


Figure 5: The Study Area and surrounding landscape.

5.0 Discussion

5.1 History

Pre-human

The Wakatipu Glacier originated from the western Southern Alps and at one point extended to the east to Nevis Bluff and to the south to near present day Athol. This glacier and associated geologic activity is largely responsible for the landforms that shape the Wakatipu Basin including its roche moutonnée features, kettle lakes, terraces and moraines.

As the glacier retreated the deposited moraine began to build with vegetation. There is evidence that at one time beech and broadleaf/podocarp forests may have covered most of the basin. Large fires burnt throughout New Zealand around 1200 AD and the closed forest that once cloaked 85-90% of New Zealand deteriorated.

It is understood that at the time the first European Settlers arrived in the Wakatipu Basin, much of the basin was covered in a diverse mix of grey scrub-land vegetation on the hill slopes with grasslands on the flooded river terraces and frost prone valley floors. Patches of remnant beech forests continue to thrive in pockets and gullies.

'Finding the journey difficult, encountering the various natural hazards of Central Otago – speargrass, wild spaniard, and matagouri tore their pant legs to shreds and filled their boots with blood. ...Eventually to their delight they discovered what Rees described as 'The magnificent panorama of open country. Not perfectly level but broken by small hills and terraces, whilst a large lake stretched away in the distance as far as the eye could see.'

- Wakatipu - William Rees and Von Tunzlemann 1860

Tangata Whenua

Evidence of Ngatimamoe settlement has been found throughout the District. These people would have traveled between the Wakatipu and surrounding areas in search of food and greenstone. Access between the Wakatipu and other areas would have been along the river corridors of the Kawarau, Mataura, Greenstone and Mararoa. The Ngatimamoe abandoned the area in the 18th century.

The origin of the name Wharehuanui is unknown. However the Maori word can be dissected as whare-huanui or house-path.

Settlement

The first recorded Europeans to visit the Wakatipu were Nathaniel Chalmers who arrived in 1853. However the first to settle the area were William Gilbert Rees and Nicholas Von Tunzlemann who arrived in early 1860. These men established sheep stations on the lands surrounding the lake. Rees's homestead was established near what is present day Queenstown.

Gold was discovered in 1862 in the Shotover River and the region quickly grew in population which in turn established a community. As the gold boom settled the Wakatipu's ability to support agriculture began to be exploited and flour mills were established, most relevant to this report, Peter and John Butel established a flour Mill on the land currently occupied by Millbrook Resort.

5.2 Cultural Landscape

During the first century of settlement in the Wakatipu, much of the native vegetation was stripped and/or burnt in favour of establishing agricultural activities. The agriculturalists, especially pastoral farmers brought with them traditional European farming techniques. The landscape quickly changed from its more natural state into a mostly pastoral landscape.

Large stretches of open lands became covered in exotic pasture grasses. Shelter belts of large exotic trees and swathes amenity trees were planted. This settlement vegetation continues to thrive in the Wakatipu and several trees and lines of trees are protected.

Many of the roads established during the last century continue to be used. These roads historically linked the established towns of Queenstown and Arrowtown with Cromwell and Wanaka.

Historical homesteads, farm sheds, cottages and other rural character structures such as walls form part of the cultural heritage of the landscape.

These elements combine to create a cultural landscape that dominates over the more natural underlying character.

'Scenery is not scenery – it is "country" – if it is good for sheep it is beautiful, magnificent and all the rest of it; if not, it is not worth looking at.'

-Samuel Butel

Figure 6: Speargrass Valley as it was in 1954 (Whites Aviation).



5.3 Architectural Heritage

Several heritage listed buildings exist within the study area. Most notably the buildings within the Millbrook Resort Village associated with the Butel family settlement and buildings on the Speargrass Flats associated with the Patterson family settlement. These buildings exhibit many of the forms and details which are typical of their era including small windows, massive stone wall and corrugated iron roofs.

In the vicinity of the heritage buildings are large mature trees. These trees include poplars, sequoias, elms, ash, oaks and walnuts. These trees are arranged as shelterbelts, avenue trees and feature trees. Some of the oldest trees in the District existing near these heritage buildings. It is understood that many of the trees, especially the poplars may be nearing an age where they are risk of being felled by high winds.

5.4 Tenure and Zoning (refer to Appendix C and D)

Aside from roads a Council owned sports field at Millbrook corner and some of the land adjacent to Mill Creek as it passes through Speargrass Flat, the Wharehuanui Study Area is almost exclusively held in private ownership. The cadastral pattern (showing lot boundaries) can be seen in several of the Appendices to this study. Larger lots outside of the resorts tend to be farmed, although rarely intensively. Mid-sized lots are often associated with peri-urban 'lifestyle properties'. The smallest lots are mostly in the residential enclaves within the Millbrook Resort.

The zoning map in Appendix D shows that the western half of the Study Area is covered by the Rural General Zone, where residential development is discretionary and is rigorously assessed against landscape criteria. A south eastern portion of the Study Area, to the north of Lake Hayes, is covered by the Rural Residential and Rural Lifestyle Zones, where rural-residential development to certain densities is anticipated. To the north east the Resort Zone has enabled golf course development intermingled with residential housing on relatively small lots within Millbrook. Waterfall Park also sits within the Resort Zone, but to date has not been developed.

Appendix C shows those distribution of existing houses and Rural Building Platforms consented in the Rural Zones. Rural Building Platforms are a prelude to development of houses. Once Rural Building Platforms are approved via resource consent, there are normally various consent conditions that need to be implemented. When Council is satisfied that those conditions have been given effect to, the Rural Building Platform is usually registered on the title and often reflected in the subdivision pattern. Once registered they reflect an ongoing right to develop.

When considering what additional development may appropriately be built in the Wharehuanui Resource Area, it is appropriate to assess:

- Existing development;
- further realistic development that can certainly occur under existing zoning; and
- approved Rural Building Platforms.

Figure 7: An avenue of trees leading to the Patterson Homestead on Ayrburn Farm.



5.5 Geology (refer to Appendix E and F)

Geologically speaking the Wharehuanui is part of a glacially sculpted valley and ridge complex west of Arrowtown. It consists of two valleys bisected by steep banks which lead up to elevated plateaus. The floodplain valleys are in part mantled by alluvial fans constructed by ephemeral tributary streams leading in to the valleys from the slopes of Coronet Peak and the associated central plateau referred to in this report as the Wharehuanui Hills.

The Study Area is composed of schist outcrops, glacial till, river alluvium, stream fans and flood plains.

The Mill Creek Catchment and its associated floodplains exist in the northern portions of the Study Area. This is a permanent stream with identified flood potential. Schist outcrops separate the central plateau from the Mill Creek Catchment. The plateau itself is composed of schist basement rock with a prominent cover deposit of glacial till. The south facing slopes leading down from the Wharehuanui Hills are similar in geologic form to the Plateau itself and gradually descend to the Speargrass Flats.

The Speargrass Flats are again, a floodplain dominated valley floors, however smaller in scale than the Mill Creek Catchment.

Several geologic hazards have been identified in the areas. These hazards are shown in the Geologic Hazards map in Appendix F.

5.6 Hydrology (refer to Appendix G)

Several surface waters exist within the Study Area (Appendix G). The most prominent is Mill Creek which drains a large catchment between the Wharehuanui Hills and the slopes of Coronet Peak. Several tributaries drain into this catchment, some spring fed.

Atop the Wharehuanui Plateau the wetland areas have been enhanced to create several amenity ponds within rural lifestyle blocks.

Also of particular note, the Arrow Irrigation Scheme passes through the area. This irrigation scheme diverts water from the upper Arrow River to properties across the Wakatipu Basin. The scheme enters the subject area as a surface water trench and is pumped up the north facing escarpment through a pipe. Once atop the plateau the scheme is channeled again as surface water before it meets the south facing escarpment that drops down to Speargrass Flat. The scheme is pumped across Speargrass Flat and again becomes surface water once atop the Slope Hill landscape.

5.7 Ecology (refer to Appendix H)

Pasture grass is the predominate vegetation cover of the Study Area and forms the overall texture and colour of much of the landscape. Large patches of exotic hardwood forest including sycamore, willows, larch, firs, gums and pines pepper the landscape in the form of shelterbelts and amenity trees.

A large forestry block exists to the north of the site and the encroachment of these wilding conifers onto adjoining properties is evident. Willows line much of the Mill Creek riparian areas. A large patch of mature exotics lines the southern flanks of Malaghans Road within the Rural Resort area. The Waterfall Park area hosts a dense, diverse mix of mostly mature exotic and native plants.

Dense scrub-land is also present within the Study Area. While some of this scrub-land contains native grey scrub-land species, these patches have in many cases been inundated with invasive briar, gorse and broom. Native bracken fern exists in small isolated patches.

The bulk of indigenous vegetation within the Study Area exists as amenity plantings within private properties. Evidence of struggling indigenous vegetation exists in some of the gullies, mostly those on the slopes that descend from the Wharehuanui Plateau towards Speargrass Flat.

Figure 9: Mill Creek as it passes through Millbrook Resort.



Figure 8: A distinct geologic feature near Malaghans Road.



5.8 Visibility (refer to Appendix I)

The Study Area is surrounded by more dramatic landforms including Slope Hill, Morven Hill, Cornet Peak, the Crown Terrace and Crown Range. Much of the Study Area is visible from these elevated lands.

As the Wharehuanui Study Area is visible from much of the surrounding Wakatipu Basin, for the purpose of this study five places have been identified as key points from outside the area where the Wharehuanui can be viewed. They are:

- The Lake Hayes Pavilion
- Entrance to the Lake Hayes recreation area from the Lake Hayes – Arrowtown Road
- The summit of Feeley Hill
- Cotter Road – Arrowtown
- Cornet Peak Base Building.

The Lake Hayes Pavilion (Fig 10) is approximately 3.5km in distance from the southern edge of the Wharehuanui area. Lake Hayes itself forms the foreground of this northerly view while the Rural Residential - North Lake Hayes Zone is visible in the mid-ground. Behind this area, the slopes leading up the Wharehuanui Hills and Rural Resort are moderately visible before the ONL slopes dominate the background.

The entrance to the Lake Hayes recreation area (Fig 11) is approximately 800m from the southern edge of the Wharehuanui. From here the Upper Hills are visible as are much of the Speargrass South Facing Escarpment and the edge of the Rural Resort area. Much of the Speargrass Valley is obscured from view by mature vegetation.

Feeley Hill (Fig 12) is immediately north of the Wharehuanui area and is considered to be an ONL. From the summit of Feeley Hill much of the study area is visible including most of the Mill Creek Catchment, portions of the Wharehuanui Hills and limited parts of the Speargrass Flats.

Cotter Ave (Fig 13) is a residential street atop a terrace in Arrowtown. Much of the rise that separates the Mill Creek Catchment from the McDonnell Road area is heavily vegetated and this vegetation obscures views into much of the Study Area. Small portion of the Mill Creek Catchment are visible as are the uppermost portions of the Wharehuanui Hills

Coronet Peak Base Building (Fig 14) offers views across most of the Wakatipu Basin, ranging from Gorge Road to the far eastern edge of the Wharehuanui. A ridge that separates the Base Building from the area known as Rocky Gully obscures views to the more northeasterly portions of the Wakatipu.

There are other, more distant places from which the Study Area can be viewed including the Remarkables Road, Tobins Track and the Crown Range Road. Any visual effects identified in the above five areas would be replicated to a lesser degree from these more elevated, distant locations. Similar to views from Coronet Peak the scope of wider visibility will render the Wharehuanui indistinguishable from the wider landscape pattern.

Figure 10: View north from near the Lake Hayes Pavilion.



Figure 11: View north from the entrance to the Lake Hayes recreation area.



Figure 12: View southwest from the summit of Feeley Hill.



Figure 13: View West from Cotter Ave.



Figure 14: View south from the Coronet Peak Base Building.





Part 2

Character

6.0 Landscape Character

Landscape is most often associated with and characterised by its visual values. This emphasis on the visual is a remnant of the 'picturesque' aesthetic which originated in 15th century England. This aesthetic presents the landscape as something that should appear as a painting and be susceptible to the same analysis and critique. This dated interpretive response does not incorporate the ecological and emotion values of place which significantly contribute to the landscape's character

Progressive approaches to landscape characterisation originating from Europe provide an alternative to understanding and interpreting the values of landscapes. These approaches attempt to escape the emphasis on the visual and instead focus on the 'action or interaction of natural and/or human factors'.⁴

The Queenstown Lakes District Plan is (the Plan) is strongly rooted in the picturesque aesthetic. However the revaluation of the Plan presents an opportunity to adopt progressive approaches to understanding and assessing landscape character, beyond the visual. That is to say that the landscape is not only a visual resource, but also a biophysical and cultural resource.

The following *Landscape Character* portion of this report will reference the *Description and Inventory* section to inform the assessment of landscape character. The Wharehuanui Study Area composes a large area of land on which, after extensive site visits and studies, it is determined three landscapes exist within. For the purpose of this study these landscapes are called the:

- Mill Creek Catchment.
- Wharehuanui Hills.
- Speargrass Flats.

Each landscape has within it separate units which in turn have distinct landscape values, be they cultural or biophysical. By breaking the Study Area up into smaller landscape units and assessing the character of each unit it is possible to dissect the attributes that make each landscape distinct. The culmination of this information then paints a more informed picture of the landscape's character as a whole.

The following portion of this study will identify the landscape character elements within each landscape unit and assess the character of the landscapes as a whole. The RMA-QPR methodology suggests landscape character studies should break the assessment into three categories:

- Land Form
- Land Cover
- Land Use.

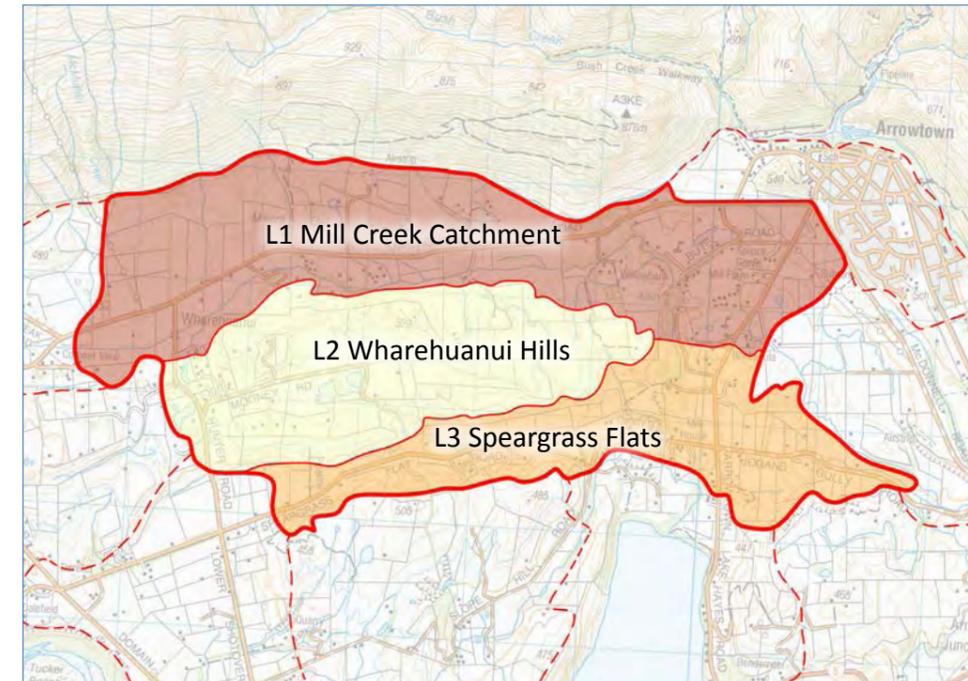


Figure 15: The three landscapes of the Study Area.

Figure 16: Table of landscapes and landscape units.

Wharehuanui Study Area		
Landscapes	U#	Landscape Units
Mill Creek Catchment	1	Millers Flat
	2	The Foothills
	3	Rural Resort
	4	Malaghans North Facing Escarpment
Wharehuanui Hills	5	Wharehuanui Plateau
	6	The Upper Hills
Speargrass Flats	7	Speargrass South Facing Escarpments
	8	Speargrass North Facing Escarpment
	9	West Speargrass Valley
	10	Waterfall Park
	11	East Speargrass Valley
	12	Lake Hayes Rural Residential
	13	Hogans Gully

⁴ (<http://conventions.coe.int/Treaty/EN/Treaties/Html/176.htm>).



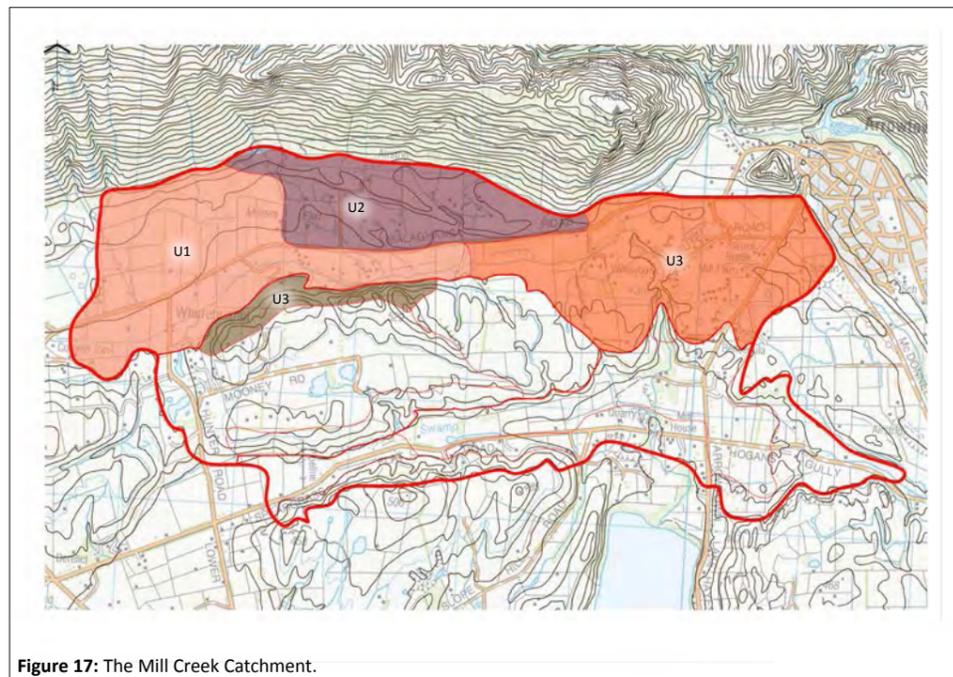


Figure 17: The Mill Creek Catchment.

6.1 Mill Creek Catchment

The Mill Creek Catchment is a landscape between the steep slopes of the ONL mountains and the upper parts of the Wharehuanui Hills. Malaghans Road runs through this mostly linear landscape linking the westerly Coronet Peak Amenity Area with the urban areas of Arrowtown. Mill Creek flows west to east through this landscape before diverting to the south and dropping down through Waterfall Park into the Speargrass Flats.

The Mill Creek Catchment is dominated mainly by the steep walls that enclose the otherwise relatively flat landscape. To the north these walls are defined by the vegetated ONL slopes. To the south the landscape's walls are defined by the often craggy escarpment that leads from the valley floor to the upper Wharehuanui Hills.

Aside from the escarpment faces, much of the Mill Creek Catchment is either rolling hummocky hills or flatland with the occasional variation of schist outcrops and river terraces.

There are considered to be four landscape units that make up the Mill Creek Catchment. They are:

- U1 Millers Flat
- U2 The Foothills
- U3 Rural Resort
- U4 Malaghans North Facing Escarpment

Land form

The Mill Creek catchment is predominately a floodplain flanked by steep sides. The headwaters of Mill Creek to the west flow into Millers Flat, which is so named for its moderate topography. It is not entirely flat and in fact descends gradually from the toe of Coronet Peak eastwards. To the north of Millers Flat the Malaghans North Facing Escarpment poignantly marks the edge of the Mill Creek Catchment. These escarpment faces are often craggy and steep with a distinct ridge and apex which falls back to the south to the Wharehuanui Plateau.

To the northeast of Millers Flat are The Foothills, a rolling hills landscape where plateaus and gullies exist between slopes and summits. To the north, this unit meets the steeper and more consistently graded ONL slopes. The Foothills extend to the east and south until meeting similar rolling hill features of the Rural Resort area.

The Rural Resort area is composed of floodplains and rolling hills between the Wharehuanui Hills and Arrowtown. Mill Creek passes through the Rural Resort area and the floodplains around that watercourse are generally flatter. Subtle terraces lead up to the south and west of Mill Creek and the topography gradually increases until the boundaries between the Wharehuanui Hills and Rural Resort areas overlap. The northern and eastern portions of the Rural Resort area are significantly flatter with one obvious schist intrusion adjacent to Malaghans Road and the ONL slopes.

Land cover

The Mill Creek Catchment, like most of the Wakatipu Basin is predominantly covered in pasture grasses. Within the Rural Resort area the mown grasses of golf surfaces compete with pasture grass as the predominant land cover.

The flat, pastoral lands of Millers Flat contain linear plantings of exotic trees which stretch across the landscape, generally running north-south and following cadastral boundaries and/or access-ways. A prominent band of mixed exotic trees exists to the south of Malaghans Road across much of the Rural Resort area. Along the margin of Mill Creek, willows are the prevalent vegetation interspersed with native grasses.

The steep slopes of the Malaghans North Facing Escarpment as well as the gullies that lead through the foothills host indigenous grey scrub-land species including kowhai, mingimingi and matgouri, which in many cases are being overrun by exotic weeds including hawthorn, briar and wilding conifers.

Other vegetation that exists within the Mill Creek Catchment includes amenity plantings of native and exotic species within the more residential portion of this landscape.

Land use

The Mill Creek Catchment is diverse in terms of its land uses which range between recreational, medium density residential and pastoral. The residential density and subsequent domestic character gradually increases from west to east and south to north towards Arrowtown. Three District Plan Zones cover the Mill Creek Catchment; the Rural General, Rural Residential and Resort zones.

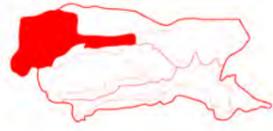
The Miller Flat landscape unit is predominantly agricultural with large plots of productive lands covering most of the flatlands.

The Flight Park Café exists within The Foothill and allows commercial and independent paraglider and hang glider pilots to land on site.

Lands adjacent to Malaghans North Facing Escarpment support a higher density of residential activity as these faces allow development to be better visually absorbed.

Within the Rural Resort unit, development has occurred according to the Millbrook Structure Plan which designates land use and activities. The two dominant land uses within this Resort Zone area Golf/Open Space and Residential. Much of the residential development within the Rural Resort area has occurred in clusters surrounded by more open lands.





U1 Millers Flat

The western most portion of the Study Area is Millers Flat which exists adjacent to and is inextricably linked to the Coronet Peak Amenity Landscape to the west.

Landscape Unit Character:

Millers Flat is so named for its moderate topography set amongst more dramatic features. Millers Flat is mostly agricultural with large areas of open lands broken by the occasional shelterbelt. Residential dwellings are generally set back from roads and adjacent to the steeper faces which enclose the flats. The overall character of Millers Flat is pastoral with a linear pocket of a rural residential character near Mill Creek itself and the north facing escarpment.



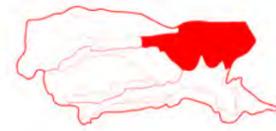
U2 The Foothills

The Foothills contain rolling hummocky hills, gullies and plateaus that lead to the steeper faces of the ONL slopes.

Landscape Unit Character:

The Foothills are a rolling hill landscape. They are distinctly separate from the ONL slopes and from the flatter lands to the west. While pasture grasses dominate much of The Foothills, patches of exotic weeds and grey scrub-land are present. Shelter belts are present but not as prevalent as they are within the adjoining lands. Parts of The Foothills contain residential activities, especially in the vicinity of Dennison Road. These residential activities also introduce a high level of amenity trees, including exotic and native plantings. A large agroforestry block forms The Foothill's northern edge.





U3 The Rural Resort Area:

The Rural Resort area contains the more open lands south and west of the urban boundaries of Arrowtown. The Rural Resort areas is so called as it contains the Millbrook Resort and portions of the Hills Golf Course.

Landscape Unit Character:

The Rural Resort area maintains much of the surrounding landscape character in terms of openness and vegetation. However golf courses take the place of pastures and clusters of homes take the places of large homestead blocks. Residential density is higher within pockets of this unit. Mature exotic trees form the structure of the landscape and existing development has, to a large degree occurred within this structural planting.



U4 Malaghans North Facing Escarpment:

These craggy faces form the walls that separate the Mill Creek Catchment from the Wharehuanui Hills.

Landscape Unit Character:

Steep and craggy faces bookend the Mill Creek Catchment. The cragginess of the escarpment faces is not as pronounced throughout the landscape unit. The slopes that lead down to the valley floor adjacent to the cliff faces generally display a dense vegetation pattern of mostly exotic weeds intermixed with occasional grey scrub-land species. The escarpment faces form the backdrop to which much of the denser residential activities of Millers Flat are set.



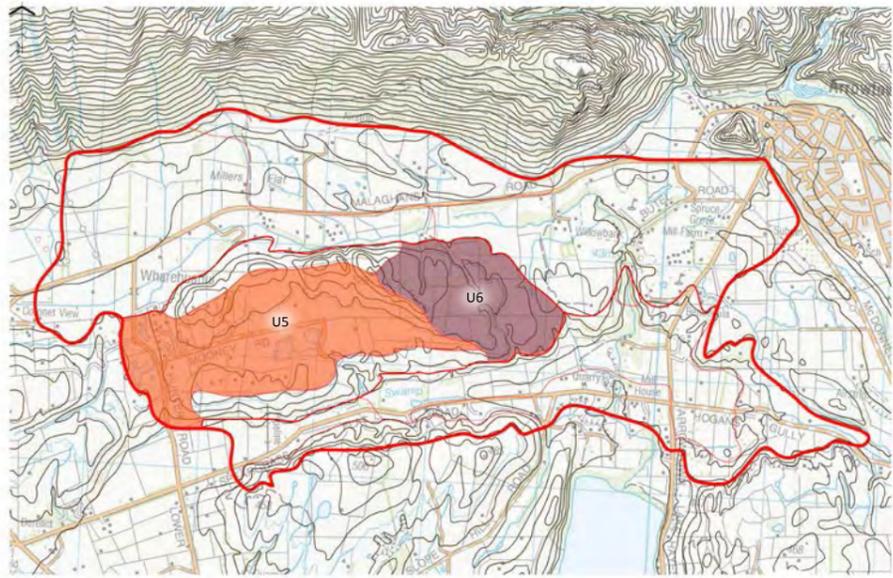


Figure 18: The Wharehuanui Hills

6.2 Wharehuanui Hills

The Wharehuanui Hills is a remnant moraine landscape similar to an esker land form. Steep, craggy escarpments define the north and south facing edge of this landscape. Atop it are plateaus and remnants of kettle lakes which have been enhanced to create large amenity ponds for private land owners. The more eastern part of this landscape rolls gently down across hummocks and plateaus to meet the flatter landscapes of the Mill Creek Catchment. The more western part of this landscape is sunk between the north and south facing escarpments.

The Wharehuanui Hills are considered to contain two landscape units. They are:

- U5 The Wharehuanui Plateau
- U6 The Upper Hills

Land Form

The Upper Hills are part of a schist outcrop with deposited glacial till. The landscape is considered to be the area of land between the north and south facing slopes that lead down into the flatter landscapes of Speargrass Flat and the Mill Creek Catchment. Within the Wharehuanui Basin the land displays varying characteristics of hummocky hills intermixed with plateaus that sink into areas of surface water.

To the east of the Wharehuanui Basin, the Upper Hills rise more dramatically and create the high point of the Study Area (529m). These hummocks and plateaus continue to gently fall to the east and eventually overlap with the Rural Resort landscape unit.

Land Cover

The Wharehuanui Hills are mostly covered in pasture grasses interrupted only by rare shelterbelts. Within the Wharehuanui Basin the vegetation cover is significantly more dense and diverse with substantial plantings in lifestyle blocks. These plantings include lineal plantings of exotic trees as shelter belts, patches of exotic trees with a park-like character and riparian plantings, often containing native species.

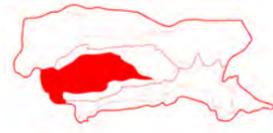
Land Use

Rural Residential development has occurred on the large lifestyle sections across the Wharehuanui Plateau. This residential density is higher in the western portions of the plateau and the density thins to the east. Large lifestyle blocks extend across the more westerly lands. These lifestyle blocks still retain a level of productive use but in many ways this use is dominated by the more domestic amenity features within the landscape. Limited residential activity is present to the east of the uppermost hills.

Figure 19: A rural Lifestyle development within the Wharehuanui Plateaus.



U5 The Wharehuanui Plateau



The Wharehuanui Basin exist on the elevate moraine terrace between Malaghans Road and Speargrass Flat Road. Malaghans North Facing Escarpment forms the northern boundary of this unit while the southerly boundary is defined by the Speargrass South Facing Escarpment. A high point on the hills separates the Wharehuanui Plateau from the Upper Hills landscape unit.

Landscape Unit Character:

The Wharehuanui Plateau has a strong rural lifestyle character with generally large plots of land in agricultural use. Set within the rural character are generally large dwellings, farm buildings , amenity gardens and ponds. The wetlands of this area are remnant kettle lakes which have been enhanced and planted.



U6 The Upper Hills:



The Upper Hills exist to the east of the Wharehuanui Plateau. They contain the highest point (529) to the elevated moraine between Speargrass Flat Road and Malaghans Road. The northern and eastern boundary of the Upper Hills and Rural Resort landscape units overlap.

Landscape Unit Character:

Elevated pasture-lands exist within the Upper Hills landscape unit. The more westerly portions of the Upper Hills are characterised by rolling hills ascending to the upper plateaus. Shelterbelts follow cadastral boundaries while amenity trees, and patches of native scrub-land mixed with exotic weeds follow the slopes of the gullies. Limited residential activity has occurred on the Upper Hills.



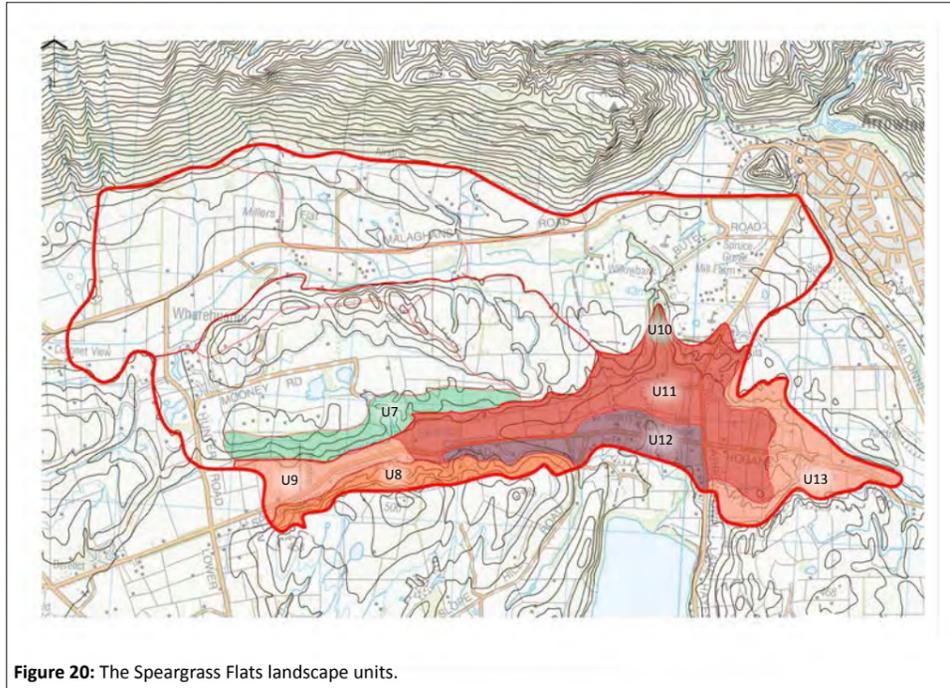


Figure 20: The Speargrass Flats landscape units.

6.3 Speargrass Flats

The Speargrass Flats landscape is located between the Wharehuanui Hills and Slope Hill/Lake Hayes landscapes. It is a mostly linear, corridor landscape. It is distinctly separate from the more elevated lands to the north and south. It is remotely connected to the Lake Hayes landscape however separated visually from the lake by existing development including buildings and plantings. The Speargrass Flat landscape extends past the Lake Hayes Arrowtown Road into the area known as Hogan’s Gully which is a similar corridor with steep sides.

The Speargrass Flats are considered to contain 7 landscape units. They are:

- U7 Mooney’s South Facing Escarpment
- U8 Mooney’s North Facing Escarpment
- U9 West Speargrass Valley
- U10 Waterfall Park
- U11 East Speargrass Valley
- U12 Lake Hayes Rural Residential Area
- U13 Hogans Gully.

Figure 21: View from the Bendemeer Hills looking west across the Speargrass Flats.



Land form

Floodplains, terraces and escarpments give form to the Speargrass Flats. Similar to the landscape unit of Malaghans North Facing Escarpment , Speargrass North Facing Escarpment displays steep craggy schist faces with distinct apexes. Speargrass’s South Facing Escarpment has a more gradual slope weaving in and out of rounded gully and spur features. Between and below these two escarpments is the West Speargrass Valley Mooney valley, a relatively flat, narrow valley that distinguishes the Speargrass Flats from the Hawthorn Landscape farther west.

The Speargrass Flats valleys, Hogans Gully and the Lake Hayes Rural Residential area all have similar characteristics in terms of form. Surface waters flow through the floodplains from the west, north and east. Mill Creek drops down dramatically from the Rural Resort through Waterfall park into the Speargrass Flats. Waterfall Park displays distinctly different character than the surrounding valleys with more dramatic relief.

Land Cover

Similar to the other landscapes in this Study Area, the predominant vegetation cover is pasture grass. Again, this cover is often broken by mature shelter belts of exotic trees and patches of mixed scrub-land in gullies. Amenity planting has taken place, most notably within the Lake Hayes Rural Residential Area. Here the density of trees, especially those to the south of Speargrass Flat Road create the boundary of the Study Area from the Lake Hayes Landscape.

Recent consent has been granted to much of the lands that occupy the Speargrass South Facing Escarpment for the planting of mixed exotic forests (Ayrburn Station). When mature, these plantings will significantly change the appearance of the land cover from pastoral to forested.

Land use

Much of the land within this landscape is zoned Rural General, although a finger of the Resort Zone extends into Waterfall Park and the Rural Residential - North Lake Hayes zone form as part of the landscape’s southern boundary.

Existing commercial activity within the Speargrass Flats landscape is limited to the Walnut Cottage Café and a few visitor accommodation units. Existing consents allows for further residential and commercial activities to occur within the Waterfall Park landscape unit.



U7 Speargrass South Facing Escarpment

This escarpment forms the southern edge of the Wharehuanui Hills and northern edge of the Speargrass Flats.

Landscape Unit Character:

This escarpment face is generally less steep than the other escarpments in this Study Area. It is mostly pastoral in character with little sign of domestic activities. The slopes ascend gently towards the Wharehuanui Hills. Vegetation includes large and mature shelterbelts. Recently consented planting includes swathes of exotic amenity trees which in the near future will change the colour and texture of much of the south facing escarpment.



U8 Speargrass North Facing Escarpment

This escarpment is significantly steeper than the south facing escarpment and forms a large portion of the southern boundary of the Speargrass Flat Landscape. The top of this landscape unit contains the Slope Hill landscape.

Landscape Unit Character:

Steep craggy schist faces break the otherwise moderately graded slopes of pasture grasses, mixed exotic and native vegetation. The topography and vegetation of this landscape unit provide a higher degree of naturalness than the surrounding landscape.



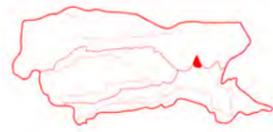


U9 West Speargrass Valley

This is a narrow valley between the escarpment faces. The West Speargrass Valley's boundaries overlap with the Lake Hayes Rural Residential and the East Speargrass Valley to the east and the Hawthorne Landscape to the west.

Landscape Unit Character:

The West Speargrass Valley is a corridor landscape. It is composed generally of the flatter lands between the north and south facing escarpments. The character of the West Speargrass Valley is inextricably linked to the escarpment faces. Vegetation patterns of open pastures, shelter belts and patches of rural amenity trees extend throughout. Some residential activity has occurred against the north facing escarpment.

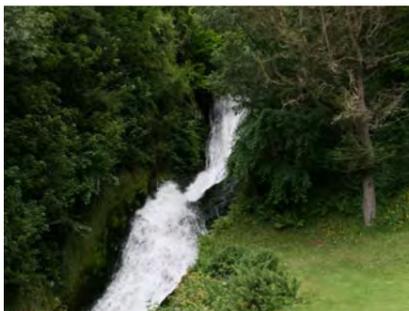


U10 Waterfall Park:

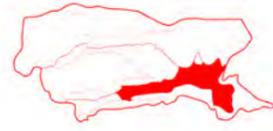
This is a small landscape unit. It's a densely vegetated park-like pocket of land dominated by a waterfall. This waterfall is part of Mill Creek and descends from the Rural Resort landscape unit into the Speargrass Flats.

Landscape Unit Character:

Waterfall Park is a pocket landscape unit defined by the dramatic relief that encloses the gorge. A water cascade descends down the escarpment face. Dense mature vegetation shrouds the gorge walls and provides a lush, vegetative character. The vegetation doesn't allow much sun into the gorge and the Waterfall Park landscape unit has a distinct micro-climate, somewhat tropical in summer months and colder and bleaker than the Basin floor in winter months. There is an existing Structure Plan which permits significant development within this unit.



U11 East Speargrass Valley:



This landscape unit forms much of the foreground to the Upper Hills and Rural Resort Areas. It consists predominantly of flat pastoral lands leading to the toe of the Wharehuanui Hills.

Landscape Unit Character:

The East Speargrass Valley is a mostly rural landscape unit existing in the foreground to the Rural Resort area. The level of residential activity within the East Speargrass Valley is higher than within the adjacent Hogans Gully unit and West Speargrass Valley. This more domestic character is a response to the landscape unit's adjacency to the more densely zoned residential activities of the Rural Residential - North Lake Hayes Area. While residential activities are present, this unit still maintains a high level of rural character.



U12 The Lake Hayes Rural Residential Area:

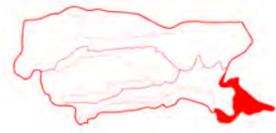


This landscape is located to the south of the more pastoral East Speargrass Valley. The Rural Residential Zoning continues to the shores of Lake Hayes. However the lands in this Zone, which are more associated to the open pastures are considered part of the Speargrass Flats Landscape while the lands to the south are considered to be part of the Lake Hayes Landscape.

Landscape Unit Character:

This landscape unit is the most domestic of all the units in the Study Area. The pastoral elements that surround this unit are generally void inside it. Instead this landscape unit hosts domestic activities set within the otherwise rural character. Vegetation within the Lake Hayes Rural Residential Area is more domestic. Patches of amenity trees are set amongst mown pastures. Avenue trees extend along sinuous driveways and access residential units. The density of residential development is higher here as a result of the Rural Residential zoning.





U13 Hogans Gully:

This landscape unit is composed of more elevated hills leading up to the east. These valleys are closely associated to the pastoral valleys below.

Landscape Unit Character:

Hogans Gully offers a high level of rural character with limited visible residential development. Mature trees extend across the lands as shelterbelts. The land is enclosed by terraces to the north and south and rolling pastoral hills descend from these terraces towards the Speargrass Flats. Portion of the terraces within Hogan Gully display a moderate level of naturalness. Residential activity occurs to the south against the escarpment face that leads up to the Bendemeer Hills.



CHARACTER



Part 3

Evaluation

7.0 Evaluation

The previous sections of this study identified three landscapes within the Study Area and the smaller landscape units within them. Elements of each landscape unit was identified and their values in terms of land form, land cover and land use were defined. The boundaries between landscapes were found to often overlap. While the maps associated with this study clearly indicate a line between landscape units, it is often the case that landscapes are folded into each other and the boundaries between them can be obscure.

The following portion of this study summaries the character of each landscape unit identified in the previous section and evaluates it's resource potential. This evaluation determines:

- Areas in which appropriate development can occur without degrading the landscape.
- Areas in which inappropriate development may degrade the landscape.
- Effective ways to manage the landscape to ensure the existing values and quality are retained or enhanced.

For ease of reference, the findings of the character study is summarised in table format in terms of the landscape unit's:

- Visibility
- Land Form
- Land Cover
- Land Use.

Following on from this character summary, an evaluation and recommendations for each landscape unit is provided in terms of its:

- Ability to Absorb Change
- Development Issues and Opportunities
- Landscape Management Strategies.

Ability to Absorb Change (refer to Appendix J)

The Wharehuanui Study Area is a rich landscape resource with a distinct quality and a high level of natural, cultural and visual values. The biophysical and cultural resources of the landscape are considered to bare an equal weight as the visual resource. However the ability for landscapes to absorb change is traditionally associated with the visual effects of change.

Visual absorption capacity can be defined as the landscape's ability to absorb physical changes without transformation in its visual character and quality.⁵ This definition suggests that in order for a landscape to absorb development there should be no adverse change in the landscape's character or quality.

A scale which describes the landscape's ability to absorb change is useful in determining how and where development may occur. This evaluation uses the following scale and considers the ability of the landscape to absorb change **over and above what is existing and permitted.**

⁵ Amir, S. and Gidalizon, E. 1988, Expert-based Method for the Evaluation of Visual Absorption Capacity of the Landscape.

Ability to Absorb Change:

- 1 **High** - Appropriate development will not adversely effect the landscape.
- 2 **Moderate to High** - Appropriate development may occur in areas where the landscape can best absorb it.
- 3 **Moderate** - Appropriate development should be strategic, managed and sympathetic to the landscape.
- 4 **Moderate to Low** - The landscape is near the threshold where further change may adversely effect it and change should be discrete.
- 5 **Low** - inappropriate change would adversely effect the landscape's character and quality

The higher the ability for a landscape to absorb change the more likely it is that development can occur without degrading the landscape's character and quality. The lower the landscape unit's ability to absorb change, the less likely it is that development can occur without adversely affecting the landscape unit's character and quality.

Development Issues and Opportunities

Each landscape unit has its own distinct features which define it. These features often provide clues to how change can occur in ways which appropriately maintain the quality and character of the landscape. Whilst a landscape unit may have a low ability to absorb change, if change is approached in an appropriate, strategic and directed manner, its effects can be minimised and the landscape character and quality maintained, and in some cases, enhanced.

Landscape Management Strategies

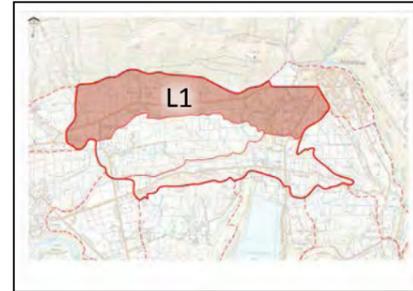
Management of the landscape is essential to the continuation of the landscape's quality and values. Within the District, management of lands has generally been left to the responsibility of private land owners, under the direction and supervision of the Council. An emphasis on the 'picturesque' aesthetic has elevated visual values at the expense of other landscape values, especially ecological. However as detailed int the Description and Inventory portion of this report, a progressive understanding of the landscape and it's values is slowly moving away from an emphasis on the visual and towards an understanding of the landscape as a holistic resource in its own right.

The landscape management strategies contained in this study this sub-heading examine strategies which not only preserve and enhance the landscape's visual values and quality, but also it's cultural, ecological and natural values.

Figure 22: An aerial view east across the Mill Creek Catchment and Speargrass Flats.



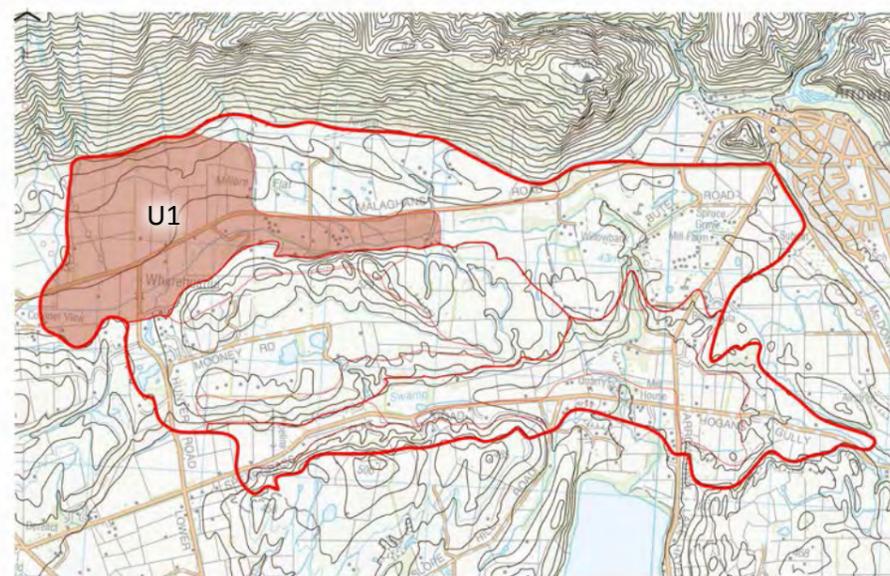
L1 The Mill Creek Catchment



U1 Millers Flat Landscape Unit



Figure 23: Near Hunter Road looking northeast across Millers Flat.

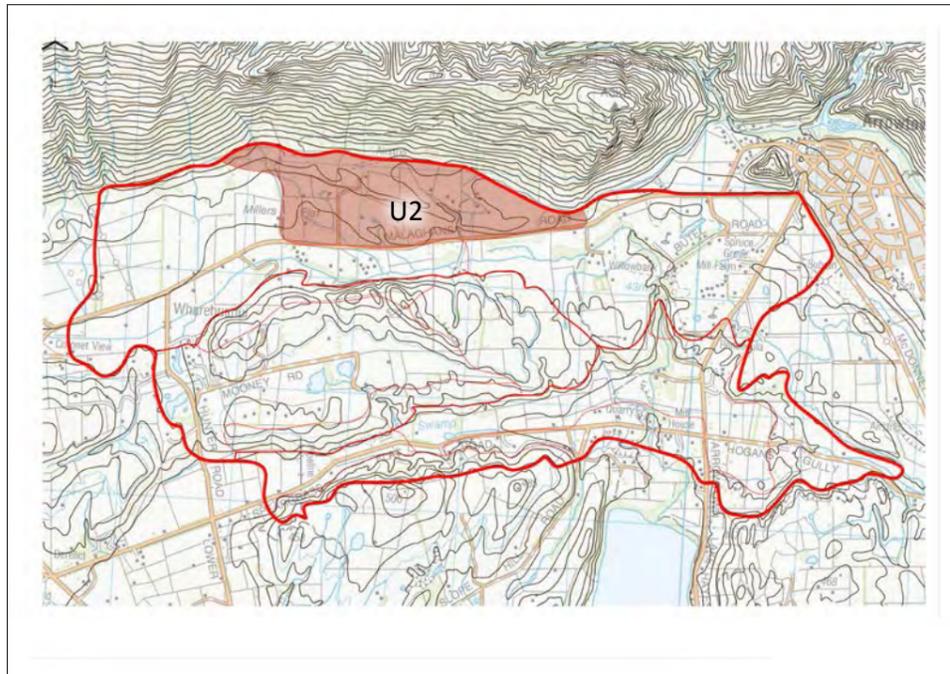


SUMMARY OF LANDSCAPE VALUES	MILLERS FLAT LANDSCAPE UNIT
Visibility	<ul style="list-style-type: none"> Highly visible from portions of Malaghans Road and Hunter Road. Moderately visible from Coronet Peak due to distance.
Land Form	<ul style="list-style-type: none"> Generally flat. Mill Creek flows through the unit to the east. Steep topography marks the northern and southern edges.
Land Cover	<ul style="list-style-type: none"> Mostly improved pasture grass. Shelterbelts, avenues and swathes of exotic and native plants. Rural character buildings and limited visible residential development.
Land Use	<ul style="list-style-type: none"> Pastoral farming. Low density residential.
EVALUATION AND RECOMMENDATIONS	
Ability to Absorb Change	<ul style="list-style-type: none"> 4 - Moderate to Low potential to absorb development within the visible broader flatlands. 3 - Moderate potential to absorb further development at base of north facing escarpment.
Development Issues and Opportunities	<ul style="list-style-type: none"> Strong rural character susceptible to degradation within the flatlands. Flat open land provides distinct views across them to the more dramatic mountains of the District. North facing escarpment allows development at it's base to be better absorbed.
Landscape Management Strategies	<ul style="list-style-type: none"> Development potential on the flat, open lands is limited and should be subject to the scale of open space retention. Planting which could impede views across the wider landscape should be restricted. Continued and accelerated management of wilding species.

U2 The Foothills Landscape Unit



Figure 24: Near Malaghans Road looking north-northeast towards Flight Park.



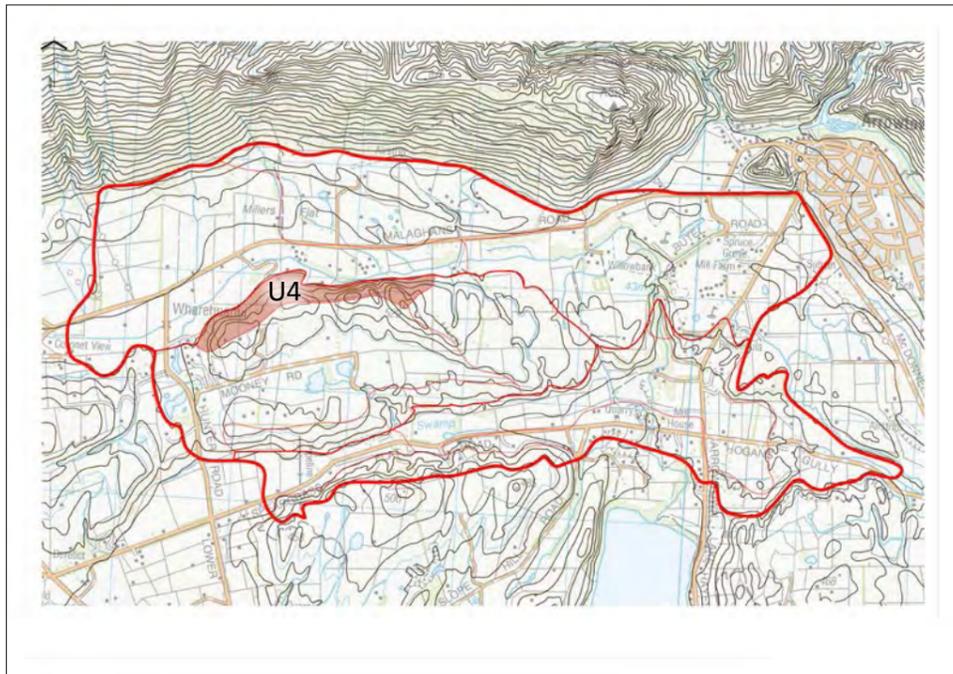
SUMMARY OF LANDSCAPE VALUES	THE FOOTHILLS LANDSCAPE UNIT
Visibility	<ul style="list-style-type: none"> The south facing slopes are highly visible from Malaghans Road. Upper portions of land have a very low level of visibility from other places within the basin.
Land Form	<ul style="list-style-type: none"> Rolling slopes extend towards the foot of ONL slopes. Plateaus exist atop The Foothills. Occasional gullies cut through The Foothills towards Malaghans Road.
Land Cover	<ul style="list-style-type: none"> Mostly improved pasture grass. Dense patches of exotic trees. Native gray scrub-land species mixed with exotic weeds exists on some slopes and gullies.
Land Use	<ul style="list-style-type: none"> Pastoral farming. Rural living. Business (Flight Park).
EVALUATION AND RECOMMENDATIONS	
Ability to Absorb Change	<ul style="list-style-type: none"> 5 - Low ability to absorb change on the south facing slopes, including the gullies have. 2 - Moderate to High ability to absorb further development, so long as it has a low visual impact on Malaghans Road or against ridges or skylines.
Development Issues and Opportunities	<ul style="list-style-type: none"> A higher density of ecological planting could enhance the ecological values of the gullies. Exotic weed management is vital to the retention of open spaces. Residential density located within the visually isolated plateaus could increase without significant degradation to the landscape. Integrity of existing skylines and ridge-lines should be maintained.
Landscape Management Strategies	<ul style="list-style-type: none"> Continued productive use, especially on the south facing slopes. Ecological planting within the gullies and areas of existing native patches. Continued and accelerated management of wilding species.

EVALUATION

U4 Malaghans North Facing Escarpment Landscape Unit



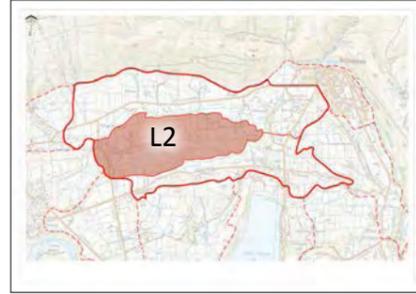
Figure 26: From Malaghans Road looking southeast.



SUMMARY OF LANDSCAPE VALUES	MALAGHANS NORTH FACING ESCARPMENT LANDSCAPE UNIT
Visibility	<ul style="list-style-type: none"> Highly visible from Malaghans Road. Moderately visible from Coronet Peak.
Land Form	<ul style="list-style-type: none"> Schist walls form much of the dramatic slope that compose the north facing escarpment. Subtle gullies flow between the more dominant schist outcrops. Glacial till and alluvium mantels the stone outcrops.
Land Cover	<ul style="list-style-type: none"> Small pockets of native and mixed exotic grey scrub-land. Exotic shrubs provide much of the structural vegetation, colour and texture on the escarpment. Unimproved pasture grass is the underlying vegetation.
Land Use	<ul style="list-style-type: none"> Limited pastoral farming.
EVALUATION AND RECOMMENDATIONS	
Ability to Absorb Change	<ul style="list-style-type: none"> 5 - Low potential to absorb development on the escarpment face itself.
Development Issues and Opportunities	<ul style="list-style-type: none"> The more natural character of these faces leave them susceptible to degradation. Pastoral farming is limited to portions of the escarpment faces. Integrity of existing skylines and ridge-lines should be maintained.
Landscape Management Strategies	<ul style="list-style-type: none"> Continued and accelerated management of wilding species. Nurture re-vegetation, especially within the gullies. Protection and enhancement of existing native vegetation.

EVALUATION

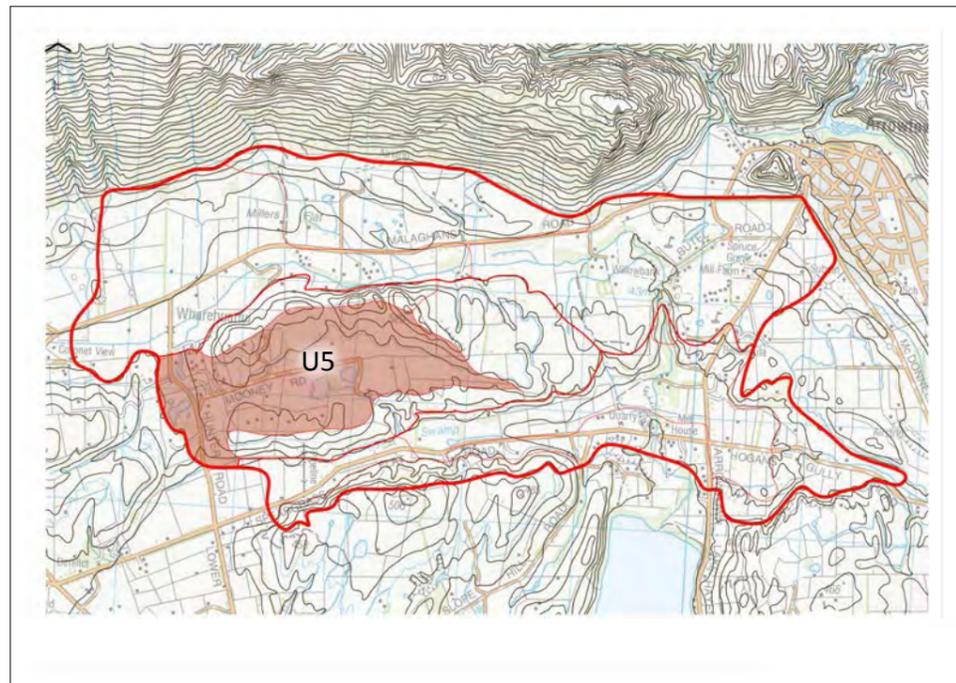
L2 The Wharehuanui Hills



U5 The Wharehuanui Plateau Landscape Unit



Figure 27: Near Mooney Road looking south across the Wharehuanui Plateau.



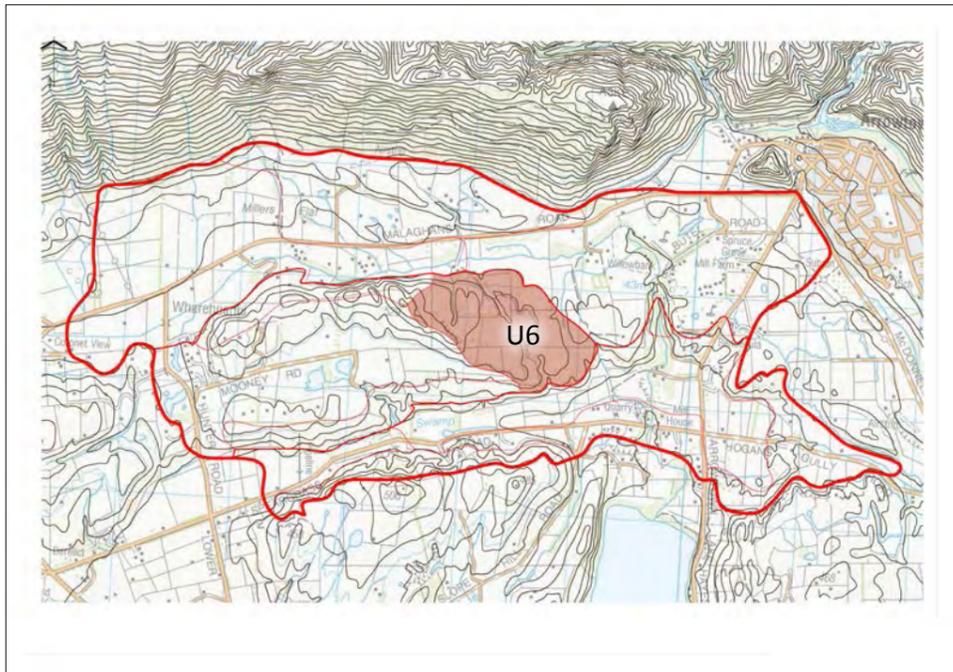
SUMMARY OF LANDSCAPE VALUES	Wharehuanui Plateau
Visibility	<ul style="list-style-type: none"> Moderately visible from Coronet Peak The escarpment screens views into the Mooney Road valley. Only development in the vicinity of the upper escarpment faces is potentially visible from Malaghans Road, Speargrass Flat Road and Mooney Road.
Land Form	<ul style="list-style-type: none"> Schist bedrock lies underneath large deposits of glacial till. A reoccurring pattern of plateaus and hummocks occur throughout the unit. Naturally occurring and human-made wetlands exist on the floor of the Mooney Valley.
Land Cover	<ul style="list-style-type: none"> Mown pasture grasses and surface waters are the primary cover. Dense patches of mature exotic trees pepper the landscape, more commonly in the lower western portions. Swathes of exotic and native plantings exist with the rural lifestyle properties ,especially prevalent along the edges of surface waters. Farm and residential buildings.
Land Use	<ul style="list-style-type: none"> Rural living. Pastoral farming.
EVALUATION AND RECOMMENDATIONS	
Ability to Absorb Change	<ul style="list-style-type: none"> 1 - High ability to absorb further appropriate development on the lower portions of the Wharehuanui Plateau. 3 - Moderate potential to absorb further development on the more elevated portions of the unit.
Development Issues and Opportunities	<ul style="list-style-type: none"> Avoid any adverse visual effects of development on the surrounding public roads, especially Malaghans Road and Speargrass Flat Road. Enhance ecological corridors on the margins of riparian areas. Residential development should maintain existing rural character.
Landscape Management Strategies	<ul style="list-style-type: none"> Rural residential living densities could increase in appropriate locations Existing rural elements should be repeated. Continued and accelerated management of wilding species.



U6 The Upper Hills Landscape Unit



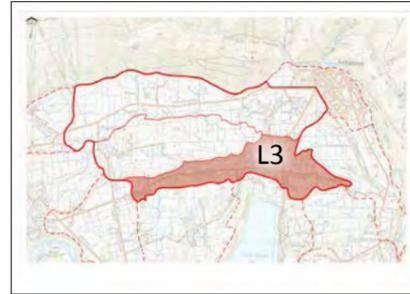
Figure 28: From within the Upper Hills looking northeast.



SUMMARY OF LANDSCAPE VALUES	THE UPPER HILLS LANDSCAPE UNIT
Visibility	<ul style="list-style-type: none"> Moderate visibility from distant views such as Cotter Ave, Feeley Knoll and the entrance to the Lake Hayes recreation Area. Limited visibility from Malaghans Road and the Speargrass Flats.
Land Form	<ul style="list-style-type: none"> Upper rolling hills forming the apex of the Wharehuanui Hills. Higher more pronounced hill forms to the east of the unit. Plateaus and gullies exist between hummocky forms.
Land Cover	<ul style="list-style-type: none"> Mown pasture grass is the dominant land cover. Patches of mature exotic shelter belt trees. Patches of rural amenity plantings. Bracken fern in localized patches. Limited farm buildings and dwellings.
Land Use	<ul style="list-style-type: none"> Pastoral farming. Rural residential.
EVALUATION AND RECOMMENDATIONS	
Ability to Absorb Change	<ul style="list-style-type: none"> 3 - Moderate ability to absorb further appropriate development especially within the lower hills and plateaus. 5 - Low ability to absorb change on the uppermost hills and ridges.
Development Issues and Opportunities	<ul style="list-style-type: none"> Development potential on the plateaus between hummocks. Integrity of existing skylines and ridge-lines should be maintained as viewed from public roads Retention of appropriate open space. Ecological plantings around waterways and gullies.
Landscape Management Strategies	<ul style="list-style-type: none"> Staged residential density from the Rural Resort Unit to the Upper Hills Unit. Retention of appropriate open space. Retention of rural character. Retention of prominent hummocky features.

EVALUATION

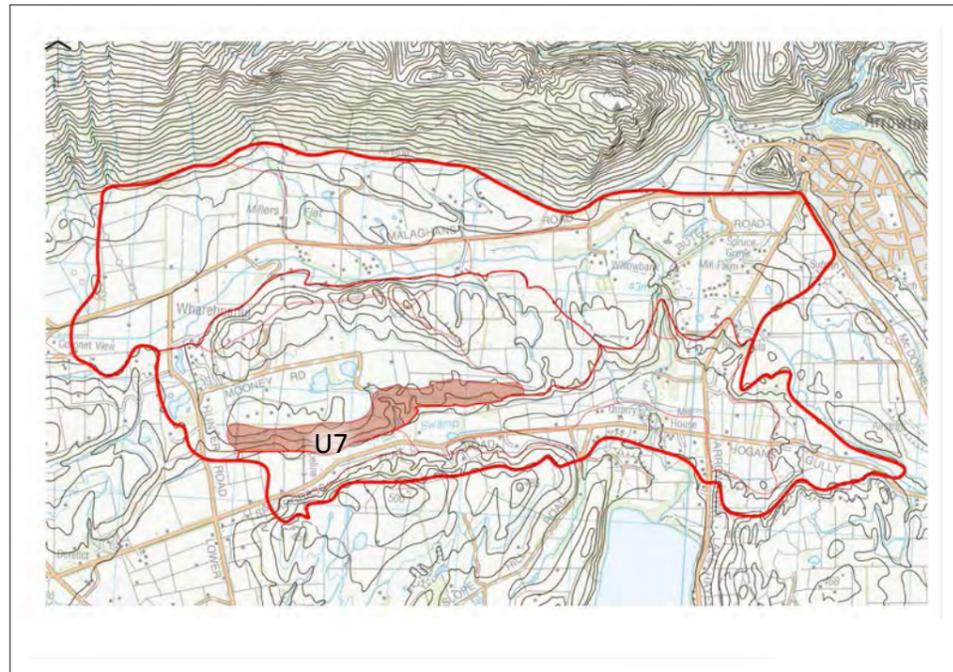
L3 Speargrass Flats



U7 Speargrass South Facing Escarpment Landscape Unit



Figure 29: From Speargrass Flat Road looking north towards the Speargrass South Facing Escarpment.

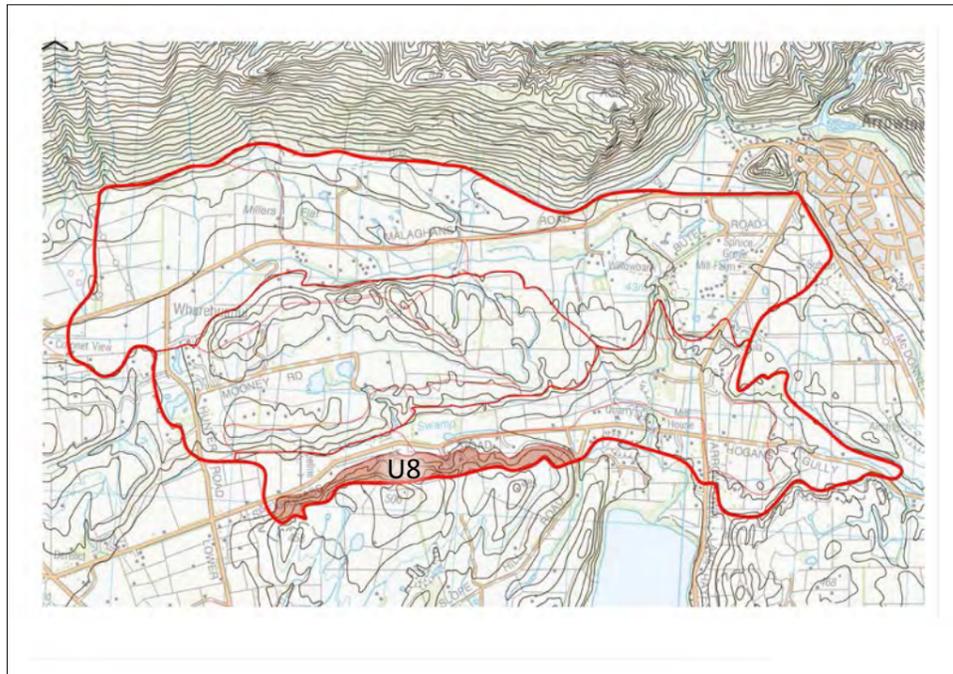


SUMMARY OF LANDSCAPE VALUES	SPEARGRASS SOUTH FACING ESCARPMENT LANDSCAPE UNIT
Visibility	<ul style="list-style-type: none"> Highly visible from Speargrass Flat Road, Hunter Road and Lower Shotover Road.
Land Form	<ul style="list-style-type: none"> Rolling slopes and gullies leading up the Wharehuanui Hills. Landscape unit provides one wall of the Speargrass Valley corridor.
Land Cover	<ul style="list-style-type: none"> Mostly improved pasture grass. Shelterbelts and avenues of exotic trees. Swathes of rural amenity trees.
Land Use	<ul style="list-style-type: none"> Pastoral farming.
EVALUATION AND RECOMMENDATIONS	
Ability to Absorb Change	<ul style="list-style-type: none"> 5 - Low potential to absorb further development.
Development Issues and Opportunities	<ul style="list-style-type: none"> Natural character can be strengthened especially in gullies. Only agricultural buildings would be appropriate for future development in most of this unit. Integrity of existing skylines and ridge-lines should be maintained.
Landscape Management Strategies	<ul style="list-style-type: none"> Continued productive use. Native planting within the gullies could enhance ecological values. Maintain open views by avoiding roadside planting.

U8 Speargrass North Facing Escarpment Landscape Unit



Figure 30: Near Speargrass Flat Road looking southwest towards the north facing escarpment.



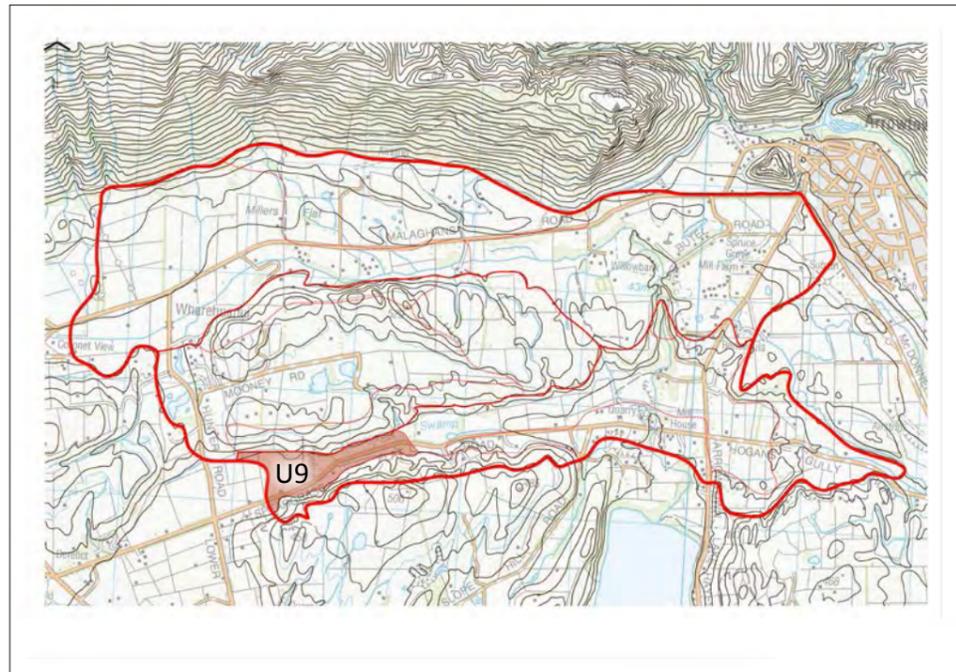
SUMMARY OF LANDSCAPE VALUES	SPEARGRASS NORTH FACING ESCARPMENT LANDSCAPE UNIT
Visibility	<ul style="list-style-type: none"> Highly visible from Speargrass Flat Road, Hunter Road and Lower Shotover Road.
Land Form	<ul style="list-style-type: none"> Schist walls form much of the dramatic face that compose the north facing escarpment. Subtle gullies flow between the more dominant schist outcrops. Glacial till and alluvium mantels the stone outcrops.
Land Cover	<ul style="list-style-type: none"> Unimproved pasture grass is the dominant land cover. Patches of exotic trees pepper the landscape. Some native grey scrub-land species are present.
Land Use	<ul style="list-style-type: none"> Infrastructural (Arrow Irrigation Scheme). Pastoral farming Rural Residential
EVALUATION AND RECOMMENDATIONS	
Ability to Absorb Change	<ul style="list-style-type: none"> 5 - Low potential to absorb further development.
Development Issues and Opportunities	<ul style="list-style-type: none"> Opportunities to enhance natural character. Ecological plantings around waterways. Integrity of existing skylines and ridge-lines should be maintained.
Landscape Management Strategies	<ul style="list-style-type: none"> Continued and accelerated management of wilding species. Re-vegetation especially within the gullies. Protection and enhancement of existing native vegetation.

EVALUATION

U9 West Speargrass Valley Landscape Unit



Figure 31: Speargrass Flat Road looking west across the West Speargrass Valley.

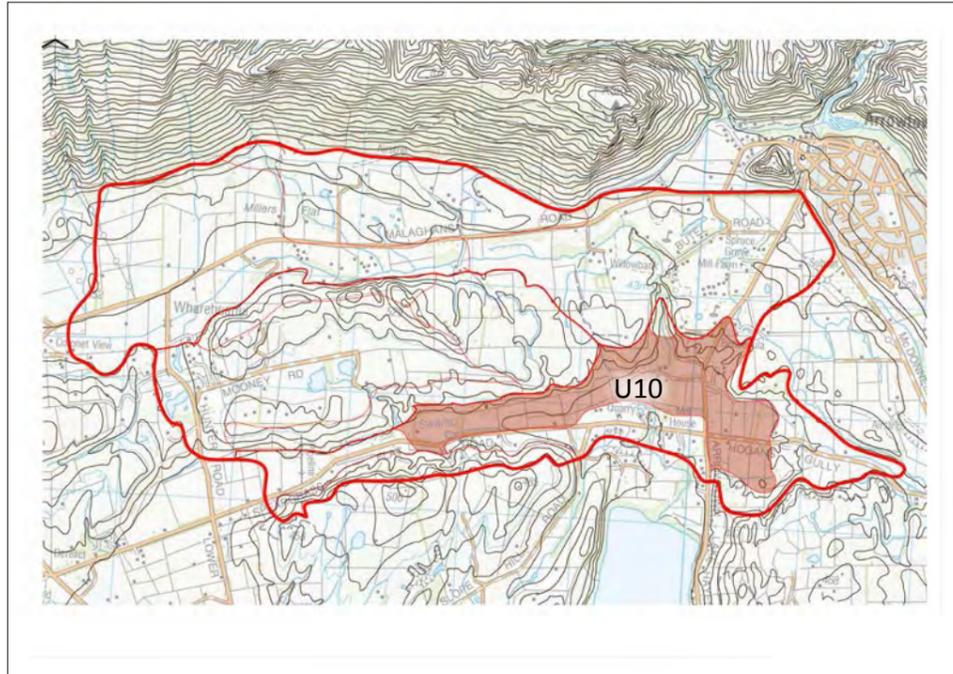


SUMMARY OF LANDSCAPE VALUES	WEST SPEARGRASS VALLEY LANDSCAPE UNIT
Visibility	<ul style="list-style-type: none"> • Visibility is limited to Speargrass Flat Road due to the corridor nature of the valley.
Land Form	<ul style="list-style-type: none"> • The flatter floodplains that exist between the more elevated Wharehuanui Hills and upper Slope Hill area.
Land Cover	<ul style="list-style-type: none"> • Improved pasture grass is the dominant land cover. • Mature exotic shelterbelt trees cut across the landscape unit. • Rural character buildings including farm buildings and dwellings.
Land Use	<ul style="list-style-type: none"> • Pastoral farming. • Rural Residential.
EVALUATION AND RECOMMENDATIONS	
Ability to Absorb Change	<ul style="list-style-type: none"> • 4 - Moderate to low ability to absorb further appropriate development.
Development Issues and Opportunities	<ul style="list-style-type: none"> • Housing should be set back from Speargrass Flat Road against the north facing escarpment.
Landscape Management Strategies	<ul style="list-style-type: none"> • Open land leading to the south facing slopes should remain open and productive. • All elements within this landscape should perpetuate the existing rural character or highlight the natural character of the adjoining escarpments. • Continued and accelerated management of wilding species.

U10 East Speargrass Flat Landscape Unit



Figure 32: View from the Bendemeer Hills looking west towards East Speargrass Flat.



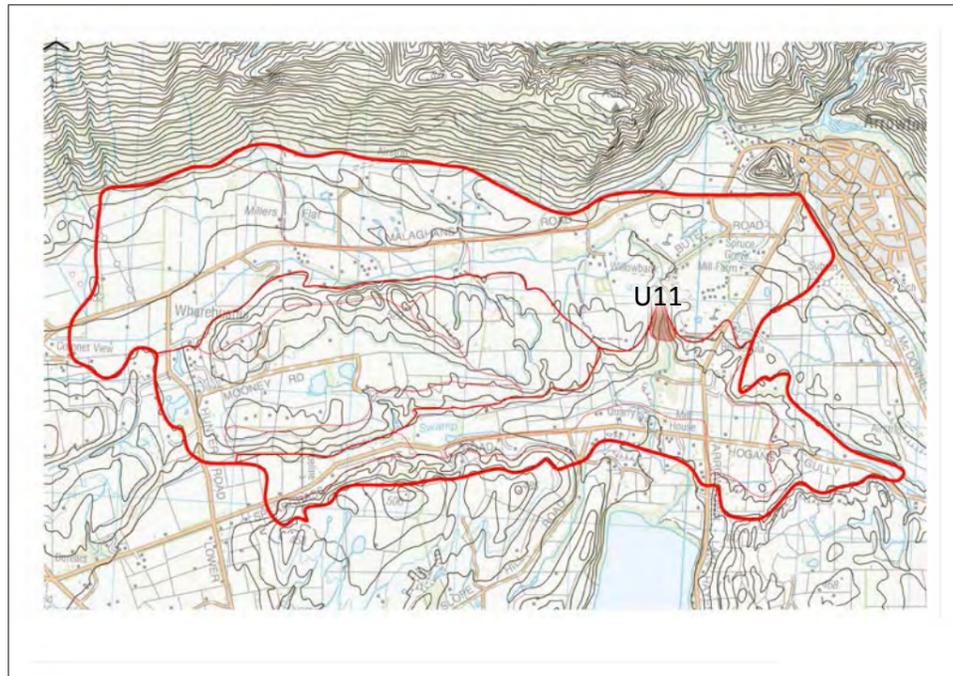
SUMMARY OF LANDSCAPE VALUES	EAST SPEARGRASS FLAT LANDSCAPE UNIT
Visibility	<ul style="list-style-type: none"> Moderate to high visibility from the Lake Hayes / Arrowtown Road, Hogans Gully Road, and Speargrass Flats Road.
Land Form	<ul style="list-style-type: none"> Moderately undulating landscape of floodplains transitioning from the Upper Hills and Rural Resort Units to the north to the Lake Hayes Rural Residential Area to the south.
Land Cover	<ul style="list-style-type: none"> Improved pasture grass is the dominant land cover. Swathes of exotic and native plantings exist within the more residential portions of this unit. Rural dwellings and farm buildings.
Land Use	<ul style="list-style-type: none"> Rural Residential Living Recreation Pastoral farming
EVALUATION AND RECOMMENDATIONS	
Ability to Absorb Change	<ul style="list-style-type: none"> 4 - Moderate to low ability to absorb further appropriate development within discrete pockets of land.
Development Issues and Opportunities	<ul style="list-style-type: none"> Housing clusters set back from Speargrass Flat Road amongst existing vegetation. Open pastoral lands to remain. Ecological plantings around surface waters.
Landscape Management Strategies	<ul style="list-style-type: none"> Pastoral, rural elements to be retained and enhanced. Enhance ecological planting along riparian areas. Continued and accelerated management of wilding species.

EVALUATION

U11 Waterfall Park Landscape Unit



Figure 31: The waterfall in Waterfall Park.

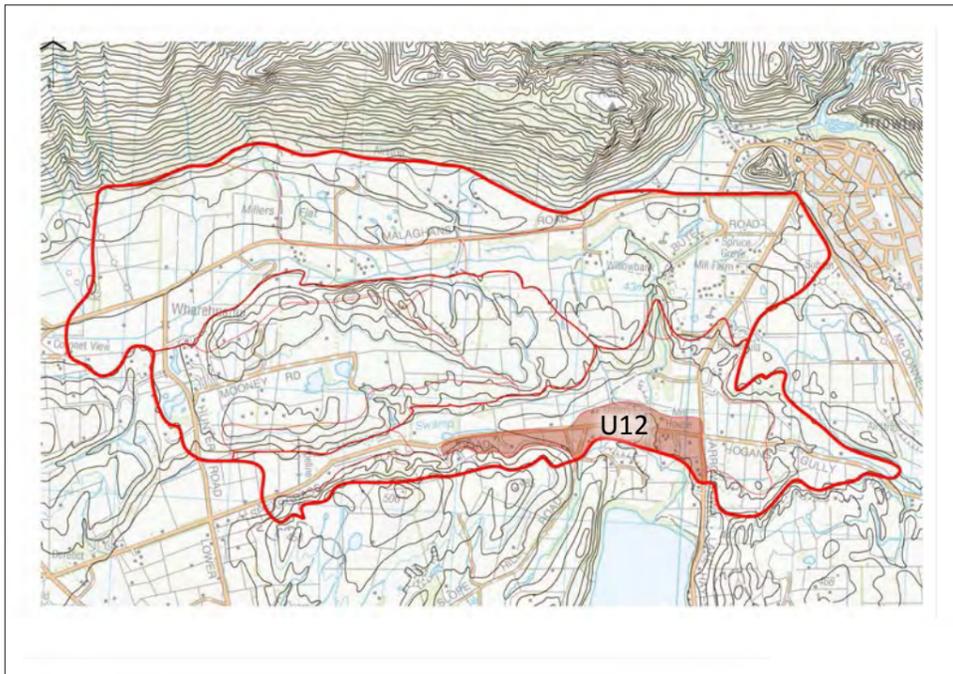


SUMMARY OF LANDSCAPE VALUES	WATERFALL PARK LANDSCAPE UNIT
Visibility	<ul style="list-style-type: none"> • Visibility into the unit is extremely limited due to existing trees and surrounding topography.
Land Form	<ul style="list-style-type: none"> • Mill Creek cascades down a rocky terrace face in this distinct gorge. • Steep wall surround the east, west and north walls of this landscape unit, which then opens to the south.
Land Cover	<ul style="list-style-type: none"> • Thick, mostly exotic and naturalized plants. • Evidence of previously existing and struggling native vegetation. • Residential and visitor facilities.
Land Use	<ul style="list-style-type: none"> • Rural residential • Historical event facility.
EVALUATION AND RECOMMENDATIONS	
Ability to Absorb Change <i>Note: The Waterfall Park Structure Plan allows for further development. This evaluation considers further development beyond what is permitted.</i>	<ul style="list-style-type: none"> • 4 - Moderate to Low ability to absorb further appropriate development.
Development Issues and Opportunities	<ul style="list-style-type: none"> • Visually cut off from the rest of the valley. • Natural character is stronger than rural character. • Flooding potential
Landscape Management Strategies	<ul style="list-style-type: none"> • Clearance of selected wilding exotics. • Highlight distinct heritage. • Retention and enhancement of natural values.

U12 Lake Hayes Rural Residential Landscape Unit



Figure 32: Letterboxes off Speargrass Flat Road.



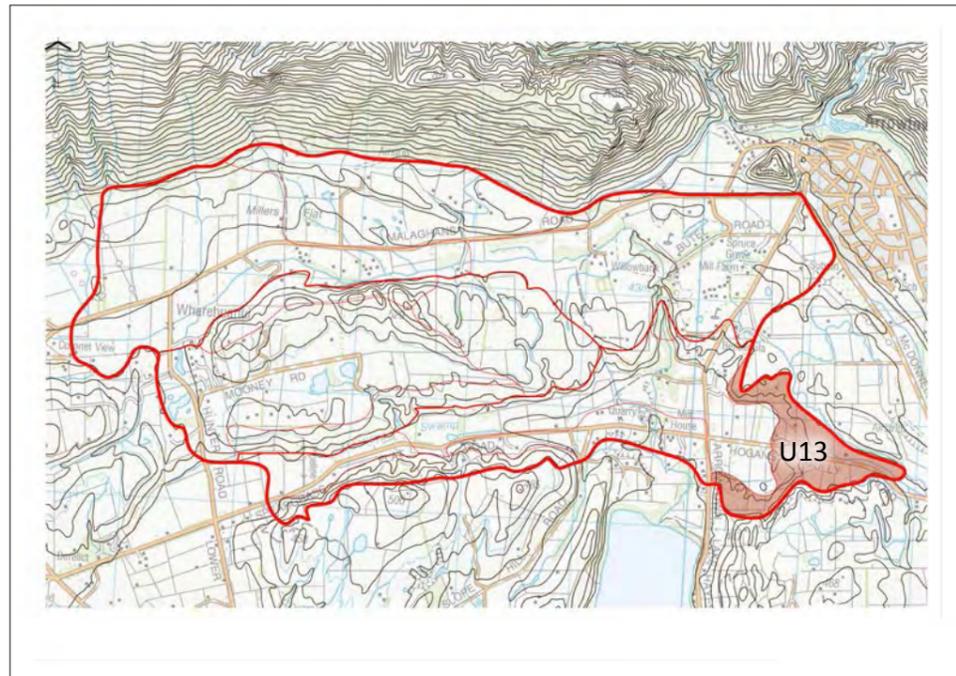
SUMMARY OF LANDSCAPE VALUES	THE LAKE HAYES RURAL RESIDENTIAL LANDSCAPE UNIT
Visibility	<ul style="list-style-type: none"> • Visibility into the site is often limited due to existing trees. • Properties that adjoining Speargrass Flat Road are highly visible.
Land Form	<ul style="list-style-type: none"> • Undulating and descending landforms extend from the Speargrass Flats towards Lake Hayes.
Land Cover	<ul style="list-style-type: none"> • Mown pasture grasses and lawns are the dominant land cover. • Dense patches of mature exotic trees extend along roads and waterways. • Swathes of exotic and native amenity planting exist in the vicinity of residential dwellings. • Suburban/rural dwellings.
Land Use	<ul style="list-style-type: none"> • Rural residential living • Limited pastoral farming • Business (Walnut Cottage) • Visitor Accommodation.
EVALUATION AND RECOMMENDATIONS	
Ability to Absorb Change	<ul style="list-style-type: none"> • 2 - Moderate to high ability to absorb further appropriate development.
Development Issues and Opportunities	<ul style="list-style-type: none"> • Housing clusters set back from Speargrass Flat Road. • Continuation of rural and pastoral character elements. • Ecological plantings around waterways.
Landscape Management Strategies	<ul style="list-style-type: none"> • Setback from Speargrass Flat Road to be in excess of 10m. • Building and landscape design should take cues from the surrounding rural and natural elements. • Continued and accelerated management of wilding species.

EVALUATION

U13 Hogans Gully Landscape Unit



Figure 33: Near Hogans Gully Road looking north across the Hogans Gully Unit



SUMMARY OF LANDSCAPE VALUES	HOGANS GULLY LANDSCAPE UNIT
Visibility	<ul style="list-style-type: none"> • Visibility into the site is limited to the vicinity of Hogans Gully Road and the Lake Hayes/ Arrowtown Road intersection.
Land Form	<ul style="list-style-type: none"> • A gully land-form descends between two terraces. • The western Hogans Gully unit overlaps with the Eastern Speargrass Flats Unit.
Land Cover	<ul style="list-style-type: none"> • Improved pasture grass is the dominant land cover. • Mature shelter belts extend across the flatter lands. • Swathes of exotic and native plantings exist in the vicinity of rural residential developments. • Rural residential and rural character buildings.
Land Use	<ul style="list-style-type: none"> • Pastoral farming • Rural residential living.
EVALUATION AND RECOMMENDATIONS	
Ability to Absorb Change	<ul style="list-style-type: none"> • 2 - Moderate to high ability to absorb change along the base of the north facing escarpment. • 4 - Moderate to low ability to absorb further appropriate change. Existing zoning allows for future subdivision on or near the south facing slopes. • 5 - Low ability to absorb change on the open flatlands near the Junction of Speargrass Flat and Hogans Gully Roads.
Development Issues and Opportunities	<ul style="list-style-type: none"> • Ecological plantings on terrace escarpment faces can enhance natural character. • Appropriate residential development is limited to the southern portions of the unit. • Retention of flat, open lands by the intersection of Speargrass Flat Road and Hogans Gully Road.
Landscape Management Strategies	<ul style="list-style-type: none"> • Pastoral lands to remain mostly in active productive use. • Upper portions of gully highly susceptible to degradation • Further appropriate development against the north facing terrace face can occur under existing zoning. • Enhance ecological planting along escarpment faces. . • Continued and accelerated management of wilding species.

8.0 Recommendations and Conclusions

8.1 Summary

A significant portion of the Wakatipu Basin was the subject of this study. The area, dubbed the Wharehuanui, exists generally between Arrowtown, Lake Hayes and Hunter Road. This area was considered to be composed of three landscapes; the Mill Creek Catchment, the Wharehuanui Hills and the Speargrass Flats.

Each landscape is considered to be composed of separate landscape units. These landscape units were determined by repeated site visits and studies of the available and applicable information including ecology, geology and tenure. These attributes were then analysed to define each unit's land form, land cover and land use. Overall this analysis determined the landscape units overall character.

Following on from the character analysis, an evaluation of the landscape's ability to absorb change without significantly diminishing the landscape character and quality was provided. Development issues and opportunities were identified as were landscape management strategies.

It was determined that the Wharehuanui area has pockets within it ranging from low to high ability to absorb change. It was also determined that in all instances, change should occur in a manner which employees and reflects the character elements of the place, be they cultural or natural. This reflection could take the form of design controls, retention of open space, protection of specific features, etc.

Figure 34: Sunrise in the Rural Resort Landscape Unit.



8.2 Recommendations (Refer to Appendix J)

The following is a summary of the findings in terms of the landscapes ability to absorb change.

- Escarpment faces, including Malaghans North Facing Escarpment and Speargrass South and North Facing Escarpments are considered to have a **low** ability to absorb change. These escarpment faces are susceptible to degradation as they are highly visible, often form a ridge or skyline and contain a high degree of natural character.
- The slopes leading up The Foothills landscape unit are also deemed to have a **low** ability to absorb change. These slopes display a distinct rolling hills land form similar to the escarpment faces. They form a ridge complex between Malaghans Road and the ONL slopes. A roche moutonnée feature to the south of Malaghans Road is included in this area. The landforms have a moderately strong rural character with patches of vegetation. They are highly visible and legible and any inappropriate development would likely lead to the degradation of this area's values and quality.
- The uppermost hills of the Upper Hills landscape unit are also deemed to have a **low** ability to absorb change. These hills contain significant hummocks which form the uppermost ridge and skyline of the Wharehuanui as seen from several public views. The open character of these hills and their natural form would be degraded should any inappropriate development occur on them.
- A pocket of open space near the intersection of Speargrass Flat Road and the Lake Hayes – Arrowtown Road is considered to have a **low** ability to absorb change. This pocket exists on the overlapping boundaries between the East Speargrass Valley and the Hogans Gully unit. It is considered that the highly visible nature of this area, its strong rural character and high degree of openness would be degraded should inappropriate development occur.
- Much of the Rural Resort and East Speargrass Valley and a small portion of the Hogans Gully units are considered to have a **moderate to low** ability to absorb change. Residential activities has formed part of these unit's existing character, but the landscape still retains a high degree of openness and rural character. It is considered that appropriate development could occur in certain pockets within these units, but that they are close to crossing the threshold with respect to the landscape's ability to absorb change.
- The broader flatlands of the Millers Flat unit are considered to have a **moderate to low** ability to absorb change. These broad flatlands are significant in the valley and offer distinct open views across the flatlands to the contrasting slopes and hummocks. Limited development could occur within this area but would need to be very strategic and directed to not adversely affect the landscape values and quality.
- Much of the Upper Hills unit is considered to have a **moderate** ability to absorb change. The strong open rural character and hummocky landforms of this area are susceptible to degradation due to inappropriate development. However the plateaus within the unit offer areas where appropriate development could occur without degrading the landscape's values or quality.
- A portion of land in the Wharehuanui Plateau unit adjacent to Hunter Road is considered to have a **moderate** ability to absorb change. Existing development in this area has degraded the rural character to a moderate degree. Appropriate development could occur in this area, however it's capacity to absorb change is limited.
- The flatter more northerly portions of The Foothills are considered to have a **moderate to high** ability to absorb change. These flatter portions, while displaying a strong rural character are not visible from the most public places. It is considered that appropriate development could occur in this area without degrading the quality or character of the landscape.

- A long strip of land taking in all of the Lake Hayes Rural Residential unit and the southern portion of the Hogans Gully unit is considered to have a **moderate to high** ability to absorb change. This strip of land already displays a strong rural residential character. It is considered that further appropriate development could occur in several pockets within this area without degrading the landscape's values or quality.
- Waterfall Park is a small, isolated landscape unit deemed to have a **high** ability to absorb change. It's surrounding land form and vegetation visually encloses it. Its character is more natural than rural and it is considered that appropriate development could occur without degrading and perhaps enhancing this landscape unit's values.
- The Wharehuanui Plateau is visually isolated and most existing development is only visible form within the unit. It is considered that the flatlands and gently rolling hills within this plateau have a **high** ability to absorb change so long as elements of the existing rural character are employed and development does not impede on the character of the adjacent escarpments or hills.

8.3 Conclusions

The Wharehuanui displays a range of landscape values and characters ranging from rural residential, distinctly rural, to highly natural. Ridge-lines, skylines, and escarpment faces are considered to be the landforms that are most susceptible to degradation. However these faces and ridges visually screen internal portions of land. These less visible pockets of land could accommodate appropriate development.

Significant areas of open character, specifically the lands in the vicinity of the intersection of Lake Hayes Estate – Arrowtown Road and Speargrass Flat Road as well as the broader flatlands of Millers Flat are susceptible to degradation resulting from inappropriate development. Any development within these areas needs to be strategic and directed as to not degrade the distinct open character.

Much of the Rural Resort and Western Speargrass Valley units are near their capacity to absorb change.

Waterfall Park and much of the Wharehuanui Plateau is well suited to absorb further appropriate development.

Development is also possible in pockets of land where it can be visually absorbed by the landscape. This includes the lands at the base of escarpments and the plateaus and valleys located between hummocks and gullies.

The Wharehuanui is a diverse area with strong natural and rural character values. Development to date has provided much of that character and in order for it to be retained future development should be directed and strategic. This report has provided a description of the landscape, an analysis of its character and an evaluation of its ability to absorb change. The recommendations of this report are intended to be used as a guide when considering future development within the area.

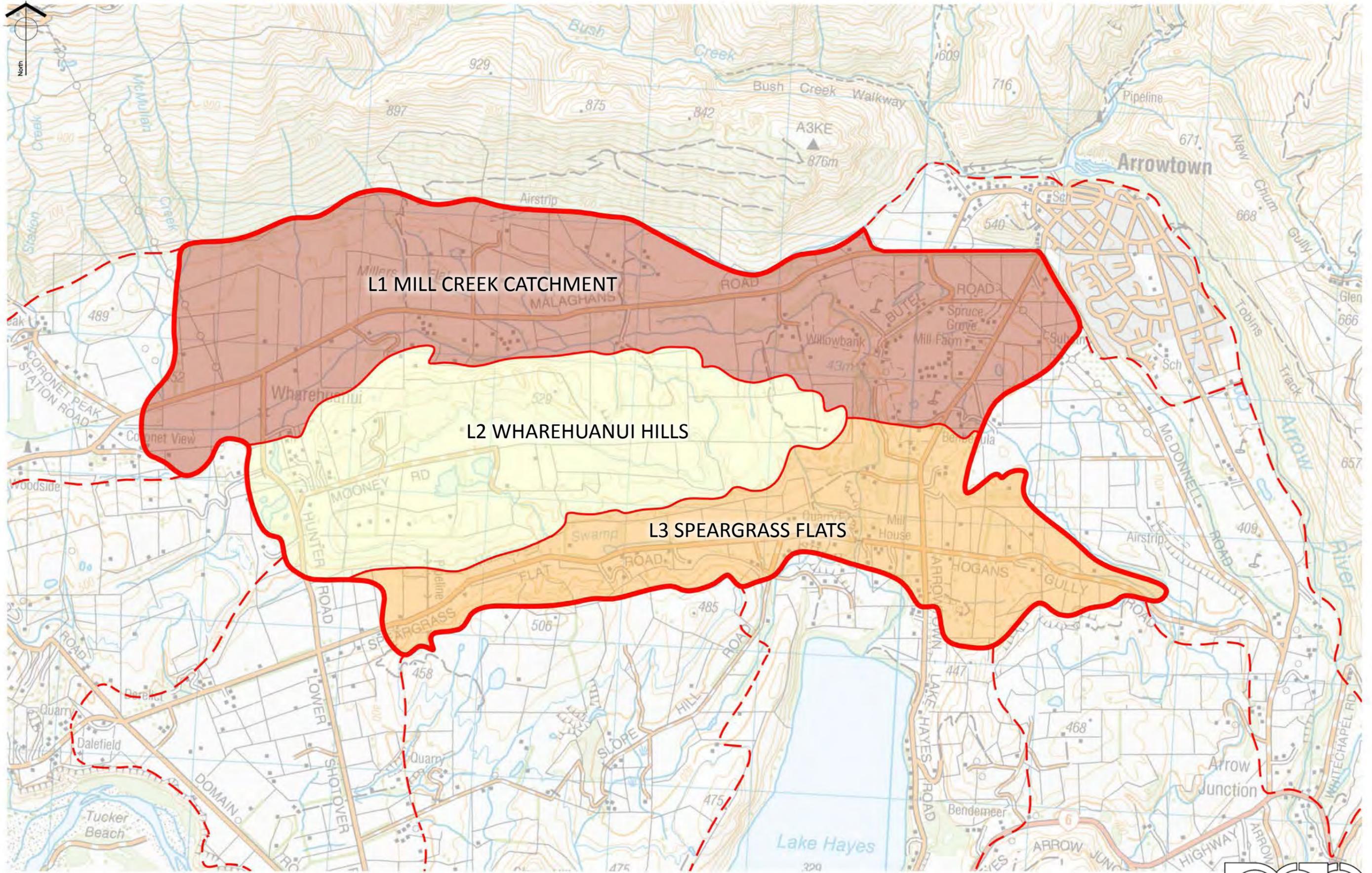
Conclusion

Figure 35: Looking northeast across much of the Wharehuanui area. The intersection of Hogans Gully and Speargrass Flat Road is seen in the lower left,

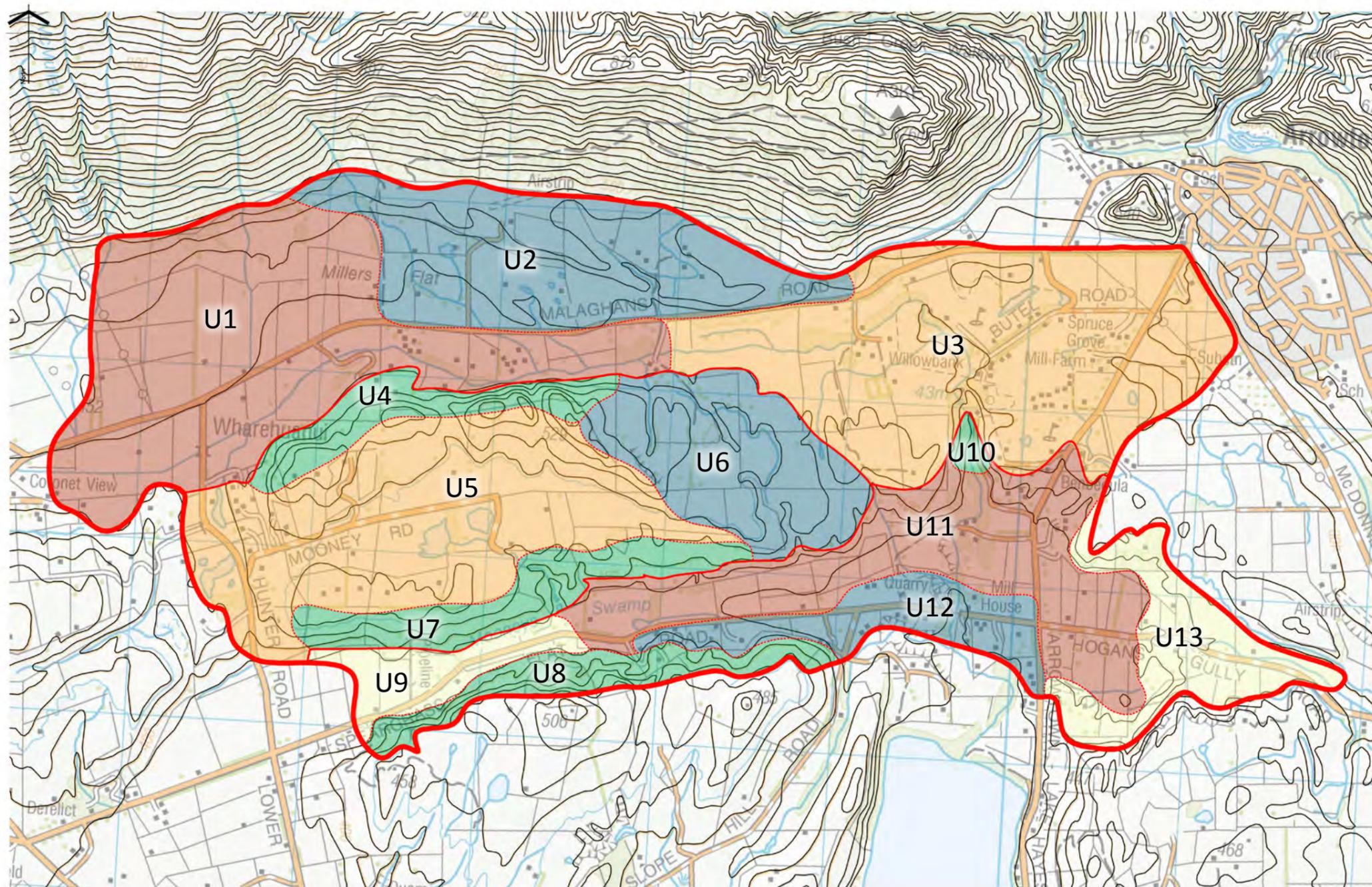




Appendix



Appendix **A** - WHAREHUANUI STUDY AREA AND LANDSCAPES
 Scale 1:25000 @ A3



LANDSCAPE UNITS

Mill Creek Catchment

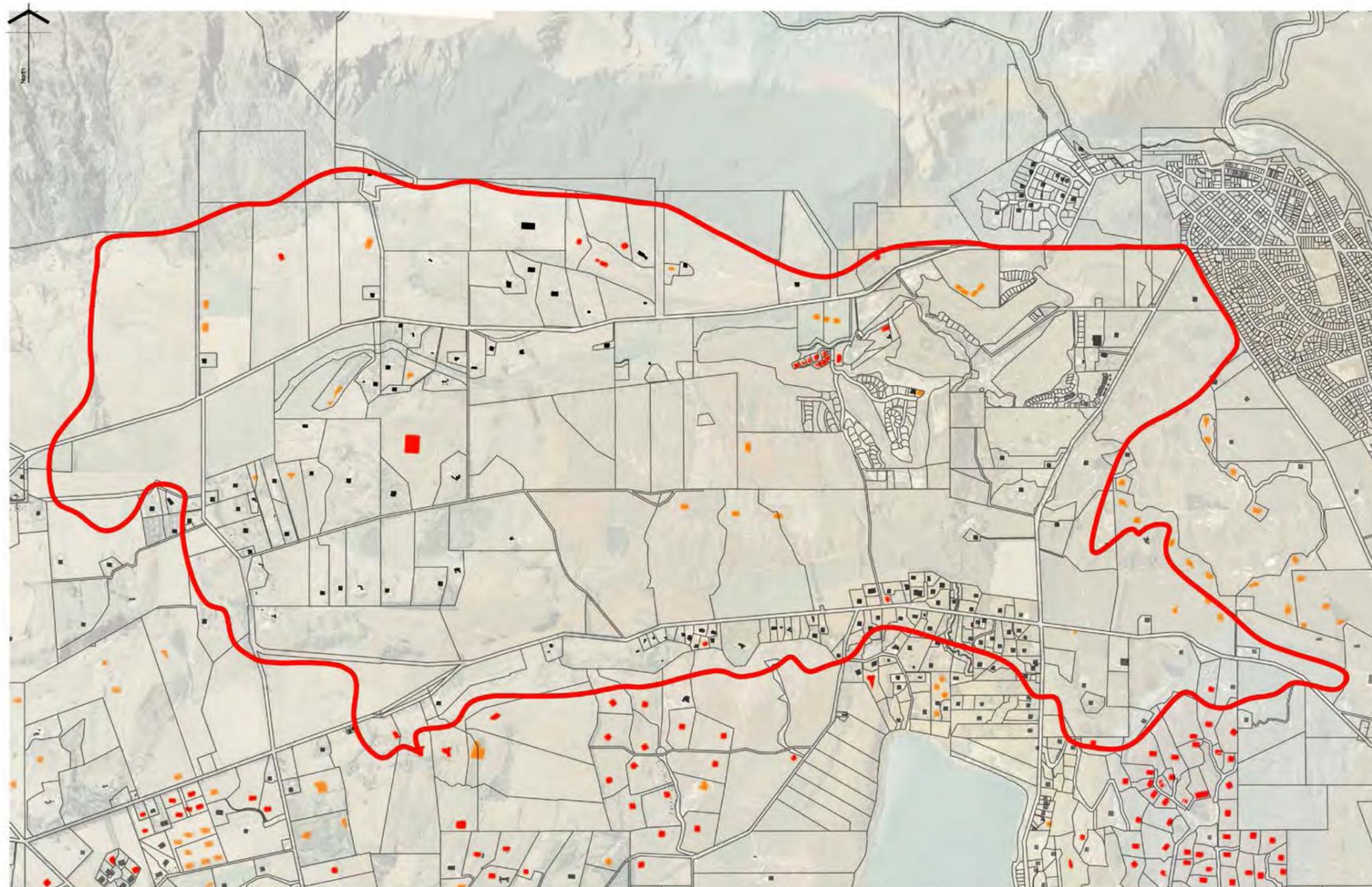
- U1 Millers Flat
- U2 The Foothills
- U3 Rural Resort
- U4 Malaghans North Facing Escarpment

Wharehuanui Hills

- U5 Wharehuanui Plateau
- U6 Upper Hills

Speargrass Flats

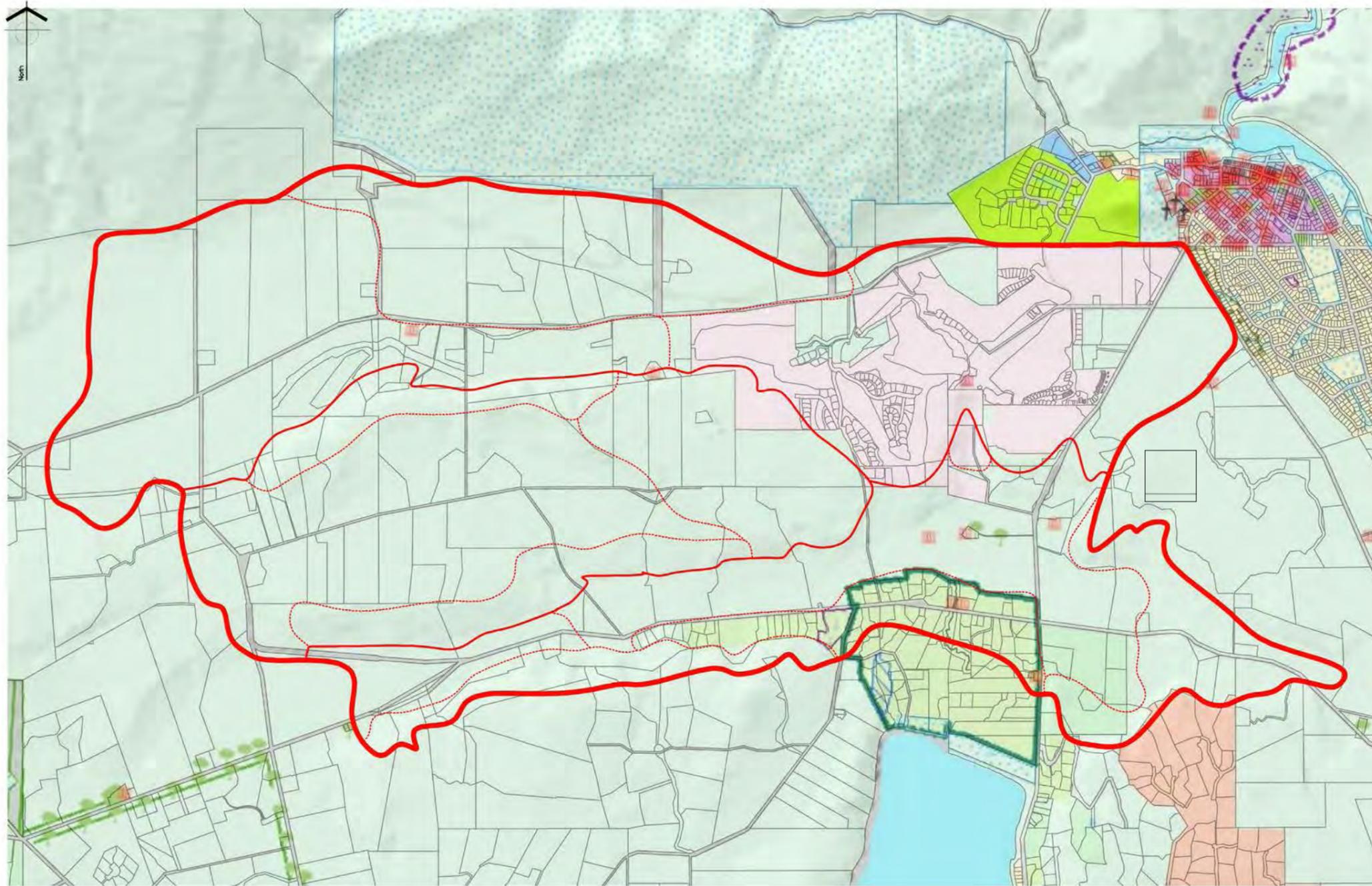
- U7 Speargrass South Facing Escarpment
- U8 Speargrass North Facing Escarpment
- U9 West Speargrass Valley
- U10 Waterfall Park
- U11 East Speargrass Valley
- U12 Lake Hayes Rural Residential
- U13 Hogans Gully



QLDC Lot Boundaries and Residential Building Platforms

-  Lot Boundaries
-  Approved Residential Building Platforms
-  Active Residential Building Platforms
-  Built Residential Building Platforms

Source: QLDC Webmaps and Rural Building Platforms 2014 map retrieved from QLDC website



QLDC Zone Key

-  Rural General
-  Resort
-  Meadow Park
-  Rural Residential - North Lake Hayes
-  Bendemeer
-  Residential Arrowtown Historic Management
-  Low Density Residential
-  Industrial
-  Designation
-  Protected Avenue of Trees
-  Protected Feature

Map adapted from QLDC Webmaps

Appendix D - EXISTING ZONING
 Scale 1:15,000 @ A3





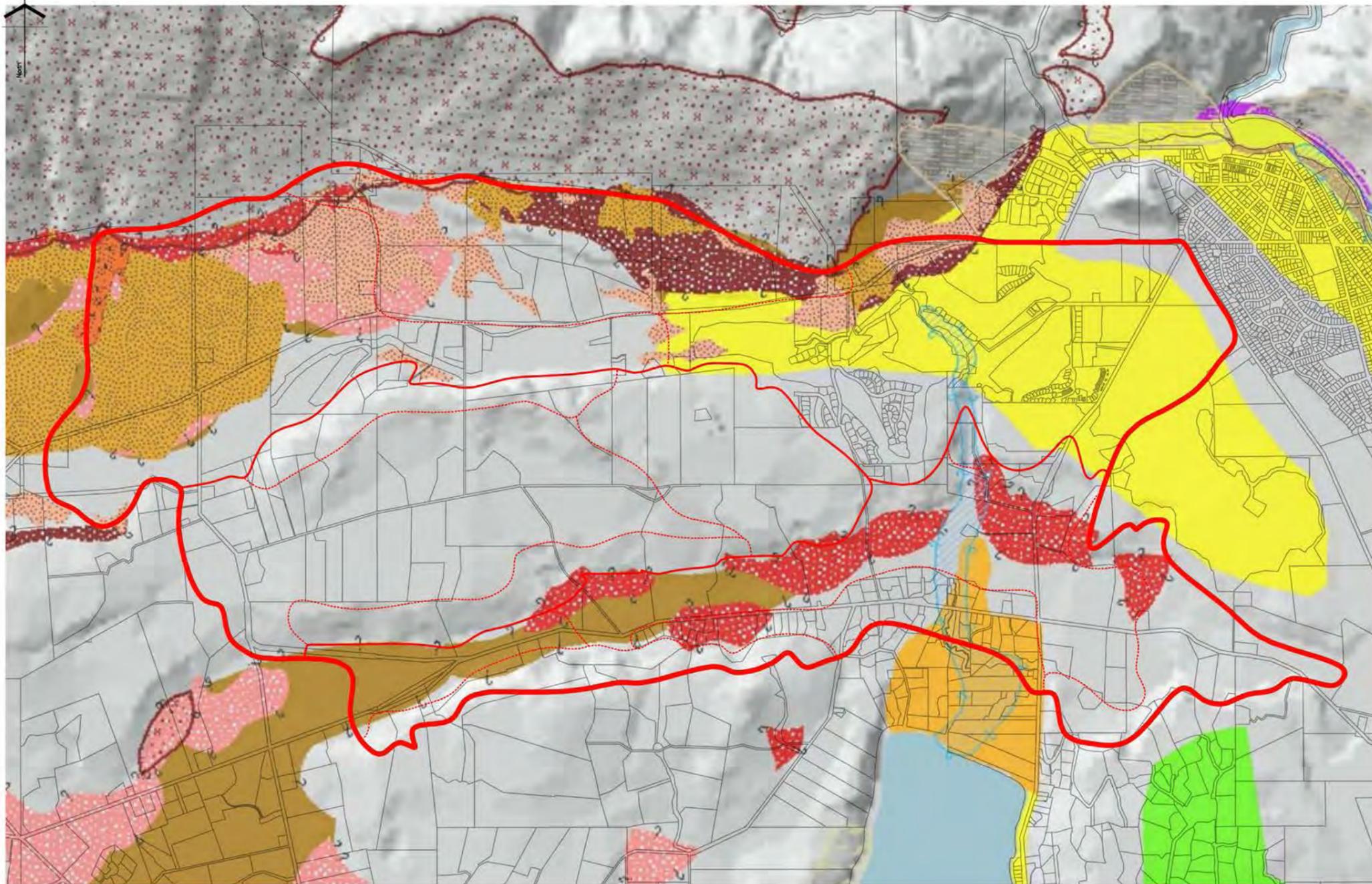
20m Contours

Source: Quickmaps

Appendix **E** - TOPOGRAPHY

Scale 1:15,000 @ A3

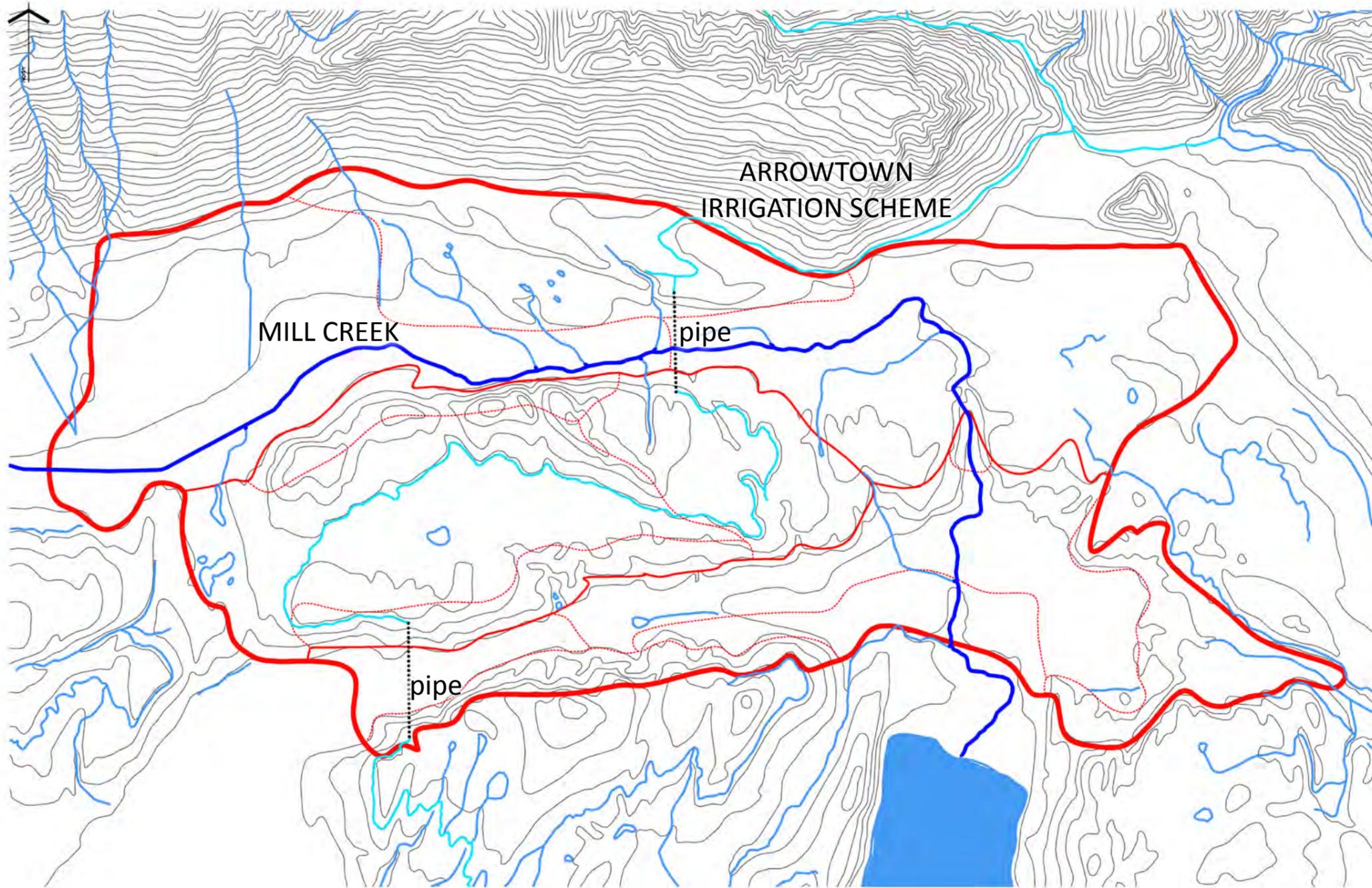




QLDC Hazards Key

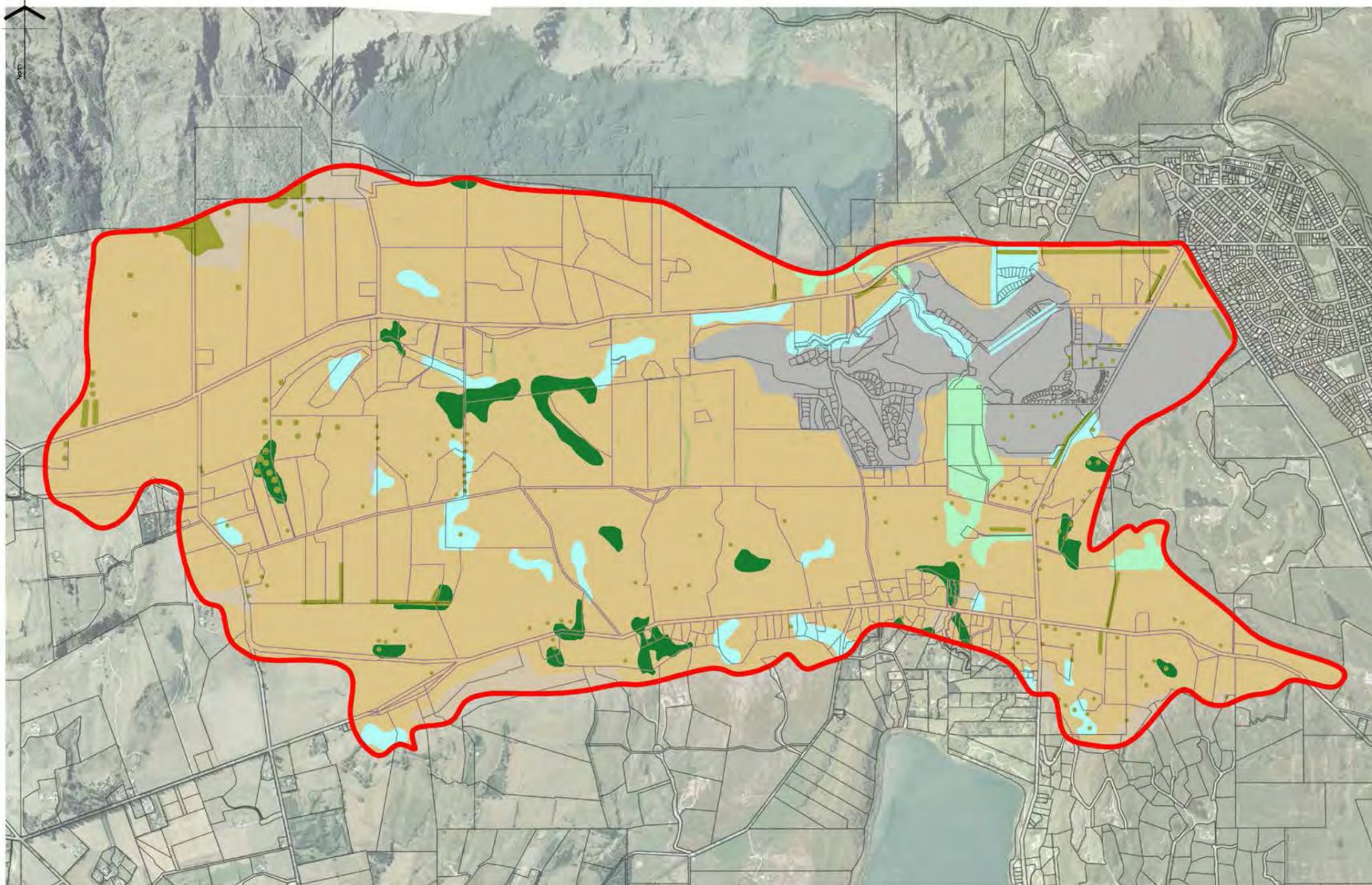
-  Landslide Area - non verified
-  Alluvial Fan - ORC: fan recently active
-  Alluvial Fan - Regional Scale: Active, floodwater dominated
-  Alluvial Fan - (Regional Scale) Active, Debris-dominated
-  Alluvial Fan - ORC: fan less recently active
-  Liquefaction Risk: Nil to Low
-  Liquefaction Risk: Probably Low
-  Liquefaction Risk: Possibly Moderate
-  Liquefaction Risk: Susceptible
-  Flooding due to Rainfall

Map adapted from QLDC Webmaps Hazard data. Davis Consulting Group.
 Note: Hazards may not be comprehensive



 Surface waters

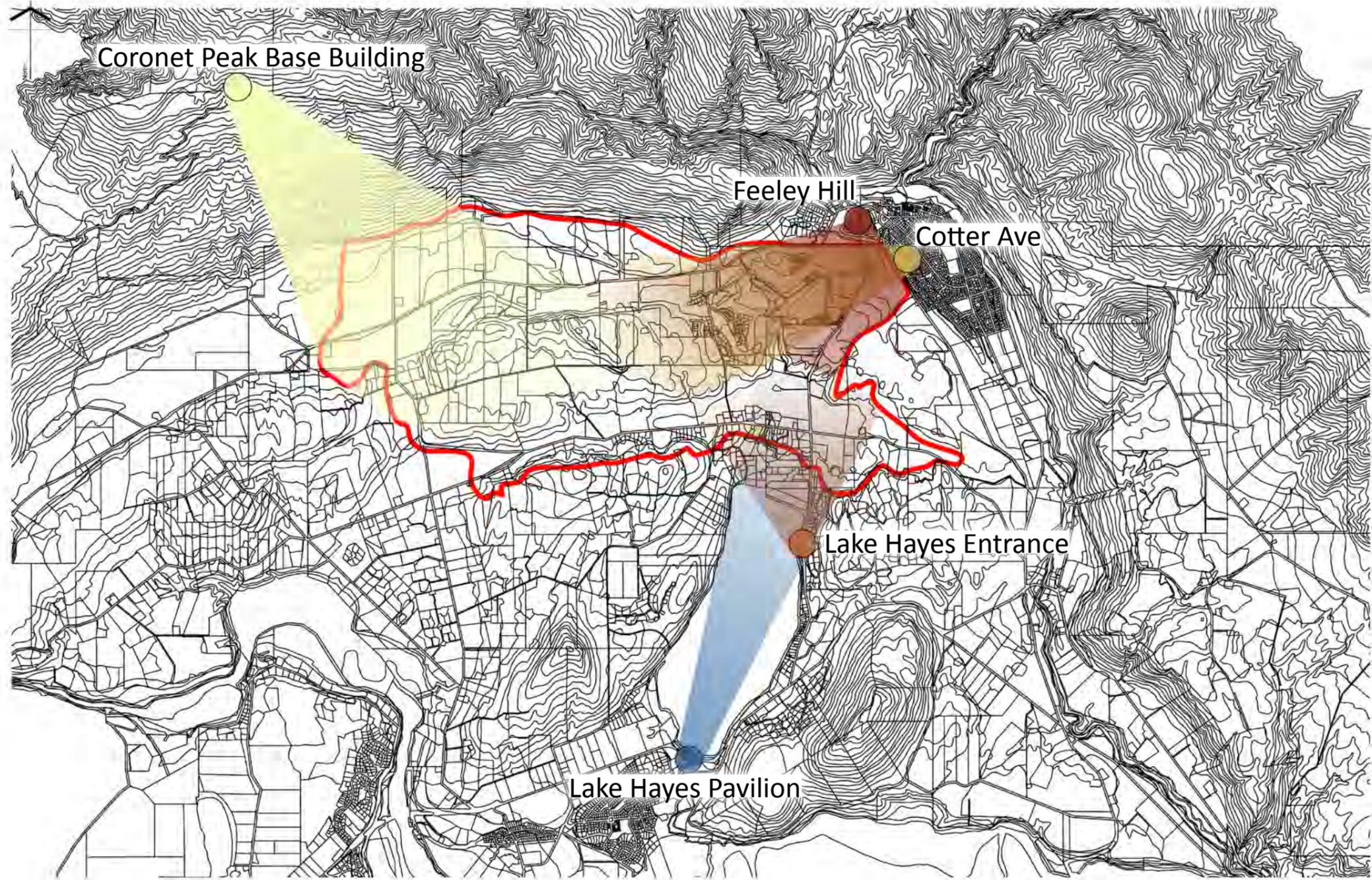
Source: Quickmaps



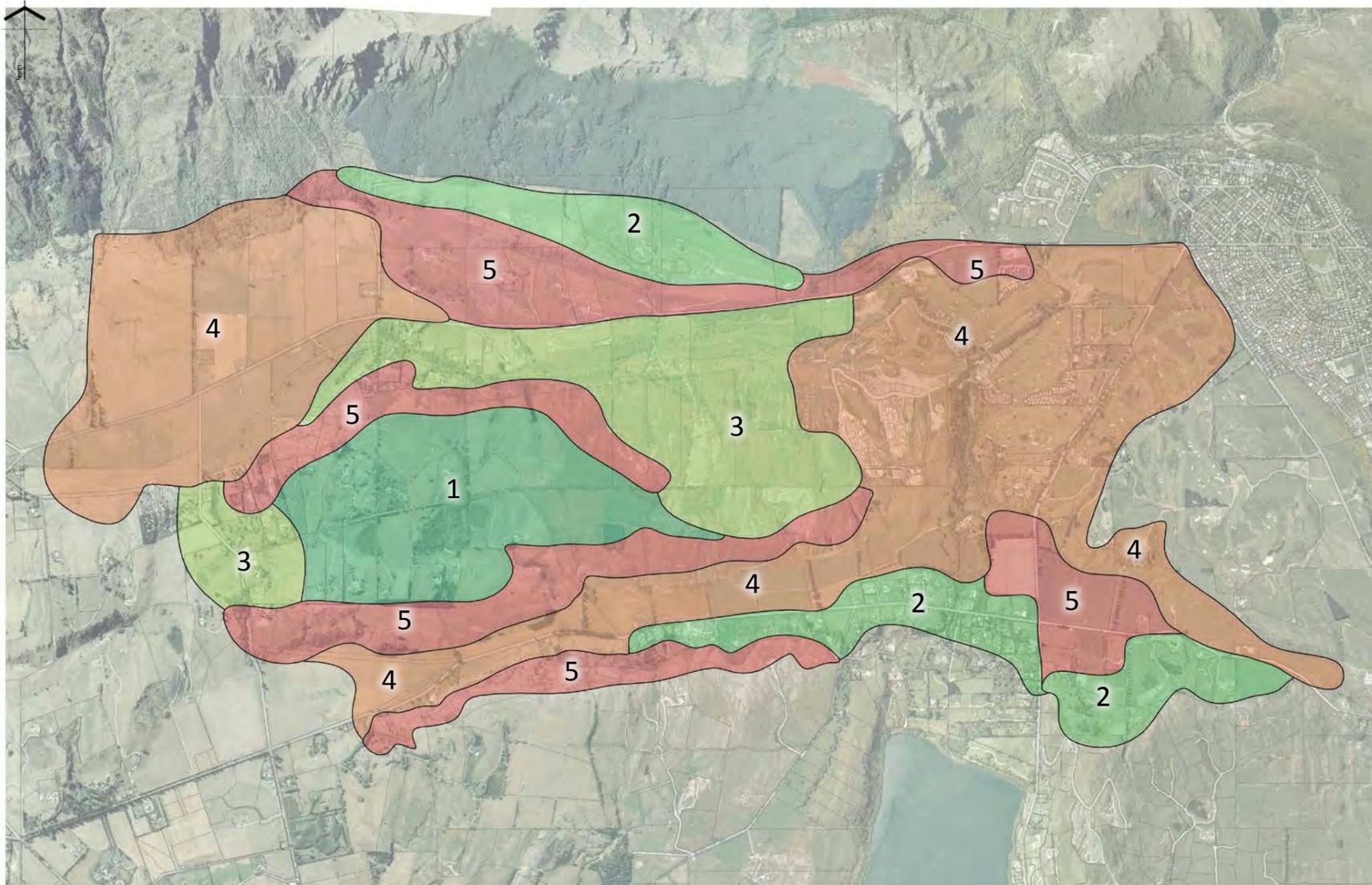
Ecology Key

-  Urban Parkland / Open Space
-  High Producing Exotic Grassland
-  Indigenous Forest
-  Manuka and/or Kanuka
-  Deciduous Hardwoods
-  Low Producing Grasslands
-  Exotic Forest

Map dated from data provided by the Davis Consulting Group, site visits and site photos.



Note: Views are from selected key viewpoints outside the study area.



Ability To Absorb Change

- 1 High
- 2 Moderate to High
- 3 Moderate
- 4 Moderate to Low
- 5 Low

Appendix J - ABILITY TO ABSORB CHANGE
 Scale 1:15,000 @ A3



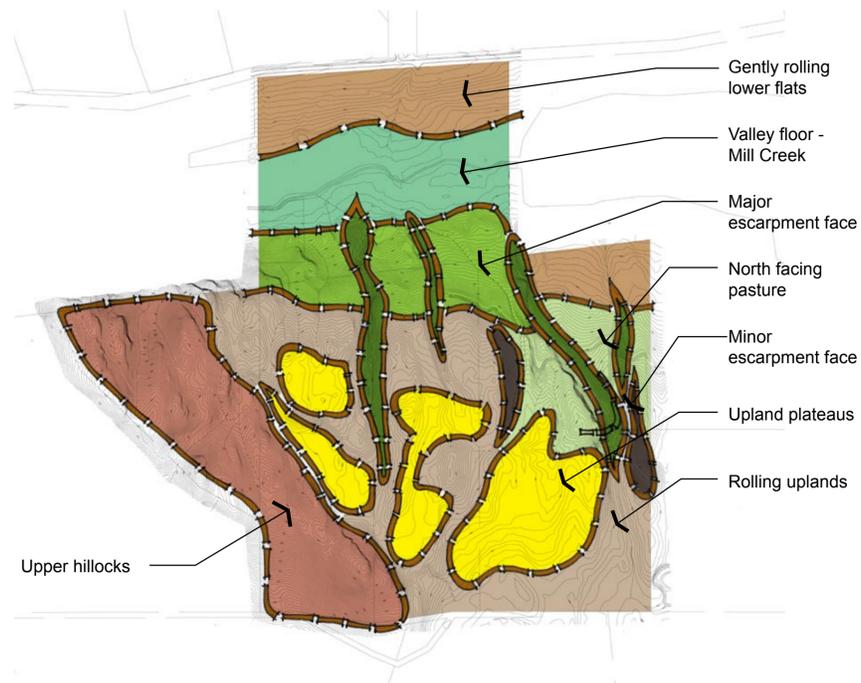
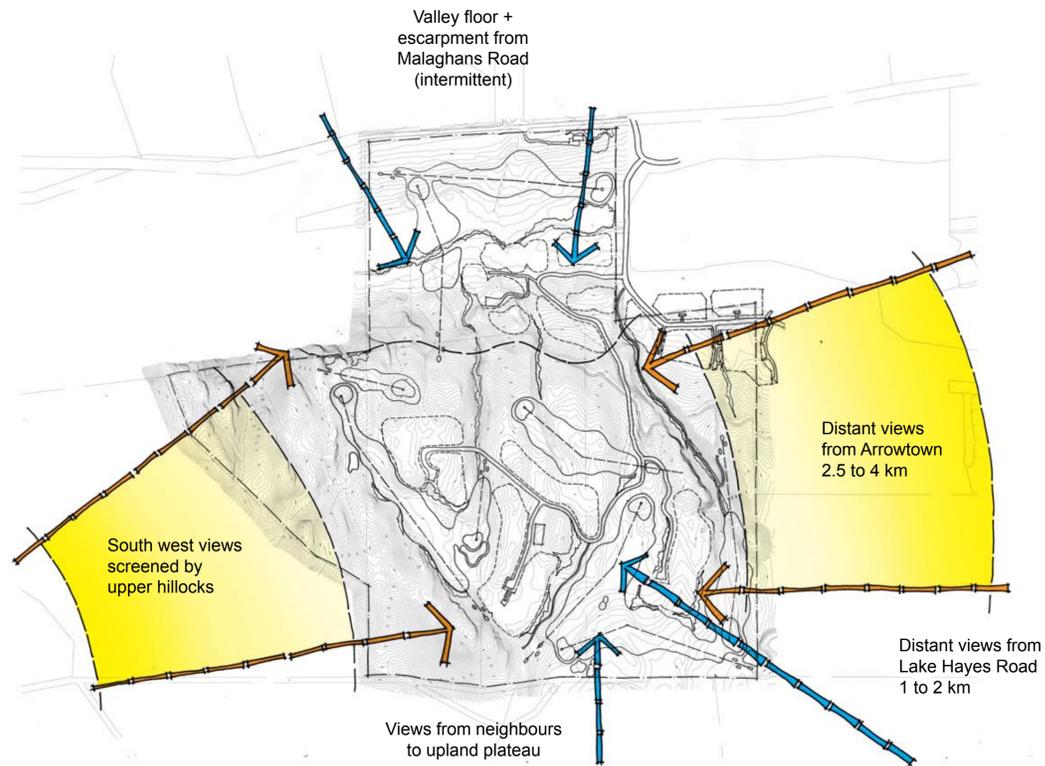
OVERVIEW



OVERVIEW

- Tourism NZ's working party on golf tourism has identified significant growth opportunities for high yielding golf tourism in NZ and particularly the Wakatipu. They have also identified a pending supply shortage for quality golf courses in the Queenstown Lakes area.
- With the adjacent Dagleish Farm on Millbrook's western boundary being offered for sale in 2014, Millbrook recognised the opportunity to expand its current 27-hole operation and, in November 2014, the Overseas Investment Office approved purchase of the 66 hectare block.
- Millbrook currently has 27-holes of golf but practically can only operate a single 18-hole course on any given day. By adding an additional 9-holes of golf there is a marginal increase in maintenance costs but a 100% increase in golf supply with two 18-hole courses able to be played simultaneously.
- As part of the District Plan review process, Millbrook is working with QLDC to review and update the 15 year old provisions of the Millbrook Resort Zone. This review is necessary to address a number of district-wide changes and some anomalies that have arisen over time. The review is able to include a possible extension of the zone over the adjoining Dagleish Farm to increase its golf offering to a 36-hole course.
- Dagleish Farm is the last remaining opportunity for Millbrook to develop a contiguous block of land with capacity for an additional 9-holes to take it to a 36-hole format. The land is uneconomic as a farming unit and unless developed, it is at risk of falling to wilding weed and rabbit infestation. The Millbrook proposal ensures that it will have a comprehensive on-going land management plan.
- The Millbrook Resort Zone presently allows up to 450 dwellings. The 36-hole proposal does not seek to increase this ceiling, but golf development on its own has well known commercial risks including construction costs that are able to be subsidised by appropriate residential property development.
- Millbrook has a proven track record as a responsible developer. It is a major contributor to the tourism industry and is one of the largest employers in the region with an annual pay roll in excess of \$8m. Indirectly, it is a significant contributor to the local construction and service sectors.
- This draft proposal provides for the maintenance and enhancement of the elevated open spaces of the Dagleish Farm and the further protection of Mill Creek, a major Source of Lake Hayes.
- Millbrook welcomes suggestions and feedback on its proposal. Any queries or comments should be directed to Ben O'Malley, Property and Development Manager; email: ben.omalley@millbrook.co.nz

THE DESIGN STORY



VISIBILITY

Visibility is one of the principle determinants in guiding the scale, layout and location of future development on the Dalgleish block. Initial investigation quickly revealed that the two 'parts' of Dalgleish Farm, being the upland plateau and lower flats adjacent to Malaghans Rd, have distinctly different visibility values.

Aside from neighbours directly to the south, the upland, being that land above the main escarpment face, is generally only visible at distance, and when viewed at a distance, those views are experienced at between approximately 2 and 4 kilometres.

The high hillock landforms, at the western side of the block, screen all views to the upper plateau and lower slopes from the west and southwest.

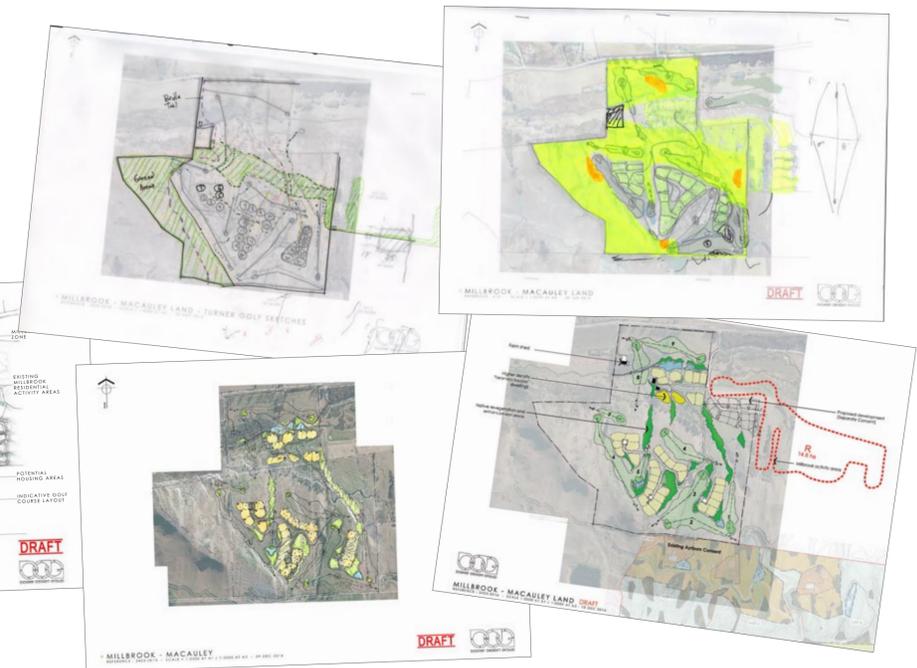
From Malaghans Road, there are glimpse views through trees to the major escarpment and the lower slopes. Existing and future consented Millbrook development is also visible from here.

SCALE + LANDFORM

The Dalgleish Farm block contains many landscape forms. From the western upper hillocks, to the valley floor, the landscape is complex and varied. This drives and affects the design layout. The draft plans have located possible restrained housing development on areas requiring the least alteration to the land, taking into account the visibility factors. These are noted above as the upland plateaus with golf course located on those locations sited approximately on the rolling uplands

The primary gully forms, running north – south, are substantially protected and will form the primary spines for ecological enhancement. Similarly, the steep escarpment face will remain in its current state, albeit with some tree removal (including wilding species).

Closer to Malaghans Road, future golf fairways are located on the flat land, with a reasonable 'paddock' buffer.

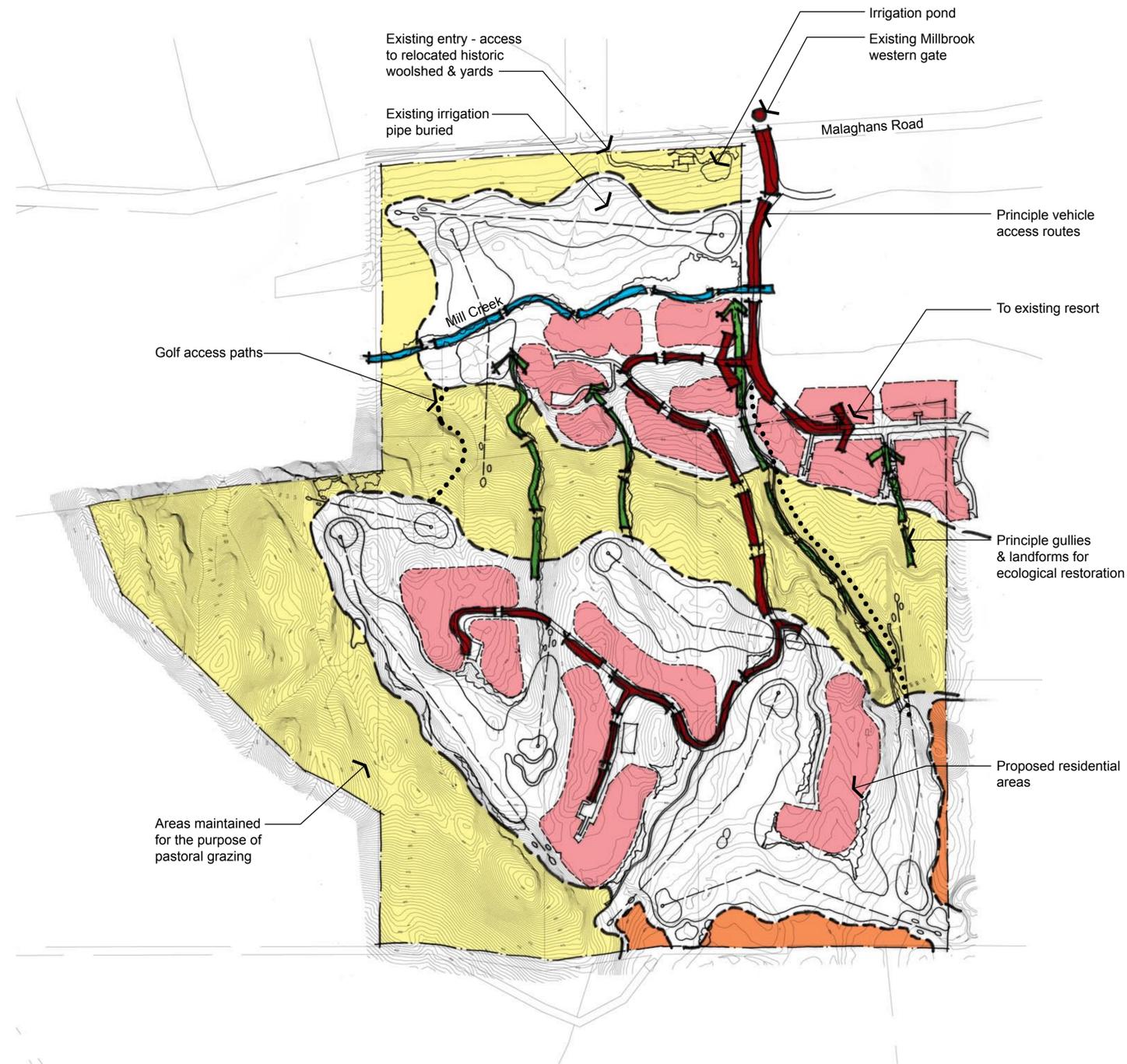


THE DESIGN PROCESS

The design process follows a creative path of investigation and elimination, developing rough concepts that explore design options and alternatives, and testing those against variables such as landform, visibility, retention of character, access and the rural guidelines of the District Plan. Some early concepts are shown below, by way of example.



THE BIG PICTURE



THE DESIGN STORY

THE HERITAGE BLOCK

Protection and maintenance of existing heritage building and significant heritage trees. Any additions to the existing cottage to be sympathetic to, and in keeping with the character of the existing cottage.

Relocation and restoration of the historic woolshed to a location adjacent Malaghans Road



'WESTERN BLOCK'

Dwelling cluster limited to 5.5 and 6.5 metres in height, dark recessive colours for both roof and wall materials, gabled roof forms, setbacks and restrictions to avoid skyline intrusion from Malaghans Road views. Stand-alone dwellings on generous lots



CENTRAL 'CLUSTER'

Dwelling cluster on northern and eastern visible edges restricted to 5.5 metres in height, allowance for 6.5 metres as loft space over garage at western edges with single level over rest of dwelling. Recessive colours, large hillock form substantially retained. Stand-alone dwellings on generous lots with gabled roof forms



VALLEY FLOOR & EDGE 'CLUSTERS'

Dwellings to be viewed as an extension of the existing established Millbrook character, adopting existing Millbrook design guidelines. Mill Creek to be enhanced through ecological planting as already established in Millbrook, and maintenance of grazing patterns on retained open spaces.



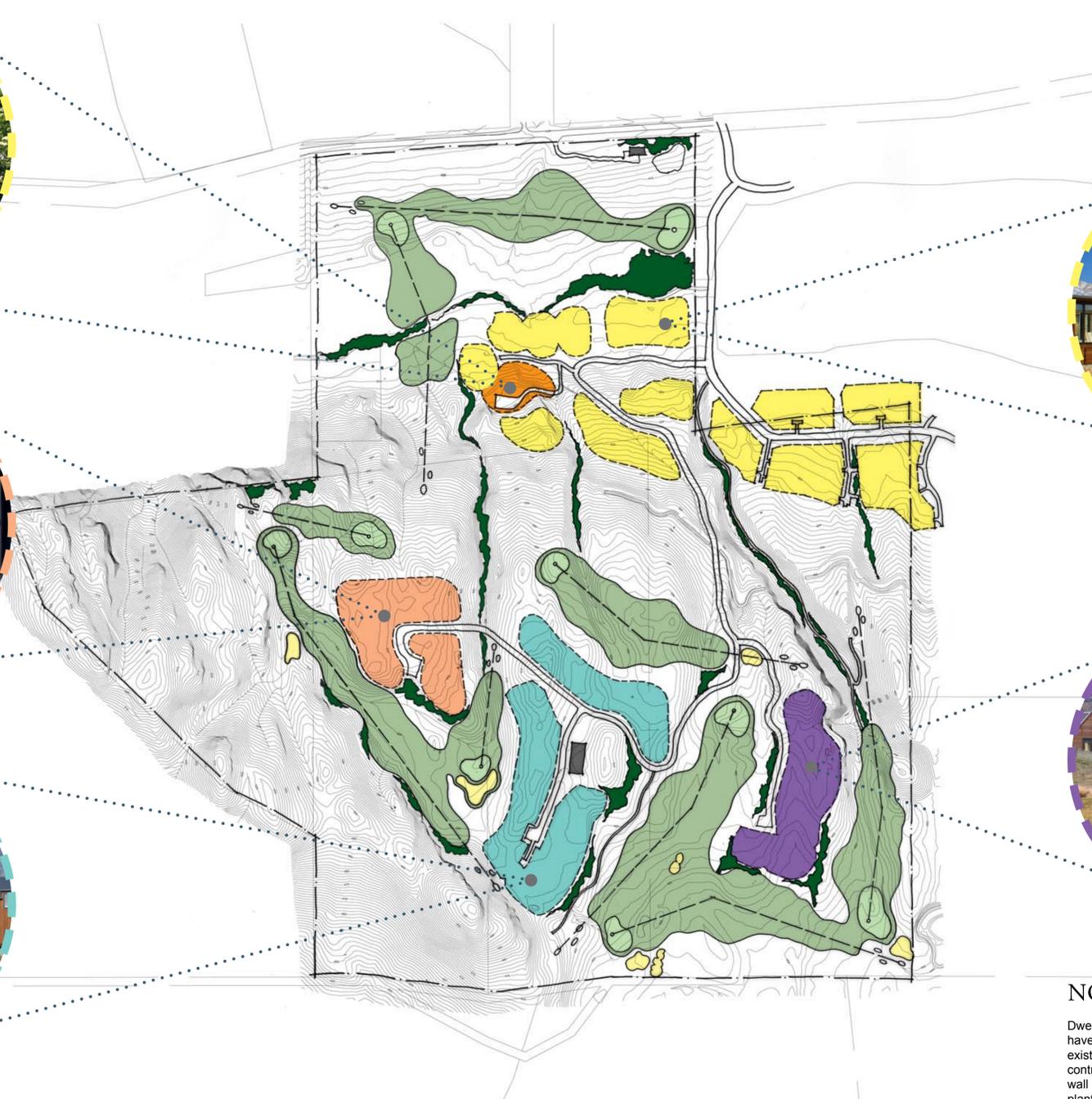
EASTERN 'CLUSTER'

A single row of stand-alone dwellings on generous lots. Dwelling heights limited to 5.5 metres, dark recessive colours and gabled roof forms.



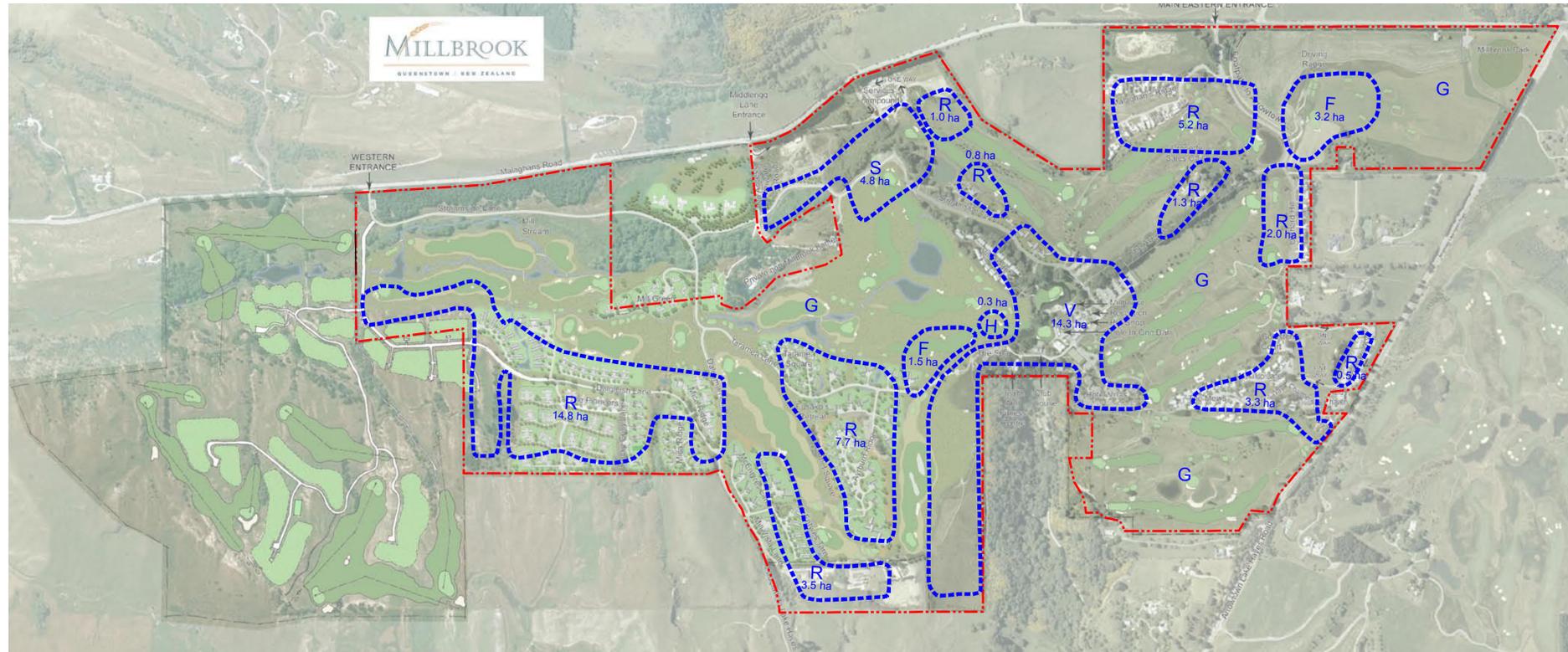
NOTE:

Dwellings on the western, central and eastern blocks to have specific design controls above and beyond those existing for current Millbrook residential lots. Design controls will have a restricted palette of dark roof and wall claddings, and promote substantially indigenous plantings



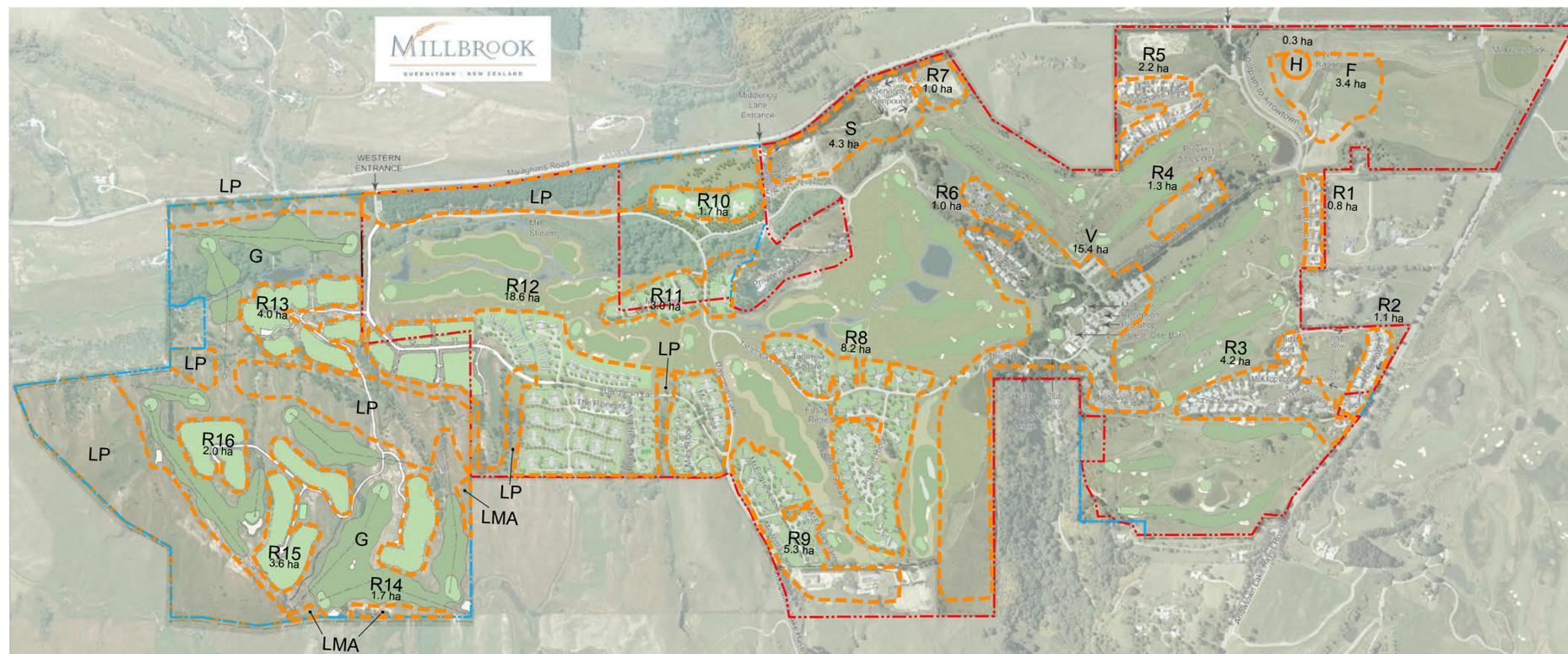
EXISTING & PROPOSED STRUCTURE PLANS

- R : Residential
 - V : Village
 - F : Recreational Facilities
 - S : Resort Services
 - G : Golf Course and Open Space
 - H : Helipad
- Activity Boundary Existing
- - - - -
- Zone Boundary
- - - - -



EXISTING STRUCTURE PLAN

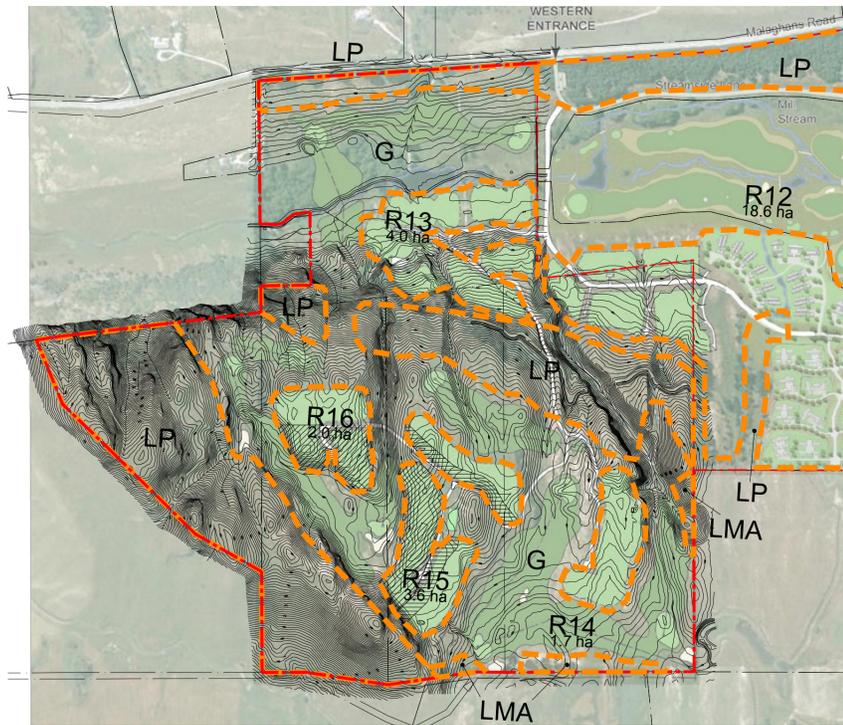
- LMA : Landscape Management Area
 - R : Residential
 - V : Village
 - F : Recreational Facilities
 - S : Resort Services
 - G : Golf Course and Open Space
 - H : Helipad
 - LP : Landscape Protection
- Activity Boundary Proposed
- - - - -
- Zone Boundary
- - - - -
- Zone Boundary Changes
- - - - -



PROPOSED STRUCTURE PLAN

COMBINED STRUCTURE PLAN & DALGLEISH BLOCK DETAIL

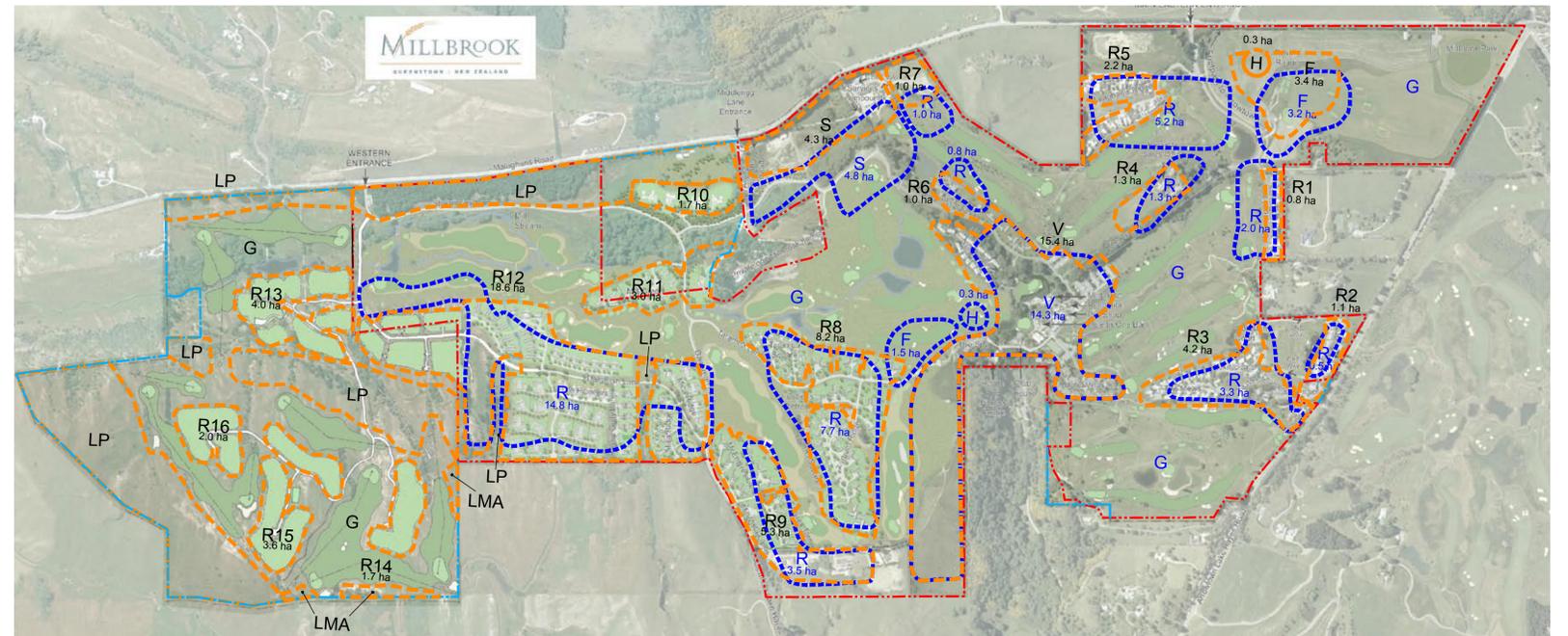
LMA : Landscape Management Area
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 V : Village
 F : Recreational Facilities
 S : Resort Services
 G : Golf Course and Open Space
 H : Helipad
 LP : Landscape Protection
 Activity Boundary Existing
 Activity Boundary Proposed
 Zone Boundary
 Zone Boundary Changes



DALGLEISH BLOCK DETAIL

Building Height Restrictions
 5.5m on R14, R15, R16
 6.5m on part R15, R16
 5.5m with 6.5m where shown
 at road side of lot on part R15

DRAFT - FOR
 CONSULTATION
 PURPOSES ONLY



COMBINED EXISTING & PROPOSED STRUCTURE PLANS

VIEWS FROM SURROUNDING LANDSCAPE



50mm lens : Human Eye at A1 when standing 1.5m away from the image



Note : zoomed in image indicative only. Shows mass of approximate residential areas

Millbrook Proposed District Plan Change Preliminary & Detailed Site Investigation

For

Millbrook Country Club Limited

February 2015



*Davis Consulting Group Limited
Arrow Lane,
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03 409 8664
Document ID: 14088*

**Millbrook Ltd,
Proposed Landuse Change,
Preliminary & Detailed Site Investigation**

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Appendix B	Historical Certificate of Title
Appendix C	Soil Profile Logs
Appendix D	ORC Bore Search
Appendix E	Laboratory analytical certificate and results, and chain of custody documentation.

EXECUTIVE SUMMARY



Millbrook Country Club Limited (MCC) are proposing to extend Millbrook Resort by changing the landuse of the neighbouring property located at 902 Malaghans Road, Arrowtown (Lot 1 DP 310442, Lot 1 DP 313841 and Lots 1-3 DP 27269 SECS 29 57 Blk VI Shotover SD). The site contains a wool shed and footbath, and a mobile sheep dipping plant also operated on the site. Furthermore, the farm may have received the broadacre application of agrichemicals such as fertilisers and persistent pesticides. Given hazardous substances have been used on the property the site is subject to the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NES), given the proposed change in landuse of the site. In order to characterise the risk to human health from the proposed plan change MCC engaged Davis Consulting Group Limited (DCG) to undertake a Preliminary and Detailed Site Investigation (PSI and DSI) to review the landuse history of the site, identify any potential contaminant risks and document an investigation completed to characterise the nature of soil contamination in the vicinity of the sheep dip and footbath.

Based on the findings of the investigation DCG concludes the following:

- Hazardous activities that have occurred on the site include the broadacre application of agrichemicals (fertilisers and possibly pesticides) and the use of hazardous substances in the operation of a footbath and mobile sheep dip;
- Based on liaison with the former owners of the property, DCG understands a portable sheep dip was bought on to the property twice a year to treat stock until 1981;
- DCG identified the potential contaminants of concern associated with the portable sheep dip and permanent foot bath to be arsenic, copper and organochlorine pesticides;
- Arsenic and copper levels in all soil samples analysed returned concentrations below the adopted guideline value;
- Dieldrin was detected adjacent to the footbath exceeding the NES soil contaminant standard, indicating that there is a risk to human health based on rural residential activity on the site;
- Based on a number of investigations completed by DCG in the Wakatipu Basin we consider it highly unlikely that persistent pesticides (DDT and dieldrin) and heavy metal concentrations associated with the broadacre application of these agrichemicals would result in contaminant concentrations exceeding the NES soil contaminant standards.

In summary, DCG considers the site is suitable for residential activity provided remedial work is undertaken in the vicinity of the footbath situated in the stockyards adjacent to the woolshed.

1.0 INTRODUCTION

1.1 Purpose

Millbrook Country Club Limited (MCC) is proposing to extend Millbrook Resort by changing the landuse of the neighbouring property located at 902 Malaghans Road, Arrowtown (Lot 1 DP 310442, Lot 1 DP 313841 and Lots 1-3 DP 27269 SECS 29 57 Blk VI Shotover SD). Pastoral farming has been the main landuse of the property. Activities such as the broadacre application of agrichemicals and the use of hazardous substances for the treatment of sheep have occurred on the property along with the operation of the permanent footbath.

The identification of potential hazardous activities occurring on the site triggers the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NES), given the proposal to change the landuse of the property. In order to meet the requirements of the NES, MCC commissioned Davis Consulting Group Limited (DCG) to undertake a Preliminary and Detailed Site Investigation (PSI and DSI) to review the landuse history of the site, identify any potential contaminant risks and document the investigation completed to characterise the nature of soil contamination in the vicinity of the sheep dip and footbath. DCGs experience in the provision of contaminated land services is provided in Appendix A.

1.2 Scope of Work

The scope of work completed during the PSI and DSI included the following:

- Review of the site history including review of property file and historic certificate of title;
- Discussions with the previous site owner;
- Completion of a site inspection to examine the condition of the property and potential risks to human health;
- Consideration of the risk to human health based on the proposed landuse change of the site;
- Review of previously completed PSIs by DCG within the Wakatipu Basin;
- Document an investigation completed into soil quality in the vicinity of a sheep dip and foot bath identified on the site;
- Preparation of a PSI and DSI report in accordance with the requirements of the Contaminated Land Management Guidelines (CLMG) No. 1.

1.3 Limitations

The findings of this report are based on the Scope of Work outlined above. DCG performed the services in a manner consistent with the normal level of care and expertise exercised by members of the environmental science profession. No warranties, express or implied, are made. Subject to the Scope of Work, DCG's assessment is limited strictly to identifying the risk to human health based on the historical activities on the site. The confidence in the findings is limited by the Scope of Work.

The results of this assessment are based upon site inspections conducted by DCG personnel, information from interviews with people who have knowledge of site conditions and information provided in previous reports. All conclusions and recommendations regarding the properties are the professional opinions of DCG personnel involved with the project, subject to the qualifications made above. While normal assessments of data reliability have been made, DCG assumes no responsibility or liability for errors in any data obtained from regulatory agencies, statements from sources outside DCG, or developments resulting from situations outside the scope of this project.

2.0 SITE LOCATION AND DESCRIPTION

2.1 Site Location

The site is located immediately to the west of Millbrook Resort at 902 Malaghans Road, Arrowtown and is legally described as Lot 1 DP 310442, Lot 1 DP 313841 and Lots 1-3 DP 27269 SECS 29 57 Blk VI Shotover SD (see Figure 1 for site location). The area of the site is approximately 66.8 hectares.

Coordinates for the site are E 2177939.2, N 5575839.7.

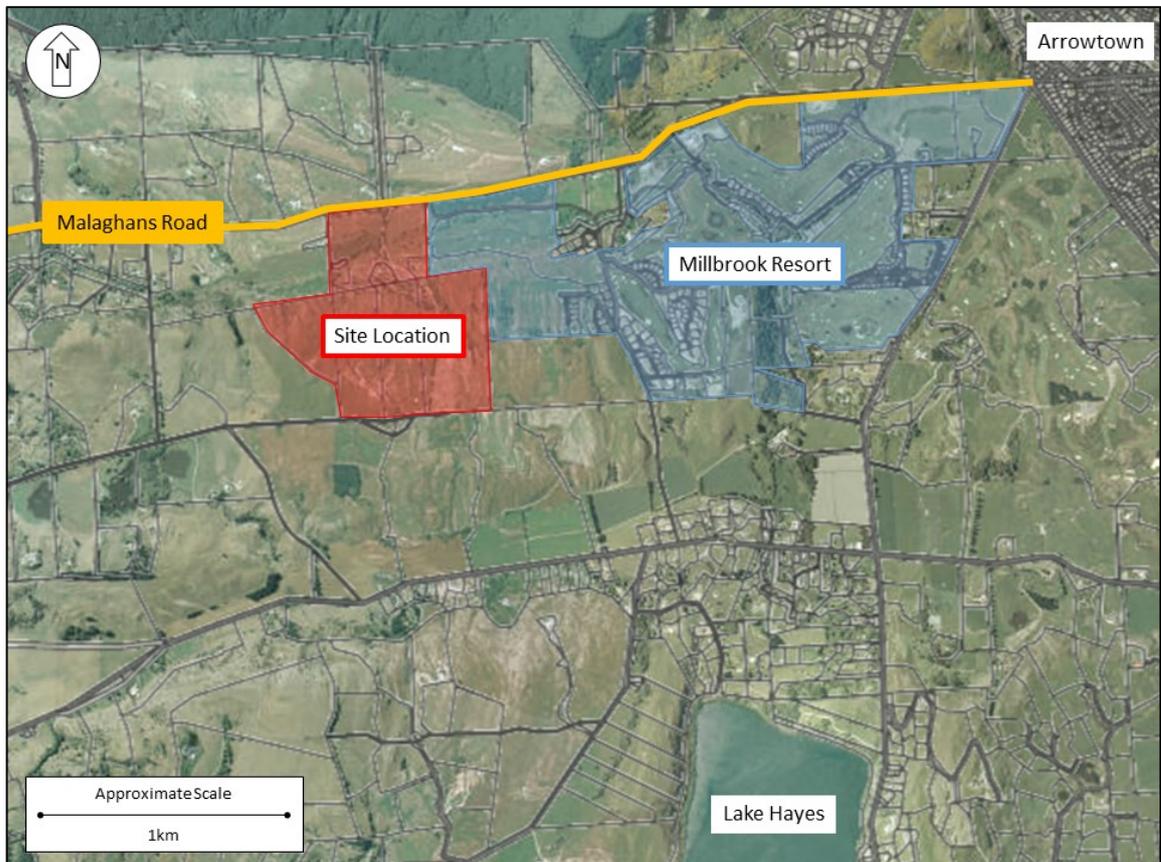


Figure 1: Site Location Plan.

2.2 Site History

The site has had a long history of pastoral farming activity dating back to the late 1800s when John Butel farmed the property (McDonald, 2010). At this time the land was most likely used for growing crops and grazing dairy cows. According to the Queenstown Lakes District Council (QLDC) property file for the site, prior to purchase by MCC, the area was owned by Ian and Phillipa MacAuley, John Pritchard and Bruce Cunningham. Mr MacAuley has operated the property as a sheep and deer farm. Mr MacAuley stated that the property had not been fertilized in the last 10 years and prior to that fertilizer was only applied on an irregular basis. The property did not contain a sheep dip, however contractors would bring a portable sheep dip to the property twice a year to dip the sheep until 1981. This was completed on the east side of the sheep yards using a product with diazinon as the active ingredient (Figure 2). A foot bath was located within the sheep yards which used a zinc copper sulphate. An offal pit is also located on the farm which is still open and primarily used for dead stock and vegetation. The pit is approximately 5 years old and is burnt off once a year. The historical certificates of title are located in Appendix B.

2.2.1 Contaminants Commonly Associated with the Landuse

Based on the Contaminated Land Management Guidelines Schedule B, the hazardous substances that may be associated with the former sheep dip, footbath and farming operations on the site include a range of organochlorine pesticides and trace metals associated with both pesticide and fertiliser use.

2.3 Additional Site Information

The CLMG No 1 requires information associated with fuel storage facilities, spill loss history, recorded discharges and onsite and offsite disposal locations. DCG requested a search of the Otago Regional Council (ORC) records for Landuse and Site Contamination Status, Resource Consents, and Resource Management Act (RMA) incidents for the site. The ORC stated that there are no records held on the Otago Regional Council's "Database of Selected Landuses" for the site regarding on or off-site disposal locations, recorded discharges, or spill loss history. A review of the QLDC property files revealed no activities considered to be hazardous under the NES.

The following provides a summary of information that the CLMG No. 1 (MfE, 2003a) indicates should be included in a PSI/DSI report:

- Presence of Drums – One rusted drum was present on site, however it was empty with no surrounding surface soil staining.
- Wastes – Other than the offal pit mentioned in Section 2.2 no other wastes were observed.
- Fill Materials - No imported fill was observed on site.
- Odours – No odours were noted.
- Flood Risk – According to the QLDC hazard maps there is no flood risk to this site.
- Surface Water Quality – An irrigation water race flows through the north of the site (Figure 2). There are some small wetlands present on site.
- Site boundary condition – The site boundaries appear to be fenced.
- Visible Signs of Contamination – No visible signs of contamination other than some dark staining around foot bath.
- Local Sensitive Environments – the nearest sensitive environment is Mill Creek, while the open water race flowing through the site could also be considered a sensitive environment.

2.4 Site Condition and Surrounding Environment

Figure 2 presents the current site layout plan. The site contains one dwelling, a hay shed, sheep yards, footbath and a woolshed with the remaining area consisting of hummocky grassland dominated by short exotic pasture grass species (Plate 1). Proposed plans for the site can be found in Figure 3 and include proposed residential housing and a golf course.

The landuse northeast of the site is zoned as Millbrook Resort Zone, which is part of Millbrook Resort. All other neighbouring properties are zoned Rural General including the subject site itself.

According to the QLDC hazard maps, an active alluvial fan runs through the north of the site as well as risk of liquefaction as indicated in Figure 4.

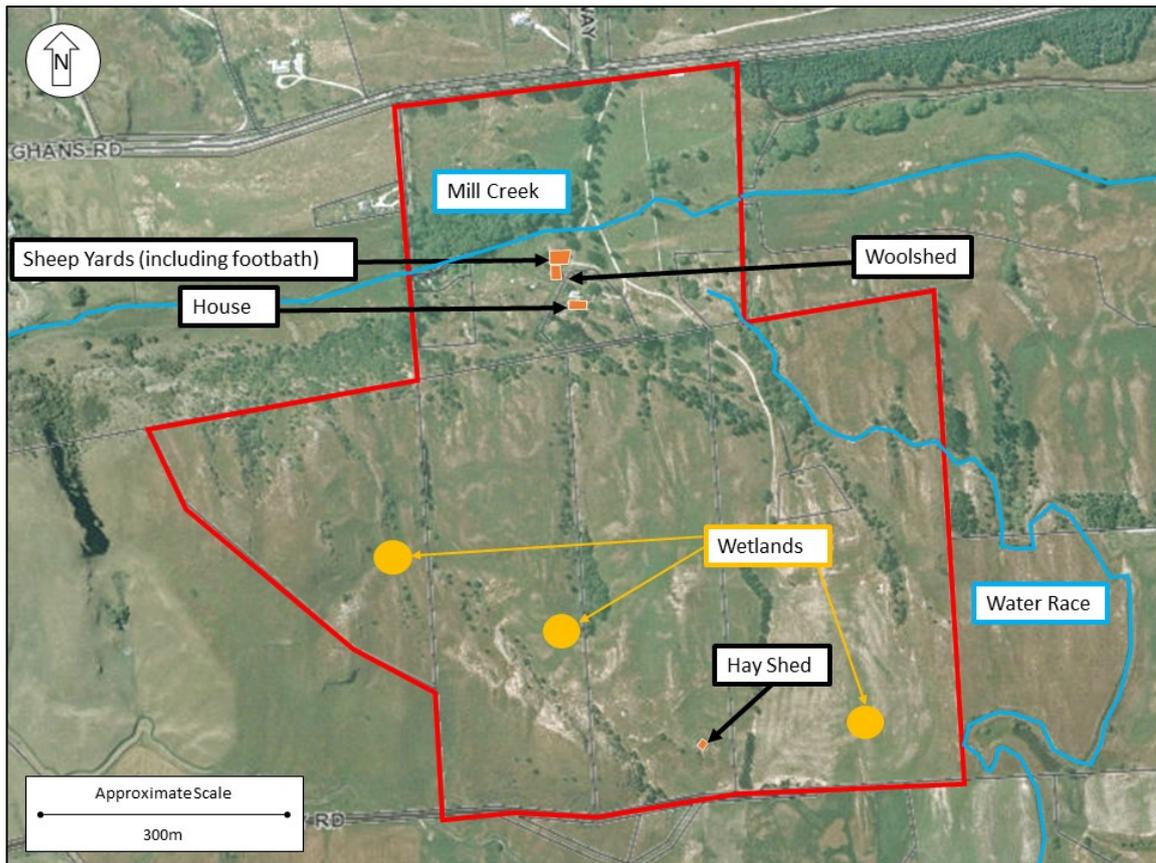


Figure 2: Site Layout Plan



Plate 1: Left - Looking east from west side of property; Right - Looking east at hay shed.

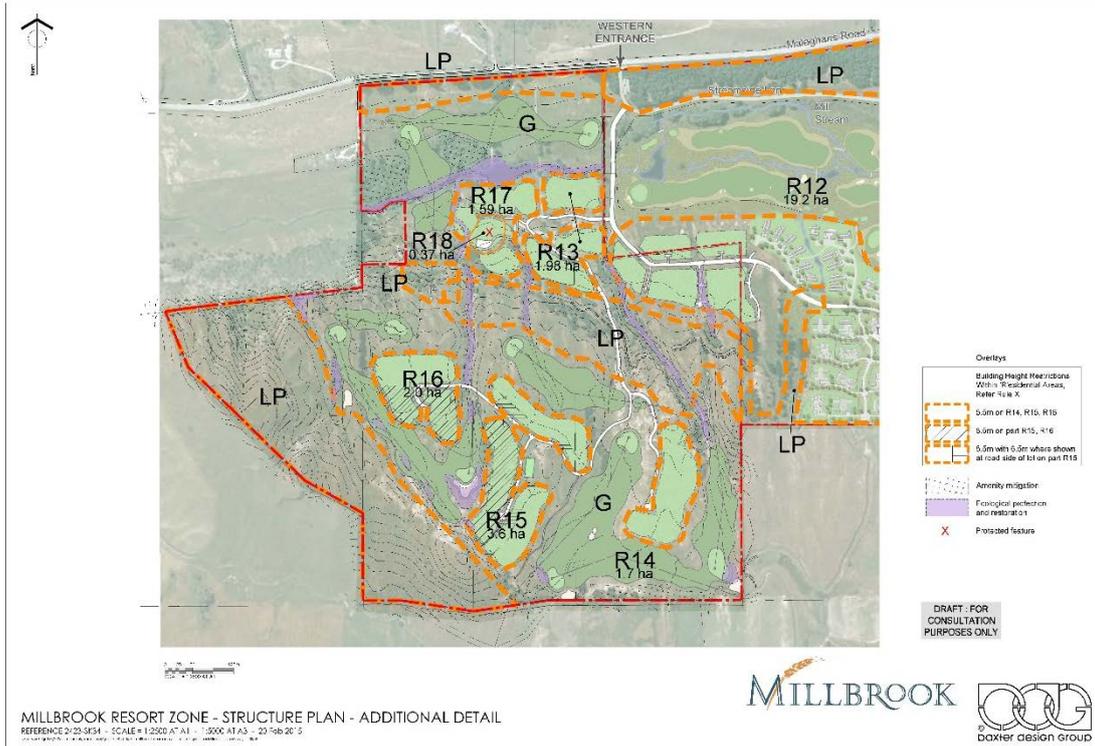


Figure 3: Proposed Site Plan.

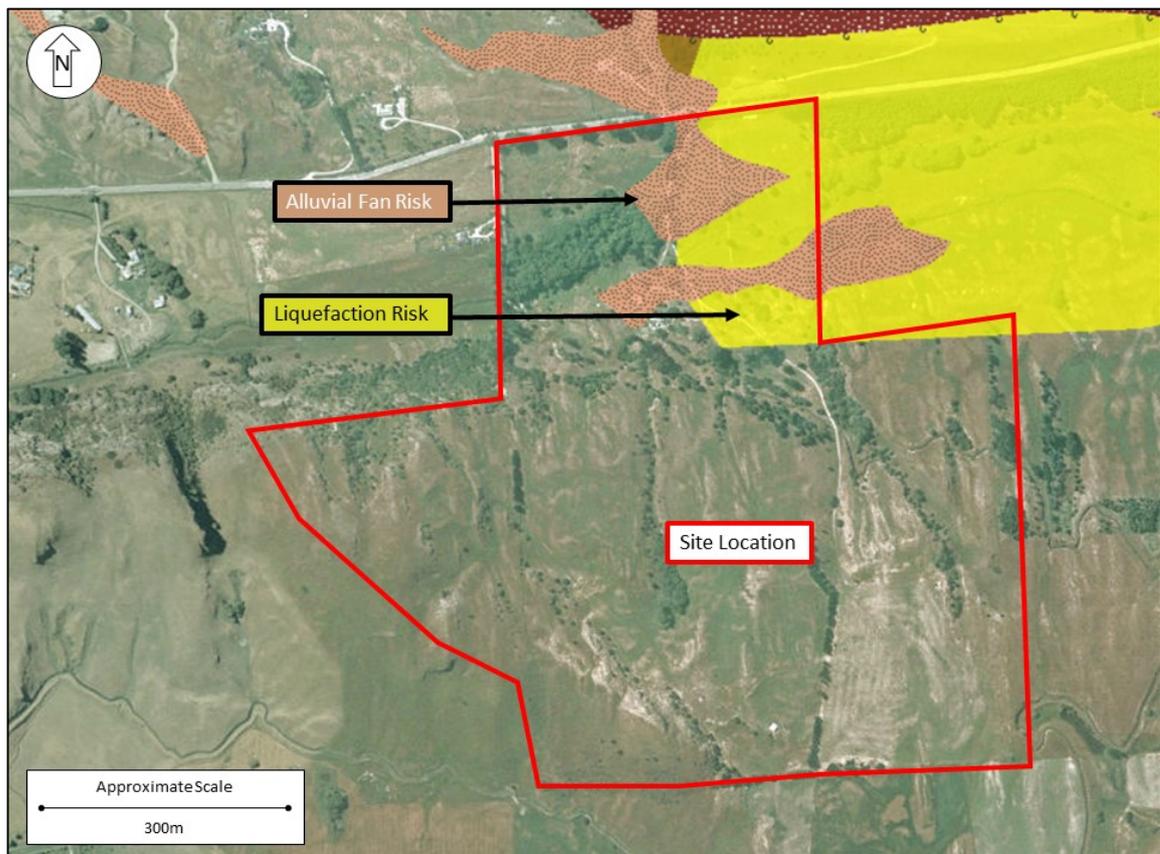


Figure 4: Site Hazard Plan.

2.5 DCG's Previous Investigations within the Wakatipu Basin

DCG has completed a number of Preliminary and Detailed Site Investigations throughout the Wakatipu Basin to consider the impact of the broadacre application of fertilisers and pesticides to soil quality. The following provides a list of the investigations DCG has completed to date:

- T20 Commercial/Retail Development, Hawthorn Drive, Frankton, Preliminary Site Investigation;
- T31 Commercial/Retail Development, Hawthorn Drive, Frankton, Preliminary Site Investigation;
- Daycare Facilities and Residential Apartments, Copper Beech Avenue, Frankton, Preliminary Site Investigation;
- Glenda Drive Subdivision, Frankton, Preliminary Site Investigation for Shotover Park Ltd;
- Hazeldine Landuse Change, Slope Hill, Wakatipu Basin Road, Preliminary Site Investigation;
- Gibbston Vines Subdivision, Lower Shotover, Preliminary Site Investigation;
- 26 Slopehill Rd, Queenstown, Preliminary Site Investigation;
- 17 Mountain View Road, Dalefield, Preliminary Site Investigation.

The location of the soil samples collected for the above investigations are provided in Figure 5 and the laboratory results are presented in Table 1a and Table 1b. In summary the results show the following:

- Arsenic concentrations range from 3 mg/kg to 16 mg/kg and are all below the soil contaminant standard of 20 mg/kg;
- Cadmium concentrations range from <0.01 mg/kg to 2.1 mg/kg and are all below the soil contaminant standard of 3 mg/kg;
- Dieldrin concentrations range from <0.01 mg/kg to 0.07 mg/kg and are all below the soil contaminant standard of 2.6 mg/kg; and
- Total DDT concentrations range from <0.01 mg/kg to 0.35 mg/kg and are all below the soil contaminant standard of 70 mg/kg.

All other persistent pesticide and heavy metal concentrations were also below tier 1 soil contaminant standards for residential activity. Based on these results DCG considers it is highly unlikely that the historical broadacre application of agrichemicals would have resulted in an impact to soil quality that would present a risk to residential activity. We therefore do not consider it is necessary to undertake intrusive investigations to characterise the soil quality of the wider site and have focussed the investigation on contamination associated with the sheep dipping area and footbath.

Table 1a: DCG’s Previous Investigations within the Wakatipu Basin Results

Sample ID	Daycare/Residential Apartments, Copper Beech Road, Frankton PSI		T20 Commercial/Residential Development, Hawthorn Drive, Frankton - PSI		T31 Commercial/Retail Development, Hawthorn Drive, Frankton - PSI		Glenda Drive, Frankton Subdivision		Hazeldine				Soil Guideline Value ¹	Soil Guideline Value ²
	SS(0.1) 12034#1	SS(0.1) 12034#2	SS(0.1) 12034#3	SS(0.1) 12034#4	SS(0.1) 12034#5	SS(0.1) 12034#6	SS(0.1) 12034#7	SS(0.1) 12034#8	SS1(0.1)	SS2(0.1)	SS3(0.1)	SS4(0.1)		
Arsenic	6	9	8	3	3	3	3	3	9	9	11	10	20	
Cadmium	0.75	1.96	2.1	0.3	0.2	0.19	0.18	<0.10	0.13	<0.10	<0.10	<0.10	3	
Chromium	19	19	18	14	15	14	16	14	11	10	9	12	>10,000	
Copper	34	44	43	22	47	24	23	30	9	12	19	13	>10,000	
Nickel	48	42	9	3	3	3	12	4	8	9	12	12		400
Lead	8	8	45	17.6	25	24	23	17	14.6	14.5	19.2	17.1	210	
Zinc	450	138	360	65	55	61	55	36	49	51	50	68		7400
Dieldrin	0.023	0.031	0.014	0.014	0.036	0.03	0.02	0.07	<0.011	<0.010	<0.010	<0.010	2.6	
Total DDT	0.032	0.138	0.023	0.018	0.044	0.037	0.02	0.031	0.358	0.108	<0.010	<0.010	70	

< denotes concentration below laboratory detection limits

¹ Appendix B Soil Contaminant Standards in New Zealand ‘Users’ Guide: NES for Assessing & Managing Contaminants in Soil to Protect Human Health 2012 (MfE, 2012).

² Schedule B (1) Guideline on the Investigation Levels for Soil and Groundwater in National Environment Protection (Assessment of Site Contamination) Measure 2013 Volume 2 (NEPC, 2013).



Table 1b: DCG’s Previous Investigations within the Wakatipu Basin Results continued

Sample ID	Gibbston Vines Subdivision		26 Slopehill Rd			17 Mountain View Road		Soil Guideline Value ¹	Soil Guideline Value ²
	SS (0.1) 12037 # 1	SS (0.1) 12037 # 2	SS (0.2) 13007 #1	SS (0.2) 13007 #2	SS (0.1) 13007	SS(0.2)13023 P1, SS(0.2)13023 P2 and SS(0.2)13023 P3	SS(0.2)13023 P4, SS(0.2)13023 P5 and SS(0.2)13023 P6		
Arsenic	8	8	14	16	8	4	4	17	
Cadmium	<0.10	0.12	0.28	1.02	0.11	-	-	0.8	
Chromium	11	14	11	12	12	10	10	>10,000	
Copper	9	10	14	14	11	8	6	>10,000	
Nickel	8	15	11	11	11	8	7		400
Lead	13.5	13.7	17.3	20	17.5	15.2	14.2	160	
Zinc	45	640	73	220	70	40	31		7400
Dieldrin	<0.010	<0.010	<0.010	0.014	<0.010	-	-	1.1	
Total DDT	<0.010	<0.010	<0.010	<0.010	<0.010	-	-	45	

< denotes concentration below laboratory detection limits

¹ Appendix B Soil Contaminant Standards in New Zealand ‘Users’ Guide: NES for Assessing & Managing Contaminants in Soil to Protect Human Health 2012 (MfE, 2012).

² Schedule B (1) Guideline on the Investigation Levels for Soil and Groundwater in National Environment Protection (Assessment of Site Contamination) Measure 2013 Volume 2 (NEPC, 2013).

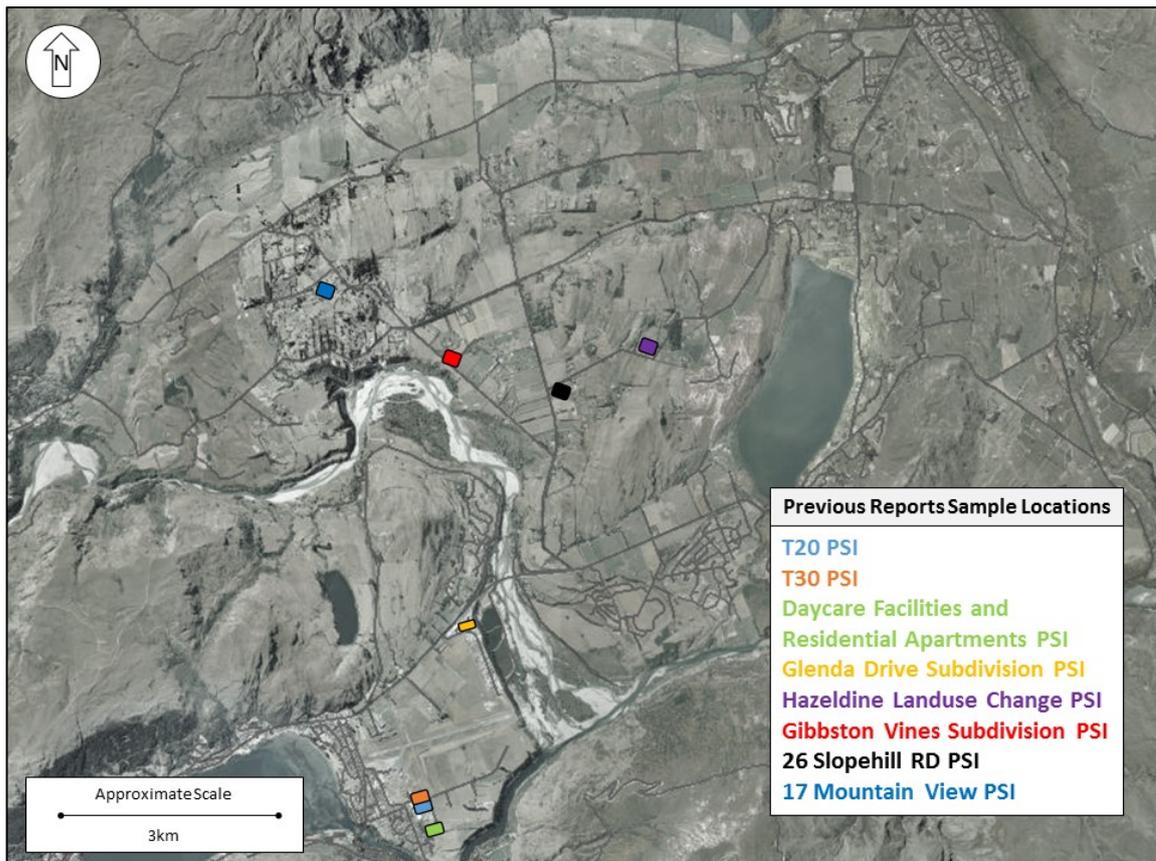


Figure 5: Previous Reporting by DCG within the Wakatipu Basin

2.6 Geology and Hydrogeology

The subject site is situated 1.6 km to the northwest of Lake Hayes, on a geology of till and associated outwash and contemporaneous fan gravels pelitic schist, variably segregated veined and foliated (Turnbull 2000). Alluvial fans feature to the northern end of the site resulting in an alluvial hazard area as well as liquefaction risk sediments (Figure 4). The surface soils were described during the collection of soil samples for the investigation; see Appendix C for the soil profile logs.

2.6.1 Hydrogeology

The site investigation did not include a groundwater assessment. The site is located within the Wakatipu Basin Aquifer system, with part of the site adjacent to Mill Creek within the Upper Mill Creek Aquifer (ORC, 2014). Groundwater level at the site is unknown but depth to water of the consented wells range between 1.2m and 12m (see Appendix D for bore locations).

The location of groundwater bores within a 1 km radius of the site (held by the Otago Regional Council) is provided in Appendix D. A total of nine bores have been drilled within 1 km of the centre of the site. The well uses include eight for domestic use and one for scheme.

2.6.2 Hydrology

Mill Creek is the dominant hydrological feature within the property and flows in an easterly direction in the north of the site. A number of gullies drain into Mill Creek however the catchments are small and it is unlikely surface water flow occurs in these gullies.

3.0 SAMPLING AND ANALYSIS PLAN

The following sets out the sampling and analysis completed to characterise the nature of contaminants associated with the portable sheep dip and footbath.

3.1 Data Quality Objectives

The data quality objectives (DQOs) of the PSI were to:

- Characterise the nature of any contamination associated with the sheep dip and footbath; and
- Determine the risk of any soil contamination encountered onsite to human health, based on the proposed residential landuse.

3.2 Sampling and Analysis Plan

The sampling and analysis plan was designed to address the specific objectives, namely the characterisation of contaminants in soil adjacent to the foot bath and sheep yards where a portable sheep dip was historically used. Figure 6 shows the location of soil samples collected adjacent to the yards and foot bath; these samples were analysed for arsenic, copper and organochlorine pesticides (OCP).



Figure 6: Sample Location Plan

3.3 Sampling Rationale

Samples from each of the 15 locations in Figure 6 were analysed individually for arsenic and copper then composited into 5 groups for OCP analysis. The sampling depth of 0-0.1m for these sample sites is considered appropriate due to the nature of the potential contaminants present, such as organochlorine pesticides and heavy metals, which generally bind strongly to soils and are unlikely to leach to significant depths.

3.4 Soil Sampling Methodology

Soil sampling was undertaken with the use of a spade. The following procedures were applied during the soil sampling process to gain representative samples:

- Field personnel wore a fresh pair of nitrile gloves between sampling events.
- Soil samples were transferred to 250 mL glass jars with Teflon lids, as supplied by Hill Laboratories.
- All soil samples were unambiguously marked in a clear and durable manner to permit clear identification of all samples in the laboratory.
- All samples were immediately placed in a cooled chilly bin to reduce the potential for volatilisation should volatile contaminants be present.

3.5 Analytical Parameters

The laboratory analytical suite determined for the site investigation is in recognition of our understanding of the current and historical use of the subject site. DCG understands the site was subject to sheep dip and foot bath activities, thus the following hazardous contaminants were analysed for their presence on site:

- Arsenic and Copper; and
- Organochlorine pesticides (including 4,4-DDE, 2,4-DDT and Dieldrin).

The laboratory methods utilised for the analysis are provided in the laboratory report (see Appendix E).

3.6 Soil Sample Field and Laboratory QA/QC

The field QA/QC procedures performed during the soil sampling are listed as follows:

- Use of standardised field sampling forms and methods;
- Samples were transferred under chain of custody procedures;
- All samples were labelled to show point of collection, project number, and date;
- Headspace in sample jars was avoided;
- The threads on the sampling jars were cleaned to avoid VOC loss;
- All samples were stored in a cooled chilly bin containing ice while in the field.

All soil samples were kept refrigerated until couriered to Hill Laboratories. Hill Laboratories is IANZ accredited for the analysis of heavy metals and pesticides. Hill conduct internal QA/QC in accordance with IANZ requirements.

3.7 Soil Guideline Values

Soil guideline values (SGVs) selected for application on this project are provided in Table 1. The selection of these guidelines is consistent with the principles of the Contaminated Land Management Guidelines No. 2: Hierarchy and Application in New Zealand of Environmental Guideline Values (MfE, 2003b).

The arsenic, copper and organochlorine pesticide soil guideline values adopted for the site assessment were based on either the Soil Contaminant Standards (New Zealand ‘Users’ Guide: NES for Assessing & Managing Contaminants in Soil to Protect Human Health, 2012) or Schedule B (1) Guideline on the Investigation Levels for Soil and Groundwater (National Environment Protection (Assessment of Site Contamination) Measure 2013). Guidelines for residential landuse 10% produce have been adopted for this site investigation based on the proposed residential landuse. Where the National Environmental Protection Measures (2013) were adopted, the most conservative values were selected for the purposes of this assessment.

Table 2: Soil Guidelines

Analyse	Guideline
Arsenic, Copper and Organochlorine Pesticides	1. Appendix B Soil Contaminant Standards <i>in</i> New Zealand ‘Users’ Guide: NES for Assessing & Managing Contaminants in Soil to Protect Human Health 2012 (MfE, 2012). 2. Schedule B (1) Guideline on the Investigation Levels for Soil and Groundwater <i>in</i> National Environment Protection (Assessment of Site Contamination) Measure 2013 (NEPC, 2013).

3.8 Soil Analytical Result Review

Following the receipt of laboratory data, a detailed review of the data was performed to determine its accuracy and validity. All laboratory data was checked for analytical and typographical errors.

Once the data quality was established the soil data was checked against the Sampling Program DQOs.

4.0 INVESTIGATION RESULTS

4.1 Analytical Results

The soil sample locations are provided in Figure 6 and summarised in Table 3 below.

Table 3: Soil Sample Summary Table

Sample Identification	Sample Depth (m)	Analysis	Composite	Notes
MB(0.1)#1	0-0.1	Arsenic and Copper	OCP	Surface sample
MB(0.1)#2	0-0.1	Arsenic and Copper		Surface sample
MB(0.1)#3	0-0.1	Arsenic and Copper		Surface sample
MB(0.1)#4	0-0.1	Arsenic and Copper	OCP	Surface sample
MB(0.1)#5	0-0.1	Arsenic and Copper		Surface sample
MB(0.1)#6	0-0.1	Arsenic and Copper		Surface sample
MB(0.1)#7	0-0.1	Arsenic and Copper	OCP	Surface sample
MB(0.1)#8	0-0.1	Arsenic and Copper		Surface sample
MB(0.1)#9	0-0.1	Arsenic and Copper		Surface sample
MB(0.1)#10	0-0.1	Arsenic and Copper	OCP	Surface sample
MB(0.1)#11	0-0.1	Arsenic and Copper		Surface sample
MB(0.1)#12	0-0.1	Arsenic and Copper		Surface sample
MB(0.1)#13	0-0.1	Arsenic and Copper	OCP	Surface sample
MB(0.1)#14	0-0.1	Arsenic and Copper		Surface sample
MB(0.1)#15	0-0.1	Arsenic and Copper		Surface sample

4.1.1 Arsenic and Copper Results

The arsenic and copper results are presented in Table 4 and summarised as follows:

- Arsenic and copper levels in all samples analysed returned concentrations below the adopted guideline value.

The levels of arsenic and copper are consistent across most of the samples analysed and are expected to be indicative of background concentrations.

Table 4: Arsenic and copper results (mg/kg) Millbrook Extension

Sample ID	Arsenic	Copper
MB(0.1)#1	12	38
MB(0.1)#2	10	20
MB(0.1)#3	10	22
MB(0.1)#4	12	25
MB(0.1)#5	11	26
MB(0.1)#6	12	23
MB(0.1)#7	10	19
MB(0.1)#8	9	13
MB(0.1)#9	7	15
MB(0.1)#10	6	12
MB(0.1)#11	8	14
MB(0.1)#12	8	13
MB(0.1)#13	7	13
MB(0.1)#14	6	10
MB(0.1)#15	8	14
Guideline ¹	20	>10,000

¹ Appendix B Soil Contaminant Standards in New Zealand 'Users' Guide: NES for Assessing & Managing Contaminants in Soil to Protect Human Health 2012 (MfE, 2012) Residential 10% produce

4.1.2 Organochlorine Pesticide (OCP) Results

The OCP results are presented in Table 5 and summarised as follows:

- Dieldrin concentrations were below laboratory detection limits in composite samples 'C7-8-9', 'C10-11-12' and 'C13-14-15';
- Composite soil sample C1-2-3 has a dieldrin concentration of 0.083 mg/kg, which is below the adopted guideline value; and
- Composite soil sample 'C4-5-6' exceeded the adopted guideline value of 0.86 mg/kg for dieldrin, with a concentration of 1.18 mg/kg.

All other organochlorine pesticide results were reported below laboratory detection limits and have not been presented within this document, however they are provided in Appendix E.

Table 5: Dieldrin results (mg/kg) Millbrook Extension

Samples	Composite Sample ID	Dieldrin
MB(0.1)#1	MB(0.1)C1-2-3	0.083
MB(0.1)#2		
MB(0.1)#3		
MB(0.1)#4	MB(0.1)C4-5-6	1.18
MB(0.1)#5		
MB(0.1)#6		
MB(0.1)#7	MB(0.1)C7-8-9	<0.010
MB(0.1)#8		
MB(0.1)#9		
MB(0.1)#10	MB(0.1)C10-11-12	<0.010
MB(0.1)#11		
MB(0.1)#12		
MB(0.1)#13	MB(0.1)C13-14-15	<0.010
MB(0.1)#14		
MB(0.1)#15		
Guideline ¹		0.86
¹ Appendix B Soil Contaminant Standards in New Zealand 'Users' Guide: NES for Assessing & Managing Contaminants in Soil to Protect Human Health 2012 (MfE, 2012) Residential 10% produce, because the soil sample analysed is a composite containing 3 samples the guideline value has been adjusted and divided by three. BOLD RED denotes guideline exceedance.		

4.2 QA/QC Results

4.2.1 Field Duplicates

One field duplicate soil sample was collected during the site investigation and was analysed to review the reproducibility of the sampling procedures and laboratory analysis. The duplicate relative percentage difference is presented below in Table 6. The duplicate and analysis are listed as follows:

- MB (0.1) #10 - analysed for arsenic and copper;
- DUP1 - analysed for arsenic and copper

Table 6: Duplicate relative percentage difference

Analyte (mg/kg)	MB (0.1) #10	DUP1	% Difference
Arsenic	6	6	0
Copper	12	12	0

An acceptable percentage difference between duplication samples is less than 30 to 50 % (MfE, 2004). DUP1 and 'MB(0.1)#10' had a percentage difference of 0 %. The QAQC analysis indicates the sampling and analysis undertaken was reproducible.

4.2.2 Laboratory Procedures

Hills Laboratories did not complete specific in-house QA/QC analysis such as spike recoveries or laboratory duplicates during the processing of the soil samples. The Chain of Custody form and the Hills Laboratory results are provided in Appendix E.

4.3 Risk Assessment

Based on the investigation results there has been some impact to soils to the south of the footpath that could be a risk to human health if regularly exposed to these soils over a long duration (years). It is expected that the area of impact is relatively localised and confined to the area within the yards to the south of the footpath. DCG recommends that the extent of the impacted soils is delineated and remedial measures undertaken to remove this risk from site.

The risk from the former portable sheep dip operation is considered to be low as the soil samples collected in the vicinity of this activity returned concentrations either below the laboratory detection limits or below the concentration that may be considered a risk to human health based on the proposed residential use of the site.

5.0 SUMMARY

Based on the findings of the Preliminary and Detailed Site Investigations, the following conclusions are made:

- Hazardous activities that have occurred on the site include the broadacre application of agrichemicals (fertilisers and possibly pesticides) and the use of hazardous substances in the operation of a footbath and mobile sheep dip;
- Based on liaison with the former owners of the property DCG understands a portable sheep dip was bought on to the property twice a year to treat stock until 1981;
- DCG identified the potential contaminants of concern associated with the portable sheep dip and permanent foot bath to be arsenic, copper and organochlorine pesticides;
- Arsenic and copper levels in all samples analysed returned concentrations below the adopted guideline value;
- Dieldrin was detected adjacent to the footbath exceeding the NES soil contaminant standard indicating that there is a risk to human health based on rural residential activity on the site; and
- Based on a number of investigations completed by DCG in the Wakatipu Basin we consider it highly unlikely that persistent pesticides (DDT and dieldrin) and heavy metal concentrations associated with the broadacre application of these agrichemicals would result in contaminant concentrations exceeding the NES soil contaminant standards.

In summary DCG considers the site is suitable for residential activity provided remedial work is undertaken in the vicinity of the footbath situated in the stockyards adjacent to the woolshed.

REFERENCES

Ministry for the Environment (2003a) *Contaminated Land Management Guidelines No. 1: Reporting on Contaminated Sites in New Zealand.*

Ministry for the Environment (2003b) *Contaminated Land Management Guidelines No. 2: Hierarchy and Application in New Zealand of Environmental Guideline Values.*

Ministry for the Environment (2012) *Users' Guide: National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health.* Wellington: Ministry for the Environment.

National Environment Protection Council (NEPC) (1999) *National Environment Protection (Assessment of Site Contamination) Measure - Schedule B (1) Guideline on Investigation Levels for Soil and Groundwater.* National Environment Protection Council.

Otago Regional Council (2014) *Otago Regional Council's "Database of Selected Landuses"*

Turnbull, I.M. (compiler) (2000) *Geology of the Wakatipu area.* Institute of Geological & Nuclear Sciences 1:250 000 geological map 18. 1 sheet + 72 p. Lower Hutt, New Zealand. Institute of Geological & Nuclear Sciences Ltd.

Appendices

Appendix A

Davis Consulting Group Contaminated Land Experience



Davis Consulting Group Contaminated Land Experience

Glenn Davis is the director of Davis Consulting Group and has over 15 years post graduate experience working as an Environmental Scientist. Glenn has accumulated a significant volume of work experience in the contaminated land field undertaking preliminary site investigations (PSIs), detailed site investigations (DSIs) and remediation projects in New Zealand, Australia, Asia, the United Kingdom and Ireland. The following provides a summary of Glenn Davis's experience.

Davis Consulting Group (2007 – present): Principal Environmental Scientist – completed multiple preliminary and detailed site investigations in Otago and Southland predominantly for the land development industry. In addition to undertaking investigation and remedial work DCG advises the Southland Regional Council on contaminated land matters including the review of consultant reports and consent applications. Key projects DCG has undertaken include:

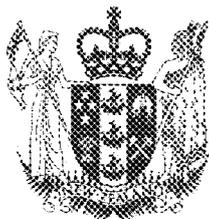
- Review of groundwater contamination associated with the former Invercargill gasworks site including the completion of a groundwater investigation and completion of an environmental risk assessment report to support a discharge consent application;
- Completion of site investigations on former landfills in Invercargill to consider the suitability of the sites for commercial/industrial development;
- Management of the removal of an underground fuel tank in Gore and subsequent groundwater investigation; and
- Completion of a number of detailed site investigations in the Te Anau area to consider the suitability of former farm land for residential development.

RPS Australia (2003 – 2006): Supervising Environmental Scientist managing multiple detailed site investigations in the land development industrial and operated as an environmental specialist for Chevron on Barrow Island monitoring and managing a number of large contaminated groundwater plumes.

URS Ireland (2001 – 2003): - Senior Environmental Scientist undertaking multiple PSIs and DSIs on services stations and train station throughout Ireland. Glenn was also involved in the design and operation of a number of large scale remediation projects, predominantly associated with the removal of hydrocarbon contaminated soil and recovery of hydrocarbons impacting groundwater.

ERM Australia (1998 – 2000) – Working as a project level environmental scientist Glenn completed in excess of 30 detailed site investigations and remedial projects on service stations, concrete batching plants, and transport depots.

Appendix B
Historical Certificates of Title



COMPUTER FREEHOLD REGISTER UNDER LAND TRANSFER ACT 1952



Historical Search Copy


R. W. Muir
Registrar-General
of Land

Identifier 40955
Land Registration District Otago
Date Issued 01 November 2002

Prior References

OT19A/129 OT19A/425

Estate Fee Simple
Area 64.6656 hectares more or less
Legal Description Lot 1 Deposited Plan 310442 and Lot 1
Deposited Plan 313841 and Section 29, 57
Block VI Shotover Survey District

Original Proprietors

Philippa Anne MacAuley as to a 1/4 share
Ian Gordon MacAuley as to a 1/4 share
Philippa Anne MacAuley, John Steven Pritchard and Bruce Young Cunningham as to a 1/4 share
Ian Gordon MacAuley, John Steven Pritchard and Bruce Young Cunningham as to a 1/4 share

Interests

The right of way easement created by Transfer 904356.8 is subject to Section 243 (a) Resource Management Act 1991
Subject to a right (in gross) to convey water over part marked Y-Z-AA on diagram attached to Transfer 839039 in favour of Arrow Irrigation Company Limited created by Transfer 839039 - 22.9.1993 at 10:09 am
980634.2 Mortgage to Rabobank New Zealand Limited - 22.12.1999 at 10:55 am
Subject to Section 243 (c) Resource Management Act 1991 (see DP 27269)
4838 Order in Council imposing Building Line Restriction - 17.3.1939 at 10.00am (affects Mooney Road frontage)
Subject to a right of way and right to convey telecommunications and transmit electricity over part marked A on DP 24886 created by Transfer 904356.8 - 25.3.1996 at 9:16 am
Subject to Section 241(2) Resource Management Act 1991 (affects DP 310442)
Appurtenant hereto is a right to take water and to convey electricity and water created by Easement Instrument 5390598.4 - 1.11.2002 at 12:29 pm
The easements created by Easement Instrument 5390598.4 are subject to Section 243 (a) Resource Management Act 1991
5413110.1 Departmental Dealing to correct the surname of Phillipa Anne MacAuley and Ian Gordon MacAuley to Phillipa Anne Macauley and Ian Gordon Macauley - 25.11.2002 at 10:30 am
8235843.1 Discharge of Mortgage 980634.2 - 24.7.2009 at 9:42 am
9840351.1 CAVEAT BY TERENCE YOUNG - 15.9.2014 at 12:09 pm
9734534.1 Change of Name of Phillipa Anne Macauley to Philippa Anne Macauley, Phillipa Anne Macauley to Philippa Anne Macauley - 25.9.2014 at 10:00 am
9862983.1 Lapse of Caveat 9840351.1 pursuant to Section 145A Land Transfer Act 1952 - produced 22.10.2014 at 4.24 pm and entered 10.12.2014 at 7.00 am
9904209.1 CAVEAT BY MILLBROOK COUNTRY CLUB LIMITED - 21.11.2014 at 3:42 pm
Subject to a right of way over part Lot 1 DP 310442 marked A, B, C, D on DP 27269 and over part Section 57 Block VI Shotover Survey District marked D on DP 27269, a right to convey water over part Lot 1 DP 310442 marked e-n, D, e-o, l-m, k-j on DP 27269 and over part Section 57 Block VI Shotover Survey District marked D, l-m on DP 27269 and a right to convey power and telecommunications over part Lot 1 DP 310442 marked A, f-g, h-i,

Identifier**40955**

D, j-k on DP 27269 and over part Section 57 Block VI Shotover Survey District marked D, j-k on DP 27269 created by Easement Instrument 9932213.1 - 17.12.2014 at 2:30 pm

Appurtenant hereto is a right to convey power and electricity created by Easement Instrument 9932213.1 - 17.12.2014 at 2:30 pm

Some of the easements created by Easement Instrument 9932213.1 are subject to Section 243 (a) Resource Management Act 1991 (see DP 27269)

The easements created by Easement Instrument 9932213.1 satisfy the Section 243 (c) Resource Management Act 1991 memorial

9935301.1 CAVEAT BY TERENCE YOUNG - 18.12.2014 at 1:44 pm

Appendix C
Soil Profile Logs



SOIL PROFILE LOGS

PROJECT NUMBER: 14088

FIELD STAFF: FR

DATE: 1/04/2014

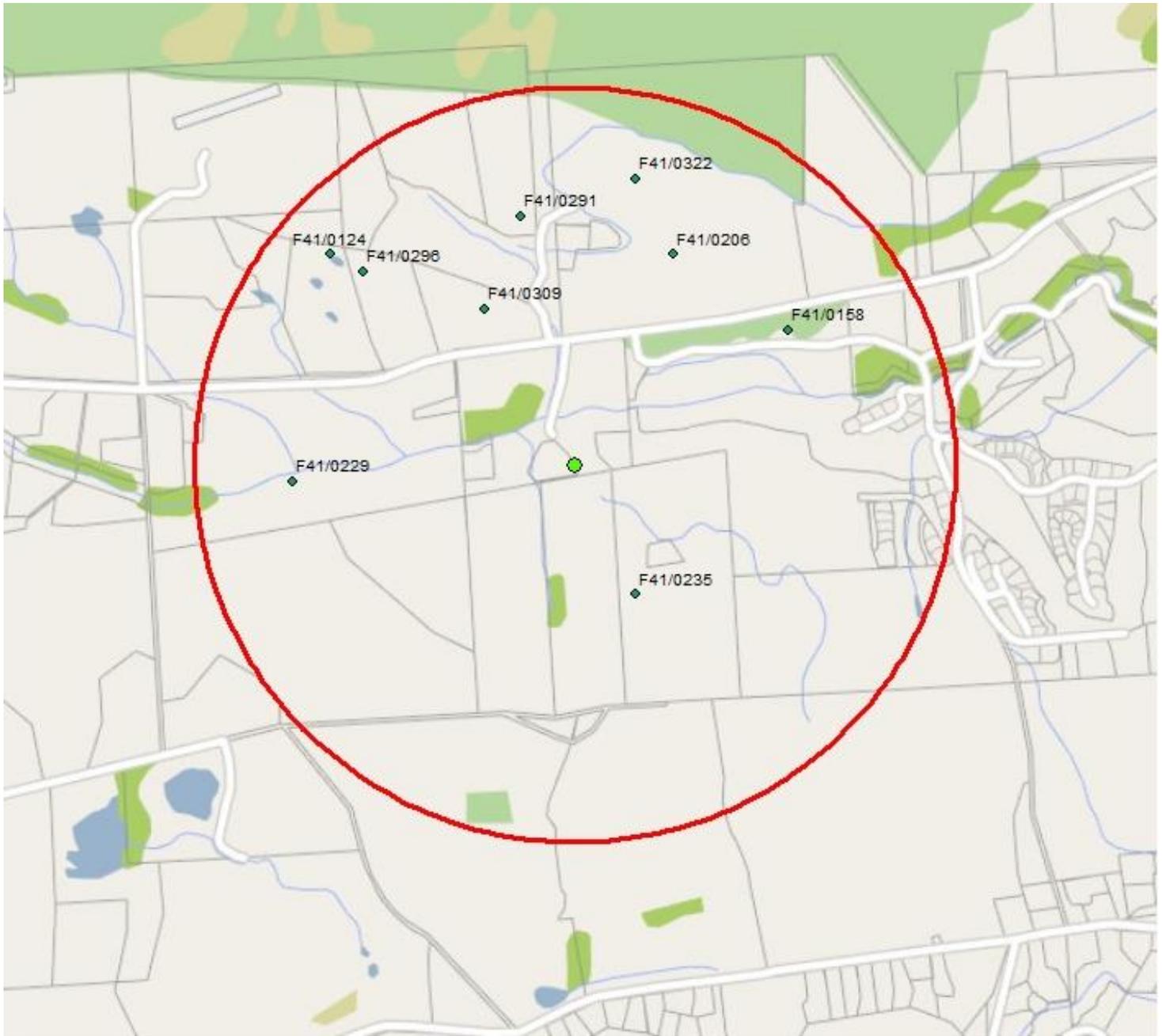
SITE NAME: Millbrook Extension

METHOD: Spade

WEATHER: Fine

Sample Location	Coordinates		Sample Depth	Sample ID	Soil Lithology
1	1267859	5014160	0-0.1	MB(0.1)#1	moderately dry brownish grey silty CLAY with one cobble
2	1267860	5014159	0-0.1	MB(0.1)#2	dark brown/black (possible staining) silty CLAY
3	1267863	5014160	0-0.1	MB(0.1)#3	light greyish brown silty CLAY
4	1267855	5014161	0-0.1	MB(0.1)#4	greyish brown fine sandy SILT with gravels
5	1267857	5014162	0-0.1	MB(0.1)#5	greyish brown fine sandy SILT with gravels
6	1267859	5014160	0-0.1	MB(0.1)#6	moderately dry brownish grey silty CLAY with one cobble
7	1267862	5014149	0-0.1	MB(0.1)#7	greyish brown fine sandy SILT with gravels
8	1267872	5014150	0-0.1	MB(0.1)#8	greyish brown silty GRAVEL with fine sand
9	1267889	5014153	0-0.1	MB(0.1)#9	light greyish brown clayey SILT with some gravels
10	1267869	5014176	0-0.1	MB(0.1)#10	light greyish brown sandy SILT
10	1267869	5014176	0-0.1	Dup 1	light greyish brown sandy SILT
11	1267880	5014172	0-0.1	MB(0.1)#11	light greyish brown sandy SILT
12	1267893	5014170	0-0.1	MB(0.1)#12	light greyish brown sandy SILT
13	1267866	5014162	0-0.1	MB(0.1)#13	friable brownish grey silty CLAY
14	1267876	5014162	0-0.1	MB(0.1)#14	greyish brown silty GRAVEL with fine sand
15	1267892	5014157	0-0.1	MB(0.1)#15	light greyish brown sandy SILT

Appendix D
ORC Bore Search



Appendix E

Laboratory analytical certificate and results, and chain of custody documentation



Chain of Custody

Sheet 1 of 2

Date Collected: 1/4/14

Sampling Conditions (brief description of weather conditions/flow rates etc): Dry

Your Address: Davis Consulting Group Ltd.
 Arrow Lane
 Arrowtown 9302

Samples Filtered and/or Preserved? [] Priority: High Priority
 CoC to be emailed back: Yes

Phone Number: 03 409 8664

Email Address: Fiona@davisconsultinggroup.co.nz

Project No/Property Name: Millbrook 14027

Who Sampled: Fiona

Samples Released By (Signature): [Signature]

Samples Received By (Signature): []
 Date and Time Released: 2/4/14 0945
 Date and Time Received: []

Laboratory use

Sample ID	Date	Time	Matrix	Analytes						
				TPH/BTEX	PAH	Metals ¹	pH	OCFs		
MB(0.1)#1	1/4/14	1400	Soil			✓				
MB(0.1)#2		1405	Soil			✓				
MB(0.1)#3		1420	Soil			✓				
MB(0.1)C1-2-3		1418	Soil					✓		
MB(0.1)#4		1435	Soil			✓				
MB(0.1)#5		1440	Soil			✓				
MB(0.1)#6		1446	Soil			✓				
MB(0.1)C4-5-6		1446	Soil					✓		
MB(0.1)#7		1501	Soil			✓				
MB(0.1)#8		1510	Soil			✓				
MB(0.1)#9		1524	Soil			✓				
MB(0.1)C7-8-9		1530	Soil					✓		

Temperature On Arrival
19.4°C
 Temperature was measured on one or more arbitrarily chosen samples in this batch.

Note:
 1 Metals Analysis to include Arsenic, Cadmium, Chromium, Copper, Lead, Nickel, Lead and Zinc



Received by: Lisa Bailey

Job No: 1257696
 Date Recv: 03-Apr-14 05:30



Chain of Custody

Date Collected: 1/4/14		Sampling Conditions (brief description of weather conditions/flow rates etc) Dry	
Your Address: Davis Consulting Group Ltd. Arrow Lane Arrowtown 9302		Samples Filtered and/or Preserved?	Priority: High Priority
		CoC to be emailed back: Yes	
Phone Number: 03 409 8664		Email Address: fiona@davisconsultinggroup.co.nz	
Project No/Property Name: Millbrook 14027		Who Sampled: fiona	
Samples Released By (Signature): [Signature]		Samples Received By (Signature):	
Date and Time Released: 2/4/14 0945		Date and Time Received:	

Laboratory use

Sample ID	Date	Time	Matrix	Analytes					
				TPH/BTEX	PAH	Metals ¹	pH	OCBs	
MB(0-1)#10	1/6/14	1539	Soil			✓			
MB(0-1)#11		1534	Soil			✓			
MB(0-1)#12		1603	Soil			✓			
MB(0-1)C10-11-12		1602	Soil					✓	
MB(0-1)#13		1620	Soil			✓			
MB(0-1)#14		1625	Soil			✓			
MB(0-1)#15		1630	Soil			✓			
MB(0-1)C MBDUP#1		1539	Soil			✓			
MB(0-1)C13-14-15		1630	Soil					✓	
			Soil						
			Soil						
			Soil						

Note:

1 Metals Analysis to include Arsenic, Cadmium, Chromium, Copper, Lead, Nickel, Lead and Zinc



Job Information Summary

Page 1 of 2

Client:	Davis Consulting Group Limited	Lab No:	1257696
Contact:	Fiona Rowley C/- Davis Consulting Group Limited PO Box 2450 Wakatipu QUEENSTOWN 9349	Date Registered:	03-Apr-2014 3:25:50 pm
		Priority:	High
		Quote No:	
		Order No:	
		Client Reference:	Millbrook 14027
		Add. Client Ref:	
		Submitted By:	Fiona Rowley
		Charge To:	Davis Consulting Group

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	MB (0.1) #1 01-Apr-2014 2:00 pm	Soil	GSoil300	Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn
2	MB (0.1) #2 01-Apr-2014 2:05 pm	Soil	GSoil300	Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn
3	MB (0.1) #3 01-Apr-2014 2:20 pm	Soil	GSoil300	Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn
4	MB (0.1) C1-2-3 01-Apr-2014 2:18 pm	Soil	GSoil300	Organochlorine Pesticides Screening in Soil
5	MB (0.1) #4 01-Apr-2014 2:35 pm	Soil	GSoil300	Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn
6	MB (0.1) #5 01-Apr-2014 2:40 pm	Soil	GSoil300	Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn
7	MB (0.1) #6 01-Apr-2014 2:46 pm	Soil	GSoil300	Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn
8	MB (0.1) C4-5-6 01-Apr-2014 2:46 pm	Soil	GSoil300	Organochlorine Pesticides Screening in Soil
9	MB (0.1) #7 01-Apr-2014 3:01 pm	Soil	GSoil300	Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn
10	MB (0.1) #8 01-Apr-2014 3:10 pm	Soil	GSoil300	Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn
11	MB (0.1) #9 01-Apr-2014 3:24 pm	Soil	GSoil300	Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn
12	MB (0.1) C7-8-9 01-Apr-2014 3:30 pm	Soil	GSoil300	Organochlorine Pesticides Screening in Soil
13	MB (0.1) #10 01-Apr-2014 3:39 pm	Soil	GSoil300	Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn
14	MB (0.1) #11 01-Apr-2014 3:54 pm	Soil	GSoil300	Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn
15	MB (0.1) #12 01-Apr-2014 4:03 pm	Soil	GSoil300	Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn
16	MB (0.1) C10-11-12 01-Apr-2014 4:02 pm	Soil	GSoil300	Organochlorine Pesticides Screening in Soil
17	MB (0.1) #13 01-Apr-2014 4:20 pm	Soil	GSoil300	Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn
18	MB (0.1) #14 01-Apr-2014 4:25 pm	Soil	GSoil300	Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn
19	MB (0.1) #15 01-Apr-2014 4:30 pm	Soil	GSoil300	Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn
20	MB DUP #1 01-Apr-2014 3:39 pm	Soil	GSoil300	Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn
21	MB (0.1) C13-14-15 01-Apr-2014 4:30 pm	Soil	GSoil300	Organochlorine Pesticides Screening in Soil

SUMMARY OF METHODS

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Environmental Solids Sample Preparation	Air dried at 35°C and sieved, <2mm fraction. Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1-3, 5-7, 9-11, 13-15, 17-20
Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn	Dried sample, <2mm fraction. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	0.10 - 4 mg/kg dry wt	1-3, 5-7, 9-11, 13-15, 17-20
Organochlorine Pesticides Screening in Soil	Sonication extraction, SPE cleanup, dual column GC-ECD analysis (modified US EPA 8082).. Tested on dried sample	0.010 - 0.04 mg/kg dry wt	4, 8, 12, 16, 21

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1-3, 5-7, 9-11, 13-15, 17-20



ANALYSIS REPORT

Client:	Davis Consulting Group Limited	Lab No:	1257696	SPV1
Contact:	Fiona Rowley C/- Davis Consulting Group Limited PO Box 2450 Wakatipu QUEENSTOWN 9349	Date Registered:	03-Apr-2014	
		Date Reported:	10-Apr-2014	
		Quote No:		
		Order No:		
		Client Reference:	Millbrook 14027	
		Submitted By:	Fiona Rowley	

Sample Type: Soil

Sample Name:	MB (0.1) #1	MB (0.1) #2	MB (0.1) #3	MB (0.1) C1-2-3	MB (0.1) #4
	01-Apr-2014 2:00 pm	01-Apr-2014 2:05 pm	01-Apr-2014 2:20 pm	01-Apr-2014 2:18 pm	01-Apr-2014 2:35 pm
Lab Number:	1257696.1	1257696.2	1257696.3	1257696.4	1257696.5

Individual Tests

Total Recoverable Arsenic	mg/kg dry wt	12	10	10	-	12
Total Recoverable Copper	mg/kg dry wt	38	20	22	-	25

Organochlorine Pesticides Screening in Soil

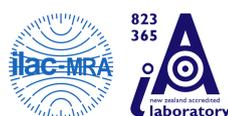
Aldrin	mg/kg dry wt	-	-	-	< 0.010	-
alpha-BHC	mg/kg dry wt	-	-	-	< 0.010	-
beta-BHC	mg/kg dry wt	-	-	-	< 0.010	-
delta-BHC	mg/kg dry wt	-	-	-	< 0.010	-
gamma-BHC (Lindane)	mg/kg dry wt	-	-	-	< 0.010	-
cis-Chlordane	mg/kg dry wt	-	-	-	< 0.010	-
trans-Chlordane	mg/kg dry wt	-	-	-	< 0.010	-
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	-	-	-	< 0.04	-
2,4'-DDD	mg/kg dry wt	-	-	-	< 0.010	-
4,4'-DDD	mg/kg dry wt	-	-	-	< 0.010	-
2,4'-DDE	mg/kg dry wt	-	-	-	< 0.010	-
4,4'-DDE	mg/kg dry wt	-	-	-	< 0.010	-
2,4'-DDT	mg/kg dry wt	-	-	-	< 0.010	-
4,4'-DDT	mg/kg dry wt	-	-	-	< 0.010	-
Dieldrin	mg/kg dry wt	-	-	-	0.083	-
Endosulfan I	mg/kg dry wt	-	-	-	< 0.010	-
Endosulfan II	mg/kg dry wt	-	-	-	< 0.010	-
Endosulfan sulphate	mg/kg dry wt	-	-	-	< 0.010	-
Endrin	mg/kg dry wt	-	-	-	< 0.010	-
Endrin aldehyde	mg/kg dry wt	-	-	-	< 0.010	-
Endrin ketone	mg/kg dry wt	-	-	-	< 0.010	-
Heptachlor	mg/kg dry wt	-	-	-	< 0.010	-
Heptachlor epoxide	mg/kg dry wt	-	-	-	< 0.010	-
Hexachlorobenzene	mg/kg dry wt	-	-	-	< 0.010	-
Methoxychlor	mg/kg dry wt	-	-	-	< 0.010	-

Sample Name:	MB (0.1) #5	MB (0.1) #6	MB (0.1) C4-5-6	MB (0.1) #7	MB (0.1) #8
	01-Apr-2014 2:40 pm	01-Apr-2014 2:46 pm	01-Apr-2014 2:46 pm	01-Apr-2014 3:01 pm	01-Apr-2014 3:10 pm
Lab Number:	1257696.6	1257696.7	1257696.8	1257696.9	1257696.10

Individual Tests

Total Recoverable Arsenic	mg/kg dry wt	11	12	-	10	9
Total Recoverable Copper	mg/kg dry wt	26	23	-	19	13

Organochlorine Pesticides Screening in Soil



Sample Type: Soil

Sample Name:	MB (0.1) #5 01-Apr-2014 2:40 pm	MB (0.1) #6 01-Apr-2014 2:46 pm	MB (0.1) C4-5-6 01-Apr-2014 2:46 pm	MB (0.1) #7 01-Apr-2014 3:01 pm	MB (0.1) #8 01-Apr-2014 3:10 pm
Lab Number:	1257696.6	1257696.7	1257696.8	1257696.9	1257696.10

Organochlorine Pesticides Screening in Soil					
Aldrin	mg/kg dry wt	-	-	< 0.010	-
alpha-BHC	mg/kg dry wt	-	-	< 0.010	-
beta-BHC	mg/kg dry wt	-	-	< 0.010	-
delta-BHC	mg/kg dry wt	-	-	< 0.010	-
gamma-BHC (Lindane)	mg/kg dry wt	-	-	< 0.010	-
cis-Chlordane	mg/kg dry wt	-	-	< 0.010	-
trans-Chlordane	mg/kg dry wt	-	-	< 0.010	-
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	-	-	< 0.04	-
2,4'-DDD	mg/kg dry wt	-	-	< 0.010	-
4,4'-DDD	mg/kg dry wt	-	-	< 0.010	-
2,4'-DDE	mg/kg dry wt	-	-	< 0.010	-
4,4'-DDE	mg/kg dry wt	-	-	< 0.010	-
2,4'-DDT	mg/kg dry wt	-	-	< 0.010	-
4,4'-DDT	mg/kg dry wt	-	-	< 0.010	-
Dieldrin	mg/kg dry wt	-	-	1.18	-
Endosulfan I	mg/kg dry wt	-	-	< 0.010	-
Endosulfan II	mg/kg dry wt	-	-	< 0.010	-
Endosulfan sulphate	mg/kg dry wt	-	-	< 0.010	-
Endrin	mg/kg dry wt	-	-	< 0.010	-
Endrin aldehyde	mg/kg dry wt	-	-	< 0.010	-
Endrin ketone	mg/kg dry wt	-	-	< 0.010	-
Heptachlor	mg/kg dry wt	-	-	< 0.010	-
Heptachlor epoxide	mg/kg dry wt	-	-	< 0.010	-
Hexachlorobenzene	mg/kg dry wt	-	-	< 0.010	-
Methoxychlor	mg/kg dry wt	-	-	< 0.010	-

Sample Name:	MB (0.1) #9 01-Apr-2014 3:24 pm	MB (0.1) C7-8-9 01-Apr-2014 3:30 pm	MB (0.1) #10 01-Apr-2014 3:39 pm	MB (0.1) #11 01-Apr-2014 3:54 pm	MB (0.1) #12 01-Apr-2014 4:03 pm
Lab Number:	1257696.11	1257696.12	1257696.13	1257696.14	1257696.15

Individual Tests					
Total Recoverable Arsenic	mg/kg dry wt	7	-	6	8
Total Recoverable Copper	mg/kg dry wt	15	-	12	13

Organochlorine Pesticides Screening in Soil					
Aldrin	mg/kg dry wt	-	< 0.010	-	-
alpha-BHC	mg/kg dry wt	-	< 0.010	-	-
beta-BHC	mg/kg dry wt	-	< 0.010	-	-
delta-BHC	mg/kg dry wt	-	< 0.010	-	-
gamma-BHC (Lindane)	mg/kg dry wt	-	< 0.010	-	-
cis-Chlordane	mg/kg dry wt	-	< 0.010	-	-
trans-Chlordane	mg/kg dry wt	-	< 0.010	-	-
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	-	< 0.04	-	-
2,4'-DDD	mg/kg dry wt	-	< 0.010	-	-
4,4'-DDD	mg/kg dry wt	-	< 0.010	-	-
2,4'-DDE	mg/kg dry wt	-	< 0.010	-	-
4,4'-DDE	mg/kg dry wt	-	< 0.010	-	-
2,4'-DDT	mg/kg dry wt	-	< 0.010	-	-
4,4'-DDT	mg/kg dry wt	-	< 0.010	-	-
Dieldrin	mg/kg dry wt	-	< 0.010	-	-
Endosulfan I	mg/kg dry wt	-	< 0.010	-	-
Endosulfan II	mg/kg dry wt	-	< 0.010	-	-
Endosulfan sulphate	mg/kg dry wt	-	< 0.010	-	-
Endrin	mg/kg dry wt	-	< 0.010	-	-
Endrin aldehyde	mg/kg dry wt	-	< 0.010	-	-

Sample Type: Soil

Sample Name:	MB (0.1) #9 01-Apr-2014 3:24 pm	MB (0.1) C7-8-9 01-Apr-2014 3:30 pm	MB (0.1) #10 01-Apr-2014 3:39 pm	MB (0.1) #11 01-Apr-2014 3:54 pm	MB (0.1) #12 01-Apr-2014 4:03 pm
Lab Number:	1257696.11	1257696.12	1257696.13	1257696.14	1257696.15

Organochlorine Pesticides Screening in Soil

Endrin ketone	mg/kg dry wt	-	< 0.010	-	-	-
Heptachlor	mg/kg dry wt	-	< 0.010	-	-	-
Heptachlor epoxide	mg/kg dry wt	-	< 0.010	-	-	-
Hexachlorobenzene	mg/kg dry wt	-	< 0.010	-	-	-
Methoxychlor	mg/kg dry wt	-	< 0.010	-	-	-

Sample Name:	MB (0.1) C10-11-12 01-Apr-2014 4:02 pm	MB (0.1) #13 01-Apr-2014 4:20 pm	MB (0.1) #14 01-Apr-2014 4:25 pm	MB (0.1) #15 01-Apr-2014 4:30 pm	MB DUP #1 01-Apr-2014 3:39 pm
Lab Number:	1257696.16	1257696.17	1257696.18	1257696.19	1257696.20

Individual Tests

Total Recoverable Arsenic	mg/kg dry wt	-	7	6	8	6
Total Recoverable Copper	mg/kg dry wt	-	13	10	14	12

Organochlorine Pesticides Screening in Soil

Aldrin	mg/kg dry wt	< 0.010	-	-	-	-
alpha-BHC	mg/kg dry wt	< 0.010	-	-	-	-
beta-BHC	mg/kg dry wt	< 0.010	-	-	-	-
delta-BHC	mg/kg dry wt	< 0.010	-	-	-	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.010	-	-	-	-
cis-Chlordane	mg/kg dry wt	< 0.010	-	-	-	-
trans-Chlordane	mg/kg dry wt	< 0.010	-	-	-	-
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.04	-	-	-	-
2,4'-DDD	mg/kg dry wt	< 0.010	-	-	-	-
4,4'-DDD	mg/kg dry wt	< 0.010	-	-	-	-
2,4'-DDE	mg/kg dry wt	< 0.010	-	-	-	-
4,4'-DDE	mg/kg dry wt	< 0.010	-	-	-	-
2,4'-DDT	mg/kg dry wt	< 0.010	-	-	-	-
4,4'-DDT	mg/kg dry wt	< 0.010	-	-	-	-
Dieldrin	mg/kg dry wt	< 0.010	-	-	-	-
Endosulfan I	mg/kg dry wt	< 0.010	-	-	-	-
Endosulfan II	mg/kg dry wt	< 0.010	-	-	-	-
Endosulfan sulphate	mg/kg dry wt	< 0.010	-	-	-	-
Endrin	mg/kg dry wt	< 0.010	-	-	-	-
Endrin aldehyde	mg/kg dry wt	< 0.010	-	-	-	-
Endrin ketone	mg/kg dry wt	< 0.010	-	-	-	-
Heptachlor	mg/kg dry wt	< 0.010	-	-	-	-
Heptachlor epoxide	mg/kg dry wt	< 0.010	-	-	-	-
Hexachlorobenzene	mg/kg dry wt	< 0.010	-	-	-	-
Methoxychlor	mg/kg dry wt	< 0.010	-	-	-	-

Sample Name:	MB (0.1) C13-14-15 01-Apr-2014 4:30 pm				
Lab Number:	1257696.21				

Organochlorine Pesticides Screening in Soil

Aldrin	mg/kg dry wt	< 0.010	-	-	-	-
alpha-BHC	mg/kg dry wt	< 0.010	-	-	-	-
beta-BHC	mg/kg dry wt	< 0.010	-	-	-	-
delta-BHC	mg/kg dry wt	< 0.010	-	-	-	-
gamma-BHC (Lindane)	mg/kg dry wt	< 0.010	-	-	-	-
cis-Chlordane	mg/kg dry wt	< 0.010	-	-	-	-
trans-Chlordane	mg/kg dry wt	< 0.010	-	-	-	-
Total Chlordane [(cis+trans)* 100/42]	mg/kg dry wt	< 0.04	-	-	-	-
2,4'-DDD	mg/kg dry wt	< 0.010	-	-	-	-

Sample Type: Soil						
Sample Name:		MB (0.1) C13-14-15 01-Apr-2014 4:30 pm				
Lab Number:		1257696.21				
Organochlorine Pesticides Screening in Soil						
4,4'-DDD	mg/kg dry wt	< 0.010	-	-	-	-
2,4'-DDE	mg/kg dry wt	< 0.010	-	-	-	-
4,4'-DDE	mg/kg dry wt	< 0.010	-	-	-	-
2,4'-DDT	mg/kg dry wt	< 0.010	-	-	-	-
4,4'-DDT	mg/kg dry wt	< 0.010	-	-	-	-
Dieldrin	mg/kg dry wt	< 0.010	-	-	-	-
Endosulfan I	mg/kg dry wt	< 0.010	-	-	-	-
Endosulfan II	mg/kg dry wt	< 0.010	-	-	-	-
Endosulfan sulphate	mg/kg dry wt	< 0.010	-	-	-	-
Endrin	mg/kg dry wt	< 0.010	-	-	-	-
Endrin aldehyde	mg/kg dry wt	< 0.010	-	-	-	-
Endrin ketone	mg/kg dry wt	< 0.010	-	-	-	-
Heptachlor	mg/kg dry wt	< 0.010	-	-	-	-
Heptachlor epoxide	mg/kg dry wt	< 0.010	-	-	-	-
Hexachlorobenzene	mg/kg dry wt	< 0.010	-	-	-	-
Methoxychlor	mg/kg dry wt	< 0.010	-	-	-	-

SUMMARY OF METHODS

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Environmental Solids Sample Preparation	Air dried at 35°C and sieved, <2mm fraction. Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1-3, 5-7, 9-11, 13-15, 17-20
Organochlorine Pesticides Screening in Soil	Sonication extraction, SPE cleanup, dual column GC-ECD analysis (modified US EPA 8082).. Tested on dried sample	0.010 - 0.04 mg/kg dry wt	4, 8, 12, 16, 21
Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1-3, 5-7, 9-11, 13-15, 17-20
Total Recoverable Arsenic	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	2 mg/kg dry wt	1-3, 5-7, 9-11, 13-15, 17-20
Total Recoverable Copper	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	2 mg/kg dry wt	1-3, 5-7, 9-11, 13-15, 17-20

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

This report must not be reproduced, except in full, without the written consent of the signatory.



Peter Robinson MSc (Hons), PhD, FNZIC
Client Services Manager - Environmental Division

Assessment of Potential Pollution Impact of the Proposed Millbrook Resort Extension

For

Millbrook Country Club Ltd

February 2015



*Davis Consulting Group Limited
P.O.Box 2450
Wakatipu 9349
03 409 8664
Document ID: 14088 (c)*

**Assessment of Potential Pollution Impact of the
Proposed Millbrook Country Club Development of Dalgliesh Farm**

Document Status

Version	Purpose of Document	Prepared By	Reviewer	Review Date
A	Draft for review	CP	GD	19 February 2015
O	FINAL	CP	GD	23 February 2015

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APPENDICES

Appendix A	Chemicals Used on Millbrook Golf Course
Appendix B	Mill Creek Water Quality Monitoring Results

1.0 INTRODUCTION

1.1 Objective

Millbrook Country Club Ltd (MCC) is seeking the rezoning of Dalgleish Farm to support a residential and golf course development of the site. Figure 1 shows the proposed structure plan for Dalgleish Farm. The proposal includes the development of approximately 50 residential sections and a 9 hole golf course. The development will also include the establishment and management of landscape protection and ecological restoration areas. MCC has identified that neighbouring properties may consider that the proposed development could result in the pollution of adjacent land with chemicals associated with the maintenance of the golf course.

In order to assess the potential effects on neighbouring properties from chemicals associated with management of the proposed golf course MCC commissioned Davis Consulting Group Limited (DCG) to undertake an assessment of potential sources of pollution, assess the possible impacts these could have on neighbouring properties and provide recommendations to reduce pollution impacts.

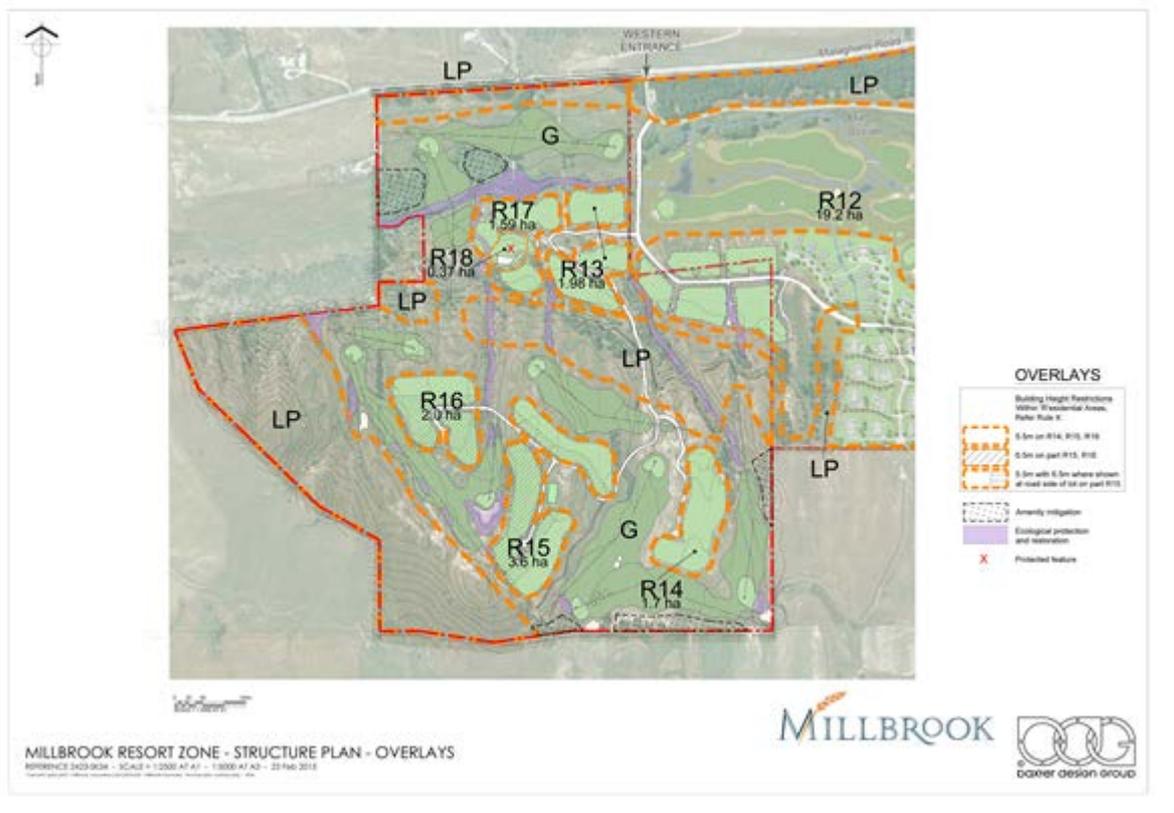


Figure 1: Proposed Structure Plan

2.0 RISK OF OFFSITE POLLUTION EFFECTS

The application of chemicals to Dalgleish Farm is anticipated on rural land and the application of approved agrichemicals such as fertilisers and pesticides similar to those used on golf courses are permitted activities. While we have not undertaken a detailed analysis of the volumes of agrichemicals used we do note that the application of chemicals on a golf course are well confined to the areas of fairways, tees and greens while the broadacre application of chemicals across crops and pasture on rural properties is routine.

Notwithstanding the risk of pollution from existing farming activities DCG has undertaken an assessment of the risk associated with the proposed golf course. The risk of effects on neighbouring properties can be examined by assessing the three core elements of risk including the sources of pollution, the pathway for migration of pollutants and the proximity of neighbouring properties.

2.1 Pollution Sources

There is a number of potential pollution sources to neighbouring properties associated with the development and operation of Dalgleish Farm including:

- Noise from construction, landscaping and maintenance activities during operation;
- Air quality from dust during construction and landscaping and overspray from chemical applications during green keeping and landscaping construction.
- Water quality from nutrient and chemical inputs during landscaping and green keeping activities during operation.
- Air and water quality from the disturbance of contaminated sites.

The generation of noise and effects on air quality during construction of the development is outside the scope of this assessment.

2.1.1 Chemicals Used in Golf Course Maintenance

A full list of chemicals used in the maintenance of Millbrook Golf Course is provided in Appendix

A. The chemicals used can be categorised as follows:

- Fertilisers for the support of grass growth;
- Herbicides for the control of weeds;
- Insecticides to control turf damaging insects;
- Fungicides to control fungal diseases;
- Wetting agents to increase the spreading ability of liquid applied to turf.

DCG has reviewed the Material Safety Data Sheets for the chemicals currently used on Millbrook golf course (see table 1). This review has found that the herbicides and fungicides are toxic to aquatic organisms, but are practically non-toxic to terrestrial birds and invertebrates. In all cases the herbicides and fungicides are also considered to have a low mobility in the environment.

Table 1: Golf Course Chemicals, Toxicity and Mobility

Trade Name	Substance	Toxicity	Mobility in the Environment
Calvary (Fungicide)	Chlorothalonil	Low toxicity in terrestrial environment but highly toxic to aquatic organisms	Low mobility in soil and not persistent in soil and water
Dithane Rainshield (Fungicide)	Mancozeb	Highly toxic to aquatic organisms, practically non-toxic to birds	Low mobility in soil, metabolizes to carbon dioxide
Instrata (Fungicide)	Chlorothalonil	See above	See above
	Fludioxonil	Highly toxic to aquatic organisms, practically non-toxic to birds	Low mobility in soil, not persistent in soil or water
	Propiconazole	Highly toxic to aquatic organisms, practically non-toxic to birds	Low mobility in soil, not persistent in soil or water
Headway Maxx (Fungicide)	Azoxystrobin	Highly toxic to aquatic organisms. Practically non-toxic to insects and birds	Low to moderate mobility in soil. Moderately persistent – persistent in soil or water
Smackdown (Herbicide)	Carfentrazone-ethyl	Very toxic to algae, less toxic to aquatic organisms. Low toxicity to birds and earthworms	Rapidly degrades in soil, low potential for movement in soils
Image (Herbicide)	Bromoxynil octanoate	Risk to birds and insects expected to be low, medium to high for mammals	EPA considers potential for groundwater contamination is low and should not persist in surface waters
Roundup	Glyphosate	Harmful to aquatic organisms	Adsorption studies indicate glyphosate has low mobility
Du Wett (wetting agent)	Trisiloxane ethoxylate Polyalkylene oxide Alcohol ethoxylate	Low risk to birds and aquatic organisms other than at very high concentrations	No information
<u>Acelepryn</u>	Chlorantranilprole	Low toxicity to terrestrial and aquatic vertebrates. Clearly toxic to invertebrates as this is the intent of the pesticide	Persistent and mobile in terrestrial and aquatic environments. Extended use expected to cause accumulation of residues in soil

The pesticide Acelepryn has a low toxicity to terrestrial and aquatic vertebrates, but is clearly toxic to invertebrates given this is the intent of the substance. Acelepryn is considered persistent and mobile in the terrestrial and aquatic environments and extended use is considered to cause accumulation of residues in soil. According to the Millbrook green keeper this product is predominantly used on the greens and tees of the golf course and applied once per year.

2.2 Pathways and Receptors

The pathways for potential offsite migration of herbicides, fungicides and pesticides include the following:

- Spray drift in air during application of chemicals;
- Spray drift entering waterways and subsequent migration of contaminants within a waterbody;
- Chemicals that sorb to soil particles and runoff from the site into waterways;
- Migration of contaminants through the soil column and into shallow aquifers;
- Offsite migration of contaminants within groundwater.

In our view the migration pathways are only potentially open along the southern and eastern boundaries of Dalgliesh Farm as the farm is predominantly within the catchment of Mill Creek and most drainage occurs in a northerly direction. The southern portion of the ridge plateau does slope to the south and golf holes 1 and 2 are within this catchment (see Figure 1). Site drainage in the vicinity of golf holes 1 and 2 will migrate in a southerly direction and has the potential to transport any contaminants that may migrate through the soil column into groundwater. Notwithstanding the above, in our view, while a migration pathway is open to the south and east, the low mobility and low persistence of the chemicals applied and the management measures employed by Millbrook Resort in the operation of the golf course will result in a low risk of offsite pollution.

The following provides a list of management practices currently utilised by Millbrook Resort to minimise the loss of silt, chemicals and nutrients to Mill Stream:

- Maintenance of silt collection areas;
- Establishing vegetation along the edges of streams to prevent bank erosion and runoff;
- Management of irrigation schedules and treatment of irrigation water with water penetrant to maximise seepage thereby minimising water runoff;
- Application of herbicides, pesticides and fertiliser with a low boom spray, and restricting application to low wind conditions to avoid overspray;

- Designation of buffer areas around surface water features where herbicides, pesticides and fertiliser are not applied;
- Application of fertiliser is minimised by selecting turf species that require low inputs, use of foliar applications, incorporation of zeolite as a soil amendment to improve nutrient holding capacity, and the use of biological and fish product to improve turf health and performance. This reduces the potential for nutrient loss to runoff or seepage;
- The golf course nutrient management plan is reviewed annually. Nutrient application is recorded each year with the objective of lowering the total nutrient application without sacrificing turf quality;
- Monitoring of water quality within Mill Stream twice a year at the stream entry and exit of Millbrook; and
- Chemical treatments are prepared and stored within a fully bunded and roofed washdown and chemical mixing facility designed to contain all runoff within a holding tank. Water contained within the holding tank is removed from site by a chemical removal firm. This minimises the risk of chemical loss to the environment.

The above practices would be extended through the proposed golf course and will mitigate the risk of pollutants migrating off the site.

To support the assessment of impacts of the existing Millbrook golf course on Mill Creek, MCC undertakes a biannual monitoring program of Mill Creek assessing nutrient concentrations that enter and exit Millbrook Resort. The monitoring results (provided in Appendix B) show that there is no discernible difference between water entering and exiting Millbrook Resort. While the results do not include all the chemicals used in the maintenance of the golf course and it is only a “snapshot” in time it is useful to show that relatively mobile substances such as nitrate do not appear to be impacting the water quality of Mill Creek.

2.3 Summary of Risk

In summary DCG has reviewed the nature of the chemicals applied to the existing golf course, the possible pathways for offsite migration of these chemicals and the proximity of neighbouring properties. In our view the application methods utilised by Millbrook and the low mobility of the chemicals within the soil column minimises the risk of chemicals migrating offsite either in air, within surface water or through groundwater. We therefore conclude that the risk to neighbouring properties from offsite pollution is low.

Appendices

Appendix A
Chemicals Used on Millbrook Golf Course

EMT

Millbrook Golf Course			
Course Manager		James Omalley	
	Price list 2014.15 Season	Pack size	2014 season Pricelist X GST

Category number	Product		
Seed			
	Arrowtown Browntop	1kg	\$31.00 kg
	Duraturf Traditional	1kg	\$6.50kg

Foliar/Soluable Fertilisers			
33826	Ferrous Sulphate	25kg	\$23.00
33824	SOA tech grade	25kg	\$26.00
33827	Magnesium Sulphate	25kg	\$20.00
34011	True Foliar Si	10L	\$150.00
34003	Fairway sequential	57L	\$590.00
34033	Andersons Turgade	10L	\$100.00

Follow F

Granule			
33532	DAP <i>Granule</i>	40kg	\$45.33
33574	SOA <i>Granule</i>	40kg	\$42.00
33678	RegenR8	25kg	\$82.60
33613	Mini Complex	25kg	\$38.00
33846	Andersons 18-0-3 5% fe	20kg	\$43.75

Fungicides			
33156	Calvary	10L	\$113.00
33162	Dithane Rainshield	10kg	\$118.66
33406	Instrata	10L	\$475.00
33405	Headway Maxx	5L	\$445.00
?????????	Fontelis	20L	??

Plant growth regulators			
33404	Primo maxx	5l	\$355.00

Herbicides			
33348	Smackdown <i>Moss</i>	1L	\$265.00
33236	Image	5L	\$241.30

Miscellaneous			
33416	Acelepryn <i>Insecticide</i>	750mls	\$430.00
36049	Li1000	5L	\$140.00
?????	Du Wett	5L	
36014	Keymark Foam	5L	\$100.00

ingredient

Wetting Agent			
33482	Biagra	200L	\$2,821.00
38037	Injectorforce	200L	\$1,179

↓ Dosing Pump

Appendix B
Mill Creek Water Quality Monitoring Results

Watercare

Laboratory Services

Auckland
52 Aintree Ave,
PO Box 107028,
Auckland Airport,
Auckland, 2150
Tel: (09) 539 7614
Fax: (09) 539 7601

Invercargill
142 Esk Street,
PO Box 747,
Invercargill, 9840
(03) 214 4040
(03) 214 4041

Queenstown
74 Glenda Drive,
PO Box 2614,
Wakatipu,
Queenstown, 9349
(03) 409 0559

www.watercarelabs.co.nz

clientsupport@water.co.nz

Certificate of Analysis

Laboratory Reference: 141015-166

Attention:	James O'Malley	Final Report:	111941-0
Client:	MILLBROOK COUNTRY CLUB LTD	Report Issue Date:	22-Oct-2014
Address:	MALAGHANS ROAD, ARROWTOWN, 9196	Received Date:	16-Oct-2014
Client Reference:	Millbrook 6 Monthly October 2014	Quote Reference :	948
Purchase Order:	MILLBROOKRES		

Sample Details	WATERS	WATERS	WATERS	
Lab Sample ID:	141015-166-1	141015-166-2	141015-166-3	
Client Sample ID:				
Sample Date/Time:	15/10/2014	15/10/2014	15/10/2014	
Description:	Millbrook Irrigation Pond	Millbrook Spa Exit	Millbrook Entry	
General Testing				
Ammoniacal Nitrogen (as N)	mg/L	<0.005	0.0080	<0.005
Bicarbonate Alkalinity (as HCO ₃)	mg/L	57	68	64
Carbonate Alkalinity (as CO ₃)	mg/L	<1.0	<1.0	<1.0
Conductivity (at 25 °C)	mS/m	10.3	13.4	12.8
Nitrate (as N)	mg/L	<0.002	0.23	0.25
Nitrite (as N)	mg/L	<0.002	0.0078	0.0077
pH (at room temp c. 20 °C)	pH unit	7.9	7.8	7.7
Total Alkalinity (as CaCO ₃)	mg/L	47	56	53
Total Oxidised Nitrogen (as N) by Calculation	mg/L	<0.002 *	0.23 *	0.26 *
Total Phosphorus (as P)	mg/L	0.0090	0.028	0.024
Total Suspended Solids	mg/L	<1.0	11	7.6
Turbidity	NTU	0.45	4.0	3.3

Results marked with * are not accredited to International Accreditation New Zealand

Where samples have been supplied by the client they are tested as received. A dash indicates no test performed.

Reference Methods

The sample(s) referred to in this report were analysed by the following method(s)

Analyte	Method Reference	MDL	Samples	Location
General Testing				
Ammoniacal Nitrogen (as N)	MEWAM, HMSO 1981, ISBN 0117516139	0.005 mg/L	All	Auckland
Bicarbonate Alkalinity (as HCO ₃)	APHA (online edition) 2320 B	1 mg/L	All	Auckland
Carbonate Alkalinity (as CO ₃)	APHA (online edition) 2320 B	1 mg/L	All	Auckland
Conductivity (at 25 °C)	APHA (online edition) 2510 B	0.5 mS/m	All	Auckland
Nitrate (as N)	APHA (online edition) 4110 B (Modified)	0.002 mg/L	All	Auckland
Nitrite (as N)	APHA (online edition) 4110 B (Modified)	0.002 mg/L	All	Auckland
pH (at room temp c. 20 °C)	APHA (online edition) 4500-H B	0.1 pH unit	All	Auckland
Total Alkalinity (as CaCO ₃)	APHA (online edition) 2320 B	1 mg/L	All	Auckland
Total Oxidised Nitrogen (as N) by Calculation	APHA (online edition) 4110 B (Modified)	0.002 mg/L	All	Auckland
Total Phosphorus (as P)	APHA (online edition) 4500-P B, J (modified)	0.004 mg/L	All	Auckland
Total Suspended Solids	APHA (online edition) 2540 D, E	1 mg/L	All	Auckland
Turbidity	APHA (online edition) 2130 B (modified)	0.05 NTU	All	Auckland
Preparations				
Membrane Filtration (0.45 µm)	APHA (online edition) 4500-P B (preliminary filtration)		All	Auckland

The method detection limit (MDL) listed is the limit attainable in a relatively clean matrix. If dilutions are required for analysis the detection limit may be higher. For more information please contact the Operations Manager.

Attachment (e)



FINAL REPORT: 26 March 2015

Economic Analysis of Development Options for Millbrook

PREPARED FOR

Millbrook Country Club Limited

INSIGHT ECONOMICS

CLEAR AND CONCISE SOLUTIONS BASED ON RIGOROUS RESEARCH AND ANALYSIS

Authorship

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Executive Summary

Context and Purpose of Report

Millbrook Resort is a world-class golf and spa resort based in Arrowtown, Queenstown. Last year, it purchased 66 hectares of adjacent land to enable ongoing development. To support possible rezoning, this report assesses the relative benefits and costs of the economic effects anticipated from Millbrook's preferred rezoning provisions as required by section 32 of the RMA (included as a schedule at the end of this report), and two other options.

- **Option 1 – Low Intensity Residential Development** – The lower slopes nearer Malaghans Road are subdivided into 12 low-density residential lots in a manner similar to existing Millbrook neighbourhoods and a 13th lot to include the existing cottage and shed, with the remaining land (being around two-thirds of the total Dalglish Farm) sold with no anticipated change from its current land use.
- **Option 2 – Large-Lot Rural Residential Development** – Most of Dalglish Farm is subdivided into 10 rural lots, each enabling one residential home and six low-density residential lots in a manner similar to existing Millbrook neighbourhood. A two hectare block without a residential development right is sold (possibly to a neighbour).
- **Option 3 – Comprehensive Golf / Residential Development** – Dalglish Farm is comprehensively developed to enable nine holes of golf and 49 residential lots. Grazing will continue on part of the farm and some land will be retired for conservation purposes. A two hectare block without a residential development right is sold (again, possibly to a neighbour) and remains outside of the resort (Millbrook's preferred rezoning provisions).

Methodology

Once the requirements of s32 RMA had been identified and practicable options had been identified through discussions with Millbrook, we developed a set of financial models to analyse their impacts. The first applied to all three options and modelled the residential development process, right from land acquisition through to the sale of new lots and dwellings. It was closely based on Millbrook's own internal analyses, with minor modifications.

The second model applied only to option 3. It covered the development and operation of the additional golf holes, including flow-on effects for Millbrook and the rest of the district. It translated the additional holes into estimates of additional rounds played, which were then converted into estimates of extra tourist nights and hence extra tourist spending. Combined with the first model above, it provided a complete picture of each option's financial impacts, both at Millbrook and also further afield.

To complete the analysis, we also needed to calculate the economic impacts of each option in terms of their contributions to regional GDP, incomes and employment. This was done using a two-step process. First, we analysed the direct effects of each option. Then, we estimated the various flow-on effects to yield total economic impacts.



Economic Impacts of Development Activities

Table 1 summarises the estimated economic impacts associated with the development component of each option. The combined residential and golf course development associated with Option 3 provides the greatest regional economic impacts. For example, it is estimated to provide a one-time GDP boost of \$21.2 million, and provide a year’s employment for 525 full-time workers. Conversely, the economic impacts of option 1, which includes only residential development, are about four times lower.

Table 1: One-off Regional Economic Impacts of Property Development (\$m)

Options	GDP	Employment	Hhld Incomes
Option 1	\$5.7	150	\$3.7
Option 2	\$7.7	205	\$5.0
Option 3	\$21.2	525	\$13.3

Economic Effects of the Golf Course Development

Our analysis of the golf course development showed that the financial and economic benefits of option 3 would extend well beyond those shown above for residential development activities. Indeed, the attraction of high-yielding tourists – to play the additional holes – will have significant spin-offs. For example, we conservatively estimate the following annual impacts for the first full year of operations following a bedding-in period:

- 12,400 additional rounds of golf played,
- 8,800 additional tourist nights, 55% of which are spent at Millbrook and 45% of which are spent elsewhere in the district.
- Additional tourist spending of \$3.9 million, 40% of which accrues to Millbrook and 60% of which leaks out to the rest of the district, and
- Increased regional GDP of \$4.0 million, 70 additional full-time jobs and increased household incomes of \$1.8 million.

Preferred Option and Recommendations

Based on the analysis described above, option 3 is our preferred option because it:

- Represents the highest and best use of the land – a prerequisite for economic efficiency in the land market.
- Enables an integrated development that will complement the resort’s existing offer, thus improving its ability to attract high-yielding tourists,
- Directly supports the New Zealand International Golf Tourism Strategy, and
- Provides significant financial and economic benefits for the rest of the district.

Conclusion and Recommendation

This report has analysed three possible options for the newly-acquired land and found that option 3 significantly outperforms the others on financial and economic grounds.



Accordingly, we recommend that:

- Millbrook pursue option 3; and
- Council acknowledge and support option 3 in order to secure the significant district-wide benefits estimated herein.



1 Introduction

This section outlines useful background information for the report.

1.1 Context

Millbrook Resort is a world-class golf and spa resort based in Arrowtown, which opened in 1993 and has grown ever since. Last year, it sought – and received – consent from the Overseas Investment Office (OIO) to purchase 66 hectares of adjacent farm land for the purposes of ongoing development. The map below identifies the new land.

Figure 1: Location of the Recently-Acquired Land



1.2 Scope and Purpose of this Report

In order for Millbrook to realise its development vision, part of the Dagleish Farm needs to be rezoned for development. As part of that process, Millbrook commissioned this report to analyse the economic effects of three possible development options in terms of section 32 of the RMA. We understand that the suggested district plan provisions which would enable Option 3 to occur are being promoted for possible inclusion in the District Plan. Information about those provisions provided by Millbrook and available from other sources was sufficient for identifying the economic effects and their costs and benefits.

1.3 Development Options

Following are the three development options analysed in this report:

- **Option 1 – Low Intensity Residential Development** – The lower slopes nearer Malaghans Road are subdivided into 12 low-density residential lots in a manner similar to existing Millbrook neighbourhoods and a 13th lot to include the existing

cottage and shed, with the remaining land (being around two-thirds of the total Dalglish Farm) sold with no anticipated change from its current land use.

- **Option 2 – Large-Lot Rural Residential Development** – Most of Dalglish Farm is subdivided into 10 rural lots, each enabling one residential home and six low-density residential lots in a manner similar to existing Millbrook neighbourhood. A two hectare block without a residential development right is sold (possibly to a neighbour).
- **Option 3 – Comprehensive Residential/Golf Development** – Dalglish Farm is comprehensively developed to enable nine holes of golf and 49 residential lots. Grazing will continue on part of the farm and some land will be retired for conservation purposes. A two hectare block without a residential development right is sold (again, possibly to a neighbour) and remains outside of the resort. It is important to note that, while this report considers the golf and residential components of option 3 separately, the two activities could not occur independent of one another.

1.4 Understanding the Dynamics of the Golf Tourism Market

As just shown, option 3 includes the development of nine extra golf holes. While this will obviously attract more players to Millbrook for its benefit, a significant share of the benefits will actually accrue to other district businesses via the attraction of additional high-yielding tourists. This role of golf courses as catalysts for regional economic growth was one of the key themes of the New Zealand International Golf Tourism Strategy, which was launched by Tourism New Zealand in 2013¹. It notes that:

- New Zealand is a distinctive golf destination waiting to be discovered. However, it currently captures less than 0.3% of the \$32 billion international golf tourism market.
- To improve competitiveness, golf product should be grouped into two trails – one per island – with each anchored by world-class “marquee courses” like Millbrook.
- The public and private sector should be encouraged to invest in new and existing golf facilities that will make meaningful contributions to those trails.
- However, international destination case studies indicate that only 20-25% of the economic impact of golf tourism is realised by the golf facilities.
- Accordingly, regional tourism organisations (RTOs) and councils should be engaged to support the development and improvement of new and existing golf facilities.

To reflect this, our analysis of the golf course development explicitly models the financial and economic impacts on the rest of the district.

¹ <http://www.tourismnewzealand.com/media/1216411/nz-international-golf-strategy.pdf>

1.5 Structure of this Report

The remainder of this report is structured as follows:

- **Section 2** describes the methodology used to estimate the impacts of each option
- **Section 3** estimates the impacts of residential development for each option
- **Section 4** estimates the golf and resort-related impacts for option 3
- **Section 5** selects a preferred option, and
- **Section 6** concludes and makes recommendations.



2 Methodology

This section describes the methodology used to estimate the impacts of each option.

2.1 Steps in the Analysis

Figure 2 shows the key steps in the analysis.

Figure 2: Key Steps in the Analysis



The rest of this section describes the various models built to enable the analysis.

2.2 Financial Models

We developed two financial models and merged their results to analyse the overall impacts of each option. The two models were:

1. A residential development model, which applied to **all options**; and
2. A course/resort development & operating model, which applied just to **option 3**

Each model is discussed further below.

2.3 The Residential Development Model

The following diagram illustrates the scope and logic of our residential development model, which started with the acquisition of the new land and finished with the sale of completed product (i.e. land and land/dwelling packages).

Figure 3: Scope of the Residential Development Model



Most of the inputs and assumptions in our residential development model were taken directly from Millbrook's own analyses, which provided detailed information on:

- Land acquisition costs and associated financing arrangements;
- The number of potential development lots for each option,
- the associated timings, and average sale prices by type of lot;
- Earthworks and site preparation costs;
- Construction costs and likely development margins; and
- Sales, marketing, and legal costs.

While Millbrook’s internal models provided a solid basis for this analysis, some simplifying assumptions had naturally been made. One was to ignore the fact that Country Club membership is a pre-requisite to purchasing property at the resort. For completeness, we coded this in to catch the resulting revenue streams.

In addition, we made some minor adjustments to the assumed timing of lot sales to reflect the possibility of a delay. Otherwise, our residential development model was essentially a direct copy of Millbrook’s own internal analysis.

2.4 The Course/Resort Development and Operating Model

Unlike the residential development model above, a significant amount of work was required to accurately estimate the likely direct and spin-off effects of the golf course development in option 3. The following diagram illustrates the raw logic of the model that we built for this purpose. It starts with course design and construction, and runs right through to capture induced tourist spending.



Fundamentally, the model assumes that the extra nine holes induces extra rounds of golf, which in turn generates extra tourist nights and hence extra tourist spending. This is because, in practice, the existing 27 holes can only operate as one 18-hole course on any given day. However, with the extra nine holes, Millbrook can operate two 18-hole courses at the same time, which effectively doubles its capacity.

To estimate the number of additional rounds, we reviewed the experience of overseas resorts that had also expanded course capacity. This led to a conservative estimate that total rounds played at Millbrook would increase by 80% relative to the status quo.²

Next, the number of additional rounds was converted to an estimate of additional stay nights by assuming that:

- 90% of additional rounds would be played by visitors versus locals (based on the mix in 2014), and that
- Each additional round played by visitors would generate an additional 0.8 stay nights in the district.³

² Note that we allow for a 5-year bedding-in period for the popularity of the full course to spread. Also, future rounds are also expected to grow organically under the status quo due to ongoing increases in visitor growth. To project these forward, we applied a conservative long-run annual growth rate of 2.2% - which is four times less than the actual growth rate over the last five years.

³ This is conservative, with the literature commonly assuming that each additional round equals one additional night. However, we consider it reasonable to assume that only 80% of additional rounds generate additional nights, with the other 20% being fitted into existing schedules.

To split the additional stay nights between Millbrook and other district accommodation providers, we used detailed records kept by Millbrook. These showed that, on average, 55% of visiting players stayed at the resort, while 45% stayed elsewhere in Queenstown.

Combining the various assumptions above produced annual estimates of additional nights spent at (i) Millbrook, and (ii) all other district providers. To convert these to estimates of additional tourist spending, we then applied a daily spending profile derived by calibrating official spending data (from Tourism New Zealand) with player-specific spending data provided by Millbrook.

Applying this spending profile to our estimates of additional nights produced estimates of additional tourist spending, again split between Millbrook and all other district businesses.

2.5 Converting Financial Impacts to Economic Impacts

The purpose of the models above was to understand the likely financial impacts of each option, mainly on Millbrook, but also further afield. To complete the analysis, we also needed to calculate the corresponding economic impacts of each option (in terms of their contributions to regional GDP, incomes and employment). These were calculated using a two-step process, as briefly described below.

First, we analysed the direct economic effects of each option by estimating the extent to which they directly bolstered GDP, incomes and employment. Then, we estimated the corresponding flow on effects associated with the:

- Ripple effect of Millbrook's own supply-chain spending, and
- Increased tourist spending by the additional Millbrook players.

Both sets of flows were fed into a highly detailed matrix – called an input output table – to estimate the economic impact of each option, as reported in the following sections.

To ensure that the analysis was as up-to-date and robust as possible, it incorporates the latest (2011) input output tables derived by Insight Economics last year. These are a considerable improvement on the previously-available 2007 tables, which are now out of date.⁴

⁴ For more information about our tables, please see our website: <http://insighteconomics.co.nz/input-output-tables/>

3 Analysis of Property Development Impacts

This section analyses the impacts of each option with respect to residential property development. For options 1 and 2, these represent the full impacts. For option 3, however, there are further impacts relating to the golf course development, which are not covered in this section. All figures in this section are exclusive of GST.

3.1 Description of the Product

Each option includes the creation of new residential lots – most of which will be sold as land only, while some lots will be developed and sold as completed land and dwelling packages. Overall, this process is expected to take between five and eight years depending on the intensity of development involved.

The following table shows the number of new lots created under each option.

Table 2: Residential Property Development Assumptions

Lots and Selling Prices	Option 1	Option 2	Option 3
New Lots Created	13	16	49
Lots Sold as Land Only	10	16	39
Lots Sold as Land & Dwellings	3	0	10

3.2 Key Assumptions

As always, a number of assumptions were made to enable the analysis. These are tabulated below.

Table 3: Residential Property Development Assumptions

General Assumptions	All Options
Design and Plan Change Costs	\$1,300,000
Build Cost per Millbrook Dwelling	\$1,500,000
Build Cost per Private Dwelling	\$2,500,000
Margin on Dwelling Construction	10%
Membership Application Fees (one-off)	\$20,000
Membership Fees (annual)	\$2,800
Selling Cost (% of Sale Price)	3.5%
Marketing (% of Sale Price)	1.0%
Legal Costs per lot	\$5,000
Contingency	5.0%
Rental of Existing Cottage p.a.	\$19,500

3.3 Development Costs to Millbrook

Table 4 shows the estimated development costs for each option.⁵ These range from \$17 million under option 1 to \$39 million under option 3.

Table 4: Estimated Development Costs (\$millions)

Development Costs	Option 1	Option 2	Option 3
Land Acquisition	\$7.0	\$7.0	\$5.3
Land Development	\$3.9	\$6.5	\$16.3
Dwelling Construction	\$4.5	\$0.0	\$15.0
Sales and Marketing	\$1.0	\$1.2	\$2.9
Total Costs	\$16.5	\$14.6	\$39.4

For options 1 and 2, land acquisition costs both equal \$7 million. However, for option 3, they are 25% less. This is because option 3 also includes the golf course development, which has been allocated a quarter share of the land acquisition cost.

Acquisition aside, development costs exhibit a clear and intuitive pattern. Namely, that they are higher for options with greater levels of development. For example, dwelling construction costs are about 3 times higher under option 3 than option 1, and so too are the number of dwellings constructed.

3.4 Economic Impacts

Finally, we summarise the impacts of each option's residential development activities on regional GDP, incomes and employment. The impacts presented below include all construction impacts regardless of whether the dwellings are constructed by Millbrook or a third party. They include both direct effects, and also flow-on effects, as set out in the table below.

Table 5: Estimated Regional Impacts of Residential Property Development (\$m)

Option 1	GDP	Employment	Hhld Incomes
Direct	\$2.8	100	\$2.3
Flow-On	\$2.9	50	\$1.5
Total	\$5.7	150	\$3.7

Option 2	GDP	Employment	Hhld Incomes
Direct	\$3.8	135	\$3.1
Flow-On	\$3.9	70	\$2.0
Total	\$7.7	205	\$5.0

Option 3	GDP	Employment	Hhld Incomes
Direct	\$9.1	315	\$7.2
Flow-On	\$9.0	155	\$4.5
Total	\$18.1	470	\$11.7

⁵ Note that the costs in Table 4 are only the costs to Millbrook and ignores those construction costs incurred by private parties building homes on the land only sites.



Table 5 shows that all three options are likely to have significant regional economic impacts. For example, option 1 is estimated to provide a one-time boost in regional GDP of \$6 million, while option 3 is estimated to provide a one-time GDP boost of over \$18 million. As expected, option 3 provides significantly higher economic impacts across the board because it involves far more intense levels of development. In addition, option 3 has significant ongoing impacts on the economy once the extended golf course is complete. These are examined in detail below.

3.5 Summary and Conclusion

This section has analysed the likely economic impacts of the residential development activities associated with each option. It has shown that the development associated with option 3 provides the greatest economic impacts for the region.



4 Analysis of Golf-Related Impacts

In addition to the impacts associated with property development, option 3 generates a number of additional benefits for the regional economy. This section analyses the impacts of the golf course development component of option 3. Please note that the results presented here need to be read alongside those of the previous section to fully compare the options under consideration. While we analyse residential and golf course impacts separately, they each form a vital component of the overall package under option 3. Indeed, as neither component could occur separately, we recommend reading the impacts presented in this section in conjunction with those presented above for option 3.

4.1 Course Design and Construction

Our analysis of golf-related impacts starts with course design and construction, which is expected to be complete by 2019. The associated costs are tabulated below.

Table 6: Course Design and Construction Costs

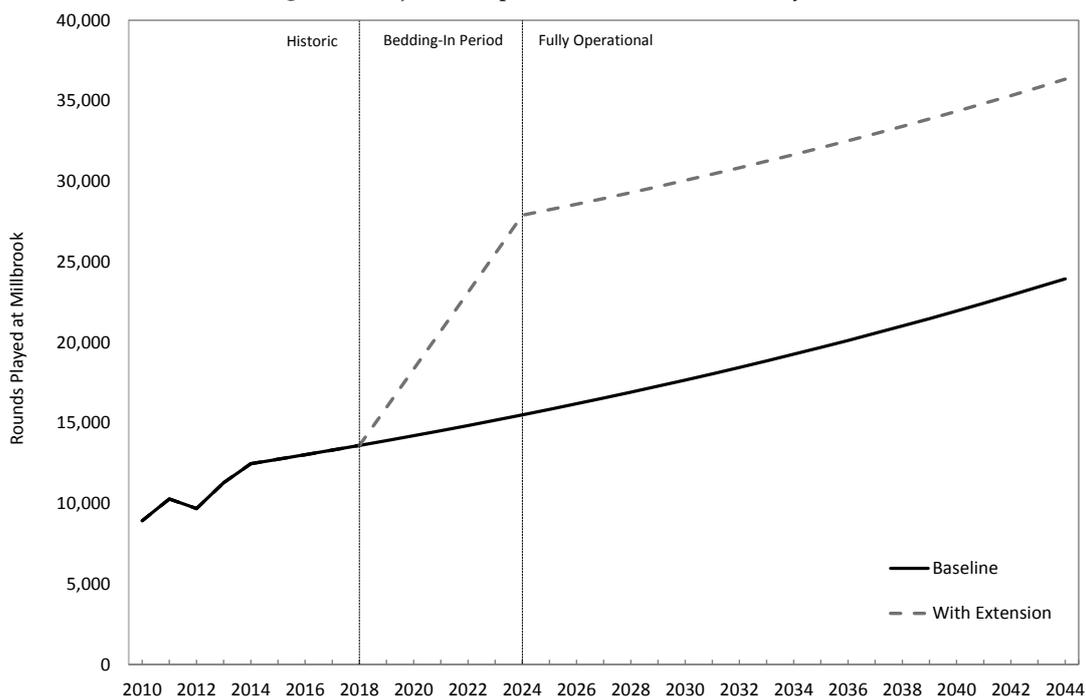
Cost Elements	Cost \$m	Shares
Land Acquisition	\$1.8	16%
Design and Plan Change Costs	\$0.5	5%
Golf Course Development	\$8.0	75%
Contingency	\$0.4	4%
Total	\$10.6	100%

Overall, course design and construction is expected to cost just over \$10 million, three-quarters of which relates to physical construction. The other major cost item is the 25% share of land acquisition costs allocated to the course, which equate to \$1.8 million when completed in parallel with residential development.

4.2 Additional Golf Rounds

As noted earlier, the addition of an extra nine holes is expected to significantly boost the number of rounds played at Millbrook and the overall rounds played within the region. The following chart shows the result, where the number of rounds is assumed to be 80% higher than the status quo in 2024, after a 5-year bedding-in period during which the popularity of the new course grows.

Figure 5: Projected Impact on Annual Rounds Played



To estimate the number of rounds expected to occur under the status quo, we assumed that they would grow at 2.2% per annum, which is four times slower than the actual rate over the last 4 years. While this may seem pessimistic, we consider it reasonable given that the course will eventually hit capacity constraints that limit further growth anyway.

Applying this growth rate to the number of rounds in 2014 produces the solid black line shown in the chart above. The dotted grey line, conversely, shows the number of rounds expected to occur with the extension.⁶

The difference between the black and dotted grey lines therefore represents the net increase in rounds generated by the extra holes for Millbrook and the region. These in turn give rise to the additional nights and expenditure that form the main focus of this section of the report.

4.3 Financial Impacts of Course as Stand-Alone Entity

Before analysing the wider impacts of the projected additional rounds, we first review the financial health of the new course as a stand-alone entity. This is shown in the table below, which calculates the NPV over a 25-year period at a discount rate of 10%. It assumes that 25% of the \$7 million land acquisition costs are attributed to the golf course under option 3, with the remainder allocated to property development

⁶ We assume that after a 5-year bedding in period the number of rounds in 2024 is 80% greater than the status quo, or an additional 12,400 rounds. Each year thereafter we assume that the number of rounds under the extension is consistently 12,400 above the status quo.

Table 7: Financial Impacts of Course Development and Operations (\$000s)⁷

Year	Land & Construction	Operating Expenses	Operating Revenues	Net Cash Flow
2014	-\$960	\$0	\$0	-\$960
2015	-\$1,100	\$0	\$0	-\$1,100
2016	-\$270	\$0	\$0	-\$270
2017	-\$2,190	\$0	\$0	-\$2,190
2018	-\$6,100	\$0	\$0	-\$6,100
2019	\$0	-\$460	\$150	-\$310
2020	\$0	-\$460	\$310	-\$150
2021	\$0	-\$460	\$460	\$0
2022	\$0	-\$460	\$620	\$160
2023	\$0	-\$460	\$770	\$310
2024	\$0	-\$460	\$920	\$460
2025	\$0	-\$460	\$920	\$460
2026	\$0	-\$460	\$920	\$460
2027	\$0	-\$460	\$920	\$460
2028	\$0	-\$460	\$920	\$460
2029	\$0	-\$460	\$920	\$460
2030	\$0	-\$460	\$920	\$460
2031	\$0	-\$460	\$920	\$460
2032	\$0	-\$460	\$920	\$460
2033	\$0	-\$460	\$920	\$460
2034	\$0	-\$460	\$920	\$460
2035	\$0	-\$460	\$920	\$460
2036	\$0	-\$460	\$920	\$460
2037	\$0	-\$460	\$920	\$460
2038	\$0	-\$460	\$920	\$460
NPV @ 10%	-\$7,270	-\$2,430	\$3,730	-\$5,970

The results above confirm the common finding that golf courses are seldom commercially viable in their own right, and are instead valued for their ability to generate on-spend for other parts of the resort.

4.4 Additional Stay Nights

The next step in the analysis was to convert the additional rounds associated with the additional holes into additional stay nights. This was done by assuming that:

- Just as in 2014, 90% of the extra rounds would be played by tourists (not locals),
- Each additional tourist would generate an extra 0.8 nights per round⁸, and
- 55% of those nights would be at Millbrook, and 45% elsewhere in the district (just as in 2014).

The following table shows the resulting increase in annual nights at 5-yearly intervals from the assumed first year of operation (2019). Following a 5-year bedding in period the additional number of visitor-nights are constant because, as explained in footnote 6,

⁷ Note that the figures in this table are constant in real terms from 2024 onward. This is due to the assumption that additional rounds are consistently 12,400 above the status quo, as in footnote 6 above.

⁸ This is conservative. The New Zealand International Golf Tourism Strategy - and also Millbrook's own OIO analysis - assumed that each round would generate 1.0 additional nights.



the additional number of rounds is assumed to be consistently 12,400 above the status quo.

Table 8: Estimated Increase in Annual Visitor Nights

Year	Spent at Millbrook	Rest of District	Total
2019	810	660	1,470
2024	4,830	3,950	8,780
2029	4,830	3,950	8,780
2034	4,830	3,950	8,780
2039	4,830	3,950	8,780
2044	4,830	3,950	8,780

Overall, the additional rounds are estimated to generate an additional 8,780 visitor nights per annum from 2024 onward.

4.5 Additional Tourist Spending

Every additional night spent in the district will give rise to additional tourist spending on a range of typical tourism products, such as food and beverages. To calculate these effects, we overlaid the projected increases in nights above with the following daily spend profile derived specifically for Millbrook players.

Table 9: Assumed Daily Spend and Millbrook Share by Place of Accommodation

Spend Category	Average Spend per Stay-Night	Staying at Millbrook		Staying Elsewhere	
		Spend at Millbrook	Spend in Rest of District	Spend at Millbrook	Spend in Rest of District
Accommodation	\$180	100%	0%	0%	100%
Food and Beverage Services	\$75	100%	0%	20%	80%
Road Transport	\$40	0%	100%	0%	100%
Fuel	\$17	0%	100%	0%	100%
Other Retail Sales	\$67	0%	100%	0%	100%
Other Tourism Products	\$33	0%	100%	0%	100%

The following table shows the resulting increases in annual tourism expenditure, again at 5-yearly intervals.

Table 10: Estimated Increase in Annual Visitor Spending (\$millions)

Year	Spent at Millbrook	Rest of District	Total
2019	\$0.3	\$0.4	\$0.6
2024	\$1.6	\$2.3	\$3.9
2029	\$1.6	\$2.3	\$3.9
2034	\$1.6	\$2.3	\$3.9
2039	\$1.6	\$2.3	\$3.9
2044	\$1.6	\$2.3	\$3.9

Our estimates suggest that the additional holes could lead to increased visitor spending of \$3.9 million per annum from 2024 onwards. Around 40% of this is expected to be



captured by Millbrook, with the remaining 60% accruing to a range of tourism-oriented district businesses, such as hotels, restaurants and bars.

The figures derived above confirm the findings of the International Golf Tourism Strategy, namely that courses do indeed act as catalysts for economic growth. While the share captured by Millbrook is higher than the average mentioned in the strategy (40% vs 25%) this is simply because Millbrook’s course is attached to a resort, enabling it to capture more than just golf-related revenues from players. Either way, our analysis shows that over half of the resulting tourist expenditure leaks out for the benefit of other businesses.

4.6 Economic Impacts

Finally, we turn our attention to the likely economic impacts associated with the construction and operation of the additional holes, including the induced increases in visitor spending. These are shown in the three tables below. As a matter of explanation:

- The first table shows the one-off impacts of course design and construction,
- The second shows the annual impacts associated with extra economic activity at Millbrook, and
- The third shows the impacts associated with additional economic activity in the rest of the district.

Table 11: One-off Impacts of Course Design and Construction (\$m)

Impacts	GDP	Employment	Hhld Incomes
Direct	\$2.4	45	\$1.3
Flow-On	\$0.8	10	\$0.3
Total	\$3.1	55	\$1.6

Table 12: Annual Impacts of Extra Activity at Millbrook (\$m)

Impacts	GDP	Employment	Hhld Incomes
Direct	\$2.2	25	\$0.8
Flow-On	\$0.3	5	\$0.2
Total	\$2.5	30	\$1.0

Table 13: Annual Impacts of Extra Activity Elsewhere in District (\$m)

Impacts	GDP	Employment	Hhld Incomes
Direct	\$1.1	35	\$0.7
Flow-On	\$0.3	5	\$0.1
Total	\$1.5	40	\$0.8

Overall, our analysis shows that the development and operation of the additional nine holes will facilitate significant and enduring economic impacts. For example, we



estimate ongoing employment for 70 people, increased household incomes of \$1.8 million and increased regional GDP of \$4.0 million.



5 Selection of Preferred Option

Having analysed the likely financial and economic impacts of each option in considerable detail, option 3 is preferred because it:

- Represents the highest and best use of the land – a prerequisite for economic efficiency in the land market.
- Enables an integrated development that will complement the resort's existing offer, thus improving its ability to attract high-yielding tourists.
- Directly supports the New Zealand International Golf Tourism Strategy, and
- Provides significant financial and economic benefits for the rest of the district.

6 Conclusions & Recommendations

This report has analysed three possible options for the newly-acquired land and found that option 3 significantly outperforms the others on financial and economic grounds.

Accordingly, we recommend that:

- Millbrook pursue option 3; and
- Council acknowledge and support option 3 in order to secure the significant district-wide benefits estimated herein.



Schedule - Resource Management Act 1991

32. Requirements for preparing and publishing evaluation reports

- (1) An evaluation report required under this Act must—
 - (a) examine the extent to which the objectives of the proposal being evaluated are the most appropriate way to achieve the purpose of this Act; and
 - (b) examine whether the provisions in the proposal are the most appropriate way to achieve the objectives by—
 - (i) identifying other reasonably practicable options for achieving the objectives; and
 - (ii) assessing the efficiency and effectiveness of the provisions in achieving the objectives; and
 - (iii) summarising the reasons for deciding on the provisions; and
 - (c) contain a level of detail that corresponds to the scale and significance of the environmental, economic, social, and cultural effects that are anticipated from the implementation of the proposal.
- (2) An assessment under subsection (1)(b)(ii) must—
 - (a) identify and assess the benefits and costs of the environmental, economic, social, and cultural effects that are anticipated from the implementation of the provisions, including the opportunities for—
 - (i) economic growth that are anticipated to be provided or reduced; and
 - (ii) employment that are anticipated to be provided or reduced; and
 - (b) if practicable, quantify the benefits and costs referred to in paragraph (a); and
 - (c) assess the risk of acting or not acting if there is uncertain or insufficient information about the subject matter of the provisions.
- (3) If the proposal (an **amending proposal**) will amend a standard, statement, regulation, plan, or change that is already proposed or that already exists (an **existing proposal**), the examination under subsection (1)(b) must relate to—
 - (a) the provisions and objectives of the amending proposal; and
 - (b) the objectives of the existing proposal to the extent that those objectives—
 - (i) are relevant to the objectives of the amending proposal; and
 - (ii) would remain if the amending proposal were to take effect.
- (4) If the proposal will impose a greater prohibition or restriction on an activity to which a national environmental standard applies than the existing prohibitions or restrictions in that standard, the evaluation report must examine whether the prohibition or restriction is justified in the circumstances of each region or district in which the prohibition or restriction would have effect.
- (5) The person who must have particular regard to the evaluation report must make the report available for public inspection—
 - (a) as soon as practicable after the proposal is made (in the case of a standard or regulation); or
 - (b) at the same time as the proposal is publicly notified.
- (6) In this section,—

objectives means,—

 - (a) for a proposal that contains or states objectives, those objectives;
 - (b) for all other proposals, the purpose of the proposal

proposal means a proposed standard, statement, regulation, plan, or change for which an evaluation report must be prepared under this Act

provisions means,—

 - (a) for a proposed plan or change, the policies, rules, or other methods that implement, or give effect to, the objectives of the proposed plan or change;
 - (b) for all other proposals, the policies or provisions of the proposal that implement, or give effect to, the objectives of the proposal.

Attachment (f)



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BUILDING A BETTER WORLD

Millbrook Resort Zone - Dagleish Farm Extension

Prepared for Millbrook Resort

February 2015

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Millbrook Resort

Millbrook Resort Zone - Dagleish Farm Extension

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Appendix 3	FS Pumping Station Point Pump Curve
Appendix 4	Letter from Otago Regional Council Containing Mill Creek Hydrological Data

1 Introduction

1.1 Purpose of Report

This engineering assessment has been prepared to support the application by Millbrook Country Club Ltd for an extension to the Millbrook Resort Zone to allow residential development of land (known as Dalgleish Farm) at the western end of Millbrook Resort.

The report addresses the feasibility of developing the Dalgleish Farm site and servicing residential development in this area. This has been based on a notional concept for the development comprising of approximately 50 residential units and 9 holes of golf.

The assessment addresses all engineering issues including road access, water supply for the properties, wastewater collection, surface water runoff and flood risk. This assessment includes the need for new services as required to service the developments in compliance with the Queenstown Lakes District Councils (QLDC) Proposed District Plan and Subdivision Standards. Infrastructure constructed for Millbrook West is generally intended to be retained in the ownership of Millbrook Infrastructure Company Ltd, a company wholly owned by Millbrook Country Club Ltd.

1.2 Background

The area of the proposed Dalgleish Farm extension to the Millbrook Resort Zone lies on the south side of Malaghans Road, immediately to the west of the existing Millbrook Resort. The area to be rezoned is approximately 66.8 hectares.

A development concept has been prepared (see Appendix 1) for this area. This concept allows for approximately 50 residential units within an area of 9 golf holes, and has been used as the basis of the assessment. However, this assessment is equally applicable to alternative developments of a similar scale.

The area of the proposed plan change is currently zoned as Rural General and is un-serviced by reticulated infrastructure. The existing house in on Dalgleish Farm is serviced by bore water and on-site sewage treatment and disposal.

Development of this land will require that new infrastructure be established.

In general, services are available at the boundary of the Dalgleish Farm area as a result of the works completed for earlier stages of Millbrook West. Infrastructure installed for previous stages of Millbrook West also caters for future stages of the Millbrook West development, and includes sufficient capacity for the proposed development of Dalgleish Farm. Development of Dalgleish Farm can be serviced by infrastructure being extended into the extended zone.

1.3 Development Size

The following table summarises the size of the established Millbrook Resort in terms of equivalent residential units, including consented stages of the Millbrook West development. These unit numbers were used in assessing the impact of Millbrook West on existing infrastructure, particularly water supply and wastewater infrastructure already serving Millbrook.

Table 1-1 : Established Millbrook Resort

Description	Unit type	Number of equivalent residential units
Residential Dwellings in the foundation resort, east of resort facilities	Hotel Villas	48
	Cottages	58
	Existing Homes (including Streamside)	45
Visitor Accommodation (equivalent residential units for water and wastewater demand)	Village Inn (51 accommodation units with no kitchen or laundry)	20
Resort Facilities (equivalent residential units for water and wastewater demand)	Hotel and resort operation (including allowance for staff)	6
	Restaurants and bars	25
	Health and Fitness Centre	9
	Spa	2
	Golf Operations	10
Millbrook West	Stage 1 Residential lots	59
	Stage 2B Residential lots	9
	Stage 2A Residential lots (consented but not constructed)	4
	Stage 3A Residential lots	20
	Stage 3B Residential lots(consented and under construction)	23
Total Existing Equivalent Lots		338

The following allowance was made for further residential units when assessing the infrastructure needs for future stages of Millbrook West.

Table 1-2 : Potential Future Development of Millbrook Resort (Millbrook West)

Description	Number of residential units
Millbrook West Stage 3C	15
Millbrook West Area A	23
Millbrook West Area D	59
Potential future development, including contingency	82
Total Estimated Equivalent Future Lots	179

These numbers of residential units are a prudent estimate of the potential infrastructure demand for the purposes of planning at this time. Only the units in the existing development and the proposed Stage 3C are confirmed numbers.

Millbrook Country Club has two agreements in place with QLDC for the supply of water and for the disposal of waste water for 5,000 day and night visitors at the Resort, without further headworks fees.

This substantially exceeds estimated potential dwelling occupants, village inn guests and day visitor numbers.

The proposed development on Dalgleish Farm is within the allowance for possible future development (82 lots) used for planning and providing services to Millbrook West. There is capacity within the infrastructure provided for Millbrook West to service the residential development proposed for Dalgleish Farm, subject to suitable extension of infrastructure.

1.4 Summary of Feasibility of Services

Servicing of the development of Dalgleish Farm is feasible as follows:

- Potable and fire fighting water supply connected to the existing Arrowtown reticulated supply via Millbrook Resort
- Irrigation water supply from the Arrow Irrigation Company
- Wastewater pumped or gravity fed to existing pump stations in Arrowtown's wastewater network, via Millbrook Resort
- Surface water drainage to Mill Creek
- Road access from Malaghan Road and Streamside Land in Millbrook West.

These means of servicing are further detailed in the relevant sections of this report.

2 Water Supply

2.1 Existing Potable Water Supply Infrastructure

There is an existing water supply for the Millbrook Resort, commissioned in 1996, from the QLDC Arrowtown public water supply reservoir. The pipeline from Arrowtown comprises approximately 2km of 225mm-diameter uPVC main direct from the Arrowtown reservoir. The main runs from the reservoir along Durham and Berkshire Streets, onto the Lake Hayes-Arrowtown Road and enters the resort via Butel Road. The main reduces to 200mm diameter at the intersection of Butel Road and Orchard Hill Road, inside the resort. Reticulation mains varying from 200mm diameter to 50mm diameter are used within the established resort to service properties and facilities there.

Millbrook West is serviced by connection from the existing 200mm diameter trunk main near to the spa at the western end of the main resort area.

2.2 Potable Water Network Capacity

Analysis of the capacity of the water supply in Millbrook Resort to service the Millbrook West development was initially done in 2006. This showed that initial stages of Millbrook West could be supplied from the existing supply without upgrade. The results of the 2006 modelling can be summarised as follows:

- The 223 lots (including equivalents) established at Millbrook Resort at the time had adequate residual peak hour pressure and Class W3 fire flow
- The modelling showed that 159 new lots of the Millbrook West development could be connected to the existing water supply network and still meet the minimum peak hour pressure of 300kPa and Class W3 fire flows, without any upgrade to the existing Millbrook Resort infrastructure.

After completion of approximately 100 lots in Stages 1 to 3A, Tonkin and Taylor Ltd (T&T) were engaged in 2013 to check the levels of service for the proposed Millbrook development. This modelling was initially carried out to determine the implications of the addition of 23 lots in Stage 3B to the existing Millbrook West Development. Findings of the modelling are recorded in their report entitled *Results of water modelling for Millbrook Resort, Arrowtown, dated 11th October 2013, T&T reference 51557.005* (included in Appendix 2). Their report takes into account the entire 294 lot proposed Millbrook West development, including contingencies and potential future development not already part of the Millbrook West concept. This effectively includes capacity sufficient for the proposed development of Dalglish Farm.

The following modelling acceptance criteria were adopted:

- Pressure during the Peak Hour Demand period is $\geq 300\text{kPa}$ to meet Queenstown Lakes District Council (QLDC) amendments and modifications to NZS 4404:2004
- Class FW2 fire flow is available to meet the New Zealand Fire Service Fire Fighting Water Supplies Code of Practice, SNZ PAS 4509:2008 for non-sprinkled structures for housing, including single family dwellings, multi-unit dwellings, but excludes multi-storey apartment blocks as contained in table 1 of the code.

The demand for the entire Millbrook West development was added into the network analysis model for Arrowtown. T&T calculated this demand as 294 lots with 3 people per lot using 700 litres each day. The demand criterion for the reticulation during modelling was the following based on QLDC's amendments and modifications to NZS 4404:2004:

- Peak Hour Flow = $6.6 \times \text{Average Daily Flow (ADF)}$ to meet the 300kPa minimum pressure at peak hour flow
- Peak Day Demand = $3.3 \times \text{ADF}$, to meet Class FW2 fire flow and 100kPa minimum residual pressure at the hydrant.

The demand condition used for the reticulation during fire flow modelling is 3.3 x ADF which equates to the peak daily flow. Fire flow requirements are in accordance with the New Zealand Fire Service Fire Fighting Water Supplies Code of Practice, SNZ PAS 4509:2008.

The T&T modelling shows that upgrades are required to the Millbrook Resort water reticulation network to meet fire flow requirements and the QLDC's requirement for minimum pressures being $\geq 300\text{kPa}$ within the proposed Stage 3B development and subsequent stages. Pressure levels of service will otherwise not be met within Stage 3B, and any dwellings above 425m at location JP-2b.

A number of potential upgrades were proposed in the report, of which Millbrook Resort chose to utilise a booster pump station to raise the levels of service to the accepted standard. This booster pump station is to be located at node JP-1 on the T&T model, adjacent to the Millbrook Spa.

2.3 Water Supply to Dalgleish Farm

Millbrook again engaged T&T to undertake the modelling to determine the operating points for the booster pump station adjacent to the Millbrook Spa and the design philosophy for the network to enable the design levels of service to be met within the full potential Millbrook West Development, including Dalgleish Farm. Their report is appended and entitled *Water supply modelling for booster station design for Millbrook Resort, Arrowtown, dated 27th May 2014 T&T reference 51557.005*.

The ground elevations to which water would be supplied within Dalgleish Farm is significantly higher and more distant than the area of the existing Millbrook Resort Zone. Initial analysis for the proposed booster pump adjacent to Millbrook Spa showed that the head to which the pump station would need to operate to also service the Dalgleish Farm would be significantly increased, and would breach the permitted QLDC maximum pressure of 900kPa. Therefore, if Dalgleish Farm is developed in the future to the west of Millbrook's existing boundaries then a second booster pump station will be required so that QLDC's maximum allowable water network pressure of 900kPa is not breached.

The second booster pump station would likely be nominally located at JP-5b2, in the vicinity the lower areas of Dalgleish Farm. Modelling has included the flows required to all areas on the suction side of the proposed second pump station in that vicinity to meet the required levels of service.

Design is being completed for the booster pump station adjacent to the Millbrook Spa. The operating and duty points for this pump station includes providing sufficient flows beyond the Millbrook boundaries and Millbrook Resort Zone, but supplying sufficient pressures only to the elevation of the proposed location of any second booster pump station.

A second pump station will then be required to service Dalgleish Farm if that is developed for housing.

2.4 Potable Water Distribution

There are three feasible options for potable and fire fighting water supply within the Dalgleish Farm:

1. Booster pump station at the lower level of Dalgleish Farm, supplying piped reticulation mains to the residential areas, including 100mm or 150mm diameter primary fire fighting mains and 50mm diameter rider mains
2. A lift pump station at the lower level of Dalgleish Farm, supplying a high level reservoir that in turn supplies piped reticulation mains to the residential areas, including 100mm or 150mm diameter primary fire fighting mains and 50mm diameter rider mains
3. A lift pump station at the lower level of Dalgleish Farm, supplying on-site storage reservoirs for residential lots that carry storage for fire fighting use and for domestic use.

It is anticipated that the Option 1 for a supply pressurised by a booster pump station would be adopted to best suit the development proposed.

2.5 Non-potable Water Supply for Irrigation

Millbrook Resort is able to obtain irrigation water from the Arrow Irrigation Scheme under water rights in place to supply 558million litres of water per annum (based on a right to 62 hectares of water, 900mm deep).

Current demand for irrigation water is 120million litres per annum to irrigate the resort and 27 holes of golf. There is therefore adequate additional supply of irrigation water to irrigate the new 9-hole golf course and landscaped open spaces on Dalgleish Farm. The Arrow Irrigation Scheme crosses Dalgleish Farm and new irrigation systems can be constructed to distribute water to the new development.

2.6 Conclusion

In conclusion, housing development on Dalgleish Farm will be able to be serviced for water supply from the existing network in Millbrook following completion of the upgrade to the existing supply with a booster pump station serving Millbrook West and a second pump serving Dalgleish Farm.

3 Wastewater Collection and Disposal

3.1 Overview

The Millbrook development has a network of collection sewers that drain to a pumping station located near to the former 18th green (now called the Arrow #9 green) and the Millbrook Village. Sewage is pumped from here via a 150mm diameter rising main that discharges to a QLDC sewer in Lake Hayes Road near to the southern boundary of Millbrook.

The existing pumping station was intended at the time of its design to cater for the full potential development of Millbrook, with allowance for 5000 day and night visitors. The pumping station was constructed with a blanked inlet connection under the 18th fairway for extension to the Millbrook West area.

Assessment of the feasibility of servicing Dalgleish Farm for wastewater is therefore based on:

- The capacity of the existing pumping system and the need for any upgrade
- The extension of piped reticulation into the Dalgleish Farm area.

3.2 Estimated Wastewater Generation

The wastewater volume that will be generated from a residential development is usually estimated based on an assumed 2.5 people per dwelling and generation of 250 litres of wastewater per person per day. In new residential subdivisions such as Millbrook with a new sewer network constructed with modern materials, infiltration is usually very small so that there is very little increase in wastewater flow as a result of wet weather. It would therefore be expected that the average volume of wastewater that would be generated by the completed Millbrook West development (including contingency) of 294 lots would be about 184m³/d.

However, Queenstown Lakes District Council specifies the following design parameters for residential subdivisions in the district:

- An occupancy of 3.5 persons
- A sewage generation of 300L/person/day
- A dry weather diurnal peak flow factor of 2.5
- A dilution/infiltration factor of 2 for wet weather.

Based on these parameters the Average Daily Flow (ADF) of wastewater generated by the completed Millbrook West development (including contingency) of 294 lots would be about 309m³/d – or 3.6 l/s. In wet weather during peak flow periods, the flow will peak at 64m³/hour, or 18 l/s.

Accordingly, allowance is made for daily peaks and potential infiltration in the detailed design of the sewerage system (pumps, sewers, wet wells and rising main design). Below are tables which have figures for the ADF and Peak Wet Weather Flow (PWWF) for the existing development, and for future stages of Millbrook West.

Table 3-1 : Millbrook Resort Foul Water Flow to Pump Station

Area	Lot Equivalent	ADF (cum/day)	Wet Weather Peak Flow (l/s)
Current Committed Development Proposals:			
Foundation Resort + Millbrook West Stage 1 + Stage 2 + Stage 3A + Stage 3B + Stage 3C	353	370	21.5
Future Development:			
Foundation Resort + Full Millbrook West Development	435	454	26.3
Foundation Resort + Full Millbrook West Development + Contingency	517	542	31

The wastewater generated by the full resort development when complete is up to 26.3 l/s in peak periods during wet weather as shown in Table 3-1 above.

3.3 Existing Wastewater Pumping System

The existing wastewater pumping station at Millbrook Village consists of two pumps in a duty/standby arrangement. The pumps are ABS Model AFP1001M220/4-42 rated at 25kW at 2800rpm. The data for the wastewater system flow is in Table 3-2 below:

Table 3-2 : Pump Station Data

Name	Data
Rising Main diameter	150mm
Rising main length	1284m
Gravity main diameter	150mm
Gravity Main length	170m
Gravity Main Grade	1/30
Static Head	14m
Friction Head (at design flow of 28 l/s)	16.5m
Total Head	30.5m

The capacity of the pumps has been calculated from the manufacturers pump curves. A duty point and system curve is attached as Appendix 3 for the above data. It shows that the two pumps can pump a flow of 28 l/s as a maximum flow for the present system in a duty-assist arrangement.

The 28 l/s pump capacity is well in excess of the flow of 21.5 l/s from the existing committed development. It is adequate for a flow in excess of that from the entire future Millbrook West development flow of 26.3 l/s. However, the existing pumps may need to be upgraded if all development proceeds as allowed for, including all potential future development and contingency. Such an upgrade is feasible, and may include changes to pump controls and additional storage if needed.

The capacity of the gravity main at the outlet of the rising main (running full) from Wallingford Charts is 43 l/s and as such does not need to be upgraded.

3.4 Wastewater Reticulation to Dalgleish Farm

Sufficient additional capacity has been provided in the pipe network in Millbrook West to convey wastewater flows from Dalgleish Farm to the pump station at Millbrook Village. As part of that network, a pump station is currently being designed adjacent to the Millbrook West Stage 3B area that is currently under construction. This pump station can also serve future Millbrook West development further to the west and it will include additional capacity that can provide for Dalgleish Farm.

All areas of the Dalgleish Farm development are not able to drain by gravity sewer to the existing reticulation constructed as part of earlier stages of Millbrook West. A second pump station will be required at the lower levels of Dalgleish Farm to lift sewage from those areas to the pump station near Stage 3B.

Higher areas of Dalgleish Farm are able to drain by gravity sewer to the existing reticulation in Millbrook West or to the additional pump station in the lower area of Dalgleish Farm, as best suits the final layout of any development.

A network of gravity pipes can be provided to collect wastewater from all properties in the Dalgleish development. The actual layout and design details would be set to the requirements of later detailed design. Pipe sizes will be 150mm diameter. The rolling profile of the topography of Dalgleish Farm means that there may be some local low-points within a development there that may require additional pump stations to supplement this gravity network.

Alternative sewer systems are also feasible and may be appropriate depending on the final development proposals. This could include pressure sewer systems, where a small pump station on each property discharges to small diameter pumping mains.

3.5 Conclusion

The proposed housing developed on Dalgleish Farm will be able to be serviced for wastewater disposal using gravity and pumped systems discharging to the reticulation network in Millbrook West. Upgrade of the pumps in the existing wastewater pumping station at Millbrook Village may be needed in the future if all development within Millbrook Resort Zone proceeds as proposed.

4 Drainage and Flood Mitigation

4.1 Surface Water Drainage Overview

The Dalgleish Farm site lies on an east-west aligned valley and ridge comprising three main parts:

- On the northern portion, lower level areas of Mill Creek and adjacent floodplain and alluvial fans, with low to moderate gradient slopes
- On the southern portion, an elevated irregular platform approximately 75-100m above Mill Creek, with moderately sloping ridge and ephemeral stream features
- Areas of steeper slopes occur on the valley flanks between these two parts.

The majority of the site drains to Mill Creek. The exception is a very small area on the southern boundary of the property that lies at the head of south-facing slopes.

The area of Dalgleish Farm is approximately 67 hectares and the area of Millbrook West is 90 hectares. The area of the Mill Creek catchment at Millbrook Village is approximately 2550 hectares.

A comprehensive concept for stormwater management has been developed as part of Millbrook West. Surface water drainage from Dalgleish Farm can be managed in accordance with that concept. This comprises a pipe and surface channel system to collect and drain water from the development that as far as possible follows the existing overland drainage patterns. The drainage system is overland as much as possible. This approach makes best use of the natural features of the site, as well as providing means to limit peak runoff and to treat potential contaminants in the stormwater runoff. The main components of the Millbrook West drainage patterns are as follows:

- Drainage of roads to surface swales. These swales are to be drained by sumps and pipe connections to surface water channels, or directly to those surface water channels if possible
- Access lanes to lots and courtyard areas adjacent to houses are drained to kerb and channel or swales and to sumps, with pipe connections to surface water channels
- Building platforms are provided with a connection to a piped collection system. Pipelines will discharge to surface water channels
- Drainage is to the ephemeral gullies that drain through the golf course areas to ultimately discharge to Mill Creek. Some soakage to ground will occur in swales.

These systems for drainage patterns and stormwater management, discharges of stormwater are expected to comply with the requirements for a Permitted Activity under the *Regional Plan – Water* and therefore consents from Otago Regional Council for stormwater discharges are not likely to be required.

4.2 Potential Increase in Peak Runoff

The development of roads and residential areas will have a potential increase in stormwater runoff as a result of a decrease of site permeability if no other controls were in place. However, the use of surface drainage swales, landscaping and stormwater ponds, and in channel controls will mitigate the increase in peak flows.

A small area of Dalgleish Farm drains towards the south to neighbouring pasture. Runoff from roofs and developed areas here can either be directed northwards to the stormwater systems on the balance of the Farm that drain to Mill Creek, or to detention areas prior to discharge to the south.

The 67 hectares of the Dalgleish Farm area is approximately 2.6% of the total catchment of 2550 hectares for Mill Creek at Millbrook, but the area of development for roads and housing is less than 0.5% of the Mill Creek catchment. Any potential increase in peak discharge to Mill Creek will be minimal because the upstream catchment runoffs are far greater and peak flows from the developed area are mitigated by the on-site stormwater controls.

The potential effects on flood risk downstream on surrounding land or in Mill Creek are therefore minimal.

4.3 Stormwater Quality

The stormwater system can incorporate provisions to trap potential contaminants prior to discharge to Mill Creek. This can be based on:

- Swale drains and overland flowpaths as the primary means of stormwater collection and conveyance of road areas
- Small local wetlands and ponding areas as part of the landscaping along the main overland flow paths
- Landscaping ponds in the golf course
- Sumps in courtyard areas at entrances to garages and residences.

There are no areas of high risk as a source of major contamination within the proposed development.

4.4 Flood Risk

The majority of proposed building sites are located in areas in the southern part of Dalgleish Farm that are elevated on slopes above overland flow paths, and are outside any area of potential flood risk.

Approximately 6 building lots are proposed in areas of potential flood risk on the south side of Mill Creek. Building platforms in these locations may need to be constructed so that they are elevated slightly to be above peak flood levels. The creek in this vicinity has low banks (in comparison to other reaches downstream in Millbrook Resort); some improvement of the channel profile would therefore also assist in reducing the potential for flooding of adjacent areas. The proposed development plan includes adequate areas as golf course or open space that are available to ensure normal and peak flows can be safely passed outside the areas proposed for residential use. This is described further in Section 4.5.

The nature of any works in Mill Creek and the adjacent flood plain would be similar to those already undertaken as part of the Millbrook West area, and it is therefore expected that construction works of a similar type could be undertaken with minimal environmental impact.

Two ephemeral stream paths terminate in alluvial fans on the right bank of Mill Creek in the vicinity of proposed building sites. To mitigate flood risk to the adjacent building sites, it will be necessary to provide a defined channel for these ephemeral flows and ensure that the building platforms are elevated above peak flows.

4.5 Mill Creek Catchment

The Mill Creek catchment takes in the southern slopes of the mountain range that includes Coronet Peak and the upper part of the downlands between Arrowtown and the Shotover River. The catchment above the Millbrook Resort site includes the steep tussock covered and forested slopes of the Coronet Peak range. The steep upper slopes drain to a relatively flat valley containing Mill Creek where land is predominantly used for farming.

It is not expected that the runoff characteristics of the catchment will change significantly over the next 50 years. The District Plan of Queenstown Lakes District Council sees current land uses in the area essentially maintained.

4.5.1 Hydrological Records

The hydrological data for this report is based on reports by others, which use statistical analysis and interpretation of 12 years of data from the Otago Regional Council (ORC), for the local ORC water level recording station (WLR). These records are at the WLR site downstream of Millbrook, which is commonly referred to as the 'fishtrap'. These records are contained in Appendix 4 in the form of a letter from the ORC. The part of the Mill Creek catchment contributing to Mill Creek at the Millbrook Resort site is 71% of the total 'fishtrap' catchment.

4.5.2 Flood Return Period Estimates

The flood flows for the respective return periods provided by the ORC have been adjusted for the catchment area contributing to the Millbrook Resort site and are presented in Table 4.1 below. The area downstream of the Millbrook West development, developed as part of Millbrook Resort (known as the Village Inn Waterway, built to Water Permit (WP) No 3804) and the realignment of Mill Creek, and new bridges and culverts in Millbrook West immediately to the east of Dalglish Farm have all been designed to accommodate these flows.

Table 4-1: Mill Creek Hydrological Data Adjusted for the Millbrook Resort Site

Dry Weather Flows	Magnitude (cum/s)
100 year ARI flow	6.6
50 year ARI flow	5.9
2 year ARI flow	2.5

Notes

1. Flow at site = 0.71 x Flow at the WLR site (fishtrap)
2. Appendix 4 contains data for the WLR site (fishtrap)

4.5.3 Functional Requirements for Mill Creek Waterway

The realigned channel of Mill Creek adjacent to the Coronet Nine 6th Hole, immediately to the east of Dalglish Farm, was designed to accommodate the 100-year ARI design storm flow of 6.6 cum/sec at an average grade of 1 in 600. This required an average 'wetted' channel cross section of 4.9 square metres. In a very basic form this equates to a channel of 6m width and 1.7m depth (including freeboard) as shown in the following figure.

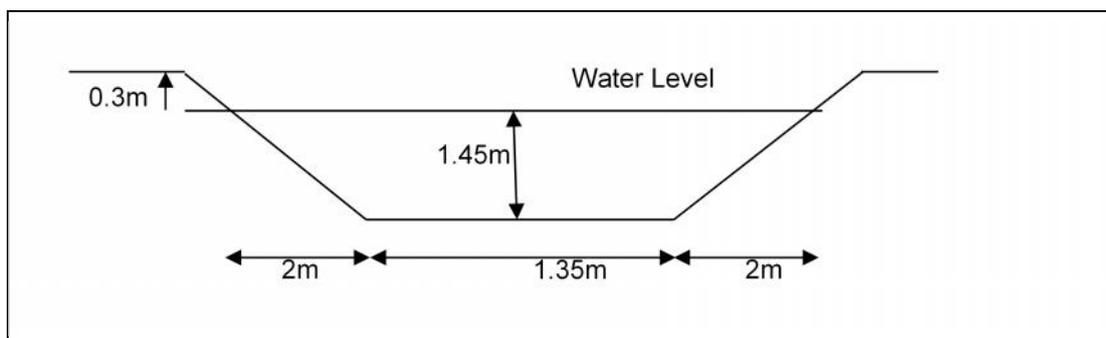


Figure 4.1: Basic Channel geometry required to flow 100 year ARI design storm at 1/600 grade

The channel itself is not exactly trapezoidal as shown, as its geometry has been formed to be more that of a natural waterway and to vary along the alignment. A similar channel can be ensured in Dalglish Farm.

4.6 Conclusion

Satisfactory stormwater drainage for the proposed Dalgleish Farm development is feasible. Similar stormwater management approaches to those already adopted for Millbrook West are suitable for adoption on this site.

There are potential flood risks in areas adjacent to Mill Creek. These are able to be mitigated by design of appropriate design of building platform locations and levels, stream channels and flood channels. Final concepts will need to be determined in detailed design.

5 Roads

5.1 Access Roads in Dalgleish Farm

Access to the site is available from roads in Millbrook West.

The main road to the high level sites on the southern part of Dalgleish Farm is proposed to follow an existing farm track. The gradients on this track are suitable for permanent road access, and a road in accordance with QLDC standards can be constructed on this route.

The road alignment proposed to the western-most part of the proposed development crosses a steep sided gully. A suitable road can be constructed here as an embankment fill, with an embankment height of the order of 7-10metres as necessary to match adjacent final ground levels.

5.2 Site Entrance from Malaghan Road

Access is proposed from a new road off Streamside Lane which has an entrance off Malaghan Road at the western end of the existing Millbrook development. The intersection at Malaghan Road has been designed and constructed in accordance with Diagram 4 of Appendix 7 of the Operative District Plan. This design is also applicable as access for Dalgleish Farm as well as the remainder of Millbrook West.

Sight distances have been measured at the entrance location. Measured sight distances are as follows:

- To the west (Queenstown) – 500metres
- To the east (Arrowtown) – 405metres.

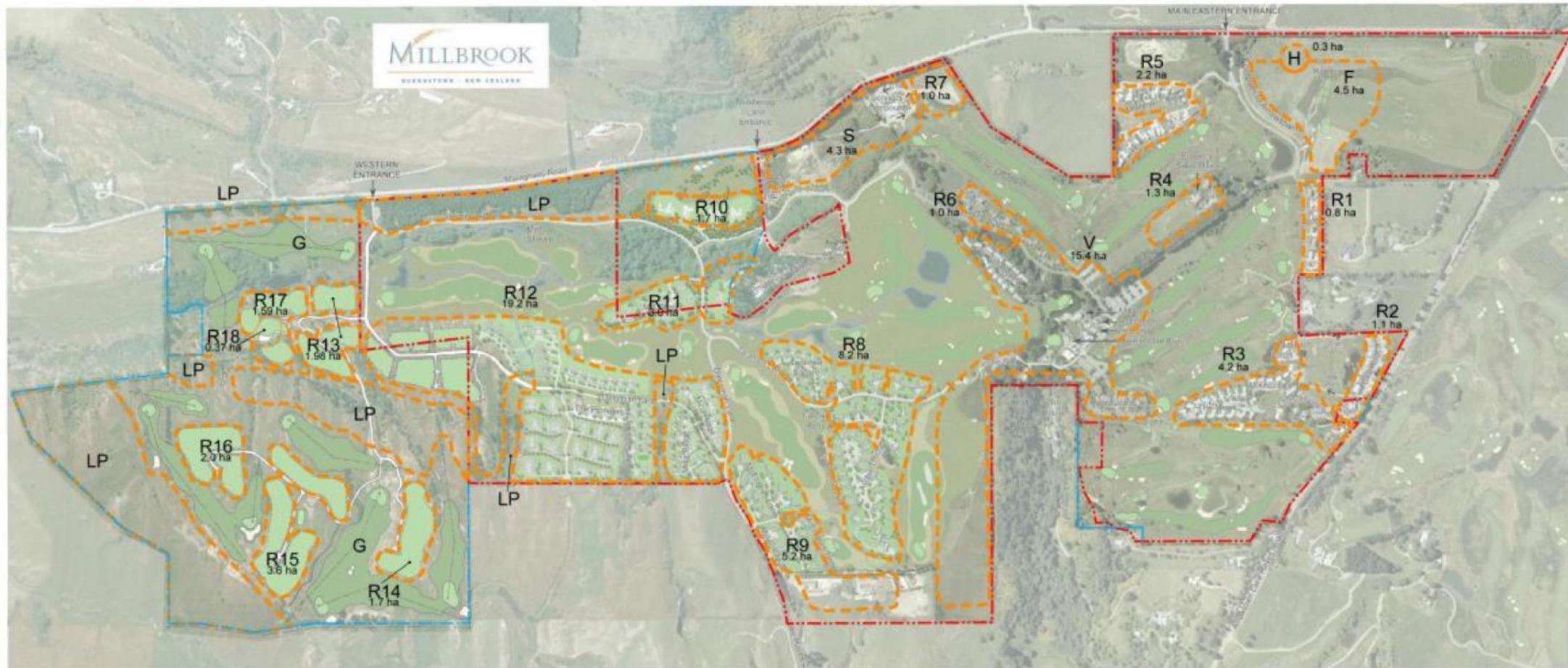
The requirements for sight distances set out in the Operative District Plan are therefore achieved.

6 Liquefaction Risk

QLDC hazards register records indicate that there are some areas of Dalgleish Farm that fall within a zone of “Probably Low Risk” for liquefaction hazard in a seismic event (Liquefaction Category LIC 1 (P)). Site investigations are required to confirm whether this is the case.

Investigation of the potential for liquefaction, and subsequent design against this risk is a relatively straightforward process. Should site investigations confirm that a risk of liquefaction exists, then that risk can be engineered out with some certainty. This is a site-specific design issue, where the precise locations for the proposed dwellings, size of the structures and nature of the foundations all play a factor in the choice of associated remedial and foundation options. This potential for liquefaction must be addressed at building consent stage.

Appendix 1 Dalgleish Farm – Proposed Structure Plan



LEGEND:
 R : Residential
 V : Village
 F : Recreational Facilities
 S : Resort Services
 G : Golf Course and Open Space
 H : Helpad
 LP : Landscape Protection

Activity Boundary Proposed
 Zone Boundary
 Zone Boundary Changes
 R18 Boundary

MILLBROOK RESORT ZONE - PROPOSED STRUCTURE PLAN

REFERENCE 2423-SK32 - SCALE = 1:5000 AT A1 - 1:10000 AT A3 - 23 Feb 2015

\\user\01\p161\2423 - millbrook_msc\cadd\2423\2423_4032 - millbrook_msc\cadd - proposed structure plan\shg - 3032



Appendix 2 Tonkin & Taylor Water Supply Modelling Reports

**Tonkin & Taylor****Fax**

To:	MWH New Zealand Ltd	Your fax no:	03 477 0616
Attention:	James Cramer Roberts	T&T job no:	50620.078
From:	Simon Rodwell	Reply fax no:	03 353 4401
Page:	1 of 8	Date:	01 Sep 2006
Subject:	Water Modelling for proposed 294 lots, Millbrook Resort, (Land to the West Dev.)		

James, following the email we received from you, 22 August 2006, and in accordance with your request and our conditions of engagement, we have completed the water supply modelling with regard to checking residual pressures and availability of Class W3 fire flow at the proposed 294 Lot Land to the West Development, Millbrook Resort, Arrowtown.

The objective of the work was to carry out a preliminary pipe size design such that:

- Pressure during the Peak Hour Demand period is at least 300 kPa.
- Class W3 fire flow is available to meet the required Queenstown Lakes District Council standards.

Methodology

We have added the demand of the development into the Watercad network analysis model for Arrowtown 2006 and 2026, last updated February 2006. This was calculated by Tonkin & Taylor as 294 lots with 3 people per lot using 700 litres each a day. The average daily demand was allocated to nodes as set out in your Millbrook Potable Water Supply Lot Diagram, which we have attached to this report. The existing number of lots or lot equivalents is around 223 giving a fully developed Millbrook Resort with around 517 lots.

The resulting Average Daily Flows (ADF) of 294 lots is 7.15 l/s was calculated and applied to the model.

The model was run for four scenarios:

- A). Existing Millbrook Resort with 223 Lot equivalents, existing water pipes (ADF of 5.42 l/s).
- B). Up to Node 4b, 382 lots for Millbrook Resort without trunk main or booster pump upgrades.
- C). Proposed Millbrook Resort with 517 Lot equivalents, no upgrades (ADF of 12.57 l/s).
- D). Proposed Millbrook Resort with 517 Lots, possible trunk main upgrades (ADF of 12.57 l/s).

The demand criterion for the Queenstown reticulation during modelling was: 6.6 x Average Daily Flow (ADF) to meet the 300 kPa minimum pressure and 3.3 x ADF, to meet Class W3 fire flow and 100 kPa minimum residual pressure at the hydrant.

Tonkin & Taylor Ltd - Environmental & Engineering Consultants, 151 Kilmore St, Christchurch, New Zealand
PO Box 13-055, Christchurch, Ph: 64-3-353 4400, Fax: 64-3-353 4401, Email: chch@tonkin.co.nz, Website: www.tonkin.co.nz

All the information contained in this message is confidential, intended only for the above named recipient(s). If you are not the intended recipient(s), you may not use any material in this message or pass it on to others. Please notify us promptly if you have received this message in error. Please telephone the person at the number above and destroy the original message. Thank you.

T&T job no: 50620.078

2

The demand condition used for the Queenstown reticulation during fire flow modelling is 3.3 x ADF which equates to the peak daily flow. Fire flow requirements are in accordance with the New Zealand Fire Service Fire Fighting Water Supplies Code of Practice, SNZ PAS 4509:2003.

Results

The results are shown below in Tables 1 & 2 and in the figures attached to this document.

Summary of figures:

i. Figures 1 & 2 – Site location plan

Revision 0

Sep 06

Table 1 – Availability of Peak Hour Pressure s				
Scenario Peak Hour Demand:	A) Existing 223 Lot Equivalent Residual Pressure (kPa)	B) 382 Lots - up to Node JP 4b - no upgrades. Residual Pressure (kPa)	C) Proposed 517 Lots - no upgrades Residual Pressure (kPa)	D) Proposed 517 Lots - trunk main upgrade. Residual Pressure (kPa)
Node J-71	598 > 300 OK	579 > 300 OK	400 > 300	579 > 300
Node J-74	510 > 300 OK	491 > 300 OK	312 > 300	491 > 300
Node J-105	454 > 300 OK	435 > 300 OK	256 needs booster	435 > 300
Node J-107	455 > 300 OK	435 > 300 OK	257 needs booster	435 > 300
Node J-108	454 > 300 OK	435 > 300 OK	256 needs booster	435 > 300
Node J-109	592 > 300 OK	541 > 300 OK	251 needs booster	541 > 300
Node J-110	635 > 300 OK	589 > 300 OK	324 > 300	589 > 300
Node J-114	615 > 300 OK	558 > 300 OK	293 needs booster	558 > 300
Node J-115	614 > 300 OK	557 > 300 OK	293 needs booster	557 > 300
Node J-116	615 > 300 OK	569 > 300 OK	304 > 300	569 > 300
Node J-117	558 > 300 OK	507 > 300 OK	217 needs booster	507 > 300
Node J-118	614 > 300 OK	557 > 300 OK	293 needs booster	557 > 300
Node J-980	616 > 300 OK	571 > 300 OK	310 > 300	571 > 300
Node JP-1	NA	493 > 300 OK	203 needs booster	493 > 300
Node JP-1a	NA	410 > 300 OK	119 needs booster	410 > 300
Node JP-1b	NA	337 > 300 OK	46 needs booster	337 > 300
Node JP-2	NA	453 > 300 OK	186 needs booster	476 > 300
Node JP-2a	NA	329 > 300 OK	61 needs booster	352 > 300
Node JP-2b	NA	309 > 300 OK	41 needs booster	331 > 300
Node JP-3	NA	420 > 300 OK	152 needs booster	442 > 300
Node JP-4	NA	383 > 300 OK	115 needs booster	405 > 300
Node JP-4a	NA	378 > 300 OK	111 needs booster	401 > 300
Node JP-4b	NA	397 > 300 OK	130 needs booster	420 > 300
Node JP-5	NA	NA	-2 needs booster	288 needs booster
Node JP-5a	NA	NA	58 needs booster	348 > 300
Node JP-5b	NA	NA	-35 needs booster	254 needs booster
Node JP-5c	NA	NA	-166 needs booster	123 needs booster
Node JP-5d	NA	NA	-50 needs booster	239 needs booster
Node JP-6	NA	NA	-68 needs booster	222 needs booster

Refer to Figures 1 & 2 for node locations.

T&T job no: 50620.078

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Scenario Peak Day Demand:	A) Existing 223 Lot Equivalents Residual Pressure (kPa)	B) 382 Lots - up to Node JP 4b - no upgrades. Residual Pressure (kPa)	C) Proposed 517 Lots - no upgrades Residual Pressure (kPa)	D) Proposed 517 Lots - trunk main upgrade. Residual Pressure (kPa)
Node JP-1	NA	377 > 100	321 > 100	529 > 100
Node JP-1a	NA	219 > 100	200 > 100	418 > 100
Node JP-1b	NA	10 needs loop	-50 needs loop	166 > 100
Node JP-2	NA	338 > 100	264 > 100	472 > 100
Node JP-2a	NA	40 needs loop	-32 needs loop	175 > 100
Node JP-2b	NA	-50 needs loop	-172 needs loop	75 needs loop
Node JP-3	NA	301 > 100	308 > 100	416 > 100
Node JP-4	NA	254 > 100	135 > 100	343 > 100
Node JP-4a	NA	153 > 100	34 needs booster	242 > 100
Node JP-4b	NA	101 > 100	-63 needs booster	151 > 100
Node JP-5	NA	NA	-25 needs booster	226 > 100
Node JP-5a	NA	NA	8 needs booster	216 > 100
Node JP-5b	NA	NA	-370 needs booster	-162 needs booster
Node JP-5c	NA	NA	-628 needs booster	-420 needs booster
Node JP-5d	NA	NA	-542 needs booster	-334 needs booster
Node JP-6	NA	NA	-304 needs booster	-97 needs booster

Refer to Figure 1 for node locations.

A) The existing 223 lot equivalents at Millbrook resort have adequate residual peak hour pressure and Class W3 fire flow.

B) The modelling shows that the first 159 lots of the Land to the West development i.e. up to Node JP-4b could be connected to the existing water supply network and meet the minimum peak hour pressure of 300 kPa. However, to provide Class W3 fire flow to Nodes JP-1b, JP-2a and JP-2b an additional 100mm pipe is required between Nodes JP-1b and JP-2b

C) The results from the model indicate that the existing water supply network to Millbrook from Arrowtown can not provide sufficient peak hour pressure or Class W3 fire flow for the additional 294 lots proposed as part of the Land to the West development without upgrades. The extra peak hour flow demanded in a fully developed Land to the West will result in peak hour pressures dropping below 300 kPa effectively from Node J-71 onwards. A booster pump placed before Node J-71 could be designed to provide sufficient pressure during peak hour flows and fire flow to the proposed 517 lots.

D.) The modelling indicates that as an alternative to a booster pump at Node J-71 a trunk main upgrade from the Arrowtown Reservoir to Node J-109 comprising a 200mm diameter pipe and a booster pump at Node JP-5 would also provide adequate peak hour pressures and Class W3 fire flow.

Please note that the model is a numerical representation of the physical reality, and subsequently bears some uncertainty. The determination of demands and peaking factors involved assumptions regarding the patterns of water use in the township, and are an approximation of the physical reality.

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TONKIN & TAYLOR LTD CHCH

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T&T job no: 50620.078

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We hope this answers your questions, if you wish to discuss these results please feel welcome to contact Simon Rodwell on 03 353 4400.

Yours faithfully,

TONKIN & TAYLOR LTD

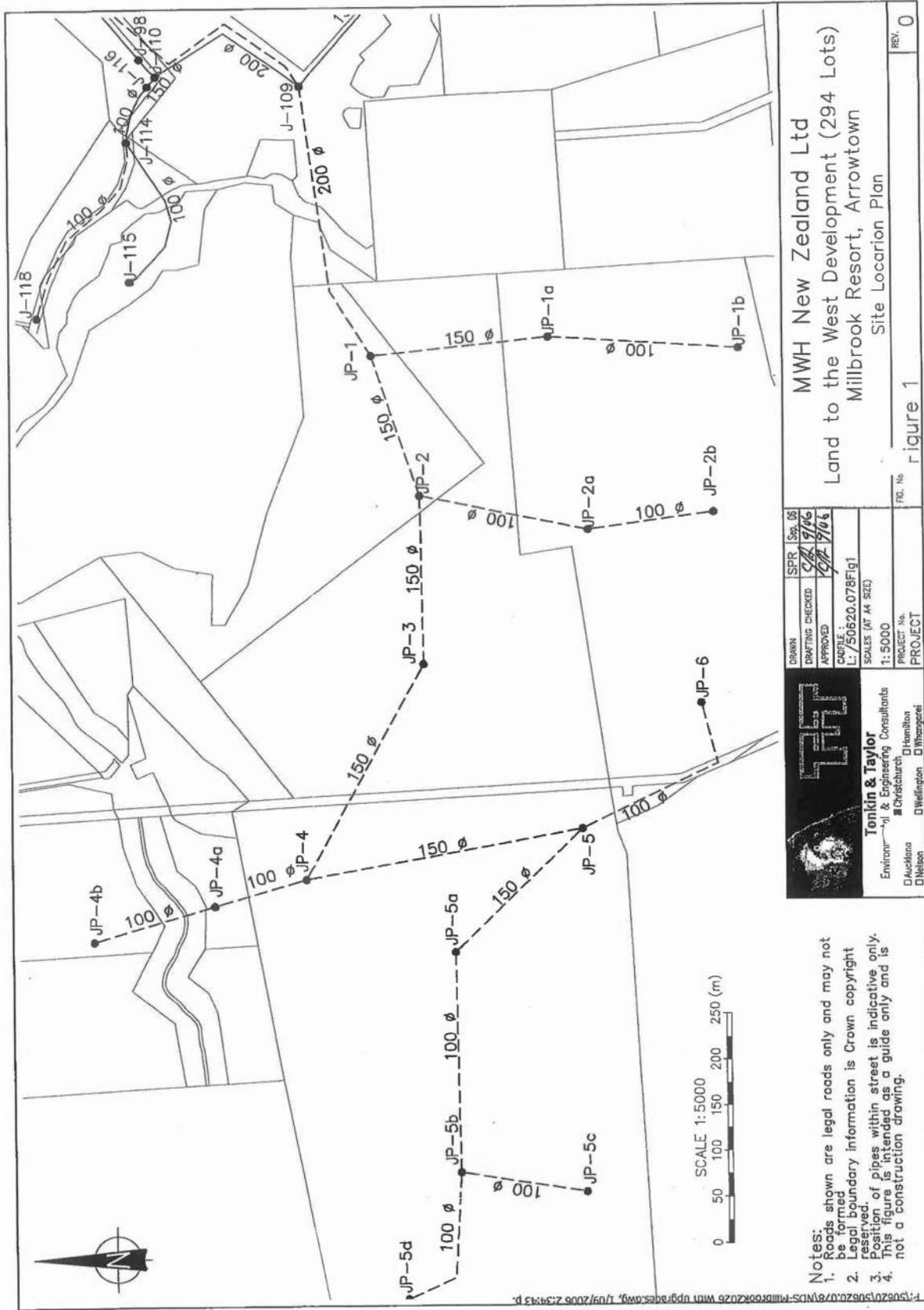


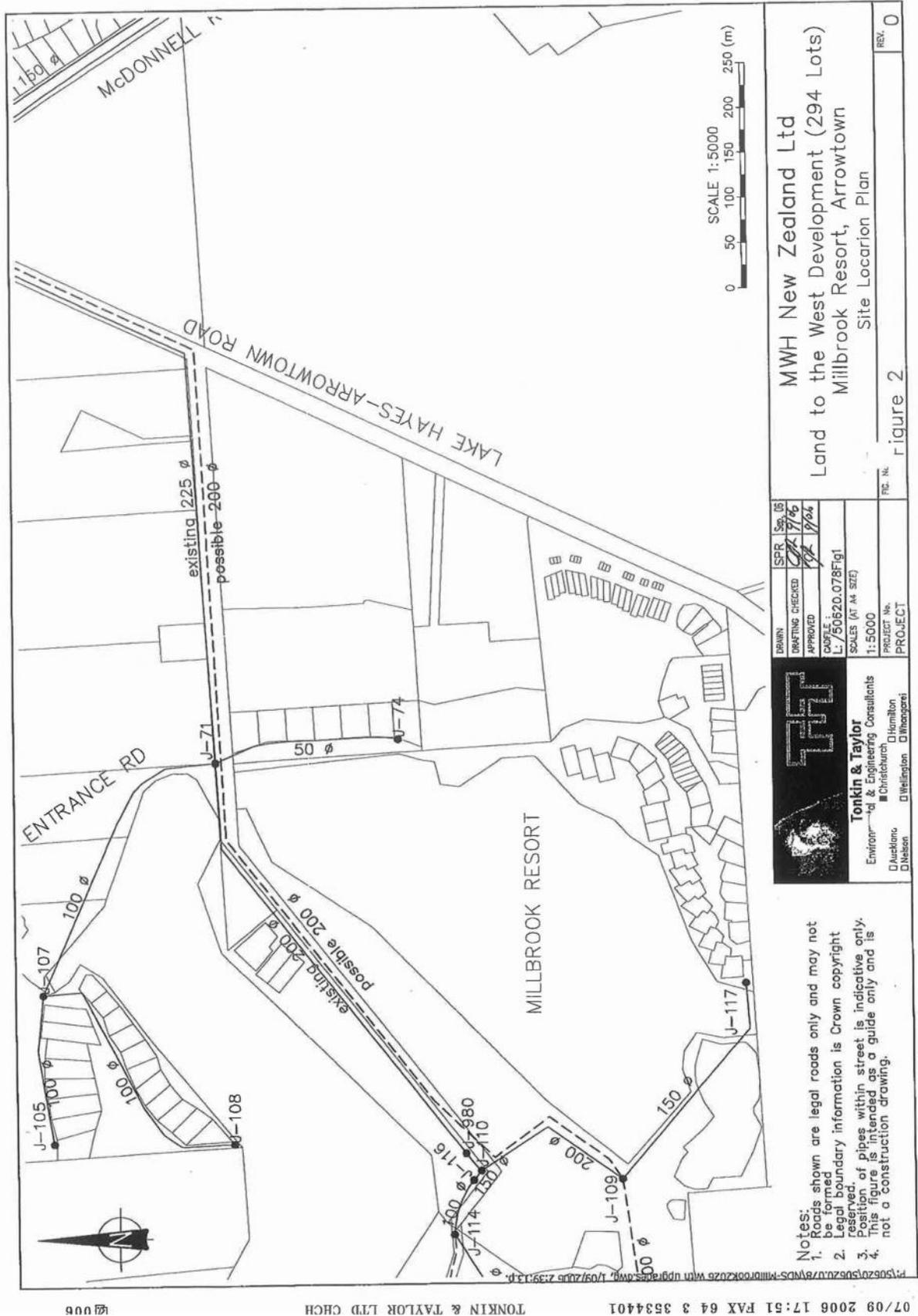
Grant Lovell

CHRISTCHURCH GROUP MANAGER

07 September 2006 P:\50617\50617.005\ap1-atrosmi\do-water\ch-fax2.doc

Tonkin & Taylor Ltd – Environmental & Engineering Consultants





T&T Ref: 51557.005
11 October 2013Millbrook Country Club Ltd.
c/- MWH New Zealand Ltd
265 Princes Street
Dunedin 9054

Attention: Peter White

Dear Peter

Results of water modelling for Millbrook Resort, Arrowtown

Following your email received 24 September, and in accordance with your request and our conditions of engagement, we have run our Arrowtown water supply model to check the levels of service for the proposed development at Millbrook Resort, Arrowtown. This work was performed for Millbrook Country Club Ltd as our client.

Modelling was initially carried out to check the implications of the addition 23 lots in Section 3B to the existing development, without the installation of the recommended upgrades outlined in the Water Modelling for proposed 294 lots, Millbrook Resort, (Land to the West Dev.), September 2006 report. Advice on the required reticulation in order to achieve levels of service within the development with the additional 20 lots in Stage 3B, and how the development should be further progressed on the basis of reticulation is outlined in the report below.

Modelling proceeded on the basis of the existing 315 lots in the proposed development, as detailed in the drawings provided by you (email dated 19/08/2013). The Arrowtown network around the development is shown in Figure 1, attached.



Tonkin & Taylor Ltd - Environmental and Engineering Consultants, 105 Carlton Gore Rd, Newmarket, Auckland, New Zealand
PO Box 5271, Wellesley St, Auckland 1141, Ph: 64-9-355 6000, Fax: 64-9-307 0265, Email: auck@tonkin.co.nz, Website: www.tonkin.co.nz

Modelling methodology

The modelled demand scenarios used to determine levels of service for the Arrowtown water supply network were

- **Peak day demand** - To determine whether available fire flows meet fire fighting requirements¹, and
- **Peak hour demand** - To determine whether minimum residual pressures at each connection are ≥ 300 kPa²

Demands

The average daily flow (ADF) demand was calculated assuming an average population of 3 people per residential dwelling and an average daily water consumption of i.e. 700 litres per person per day, as per Queenstown Lakes District Council requirements as per the 2006 report. Development demands during the peak day and peak hour demand scenarios were calculated as follows

- Peak day flow (PDF) = 3.3 x ADF
- Peak hour flow (PHF) = 6.6 x ADF

Table 1 Design demands for Arrowtown development

Development	Number of dwellings	Average daily flow (ADF)		Peak day flow (PDF)		Peak hour flow (PHF)	
		m ³ /day	l/sec	m ³ /day	l/sec	m ³ /hour	l/sec
Existing	223	467	5.4	1550	17.9	128.8	35.8
	92	190	2.2	640	7.4	53.1	14.8
Stage 3B	23	52	0.6	164	1.9	13.3	3.7
Remaining Development	179	376	4.3	1244	14.4	103	28.7

We have added the demand of the existing 315 and proposed 23 lots in Stage 3B into our Mike Urban PDF EPS network analysis model for Arrowtown, last updated December 2011. Demands were entered into the model at the nodes shown in Figure 2, attached. Demands for the Arrowtown network outside of Millbrook Resort development are taken from 2010-2011 SCADA data.

Modelling results

Stage 3B

Modelling results are presented in Table 1 below. Note that these results relate to the Millbrook Resort development alone with 2011 demands, and do not include demands from other proposed developments within Arrowtown modelled by Tonkin & Taylor.

¹ Fire flow requirements are in accordance with SNZ PAS 4509:2008, "New Zealand Fire Service Fire Fighting Water Supplies Code of Practice".

² The minimum residual pressure requirement is as set out in Queenstown Lakes District Council Amendments and Modifications (2005) to NZS 4404:2004, "Land Development and Subdivision Engineering".

Table 1 Minimum pressures and fire flow availability

Nodes assessed	Residual pressure (kPa) ⁽¹⁾		Fire flow available (l/sec) ⁽²⁾	
	Without upgrades	With proposed 200mm trunk main upgrade	Without upgrades	With proposed 200mm trunk main upgrade
JP-1	490 ≥ 300 OK	530 ≥ 300 OK	52.0 ≥ 25 OK	65.0 ≥ 25 OK
JP-2	485 ≥ 300 OK	520 ≥ 300 OK	45.8 ≥ 25 OK	57.2 ≥ 25 OK
JP-2a	355 ≥ 300 OK	395 ≥ 300 OK	34.8 ≥ 25 OK	43.8 ≥ 25 OK
JP-2b	300 ≥ 300 OK	330 ≥ 300 OK	23.8 ≥ 25 OK	29.1 ≥ 25 OK
JP-3	480 ≥ 300 OK	520 ≥ 300 OK	43.3 ≥ 25 OK	53.1 ≥ 25 OK
JP-4	460 ≥ 300 OK	500 ≥ 300 OK	39.9 ≥ 25 OK	48.4 ≥ 25 OK
JP-4a	485 ≥ 300 OK	525 ≥ 300 OK	36.5 ≥ 25 OK	44.0 ≥ 25 OK
JP-4b	490 ≥ 300 OK	530 ≥ 300 OK	37.2 ≥ 25 OK	43.7 ≥ 25 OK
JP-5	350 ≥ 300 OK	390 ≥ 300 OK	32.2 ≥ 25 OK	39.2 ≥ 25 OK
JP-5a	330 ≥ 300 OK	370 ≥ 300 OK	27.3 ≥ 25 OK	33.3 ≥ 25 OK
JP-5b	290 ≤ 300 NOT OK	330 ≥ 300 OK	16.7 ≥ 12.5 OK	19.4 ≥ 12.5 OK
JP-5c	130 ≤ 300 NOT OK	170 ≤ 300 NOT OK	7.9 ≤ 12.5 NOT OK	10.4 ≤ 12.5 NOT OK
JP-5d	265 ≤ 300 NOT OK	305 ≥ 300 OK	13.6 ≥ 12.5 OK	15.7 ≥ 12.5 OK
JP-6	315 ≥ 300 OK	355 ≥ 300 OK	26.8 ≥ 25 OK	32.5 ≥ 25 OK

(1) A minimum residual peak hour pressure of 300 kPa is required as per QLDC amendments to NZS 4404:2004.

(2) A total of 25 l/sec is required from within 270 m of each non-sprinklered, residential dwelling for Class FW2 fire fighting as per SNZ PAS 4509:2008.

(3) A minimum of 12.5 l/sec is required from each hydrant as per SNZ PAS 4509:2008.

Without upgrades

Without any of the upgrades outlined in the 2006 report (booster pump at J-71 or trunk main upgrade and booster station at JP-5), modelling shows that during the 2011 design peak hour demand scenario, the residual pressures in the development will be at least 130 kPa. Hence, the Queenstown Lakes District Council (QLDC) requirement for minimum pressures being ≥ 300 kPa is not met within the proposed development. Pressure levels of service will not be met within Stage 3B, and any dwellings above 425m at location JP-2b

Modelling also shows that a minimum of Class FW2 fire flow cannot be achieved at Stage 3B during the 2011 design peak day demand scenario, as required for FW3 development. Throughout the remainder of the development however, the standard is achieved. All remaining hydrants can deliver at least 12.5 l/sec within 135 m of the proposed lots, with the remaining 12.5 l/sec available from within 270 m (total of 25 l/sec as required for FW2 firefighting).

With proposed trunk main upgrade

With the installation of an additional 200mm trunk main, modelling shows that during the 2011 design peak hour demand scenario, the residual pressures in the development will be at least 170 kPa. Hence, the Queenstown Lakes District Council (QLDC) requirement for minimum pressures being ≥ 300 kPa is not met within the proposed development. Pressure levels of service will not be met within Stage 3B. The addition of the proposed trunk main will increase the pressures within Millbrook Resort by around 40 kPa.

Modelling also shows that a minimum of Class FW2 fire flow cannot be achieved at Stage 3B during the 2011 design peak day demand scenario, as required for FW3 development. Throughout the remainder of the development however, the standard is achieved. All remaining hydrants can deliver at least 12.5 l/sec within 135 m of the proposed lots, with the remaining 12.5 l/sec available from within 270 m (total of 25 l/sec as required for FW2 firefighting).

Required reticulation upgrades

Addition of Stage 3B to the existing reticulation within Millbrook Resort will not cause levels of service within the remainder of Millbrook Resort to drop below council standards, as shown in table 1 above. However, due to the elevation of lots in Stage 3B, upgrades will be required in order for levels of service to be met within this section of the development. The Arrowtown reservoirs are at an elevation of 458mRL, with the highest platform of Stage 3B at 442mRL, resulting in a static pressure of less than 300 kPa.

Levels of service in Stage 3B can be met with the installation of a localised booster pump at node JP-5, provided the pump operates continually. We strongly recommend that an additional booster pump be installed for redundancy. Alternatively, a duplicate pump could be installed at the existing Arrowtown Booster Pump Station. However, this would require pressurisation of the entire Arrowtown network. Consideration of future development within Millbrook Resort will need to be considered in conjunction with development of stage 3B when determining the appropriate upgrade.

Further development

With installation of the 23 lots in stage 3B, the current reticulation layout in the western area of Millbrook Resort will be at capacity. In Table 1 it can be seen that at JP-2b, pressure levels of service will just be met when Stage 3B is carried out. Any development further to Stage 3B in Millbrook Resort will cause levels of service to be insufficient at this point, and further upgrades to the network would be required in order for levels of service to be met.

The 2006 report outlines potential options to allow for adequate levels of service within the development. A booster pump placed before J-71 could be designed to provide sufficient pressure to the development. This will require the booster station to operate continuously in order to achieve levels of service to Stage 3B. It is recommended that an additional booster pump would also be installed for redundancy.

Installation of a booster station at J-71 and JP-5 would allow for the booster station at J-71 to operate during peak hour flows only. As outlined above, levels of service in Stage 3B can be met with the installation of a localised booster pump at node JP-5, provided the pump operates continually. It is recommended that an additional booster pump would also be installed at each location for redundancy.

As outlined above, a duplicate pump could be installed at the existing Arrowtown Booster Pump Station. However, this would require pressurisation of the entire Arrowtown network.

Modelling indicates that an alternative to a booster pump at J-71 a trunk main upgrade from the Arrowtown reservoir to J-109 comprising a 200mm diameter pipe and a booster pump at JP-5 would provide adequate levels of service. Installation of the booster pump would be required before development of Stage 3B goes ahead, with the installation of the duplicate trunk main required for and further development past this point.

The appropriate upgrade will depend on any future plans for development within the area and should be discussed with QLDC.

Discussion

Modelling has been carried out on the basis of the design demands for the existing 223 lots in the eastern section of the development. However, 2011 flow data indicates that the full design demand in the area is currently not being utilised.

In order to achieve levels of service to the development with the addition of stage 3B, and further development, the three existing booster pumps located at the Arrowtown Pump Station are required to operate, as outlined in the Operating Manual³. This is on the basis that the full design demand is being used.

The modelling carried out incorporates the Millbrook Resort development alone with 2011 design demands, and did not include demands from other proposed developments within the Arrowtown network. As outlined in the Effects of the Arrowtown South Development report, April 2010⁴, with addition of further developments to the Arrowtown network, upgrades to the existing booster station, borefields and reservoirs may be required in order to achieve levels of service throughout the township.

³ Arrowtown Operating Manual, Duffill Watts & King Ltd, supplied to T&T by Tony Francis, 24 June 2008

⁴ Results of water supply modelling for Arrowtown South development – Effects of development connection on future network capacity, prepared for MWH Dunedin, 28 April 2010

Applicability and Closure

The model is a numerical representation of the physical reality, and subsequently bears some uncertainty. The demands and peaking factors used are based on assumptions regarding the patterns of water use in the township, and are an approximation of the physical reality. Hence, actual demands within the network may differ from those modelled.

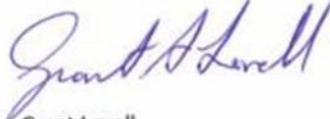
This report has been prepared for the benefit of Millbrook Country Club Ltd with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.

In addition, the modelling results presented in this report show the available levels of service for the current Arrowtown network, based on the 2011 demands, and are not a guarantee of available levels of service in the future.

We trust this modelling report meets your requirements. Please contact Janelle Cowley (jcowley@tonkin.co.nz) on 03 363 2450 if you wish to discuss these results or any other aspect of this modelling report.

Yours sincerely,

TONKIN & TAYLOR LTD



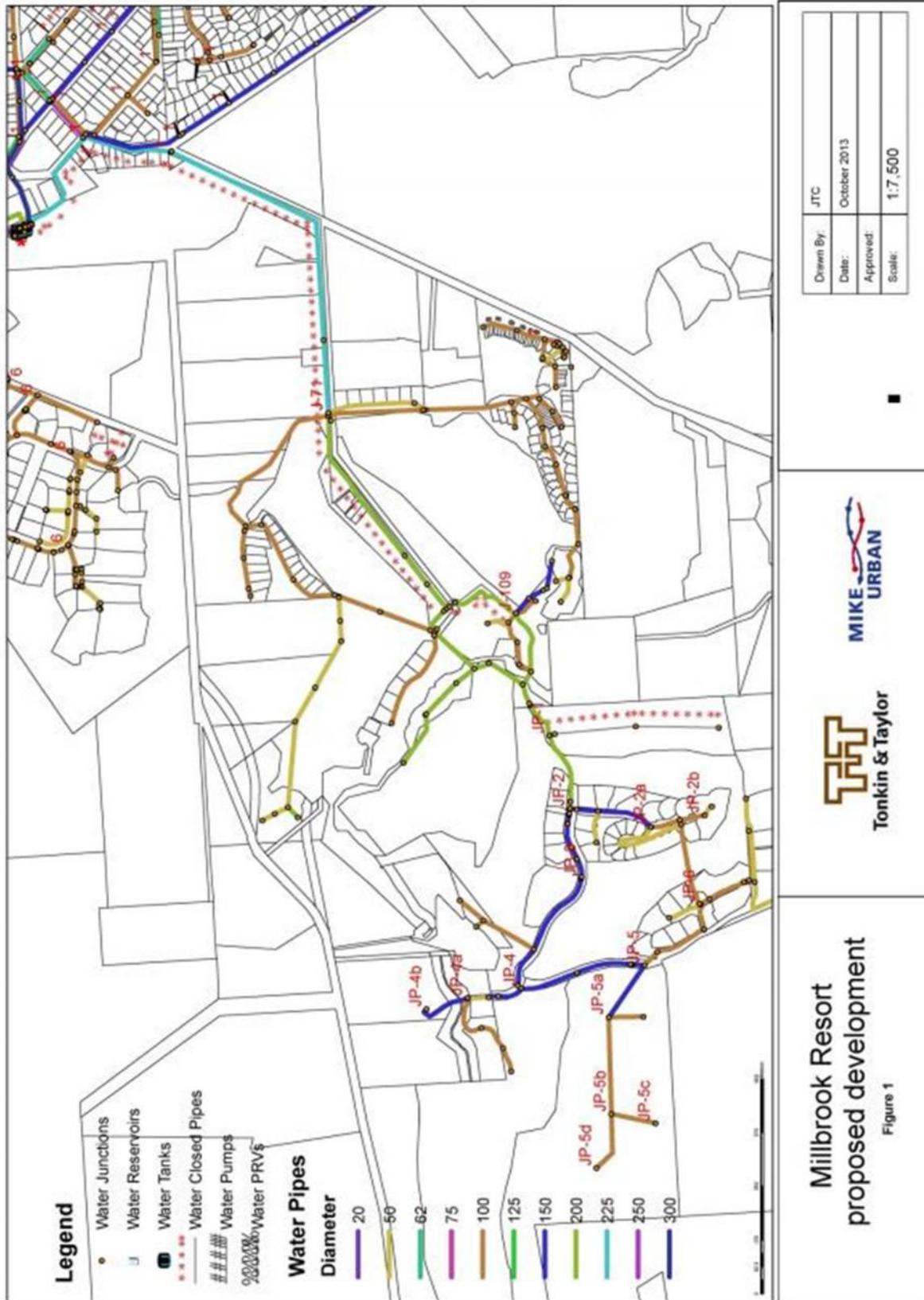
Grant Lovell
CHRISTCURCH GROUP MANAGER

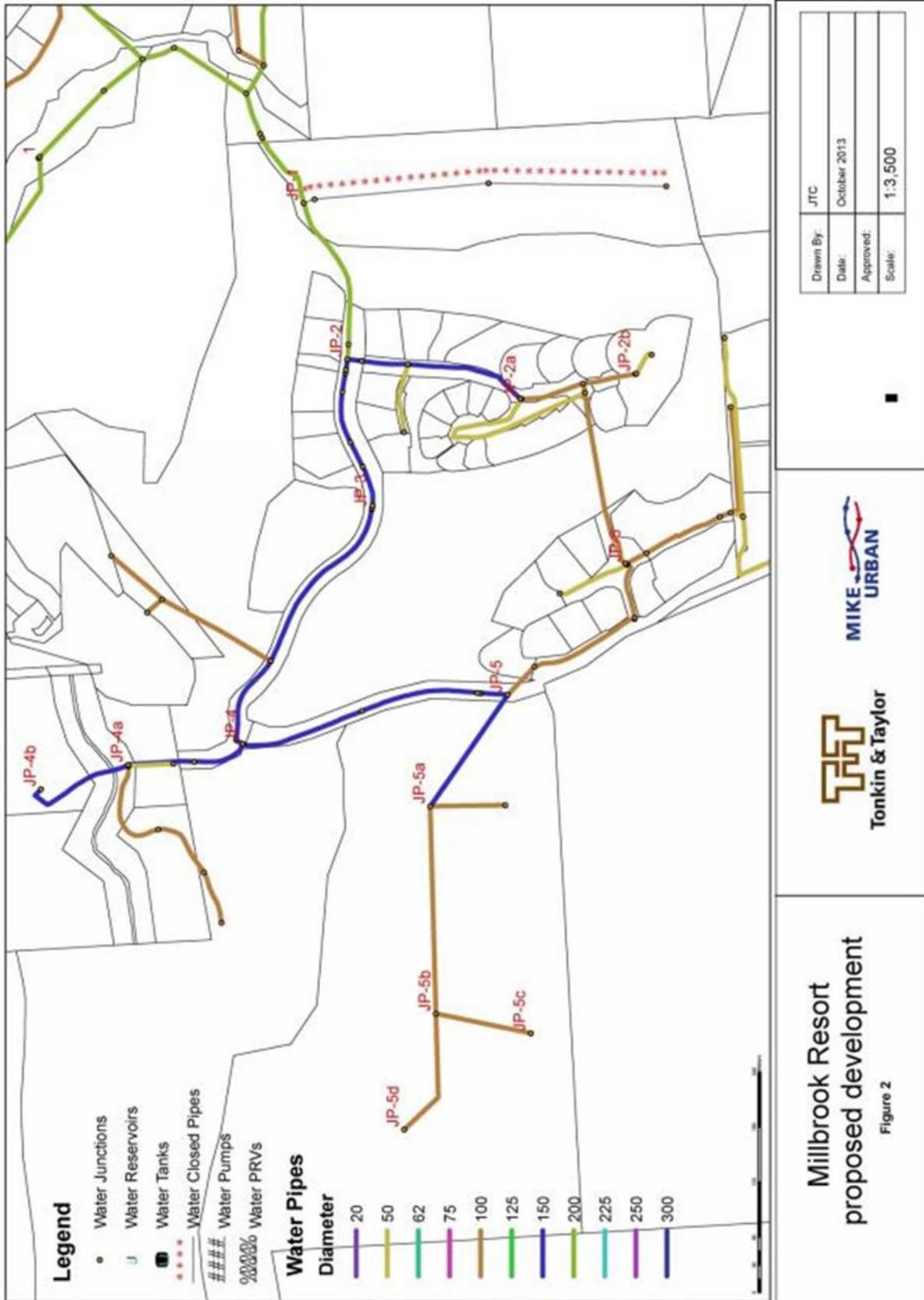
Report prepared by:
Janelle Cowley
CIVIL ENGINEER

Attachments:

- **Figure 1**
- **Figure 2**

11-Oct-13
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T&T Ref: 51557.005
03 October 2014Millbrook Country Club Ltd
Millbrook Resort
Malaghans Road
Arrowtown

Copy to: Peter White, MWH New Zealand Ltd

Attention: Stu Andersen

Dear Stu

Water supply modelling for booster station design for Millbrook Resort, Arrowtown

1 Introduction

As per our letter of engagement dated 12 September 2014, and in accordance with your request, we have undertaken modelling to determine the required network infrastructure to allow for levels of service to be met within the proposed development at Millbrook Resort, Arrowtown. This work was performed for Millbrook Country Club Ltd as our Client.

This modelling is further to the modelling carried out in the report '*Water supply modelling for booster station design for Millbrook Resort, Arrowtown*', dated 27 May 2014, T&T Ref. 51557.005, and should be read in conjunction with this report.

2 Modelling outline

The purpose of this modelling was to determine the required duty points to allow for Millbrook Resort development:

- i. To meet fire fighting requirements¹; and
- ii. To have a minimum residual pressures at each connection of ≥ 300 kPa² during the design peak hour demand scenario.

To assist in the development of the Millbrook booster station we have determine the required booster pump station duty points for the two scenarios below:

¹ Fire flow requirements are in accordance with SNZ PAS 4509:2008, "*New Zealand Fire Service Fire Fighting Water Supplies Code of Practice*".

² The minimum residual pressure requirement is as set out in Queenstown Lakes District Council Amendments and Modifications (2005) to NZS 4404:2004, "*Land Development and Subdivision Engineering*".



Tonkin & Taylor Ltd - Environmental and Engineering Consultants, 33 Parkhouse Rd, Wigram, Christchurch, New Zealand
PO Box 13-055, Christchurch, Ph: 64-3-363 2440, Fax: 64-3-363 2441, Email: chch@tonkin.co.nz, Website: www.tonkin.co.nz

- Millbrook West development up to and including Stage 3 F, and
- Full Millbrook West development (advised horizon of 2018).

3 Initial investigation

Modelling was initially requested to determine the duty points required to service the entire Millbrook Resort west, including the dwellings located on the Macauley land, from a booster station located at JP-1. Initial investigations indicated that with that arrangement QLDC levels of service would not be met.

The proposed booster station located at JP-1 is located at an elevation of approximately 400 mRL. The inclusion of the Macauley land brings the highest platform that the booster station is require to service up to between 465 mRL and 478 mRL. This requires a static discharge pressure from a booster station at JP-1 of approximately 94-107 m to allow for levels of service to be met, hence, pressures on the discharge side of the booster station will be above 900 kPa.

Two booster stations will be required to Service Millbrook West. Millbrook Resort advised³ that the booster stations are to be located at JP-1 (Pump station 1), to service up to and including Stage 4, and an additional booster station (Pump Station 2), as outlined in Appendix A, Figure 2, to service the dwellings located on the Macauley land.

Modelling was carried out for design of the Pump Station 1 only, and further modelling is required in order to determine the duty points required for Pump Station 2.

4 Methodology and demands

The methodology and demands used in this analysis are as per our previously carried out report (*Water supply modelling for booster station design for Millbrook Resort, Arrowtown*, dated 27 May 2014, T&T Ref. 51557.005). However, demand distribution had differed, with the inclusion of the Macauley land causing demand location to expand further west.

The modelled demand scenarios used to determine the required duty points of the booster station pumps were

- Peak day demand - **To determine whether available fire flows meet firefighting requirements⁴; and**
- Peak hour demand - **To determine whether minimum residual pressures at each connection are ≥ 300 kPa⁵.**

As per the October 2013 report, modelling took into consideration the design demand of the existing 315 currently developed lots, and also the remaining 202 lots, bringing the development to a total of 517 lots. The respective design demands are outlined in Table 1 below.

³ Email between Grant Klyuts (MWH) and Janelle Cowley (T&T), dated 25 September 2014

⁴ Fire flow requirements are in accordance with SNZ PAS 4509:2008, "New Zealand Fire Service Fire Fighting Water Supplies Code of Practice"

⁵ The minimum residual pressure requirement is as set out in Queenstown Lakes District Council Amendments and Modifications (2005) to NZS 4404:2004, "Land Development and Subdivision Engineering".

Table 1: Design demands for Millbrook Resort development Booster Station located at JP-1

Development	Number of dwellings	Average daily flow (ADF)		Peak day flow (PDF)		Peak hour flow (PHF)	
		m ³ /day	l/sec	m ³ /day	l/sec	m ³ /hour	l/sec
Existing east of booster station	223	467	5.4	1550	17.9	128.8	35.8
Existing west of booster station	92	193	2.2	638	7.4	53	14.8
Remaining up to Stage 3F ⁽¹⁾	74	155	1.8	513	5.9	43	11.9
Remaining Development	128	269	3.1	887	10.3	74	20.5

4.1 Pressure

4.1.1 Duty Points

Modelling has been based on achieving a minimum of 300 kPa within the area serviced by Pump Station 1. The required duty points for the booster station are outlined in Table 2 below.

Table 2: Duty points

Development ⁽¹⁾	Head	Flow	Suction Pressure	Outlet Pressure
	m	l/s	m	m
PD Demand up to Stage 3F	19.3	26.6	57.2	76.5
Final Design PD Demands	37.3	47.2	46.2	83.5

(1) Existing 2011 PD demands for all of the Arrowtown network, and design demands of Millbrook Resort (all 517 lots)

4.2 Fire flow

The required duty point to produce FW2 within the area serviced by Pump station 1 is outlined in Table 3 below.

Table 3: Firefighting duty points

Development ⁽¹⁾	Head	Flow	Suction Pressure	Outlet Pressure
	m	l/s	m	m
PD Demand up to Stage 3F	10.1	38.3	58.9	69
Final Design PD Demands	21.6	48.6	53.9	75.5

(1) Existing 2011 PD demands for all of the Arrowtown network, and design demands of Millbrook Resort (all 517 lots)

5 Levels of service

Pressures and fireflow have been evaluated for the dwellings up to Stage 3F and also full development. The sections located in the Macauley land have not been assessed and further modelling is required to confirm levels of service at these locations. Minimum pressures outlined below are based on the booster station operating at the model duty point outlined in the above tables.

Pressure:

Modelling results are presented in Table 4 below. Modelling indicates that during the 2011 design peak hour demand scenario, the residual pressures in the development will be at least 300 kPa. Hence, the Queenstown Lakes District Council (QLDC) requirement for minimum pressures being ≥ 300 kPa is not within the proposed development with the use of a booster station.

Table 4: Minimum pressure

Nodes assessed	Residual pressure (kPa) ⁽¹⁾	
	Development up to Stage 3F	Full development
JP-1	690 \geq 300 OK	750 \geq 300 OK
JP-1a	630 \geq 300 OK	690 \geq 300 OK
JP-1b	570 \geq 300 OK	630 \geq 300 OK
JP-2	580 \geq 300 OK	730 \geq 300 OK
JP-2a	550 \geq 300 OK	600 \geq 300 OK
JP-2b	490 \geq 300 OK	530 \geq 300 OK
JP-3	670 \geq 300 OK	720 \geq 300 OK
JP-4	640 \geq 300 OK	670 \geq 300 OK
JP-4a	670 \geq 300 OK	700 \geq 300 OK
JP-4b	670 \geq 300 OK	700 \geq 300 OK
JP-5	520 \geq 300 OK	550 \geq 300 OK
JP-5a	500 \geq 300 OK	510 \geq 300 OK
JP-5b	460 \geq 300 OK	460 \geq 300 OK
JP-5b2	510 \geq 300 OK	300 \geq 300 OK
JP-5c	300 \geq 300 OK	300 \geq 300 OK
JP-5c2		500 \geq 300 OK
JP-5d	530 \geq 300 OK	430 \geq 300 OK
JP-5d2	360 \geq 300 OK	370 \geq 300 OK
JP-6	490 \geq 300 OK	520 \geq 300 OK
JPM-1		320 \geq 300 OK

(1) A minimum residual peak hour pressure of 300 kPa is required as per QLDC amendments to NZS 4404:2004.

(2) A total of 25 l/sec is required from within 270 m of each non-sprinklered, residential dwelling for Class FW2 firefighting as per SNZ PAS 4509:2008.

Fireflow:

Modelling has also shown that Class FW2 (25 l/sec) fire flow can be produced to all sections within the development. The determined duty point will allow for the minimum 25 l/s to be met at the highest platform level in Stage 3B.

6 Low flows

The booster station should be designed to provide low flows to the development. The flow duration curve for the period June 2008 to May 2011 is shown in Figure 1, Appendix B. Flow data indicates that there is a wide range of flows within the development throughout the year, with approximately 20 m³/hr being exceeded 10 percent of the time. The 95 percentile flow is approximately 10 m³/hr and the booster station needs to be designed to accommodate this.

7 Applicability

The model is a numerical representation of the physical reality, and subsequently bears some uncertainty. The demands and peaking factors used are based on assumptions regarding the patterns of water use in the township, and are an approximation of the physical reality. Hence, actual demands within the network may differ from those modelled.

This report has been prepared for the benefit of Millbrook Country Club Ltd with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.

In addition, the modelling results presented in this report show the available levels of service for the current Arrowtown network, based on the 2011 demands, and are not a guarantee of available levels of service in the future.

We trust this modelling report meets your requirements. Please contact Janelle Cowley (jcowley@tonkin.co.nz) on 03 363 2450 if you wish to discuss these results or any other aspect of this modelling report.

Yours sincerely,

TONKIN & TAYLOR LTD

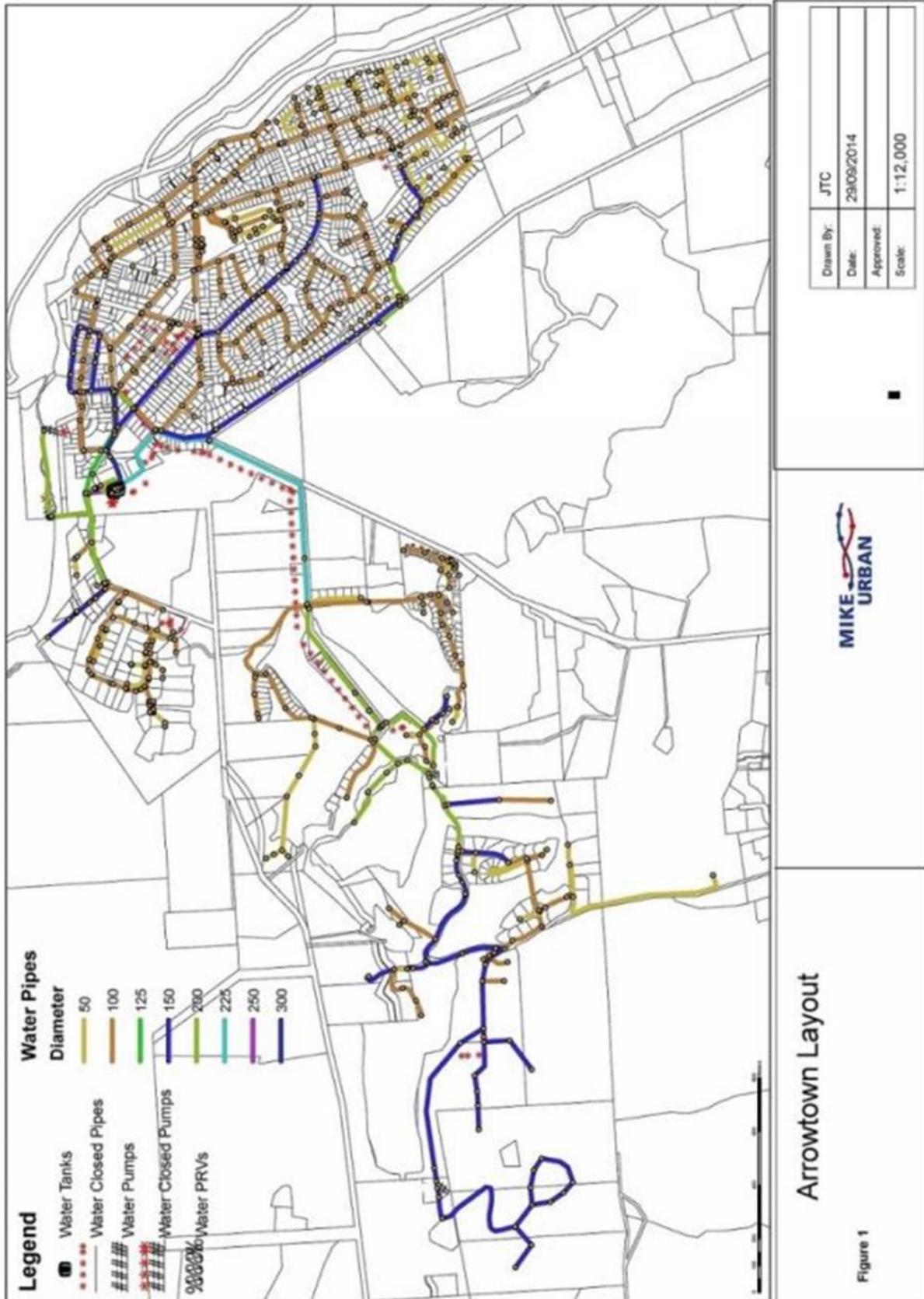

Grant Lovell

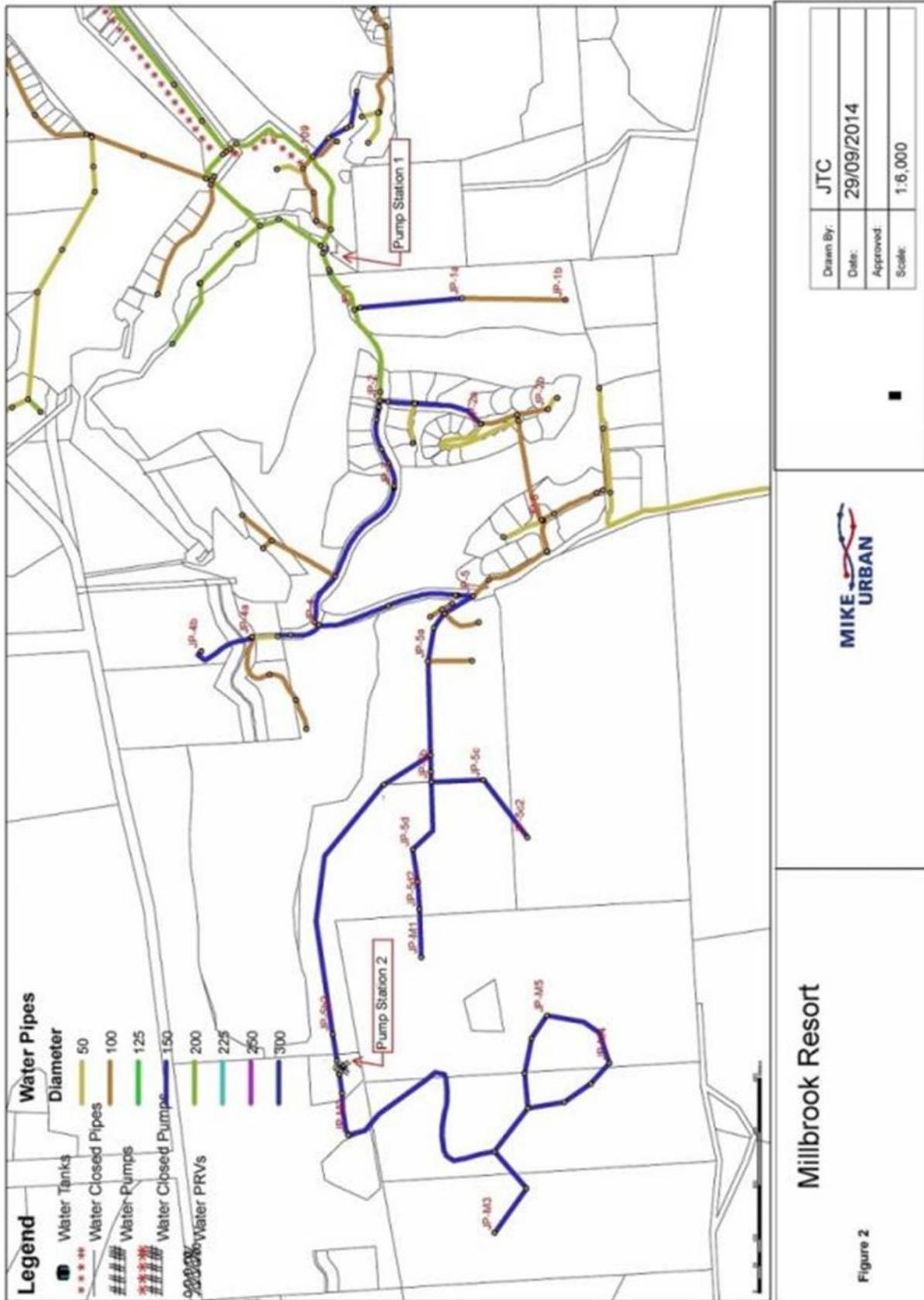
PROJECT DIRECTOR

3-Oct-14
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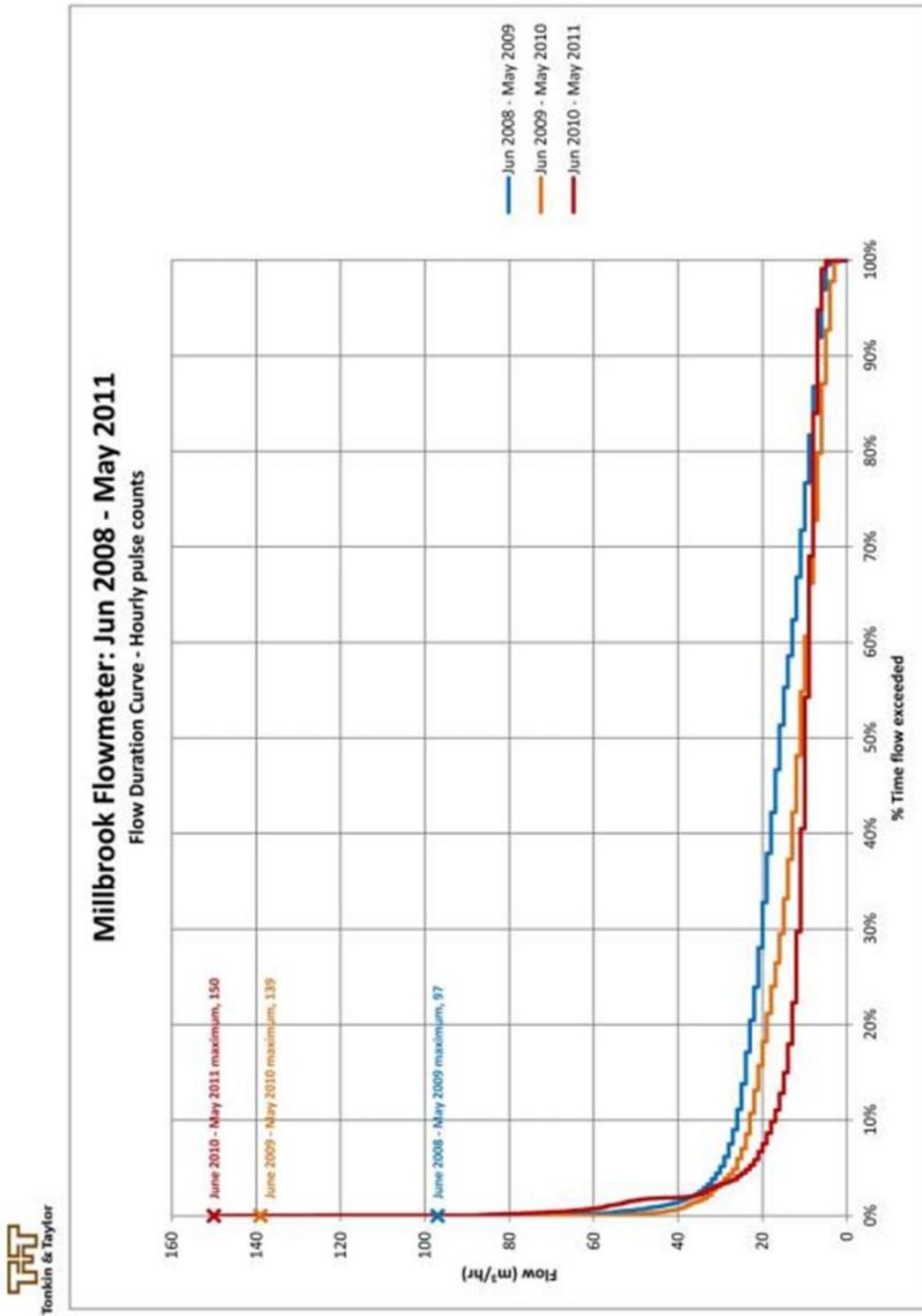
Appendix A: Millbrook Resort Layout

- **Figure 1**
- **Figure 2**





Appendix B: Millbrook 2009-2011 FDC



 Tonkin & Taylor

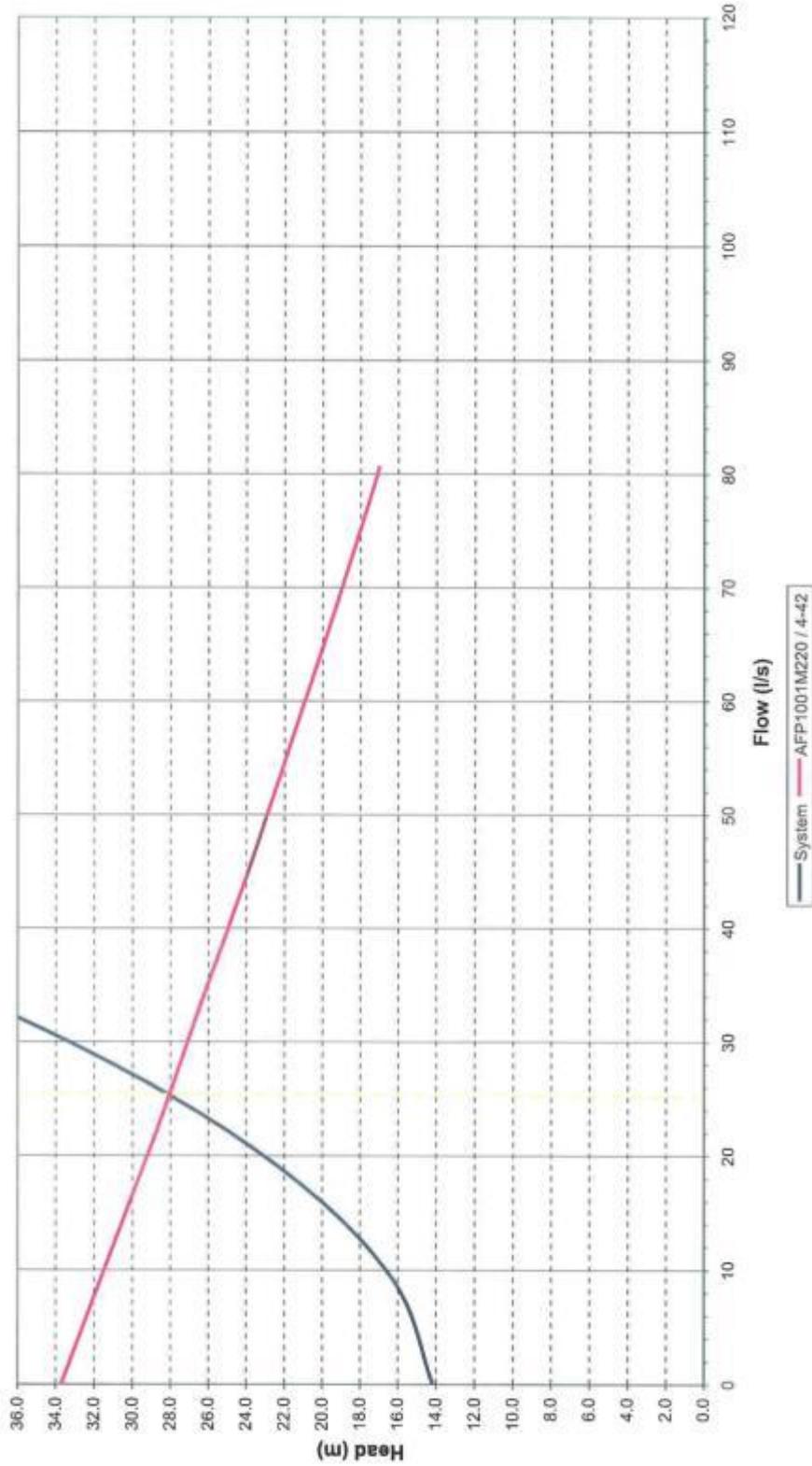
P:\1557\1557.0050\Working\Material\Booster Station\2011-06-02 pav Millbrook flowmeter - Jun-May FD curves last 3 years.xlsx

PAV 29/09/2014 5:16 p.m.

Appendix 3 Pumping Station Point Pump Curve

Project Number: Z1325700

Sewage Pump Station Duty Point Graph

Sewage Pumps - Duty Point


Appendix 4 Letter from Otago Regional Council Containing Mill Creek Hydrological Data



Our reference:

HY010

23 February 1995

Mr G Dent
Duffill Watts and King
P O Box 5269
Dunedin

FILE NO 2493/15/2			
DUFFILL WATTS & KING LTD - Dunedin			
27 FEB 1995			
DIR.	REF.	REF.	ACT
	GAHD		

Dear Sir

Please find enclosed a table of monthly mean flows in Mill Creek at the Fish Trap site, a listing of maximum and minimum flows recorded at the site for each year of record, and a listing of calculated peak flows for various return periods.

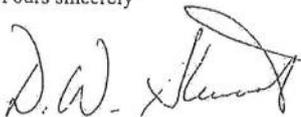
With regard to the monthly listing, the mean annual flow should be calculated by adding the means of each month (second last line of values) together and dividing by 12. This gives a flow of 430 litres per second.

The list of calculated peak flows for various return periods was derived using the Extreme Value type 1 (EV1) distribution and the method of probability weighted moments as described in "Flood Frequency in New Zealand" by A I Mc Kerchar and C P Pearson, Publication No 20 of the Hydrology Centre, Christchurch, 1989. Data used were those listed in the PEXTREME listing included with this letter.

If you have any questions regarding the information please contact me.

An account for the analysis is enclosed.

Yours sincerely



D W Stewart
Manager Hydrology
Encl
jwst2dent - ikw sl2 dent

Mission Statement: "To promote the sustainable management of the region's resources"
70 Stafford Street, Private Bag, Dunedin. Telephone (03) 474-0827. Facsimile (03) 479-0015



ORC 21

Peak Flow Estimates for Mill Creek at Fish Trap

Return Period (yrs)	Calculated Flow (m^3s^{-1})	Standard Error (m^3s^{-1})
2	3.4	± 0.4
5	5.0	± 0.6
10	6.0	± 0.9
20	7.0	± 1.1
50	8.3	± 1.4
100	9.3	± 1.7

Values were calculated using the Extreme Value Type 1 (EV1) distribution and the method of probability weighted moments as described in the publication "Flood Frequency in New Zealand" by A I McKerchar and C P Pearson, Publication No 20 of the Hydrology Centre, Christchurch, 1989.

jwsl2dent - lkw sl2 dent



19 January 2015

Dan Wells
John Edmonds & Associates Ltd
P O Box 95
QUEENSTOWN

Dear Dan

**MILLBROOK MACAULEY LAND: APPRAISAL OF KNOWN AND INFERRED HAZARDS
AND POTENTIALLY ADVERSE GEOTECHNICAL FEATURES AT SITE**

As requested, please find below a discussion on the geology within the property footprint and my interpretation of the various geotechnical issues which could have some bearing on future utilisation of some site elements. This report is designed to complement the various planning assessments being prepared for plan change consent purposes.

The mapping undertaken was essentially at the reconnaissance level, but modelling in most areas is not difficult as the host lithologies are reasonably well displayed, or can be inferred with a significant degree of confidence. Field work was supplemented by the use of stereopair aerial photos, and hazard features of regional interest were addressed by reference to QLDC-supplied data maps and other known sources.

GEOLOGICAL SETTING

(a) Physiography

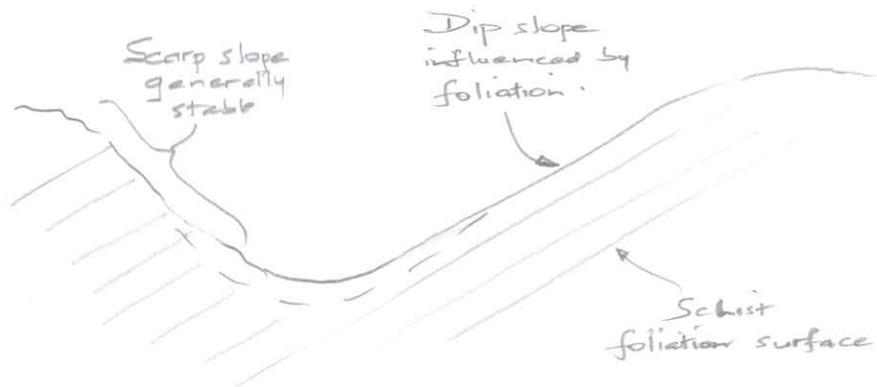
The site occupies part of an east-west-trending, glacially sculptured, valley and ridge complex just west of Arrowtown (Fig. 1). Mill Creek, and its associated floodplain, traverse the northerly lobe of the property as a variable width band (Fig. 2a) that is flanked by low to moderate gradient slopes. These, in part, are mantled by fans constructed by ephemeral, tributary streams. As indicated by Cross Sections AA' to CC' on Figure 2b, the elevated southern half of the property effectively forms an irregular platform approximately 75 – 100m above Mill Creek, this being a region within which there are substantial proposed developments (Attachment 1).

(b) Rock Types and Distribution

(i) Schist is the basement lithology in the region. At the site it is prominent in outcrop to the south of Mill Creek and there are several small outcrops close to Malaghans Road (Fig. 2a) which suggest schist is close to the surface in the northern sector.

Pertinent characteristics include:

- Greyschist dominates on site.
- Planar, thin foliations dip to the WSW at about 30°.
- Strike ridges are locally prominent landforms in the plateau area.
- Foliation influences terrain morphologies in the vicinity of incised gullies.



- No significant discontinuities, such as faults, were observed in outcrop.
- Jointing is not well developed. Steeper slopes not prone to rockfall, as a consequence.
- Generally south of Mill Creek there is a slight component of foliation dip into the slope, inherently increasing overall slope stability.

(ii) Glacial till is present as an irregular mantle on schist in the plateau area. Outcrops are poor (commonly rabbit holes) but it can be inferred that:

- The till is ablation in type, i.e. essentially fluvial deposits formed on the schist surface during the melting of the intruding glacier. A well-graded, gravel/sand/silt mix generally present.
- Estimated minimum age for the glacier that intruded into the plateau area is 70,000 years. (Morven Ferry Glacial Advance in local terminology).
- Where the till has a significant thickness the terrain tends hummocky. Note that in lower relief areas, such as the south-east property sector, there is a tendency towards a boggy condition.

(iii) River alluvium probably forms the effective terrace occupied by Malaghans Road near the present site entrance. (Could be till; not established in site-related outcrops).

(iv) Stream fans, of various dimensions, flank the Mill Creek floodplain (Fig. 2a). While not obviously active, each is potentially subject to stream incursions during future rainstorm events.

(v) Landslide deposits are minor, and limited to the walls of one gully in the central - west region of the plateau area (Fig. 2a). In general, the slopes, at all inclinations, are not affected by mass movement.

(vi) Floodplain sediments form a variable width (30 – 100m) deposit on the valley floor. The host surface tends flat and is unlikely to project more than about 1m above the stream surface.

The subsurface material characteristics and depth parameters are not known. As depicted on Figure 2b, schist is likely to underlie the sediments at a depth of 10m.

(c) Groundwater and Surface Flows

Mill Creek drains 25 km² of catchment west of the site. It is clearly a permanent stream with a significant flood potential. Left and right bank tributaries intersecting the site are ephemeral but there is also flooding potential, particularly in the catchment to the north, which originates on the steep, valley wall.

Of interest is seepage along the axis of a gully close to the eastern property boundary (Fig. 2a). The seepage can only originate as race leakage from a non-specific but reasonably defined point at the gully head adjoining the race.

Two significant springs are present along the true left side of the floodplain, upstream from the access road (Fig. 2a). It is assumed both are sourced in subcatchments north of Malaghans Road and west of Dennison Way and both notionally drain to the south via gutters in the schist, now overlain by alluvium (or till). Flow volumes are unknown; it is assumed they will be seasonably variable.

GEOTECHNICAL HAZARDS: GENERAL

(a) QLDC/ORC Depictions

Attachments 2a and 2b illustrate the extent of the known hazards directly pertaining to the site. They include:

(i) Liquefaction, categorised as LIC 1 (P), which implies a low risk. Comment:

- For some reason, unknown to QLDC staff, the hazard ceases in an upvalley direction at the position of the present site access road, whereas similar valley floor conditions extend well to the west.

In a pragmatic sense, it would be prudent to accept all of the north embayment at the site is categorised as LIC 1 (P) in the QLDC classification.

- The designated liquefaction risk zone clearly incorporates areas which are known, or inferred to be, in situ schist. A refinement of the zone is clearly warranted.
- It is acknowledged that the valley floor floodplain comprises at least some weak sediments with unknown liquefaction susceptibility. Depending on final development proposals, some subsurface investigations in the fill deposits may be required on the right bank.

(ii) Alluvial fan, an ORC assessment, subclassified as "fan less recently active".

As previously mentioned, all the lower fan elements must be subject to some flows during storm events, which will need addressing in sympathy with the development proposals.

(b) Other Hazard Issues

(i) Flooding

Mill Creek, at site, is the flow path from a large (25 km²) catchment to the west and it is evident that there is some inundation of at least parts of the floodplain during storms of a regular nature. As the flat, 'dry', floodplain on the true right bank downstream of the road bridges lies only 1m (approx.) above creek level, it must be assumed to be inundated by flooding as well; perhaps on a 1 in 200 year basis (speculative estimate).

Given a development proposal includes dwelling platforms on parts of the right bank floodplain (Attachment 1) it would be prudent to approve key areas in terms of flood hazard and risk, and develop mitigating solutions, as appropriate.

(ii) Seismic Events

It is assumed that the greatest risk is posed by an M8, or greater, earthquake on the Alpine Fault. Assessed felt intensities at the Wakatipu Basin have been integrated into statutory

authority requirements for building codes, which have evolved over time as earthquake characteristics become better understood.

At a more local level there is an active, west-side-up, reverse fault trending north-south through the west end of the Gibbston Basin (est. MCE M7.3), and seismic monitoring has established the presence of numerous, shallow crustal events in the Arrowtown region (Fig. 3). The latter earthquakes have small magnitudes (generally <M3.8) and have not been associated with any known faults that rupture the surface, but there is clearly some local, ongoing, crustal strain. Implications for the site:

- Minor earthquakes will continue to be generated near Arrowtown at irregular intervals. Building codes adequate for mitigation purposes.
- Surface ruptures are not likely in the Arrowtown region.
- There is a very low risk of a large earthquake being generated on a nearby fault in the life of any dwelling that exists or will be constructed in the future.

(iii) Mass Movement

Apart from the minor intra-property occurrences, the nearest known landslides to the site lie in schist terranes approximately 0.7 km away from the boundary.

Mass movements are not an issue of consequence in the proposed development area, therefore.

SITE GEOLOGICAL FEATURES OF INTEREST

(a) Malaghans Road – Mill Creek Floodplain

The proposed development in this zone is limited to fairways and greens. Note:

- In general, schist with a variable alluvial cap should dominate, although fan deposits in the central region could have a significant thickness.
- In the eastern sector, the floodplain-proximal slope tends wet. This should be noted in any layout.
- Two springs, and a steep riser, are floodplain-proximal features in the western sector. Perhaps appropriate earthworks should be undertaken to modify the local terrain.
- Flooding on the central fan can be restricted to the axial channel by appropriate earthworks.

(b) Mill Creek Floodplain

Proposed zonal developments include a farm shed, a fairway, and parts of a low elevation dwelling complex. Note:

- The farm shed should be elevated on fill or be bunded, should the current proposed site be occupied.
- Central parts of Fairway 8 will occupy the floodplain. As a low risk area, flooding on sporadic occasions may be acceptable.
- Central parts of the dwelling complex occupy the floodplain footprint, the flood hazard for which will be notionally exacerbated by the formation of adjoining ponds (Attachment 1).

The flood risk to dwellings in this terrain needs to be vigorously appraised.

(c) Right Bank Fans

These are, in part, the proposed locations for low level housing development. Note:

- Appraise each site to minimise flood risk from the superadjacent catchments. Adjust platform locations.
- Develop platform-proximal channelling/bunding, as appropriate.

(d) North Facing Slopes

In the central area both higher and lower density dwelling construction is proposed.

- The terrain is assessed as stable; schist with a probable alluvium mantle.
- A concrete pipe siphon segment rises up through the central section; inherent concern with integrity under major seismic event conditions.

Further to the east dwellings are proposed in lower relief terrain, comprising schist with a patchy till cap. Note:

- The wet gully is being avoided in the proposed layout.
- Review the potential for water race embankment failure at any location between the mini siphon and the eastern property boundary.
- The western platforms are close to the flanking slope of a strongly incised gully. As previously highlighted, the eastern slopes tend to be controlled by foliation and slope regression, by slab failure, is a future possibility.

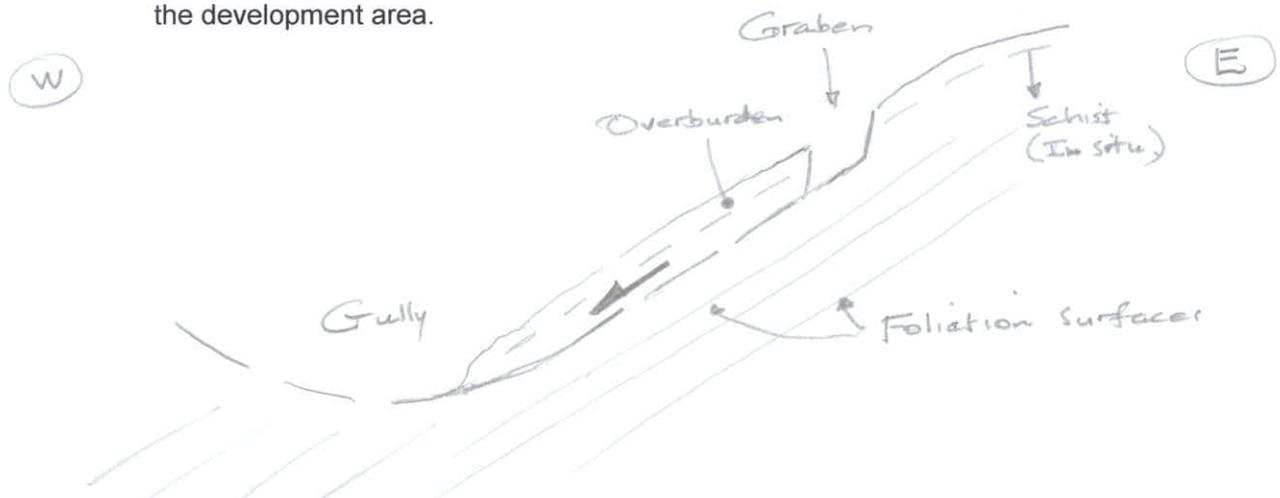
Ensure an adequate setback from the slope crest is implemented for pertinent platforms or design a stable foundation.

(e) Plateau Zone

In effect, the terrain varies markedly, but the highest, and most pinnacle element, lies to the west, and outside of any proposed development.

With reference to Attachment 1 and Figure 2a, it is evident that there are multiple housing areas intermixed with golfing venues, each of which will occupy schist in isolation, and schist with a variable till cap. Both are inherently stable, but note:

- There is a small, recent landslide on the east flank of a deep gully in the western region of the development area.



- The foliation failure is not going to impact on any proposed construction area but is a good example of a dip slope failure in schist in a specific terrain. (Note also the potential for a like failure in any major dwelling excavations).
- On the gully wall opposing the above there is evidence for an old failure in a schist scarp slope. I have annotated the approximate vacated outline, and it is unlikely to regress, but it proves that scarp slopes are not necessarily absolutely stable, in the long term.
- Approximately 100m south-west of the above slide feature there is an assessed area of soil creep; probably a till capping on schist, creeping under wet conditions. Of no significance in a development context.

CONCLUSIONS

- (a) There are several significant terrain elements in the Macauley block, including a floodplain-dominated valley floor to the north, low to moderate relief flanking slopes, and a high, effective plateau to the south.
- (b) Schist is the basement rock in the area and it outcrops extensively to the south of Mill Creek. Glacial till, at least 70,000 years in age, is a prominent cover deposit on schist in the plateau area, while stream fans, and assessed river alluvium, flank the valley fill deposits.
- (c) Schist outcrop areas are largely sound with rare, small landslides being defined in a single gully. Foliation has influenced terrain development in the past and care should be taken in the siting of dwellings in dip slope situations, adjoining deeper gullies, at all elevations. Rockfall is absent.
- (d) Several dwelling clusters are proposed on the north-facing slopes south of the valley axis. Apart from some wet conditions, deemed to be sourced in a leaking race, there are no obvious adverse conditions, providing schist dip slope issues are recognised.
- (e) The lowermost cluster of dwellings is sited variously on fans and a floodplain to the south of Mill Creek. This zone is characterised by QLDC as a low risk area for potential liquefaction, and flooding, and/or erosion, are prospective hazards on both the floodplain and fans during storm events.
- (f) The terrain to the north of Mill Creek is designed as a golfing facility. Issues of flooding on both the floodplain and the central fan are clearly subjective at this stage, although hazard mitigations by earthworks are optional in this area.
- (g) There is some intuitive concern with the long-term integrity of the water race, especially under the influence of strong seismic shaking. For instance, the upper reach of the main siphon is composed of butting concrete pipes, and there is a 450m reach of open race in the property, with unknown construction methodologies being applied along the complete length of the outer embankment.

RECOMMENDATIONS

- (a) Review the flooding risk for proposed platforms extending onto the right bank floodplain. If the hazard is acceptable, undertake appropriate subsurface investigations to:
 - Assess subfoundation material types.
 - Address the QLDC-defined liquefaction issue.
- (b) Where dwellings are to be sited on right bank fans at lower elevations, adjust platform locations in association with engineering solutions to the relevant flooding and erosion hazards.

- (c) Review the integrity of the irrigation pipe and open race complex in relation to the proposed dwellings at lower elevations. Of particular interest is the response to a major seismic event.

This report is fundamentally an assessment of the geological conditions at site, and any consequential adverse features which may impact on development proposals, as highlighted by Attachment 1. I trust the level of mapping and appraisal detail is sufficient to qualify the hazards and risks which clearly apply, in part, to the major development items at lower elevations in particular.

Regards,

A handwritten signature in blue ink, appearing to read "Rayden", is written below the text "Regards,".

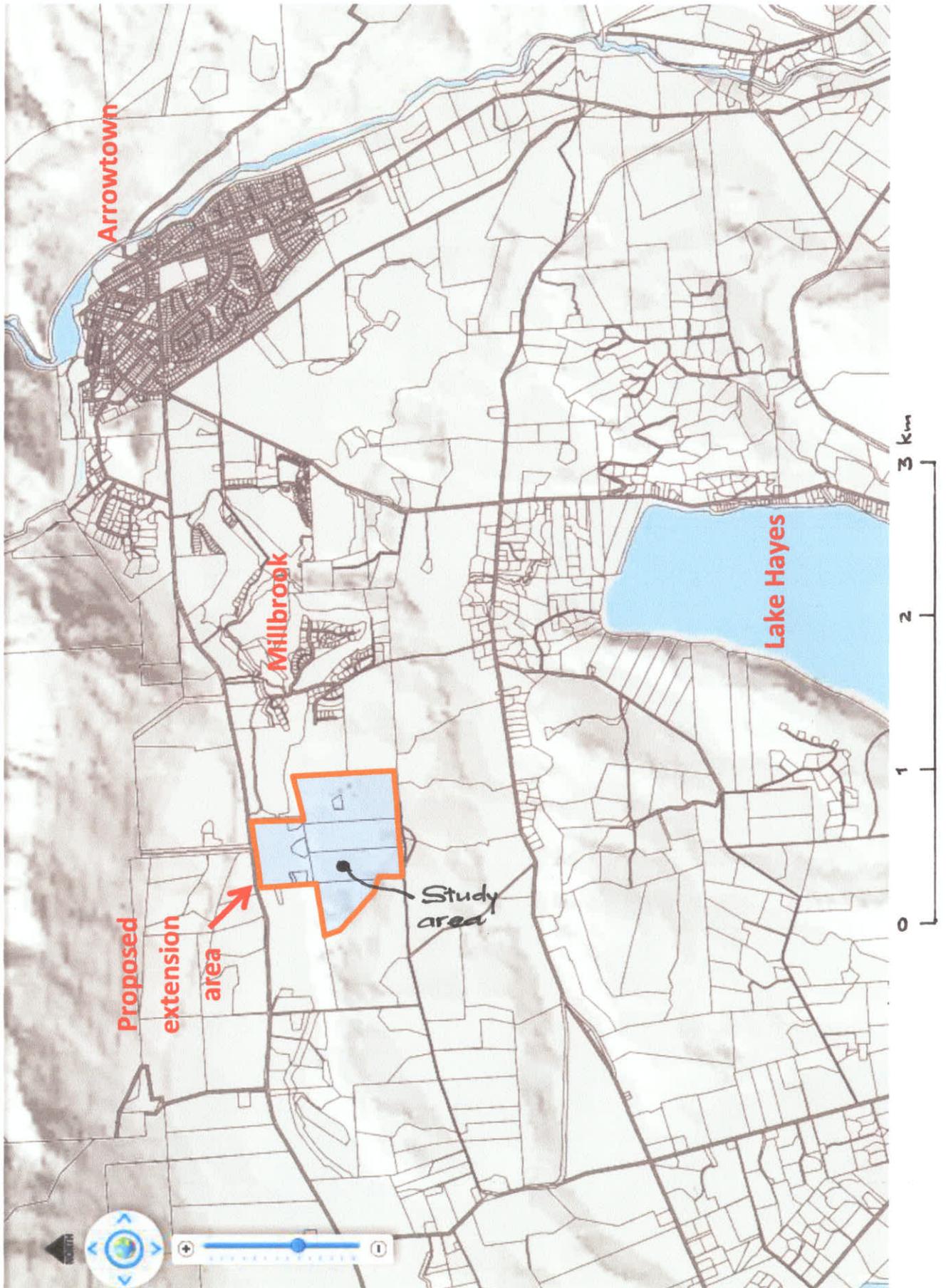


Fig.1 Location of Millbrook site

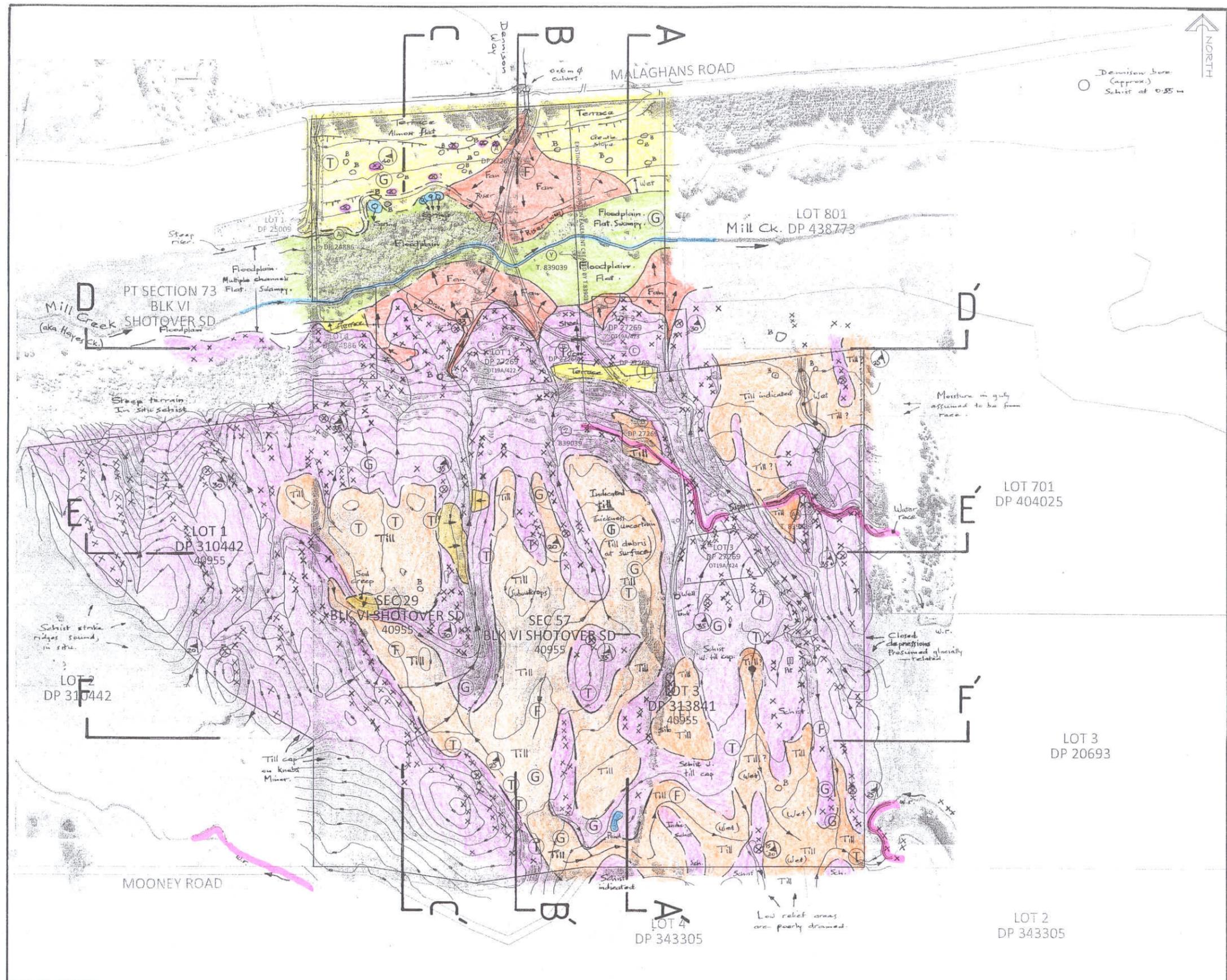


Fig. 2a

Geological Plan of the Millbrook Extension on the Macauley Farm Block

Scale 1:2500

	Schist. An applied cross denotes outcrop visited or remotely observed.		Landslide		Boulder at surface.
	Glacial fill (ablation)		River alluvium (assumed).		Spring
	Stream fan		Water race (open)		Schist foliation attitude.
	Floodplain (Mill Creek)				
					Geological cross section.

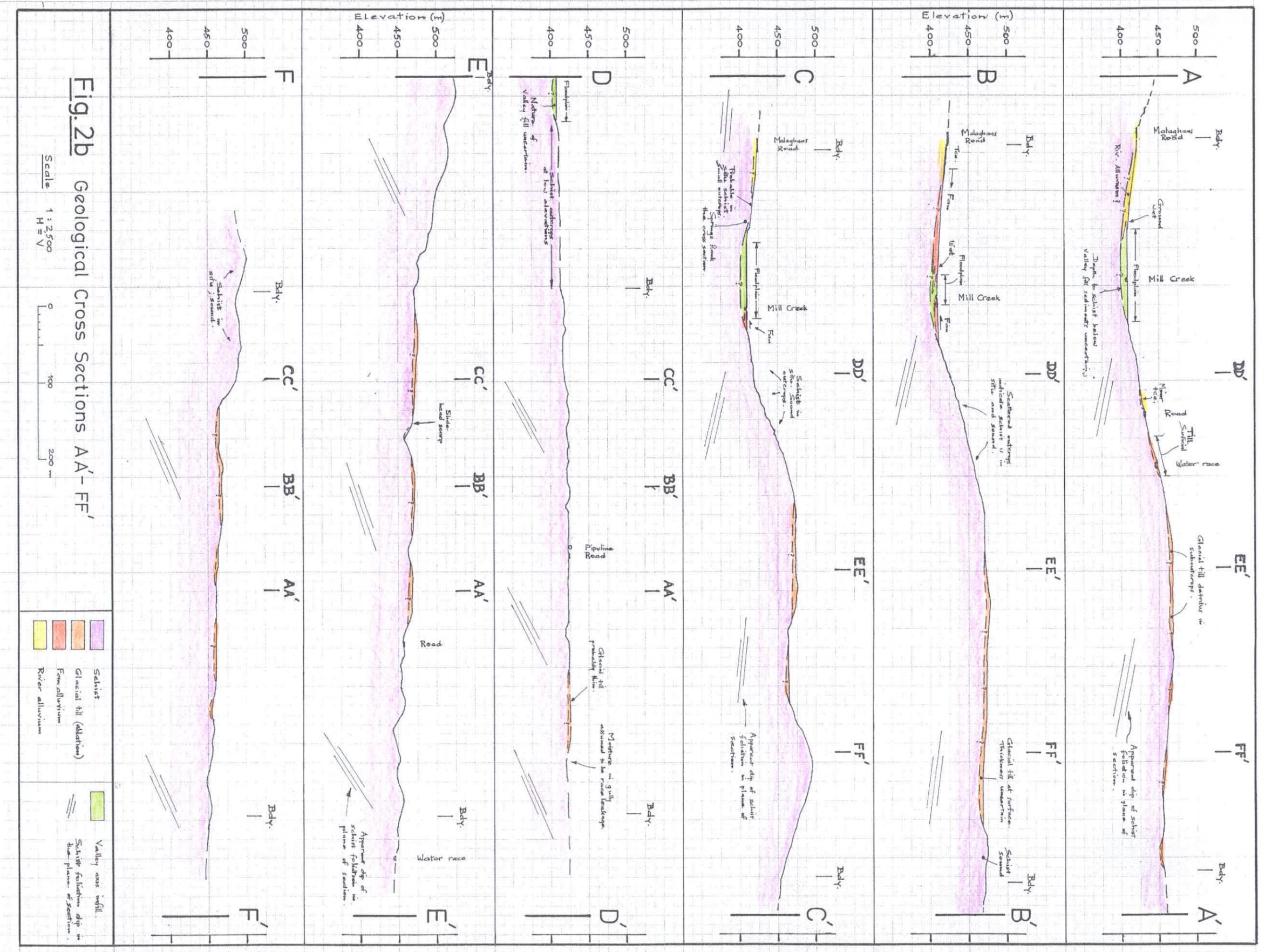
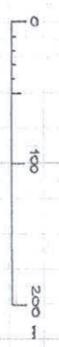


Fig. 2b Geological Cross Sections A-A' - F-F'

Scale 1 : 2,500 H = V



- Schist
- Glacial till (alluvium)
- Fine alluvium
- River alluvium
- Valley axis infill
- Schist foliation dip in true plane of section

Fig. 3

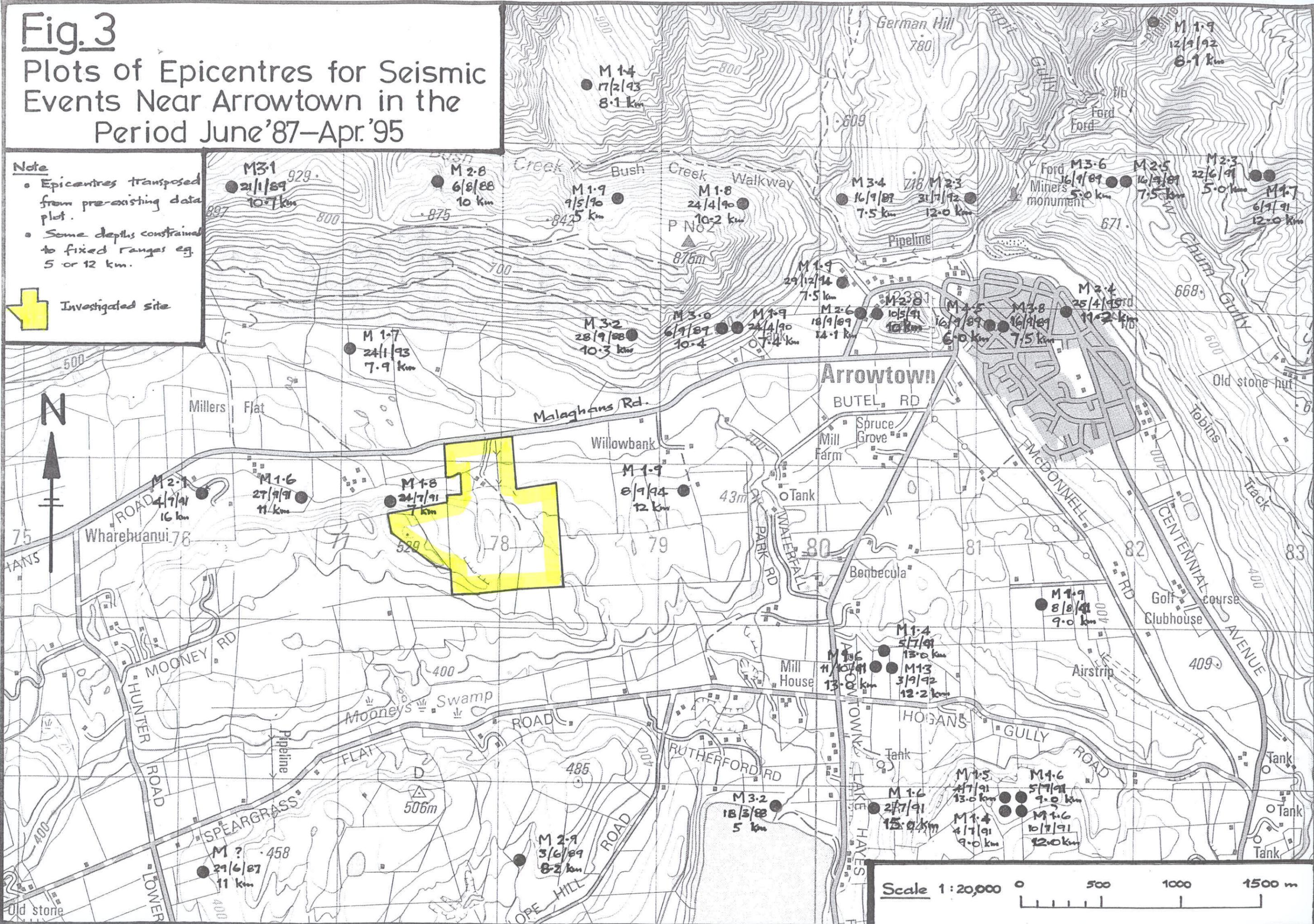
Plots of Epicentres for Seismic Events Near Arrowtown in the Period June '87-Apr. '95

Note

- Epicentres transposed from pre-existing data plot.
- Some depths constrained to fixed ranges eg. 5 or 12 km.

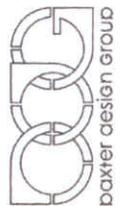


Investigated site

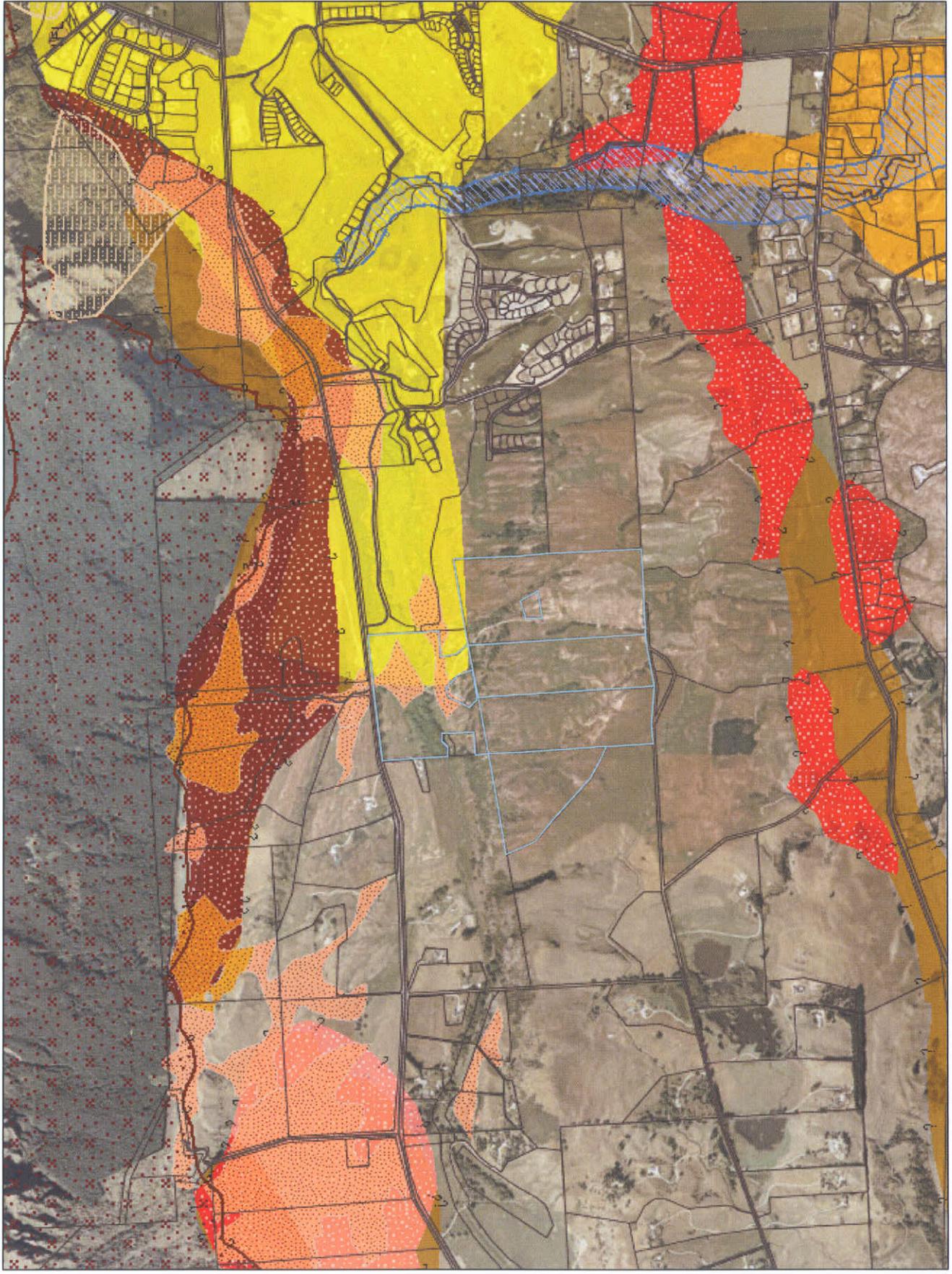


Scale 1:20,000 0 500 1000 1500 m

Attachment 1



Malaghans Rd - Hazards



Legend

- Dangerous Goods License
- LPG CYLINDER
- POTENTIALLY CONTAMINATED SITE
- Flood Return period
 - 150 Year
 - 100 Year
 - 75 Year
 - 50 Year
- Faults
 - Active
 - Inactive
- Potentially Contaminated Sites
 - Contaminated Sites
 - Potentially Contaminated Sites
 - Managed / Remediated
 - Dangerous Goods Licence
 - Landfill
- Landslide Areas
 - Active Pre-existing Schist Debris Landslides
 - Pre-existing Schist Debris Landslides
 - Dormant Pre-existing Schist Debris Landslides
 - Slope Failure Hazard in Superficial Deposits
 - Shallow Slips and Debris Flows in Colluvium
 - Debris Flow Hazards
 - Rockfall
- Landslide Areas (Outside priority areas)
 - Flooding - rainfall
 - Flooding - damburst
 - Erosion Areas
 - Alluvial Fan High Hazard - Channels
 - Alluvial Fan High Hazard - Incision Line
 - Alluvial Fan High Hazard - Catchment Areas
 - Alluvial Fan High Hazard - Hazard Area
 - Alluvial Fan High Hazard - Source Area
- Alluvial Fan - ORC
 - fa - fan active bed
 - fra - fan recently active
 - fla - fan less recently active
- Alluvial Fans Regional scale
 - Active, Composite
 - Active, Debris-dominated
 - Active, Floodwater-dominated
 - Inactive, Composite
 - Inactive, Debris-dominated
 - Inactive, Floodwater-dominated
- Liquefaction Risk
 - LIC 1 - Nil to Low
 - LIC 1 (P) - Probably Low
 - LIC 2 (P) - Possibly Moderate
 - LIC 3 (P) - Possibly High
 - Possibly Susceptible
 - Susceptible
- Avalanche Areas
 - Avalanche Areas

Lines and areas with approximate locations are shown with "x".



The information provided on Dekho is intended to be general information only. While considerable effort has been made to ensure that the information provided on this site is accurate, current and otherwise adequate in all respects, Queenstown Lakes District Council does not accept any responsibility for content and shall not be responsible for, and excludes all liability, with relation to any claims whatsoever arising from the use of this site and data held within.



Attachment 2a

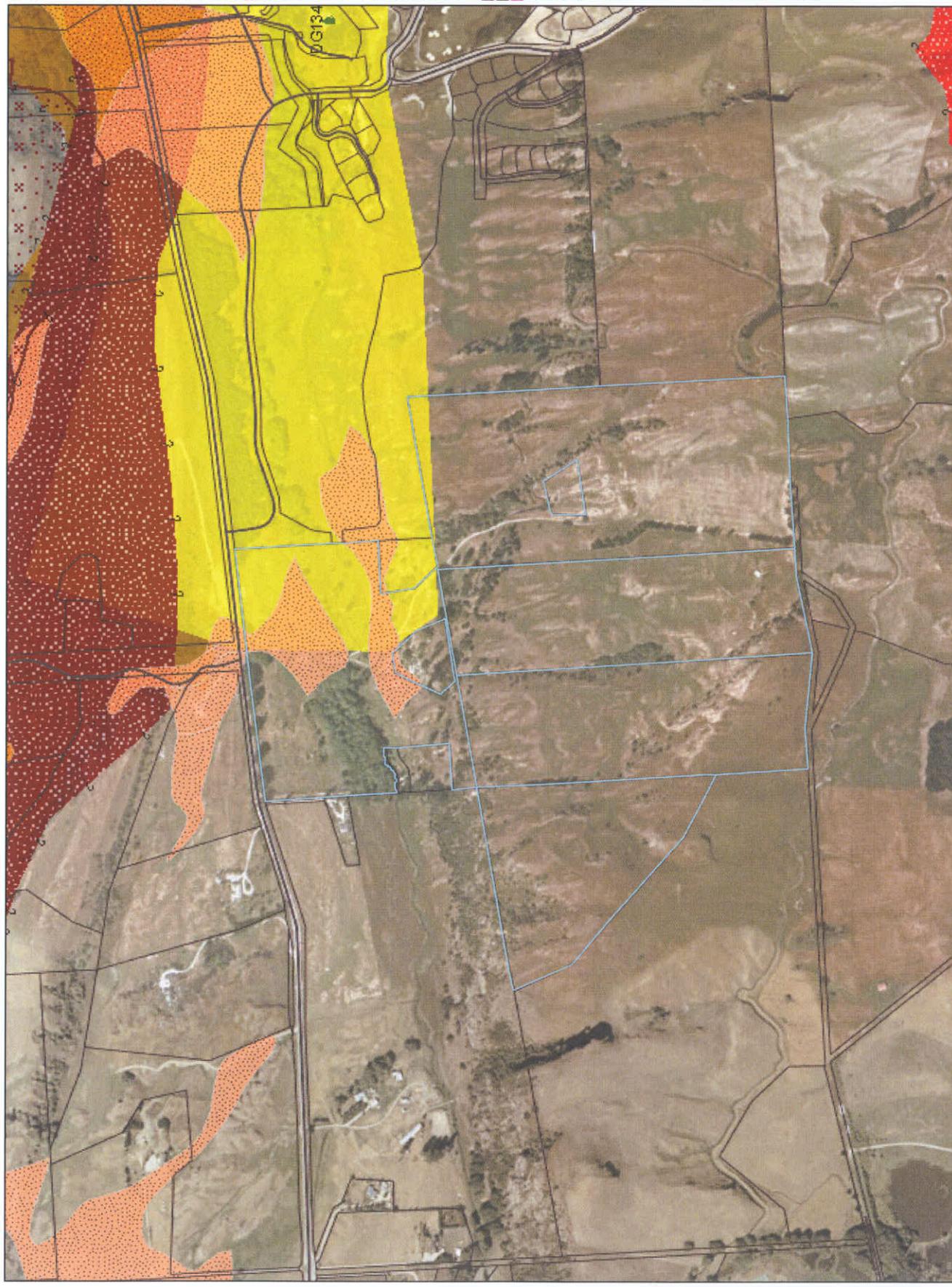
Scale 1:19,188

0 900 1,800 Metres

Map produced by Queenstown Lakes District Council's Dekho GIS viewer

Map date:
16/12/2014

Malaghans Rd - Hazards



- Legend**
- Dangerous Goods License
 - LPG CYLINDER
 - POTENTIALLY CONTAMINATED SITE
 - Flood Return period
 - 150 Year
 - 100 Year
 - 75 Year
 - 50 Year
 - Faults
 - Active
 - Inactive
 - Potentially Contaminated Sites
 - Contaminated Sites
 - Potentially Contaminated Sites
 - Managed / Re-mediated
 - Dangerous Goods Licence
 - Landfill
 - Landslide Areas
 - Active Pre-existing Schist Debris Landslides
 - Pre-existing Schist Debris Landslides
 - Dormant Pre-existing Schist Debris Landslides
 - Slope Failure Hazard in Superficial Deposits
 - Shallow Slips and Debris Flows in Colluvium
 - Debris Flow Hazards
 - Rockfall
 - Landslide Areas (Outside priority areas)
 - Flooding - rainfall
 - Flooding - damburst
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 - Alluvial Fan High Hazard - Incision Line
 - Alluvial Fan High Hazard - Catchment Areas
 - Alluvial Fan High Hazard - Hazard Area
 - Alluvial Fan High Hazard - Source Area
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 - Active, Composite
 - Active, Debris-dominated
 - Active, Floodwater-dominated
 - Inactive, Composite
 - Inactive, Debris-dominated
 - Inactive, Floodwater-dominated
 - Liquefaction Risk
 - LIC 1 - Nil to Low
 - LIC 1 (P) - Probably Low
 - LIC 2 (P) - Possibly Moderate
 - LIC 3 (P) - Possibly High
 - Possibly Susceptible
 - Susceptible
 - Avalanche Areas
 - Avalanche Areas
- Lines and areas with approximate locations are shown with '??'**

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Attachment 2b

Scale 1:5000
Map produced by Queenstown Lakes District Council's Dekho GIS viewer

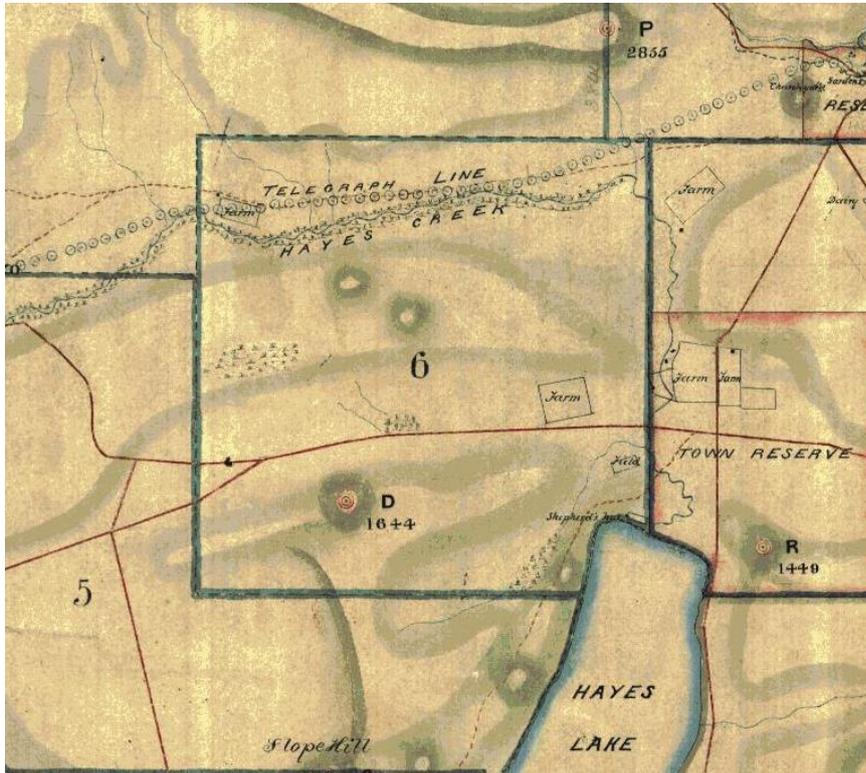
925 Metres

462.5

Map date:
16/12/2014



Dagleish Farm, Malaghans Road, Arrowtown



Topographical sketch of the Shotover District showing Block VI, May 1865

Historic Heritage Assessment

Prepared for Millbrook Country Club

February 2015

Jackie Gillies + Associates

Architecture + Conservation + Archaeology
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Section A – Introduction

A.1 Executive summary

This assessment relates to Sections 29, 30, 56, 57, 62 & 63 Block VI Shotover District and the existing buildings located on Section 63; a stone cottage, a woolshed/barn and associated farm structures.

Previous historical investigation of the site had identified the stone cottage as originally belonging to Elias de la Perrelle and as having been built *circa* 1882. Historical research for this report has shown this not to be the case, with the cottage having a later connection to and construction by the Butel family, possibly around the time of the wedding of John Butel the Younger in 1894 and the birth of his son in 1896.

The woolshed may have been designed as dual-purpose building i.e. a woolshed and barn. Discussions with Alan Reid, who used to farm nearby, have established that it was built by George Elliott in the 1940s or 1950s.

Overall, the farm, including its buildings, is considered to have medium/moderate historic heritage significance. The current Category 3 registration for the stone cottage under the Queenstown Lakes District Plan (November 2012) is considered to be correct.

The proposed development of Dalglish Farm will affect the setting of the historic cottage and woolshed/barn, as well as producing additional effects on the developed landscape and the potential archaeological values of the property.

To mitigate these effects it is recommended that:

- + The stone cottage be repaired and improved. This work could include, for example, the removal of the existing 1980s rear extension and the creation of a new extension that is less dominant and linked to the cottage in a manner more sympathetic to the architectural values of the original historic building.
- + An appropriate 'curtilage' should be formed around the stone cottage to protect its immediate setting and, if possible, a north view shaft should be created so that it remains identifiable from Malaghans Road and the fairway that runs close to the road.
- + The part of the Residential Activity Area that surrounds the stone cottage should have particular design controls that take account of the heritage values of the stone cottage.
- + The barn/woolshed should be repaired so that it can continue to be used – preferably for agricultural purposes. The existing modern lean-tos are of no heritage value and are out of scale and keeping with the original, much more traditional design of the building. Accordingly their removal and the replacement of the larger one with a smaller more suitable structure is recommended. Retention of the woolshed/barn on its present site is preferred, but if there are necessary grounds for its relocation, it is recommended that it be kept within the historic 'farm' in a location where it can be readily seen and where it contributes to the landscape.
- + Additional and replacement plantings should be, where possible, of European specimen trees, particularly in the area of the historic cottage, in order to continue the character of the 'Butel' landscape.
- + Any subsurface earthworks on the property, particularly around the historic cottage, are monitored under an archaeological authority.

In heritage conservation terms, the impact of the proposed development on the heritage values of Dalgleish Farm cannot be fully mitigated against. Where a positive heritage outcome can be achieved, in our view, is in ensuring the long term survival of the old/historic structures. The proposed development does provide the opportunity for the repair of the barn and the repair and improved use of the stone cottage. The heritage success of the project will, however, depend upon the way in which the proposed future changes are managed from the heritage conservation point of view.

A.2 Instructions

This assessment arises from an initial email from Ben O'Malley of Millbrook Country Club (MCC) on 11th December 2014 advising that:

Millbrook Country Club (MCC) has agreed to purchase Dalglish Farm with the intention of developing a further 9 holes of golf and up to 50 houses upon the land. Design work has progressed toward a potential development layout (see drawings 2423- SK12 & 2423- SK16 by Baxter Design Group). MCC propose to amend the zoning in the District Plan to enable this to occur. This means that the 'general parameters' of appropriate development will be established in the District Plan, with subsequent matters of detail (such as detailed development layouts and engineering schemes) addressed through future resource consents.

Updated plans 2423-SK32-34 were enclosed within a subsequent email and the initial 'heritage' brief requested:

A report which can be attached to the planning (Section 32) report which accompanies the plan change and which provides "An assessment of any heritage values of note on the site and/or the likelihood of archaeological sites being located there. An analysis as to whether the proposed development may in anyway pose a risk to those values and/or sites. Recommendations as to how any risks to values and/or sites can be mitigated or avoided."

Updated plans 2423-SK32-34 have been superseded by 2423-SK32 & 34 dated 23rd February 2015 (Appendix A).

A.3 Brief Description of the site and buildings

The name, Dalglish Farm, relates to the current legal description of the farm as follows:

Lot 1 DP 310442, Lot 1 DP 313841, Lots 1-3 DP 27269 Secs 29 & 57 Block VI Shotover SD.

However, to investigate the history and significance of the farm, it is necessary to refer back to the following historical descriptions:

Sections 29, 30, 56, 57, 62 & 63 Block VI Shotover District.

The stone cottage which currently exists at Dalglish Farm is registered on the QLDC District Plan as a Category 3 Protected Item, Ref. 71, Map 26. It lies within Section 63 Block VI Shotover District. A Category 3 item is one where:

"Preservation of the heritage resource is encouraged. The Council will be more flexible regarding significant alterations. Category 3 shall include all places of special historical or cultural significance."

The area covered by this assessment is delineated on the plan by Baxter Design Group in Appendix A and is limited to the historic sections defined above.

A.4 Historic Heritage Assessments

The objectives of this historic heritage assessment are: -

- + Understand Dalglish Farm by drawing together information, both documentary and physical information, in order to present an overall description of the place through time;
- + Assess its significance, both generally and for its principal parts;

- + Define the issues affecting the significance of the farm and its component parts and how these are vulnerable to damage from the proposed District Plan change; and
- + Propose measures that lessen/mitigate any damage identified.

There are many aspects to the concept of 'significance' but essentially these may be described by reference to the following established values:

Historical and Social significance

Those values that are associated with a particular person, group, event or activity. These may be, for instance, social, historical, economic or political.

Cultural and Spiritual significance

These are values associated with a distinctive way of life, philosophy, tradition, religion or belief.

Architectural and Aesthetic significance

These values may be associated with a particular design, form, scale or colour.

Technological or Craftsmanship significance

Under this category, values may relate to traditional, innovative or unusual building techniques and construction methods or those that are particularly notable for their time or quality.

Archaeological significance

These values assist in our understanding of past events, activities, people or patterns by the appreciation of archaeological information that can be gained from a building or site.

Contextual significance

These are values relating to the setting of a building or site in terms of landscape, townscape and its relation to the environment.

A.5 Methodology and limitations affecting this assessment

The study process for this assessment has involved a series of work stages – these are reflected in the format of this report.

Firstly there is 'understanding'. This stage has involved both a physical examination of the place – its fabric, features and landscape – through site visits and rapid visual surveys, and an examination of records and historical sources relating to it. The latter has included primary records and archives regarding its history, archaeology and social value, and secondary sources, such as books, guides and illustrations. The principal sources are given below, together with some notes on the information available.

▪ Lakes District Museum

A number of visits have been made to the museum to establish if it holds specific historical information about the farm and to look for supporting information to back-up ideas developed during the writing of this assessment. For example, the rates books for the late 19th and early 20th centuries have been examined to look for any sudden increases in the rates which might indicate that improvements had been carried out at the farm, such as the construction of new buildings. Discussions have been held with both David Clark and Anne Maguire at the museum to find out if they know of any other sources of written or oral history that might shed light on the development of the farm.

- Queenstown Library
Research has been carried out with a number of local history books in the Reference Section.
- Present and past occupiers
Enquiries have been made with Ian & Pip Macauley, who have owned the farm since the early 1980s. In addition, enquiries have been made with Evelyn Dennison who lived in the cottage as a young girl in the 1950s. Alan Reid, who was originally associated with the Willowbrook farm and knew the Elliot family, has been interviewed about his memories of Dalgleish Farm (February 2015).
- Papers Past online – The National Library of New Zealand
Extensive research has been undertaken with this online archive of local and national newspapers to look for any reports or other references to the land and the people known to have owned or occupied it during the 19th and early 20th centuries. The main newspapers that have provided useful information have been –

Lake Wakatip Mail (1863 – 1920);
Otago Witness (1851 – 1909); and
Otago Daily Times (1861 – 1920).

In particular, the Lake Wakatip Mail has provided a substantial amount of information about Elias de la Perrelle.
- Archway – Archives New Zealand
An online search of the records held by Archives New Zealand has been carried out and a visit has been made to the Dunedin offices of Archives New Zealand to view the affidavit & inventory made by Helen de la Perrelle on her husband's death in 1881. Rating Valuation Roll books were also researched. A copy of the coroner's report into Elias' death that is held in the Wellington offices of Archives New Zealand has been obtained from Lakes District Museum. A copy of the will for John Butel the younger has also been examined when the farmland in question passed to Catherine and Mathew Elliot.
- Queenstown Lakes District Council Edocs system
Council records have been investigated and reference has been found to the extension of the 'woolshed' in 1987, the extension and alteration of the cottage in 1991, and a subdivision of the site in 1995.

In addition, general research has been carried out with:

- Queenstown Historical Society;
- New Zealand History Online - <http://www.nzhistory.net.nz>; and
- The Cyclopedia of New Zealand - <http://www.teara.govt.nz>
- The list of Heritage New Zealand Pouhere Taonga - <http://www.heritage.org.nz>

Section B of this assessment therefore covers the history of the site and a description of the buildings.

The second stage is the assessment of 'Significance' and appraises the farm in terms of significant fabric, elements and landscape.

The final stage is the assessment of the effects of the proposals on the identified historic heritage values of the farm.

The principal constraint upon this assessment has been the difficulty in finding late 19th and 20th century information about the farm. This is due to two factors; firstly in 1882 it became

part of the large Butel 'empire' and it is impossible to separate the history of the subject land from that of the rest of Butel's land in this part of the District. Secondly, online 20th century records are quite scarce and those that do exist are very difficult to readily and efficiently search.

As a result of the rural location, it has not been possible to find many historic photographs of the farm and no mid-20th century aerial photographs showing the farm in any detail have been located.

Parts of the farm have small areas of dense vegetation and there is a larger area within Section 62 around Mill Creek where the ground is marshy and there are dense willows. It has not been possible to establish that there are no historic or archaeological features within these areas. However, enquiries with Ian and Pip Macauley have confirmed that they have not become aware of any such features there during the 30, or so, years that they have owned the farm.

A.6 Acknowledgements

There have a number of people who have given their time to assist in the preparation of this assessment. In particular, the assistance of the following people and organisations is recognised:

Ian & Pip Macauley
David Clark & Anne Maguire of the Lakes District Museum
Evelyn Dennison
Alan Reid
The staff of Archives New Zealand

A.7 Authors

This assessment has been prepared by Robin Miller BSc DipBldgCons MRICS IHBC, Director of Jackie Gillies + Associates and Ben Teele, Senior Archaeologist, of Jackie Gillies + Associates.

Section B – Understanding

B.1 Arrowtown & Malaghan's Road – in context

The lakes region of interior Central Otago was traditionally important to Kai Tahu whānui, who travelled to sites throughout the region to māhika kai (food and resource gathering sites) to gather resources for their own use, as well as for trade. The hunting of moa, weka, eels, ducks, the digging of fern root and fī root, gathering of taramea, and precious stone resources such as pounamu and silcrete, were a main focus of activity. Numerous ara tawhito (traditional pathways) passed through the area and a number of sites of permanent residence were located near lakes Whakatipu-wai-Māori, Wanaka and Hāwea. Ka-muri-wai (the Arrowtown Flat) and the Haehaenui (Arrow River) area were particularly noted as hunting grounds for weka. The Kawarau River which drains Whakatipu-wai-Māori to the south of Arrowtown was part of the major ara tawhito linking the interior with the east coast of Te Wai Pounamu by way of the Mata-au (Clutha).

The land in the Arrowtown area was alienated through the 1848 Kemp's purchase for the Crown and subsequent declaration as part of the Otago goldfields. Today tangata whenua for the area retain strong connections to the land, and this is borne out by the names and stories of the area.

Gold was first discovered on the Arrow in 1862 by William Fox. In the same year the goldfield was opened and miners poured into the region, many from Victoria, Australia. During the goldrush years the total population of the Shotover and Arrow districts was estimated at about 3000.

The Arrow Township (originally called Fox's) was established and Fox remained in the district as proprietor of the 'Golden Age' hotel. Like other goldfield towns in Central Otago, Arrowtown grew rapidly. In the early years accommodation for the miners consisted merely of calico tents, but this gradually changed with the erection of more permanent structures of timber and iron, and later in stone. At the end of 1864 Arrow contained 19 wholesale and retail stores, 10 hotels and several private dwellings. Arrowtown was constituted a borough in 1867 and was declared a municipality on 14 January 1874.

When the goldrush ended, the town's economy centred on wheat and cereals grown in the vicinity. Speargrass Flat, the area north of Lake Hayes, provided fertile ground for agriculture with ample water supply in natural waterways and mining water-races. In 1862 James Flint at Glenpanel near Lake Hayes harvested the first grain crop in the district. The first flourmill in Wakatipu was the Brunswick Mill at Kawarau Falls established in 1866 by businessman Bendix Hallenstein and J. W. Robertson, the first mayor of Queenstown. Hallenstein and Robertson encouraged wheat growing in the region by making cash advances to local farmers, and the Wakatipu District soon became the foremost wheat growing region in the country.

B.2 Brief historical description of the land that today forms Dalgleish Farm

The land at Dalgleish Farm lies within Block VI, Shotover District. A topographical sketch of Shotover District dated May 1865 is included in Appendix B. This shows Hayes Creek (now Mill Creek) running through the northern end of the block with a telegraph line on the northern bank (roughly where Malaghans Road runs today). A rectangular box and annotation indicates the location of a farm on the northern side of the creek in the very north-east corner of the block. In the southern half of the block, there is a track or 'road' running east/west and connecting the northern end of Lake Hayes with Arthurs Point and the Shotover River. Another rectangular box and 'farm' annotation is shown on the north side of the road towards the eastern edge of the block. Block VI is also shown in more detail in the December 1864 survey plan (Appendix B).

A field sketch dated 7th April 1868 shows sections 29, 30, 56, 57, 62 & 63 Block VI Shotover District and is annotated with names of those who had made applications for the land (although the annotations maybe of later date than the actual survey date shown on the plan). This field sketch has been superimposed on to map 26 of the current QLDC District Plan to indicate the present day position of these sections in relation to Malaghans Road (Appendix B). The application annotations are:

Elias de la Perrelle	Sections 62 & 29
Elias de la Perrelle	Sections 63 & 57
John Butel	Section 31
Peter Butel	Section 32
John Shepherd	Section 26

A further survey of the same date shows the application of:

James Ogilvie	Sections 66 & 30 and Educational Reserve Section 34
---------------	---

There is no reference on the survey plans to the ownership of Section 56, but as will be described later, it seems to have been part of Thurlby Domain in the latter part of the 19th Century.

At the commencement of this heritage assessment project, the 'local knowledge' seemed to suggest that the existing stone cottage at the farm had been built by the 1860s' occupier of the majority of the farmland that is now Dalgleish Farm, Elias de la Perrelle.

B.3 Elias and Helen de la Perrelle (Perelle/Perrille)

Elias de la Perrelle is believed to have been born in St. Helier (Jersey) in the Channel Islands in 1834. It was there that he met John Butel (son of John Butel of Normandy) and his brother, Peter. Elias is said to have travelled with the brothers, who arrived in Otago in the early 1860s having made their way to the province from California, via Boston and Alaska, and then on to Melbourne. Peter arrived first in 1862, followed by John in 1863.

The first mention of Elias in Arrowtown is in December 1864, when he and Michael Bohan placed an advertisement in the Lake Wakatip Mail¹ saying that Bohan had sold his blacksmith's business to Elias Perrelle as witnessed by William Butler and 'Mr. Butel'.

A couple of years later, Elias appeared in the 1866 list of persons who had applied to be on the electoral roll. The list was published in the Lake Wakatip Mail² and his entry was as follows:

No.	Name	Residence	Nature of qualification	Description of and where the property is situated	Signature attested by:
216	Perrelle, Elias de la	Arrowtown	Household	Dwelling-house	Chas E Haughton, householder

It is noted that he was living in a dwelling in Arrowtown at the time and there is no mention of him residing on land or at a farm (other entries clearly distinguish this, for example, *William Scoles, leasehold, 90 acres, Arrow Flat* and *William Patterson, leasehold, 50 acres, Hayes Flat*).

In 1866, Elias was noted as being one of the directors of the Columbian Quartz Mining Company when the company held its first meeting on 30th May that year³ and in February

¹ Lake Wakatip Mail, Issue 175, 31 December 1864, Page 3

² Lake Wakatip Mail, Issue 309, 14 April 1866, Page 1

1867, he (along with a number of others) expressed their support being 'residents in the Electoral District of the Lakes' for Charles E. Haughton in the forthcoming Provincial Council elections⁴.

On 26th June 1867, under the heading of 'Meeting of Stock-owners'⁵, the Lake Wakatip Mail reported on an outbreak of pleuro-pneumonia in cattle and "Mr. De la Perelle" is mentioned as seconding a motion on the proposed boundaries of a temporary quarantine area between Hayes Creek and the Shotover and Kawarau rivers. He was also elected to a committee to monitor and effect those quarantine measures. This suggests that Elias owned cattle in the vicinity of Arrowtown, but the first actual evidence found of his connection to part of the farmland that is the subject of this assessment appears to be in December 1867. In that month, an advertisement appeared in the Lake Wakatip Mail⁶ advising that he had applied for a lease on two parcels of land:

V.  R.

GOLD FIELDS DEPARTMENT,
Arrowtown, 13th December, 1867.

I HEREBY GIVE NOTICE that the under mentioned persons have made applications to me for Agricultural Leases, and that such applications and any objections thereto will be heard before me on Thursday, the 26th day of December, 1867:—

JAMES OGILVIE—Section 30, block 6: Shotover Survey District: 50 acres.

JAMES OGILVIE—Part of section 30 and part of section 41, block 6, Shotover Survey District: 56 acres.

ELIAS DE LA PERELLE—Part of section 29, block 6, Shotover Survey District: 50 acres.

ELIAS DE LA PERELLE—Part of section 29 and part of section 41, block 6, Shotover Survey District: 50 acres.

LOWTHER BROAD,
Warden of Gold Fields.

Figure 1 Lake Wakatip Mail, Issue 472, 19 December 1867, page 2

It is also interesting to note that the advertisement also refers to the application of James Ogilvie for Section 30, Block VI, another one of the sections now contained within the extents of Dalgleish Farm.

³ Lake Wakatip Mail, Issue 323, 2 June 1866, Page 2

⁴ Lake Wakatip Mail, Issue 393, 6 February 1867, Page 2

⁵ Lake Wakatip Mail, Issue 436, 26 June 1867, Page 3

⁶ Lake Wakatip Mail, Issue 472, 19 December 1867, Page 2

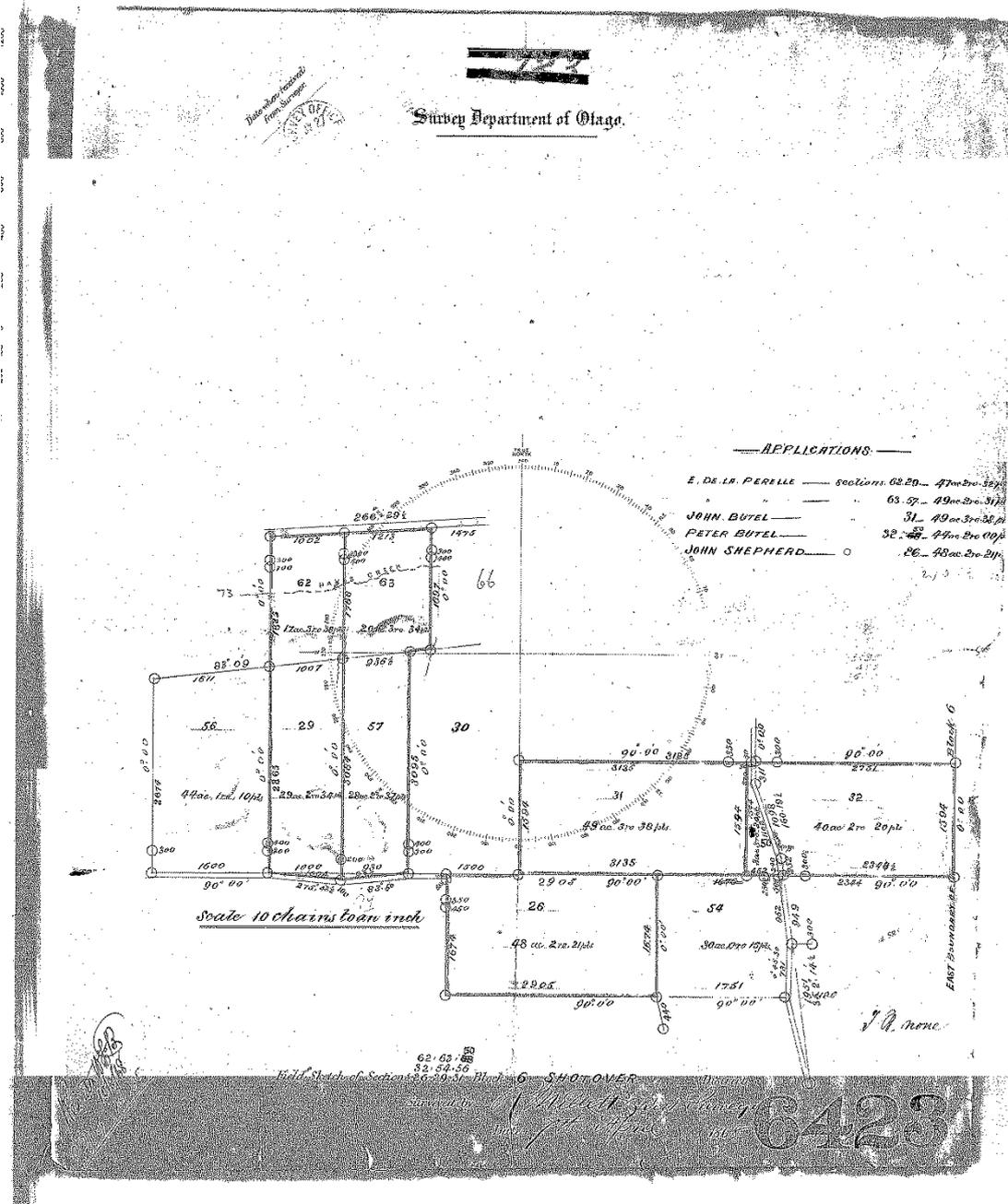


Figure 2 Survey of Sections in Block VI Shotover District dated 7th April 1868 and referring to two applications by E. De La Perelle

No advertised application has been found in the local press of the time, but (probably later) annotations on a survey of sections in Block VI Shotover District, dated 7th April 1868, shows that Elias had applied additional sections there – although the actual date of application/grant is not known. The applications are assumed to have been made on a leasehold basis (see later).

It is clear from the local press that Elias was an active member of the Arrowtown community. For example, in 1869 he was one of the trustees involved in the setting up of an Anglican church in the town⁷ and in January 1871 he was involved in the tender arrangements for its construction⁸. He was also one of the directors of the Wakatip Agricultural & Pastoral

⁷ <http://www.stpeters.co.nz/churches/st-pauls/arrowtown-church-history/>

⁸ Lake Wakatip Mail, Issue 638, 26 January 1871, page 2

Association⁹, a member of the Loyal Arrow Lodge¹⁰, a director of the Arrowtown Building Society¹¹, an Arrowtown member of the Lakes District Jockey Club¹² and a committee member of the Wakatip Hospital¹³. There are also references to him being a Sergeant in Otago Rifles.

In September 1879¹⁴, Elias was listed in a Government notification published in the local press as being an occupier of Crown lands who had rent outstanding from two leases dated 1873 and 1874 respectively. Unfortunately, the notification does not specify the land held under the leases.

A year later, in July 1880, the Waste Lands Board reported approval of Elias' application to purchase 'under deferred-payment' Sections 63, 57, 29 & 62, Block VI Shotover District:

The application of E. de la Perelle, to purchase under deferred-payment lease sections 63, 57, 29, and 62, block VI, Shotover, was approved.

Licenses for deferred-payment lands were allowed to issue as follow :—Martha Creighton, section 3, block II, Kyeburn ; James Muir, section 9, block X, Leaning Rock ; A. J. Wright, section 22, block I, Budle ; and Hugh Douglas, section 15, block V, Toi-Tois.

Figure 3 Otago Witness, Issue 1494, 3 July 1880, Page 19

Elias' death on 1st December 1881 was widely reported as he committed suicide at his farm shooting himself with a rifle after setting fire to his surroundings. A report on the circumstances was given in the Lake Wakatip Mail¹⁵ saying that neighbours saw smoke coming from a chaff-house on the farm and then found the remains of his body, shot through the heart. An inquest was held in Arrowtown on 2nd December 1881 and the report a week later of the Coroner and witness statements¹⁶ are held in the Wellington Office of Archives New Zealand. The verdict of the coroner was that he had met his death by "gunshot wound at his own hands while in a state of temporary insanity".

The neighbours who were involved in the incident were Peter Butel and James Ogilvie. At the inquest, Peter Butel said he was on the road to Miller's Flat (most likely now Malaghans Road) when he saw smoke coming out of the roof of Elias' dwelling house. He investigated the fire, found the body and then alerted James Ogilvie telling him to fetch buckets and water to put the fire out.

The statements of both Butel and Ogilvie conflict slightly with the newspaper over the type of building Elias was found in; the witness statements describe him as having shot himself in his house at the farm (rather than in a chaff-house as stated by the paper) and as having started the fire by lighting bags of chaff. The witness statements also indicate that Elias did not live at the farm, but went there most days, and that he had no one in his employment there (and hence no need for accommodation of any sort on the site). A final piece of relevant information in the witness statements is that once Peter Butel found Elias' body, he went to Arrowtown for the help of the local policeman, William Brown. James Ogilvie said that before the incident he had seen Elias in his buggy going to his farm and, that once he

⁹ Lake Wakatip Mail , Issue 647, 6 April 1871, Page 3

¹⁰ Lake Wakatip Mail , Issue 776, 24 September 1873, Page 2

¹¹ Lake Wakatip Mail , Issue 778, 8 October 1873, Page 3

¹² Lake Wakatip Mail , Issue 784, 19 November 1873, Page 2

¹³ Lake Wakatip Mail , Issue 791, 6 January 1874, Page 3

¹⁴ Otago Daily Times , Issue 5485, 17 September 1879, Page 1

¹⁵ Lake Wakatip Mail , Issue 1247, 9 December 1881, Page 2

¹⁶ R24427167/ ACGS/ 16211/ 1881/2276: Coroner, Queenstown Date: 9 December 1881 Subject: Inquest proceedings on Elias de la Perelle

had been told of the incident, he and his workman went to help – they stayed on site to put out the fire with buckets of water whilst the policeman was called. All of this would seem relevant to the location of Elias' building on the farm i.e. within sight of the road to Miller's Flat and close to a good source of water.

Elias died intestate and his wife, Helen, was required to file an inventory and affidavit verifying the details of his estate in the District Court, which she did on 28th March 1882. The inventory gives a good description of how the land was being farmed at the time of Elias' death and answers the question over the extent of buildings on the land then and whether Elias had indeed built a house at the farm. The inventory for Sections 29, 57, 62 & 63, Block VI, Shotover District lists the only features as being follows:

"...small stone shed (one room) thereon

<i>Oats</i>	<i>20 acres</i>
<i>Wheat</i>	<i>40 acres</i>
<i>Potatoes</i>	<i>2 acres</i>
<i>Mangles</i>	<i>1 pole"</i>

The inventory is not specific about stock that Elias owned on the farm or at his premises in Arrowtown. It merely mentions 'Horses, carriages, farming stock and implements', which were valued at just over £120 British pounds in total.

After his death, ownership of the farm passed to Elias' wife, Helen, who then sold it on to John Butel at the end of March 1882. The administration accounts filed by Helen on 21st July 1883 show that the proceeds from the sale were £438 British pounds and 15 shillings.

On 5th November 1886, the Lake Wakatip Mail¹⁷ advertised the forthcoming auction on 17th November of Sections 14 and 15, Block IX in Buckingham Street, which was the land Elias had owned in Arrowtown. The land was to be sold with "the blacksmith's shop and all other buildings on them". The sale was on behalf of the mortgagee and Mrs Helen de la Perrelle was stated as being the occupier.

Mrs de la Perrelle filed for bankruptcy in 1896¹⁸ noting "I am a widow resident at Arrowtown since 1864 and have a family of one son and two daughters..... I kept on my late husband's blacksmith's business up to ten years ago, when I made everything over to my creditors.....".

Shortly afterwards Helen de la Perrelle left the District and moved with her children to the Gore area. Her son became well-known as a newspaper owner and, later in his life, as a politician.

Conclusions from the historical record

- Although Elias arrived in Arrowtown in 1864, the first evidence of his occupation of part of the farmland that forms Dalgleish Farm today is in December 1867 when he applied for a lease on Section 29;
- Elias' application to purchase Sections 63, 57, 26 and 62, Block VI was approved in July 1880;
- By the time of his death on 1st December 1881, he had built only a one room stone shed on the farm. This is likely to be the chaff-house referred to in the newspapers;
- There are no references to any other buildings at the farm. If the inquest witnesses were correct and Elias had built a dwelling house at the farm, the lack of mention of it in the affidavit/inventory would suggest it had burnt down/been demolished by that time.
- Elias had clearly owned some stock during his life, but the inventory makes no mention of any farm buildings, such as a cow byre or barn, on the farm.

¹⁷ Lake Wakatip Mail , Issue 1562, 5 November 1886, Page 2

¹⁸ Lake Wakatip Mail, Issue 2109, 12 June 1896, page 6

- The location of the building in which Elias' body was found is not given, but references to it being within sight of the Miller's Flat road and close to a good water source would suggest that it was within Sections 62 or 63 and quite close to Hayes Creek.
- The reason for Elias' suicide does not seem to have been established other than temporary insanity. It is conjecture, but perhaps his temporary insanity was caused by financial worries after purchasing the farm land.

The conclusion of the historical research into Elias de la Perrelle is that the buildings that exist at Dalgleish Farm today do not originate from his time there and that they were built after the date when Helen made her affidavit (21st March 1882).

It is clear, however, that from an archaeological point of view, the farm could still provide archaeological evidence of human activity to at least 1867, including possibly the remains of the building in which Elias was found.

B.4 James Ogilvie

As mentioned in B.3 above, James Ogilvie applied for a lease on Section 30 Block VI Shotover District in December 1867 at the same time as Elias de la Perrelle applied for Section 29. Nearly 15 years later, at the time of Elias' death, Section 30 Block VI was still held and farmed James Ogilvie, who had also leased Section 66 by then.

James Ogilvie died in mid-1891 and a brief obituary in the Lake Wakatip Mail¹⁹ describes him as having been born near Kirkcaldy in Fifeshire, Scotland. He was said to have first gone to the Victorian goldfields before arriving in Otago in 1862. He mined at New Chum Gully near Arrowtown and was described as being one of the town's earliest residents. A reasonable account of his farm was provided in the Lake Wakatip Mail, when the farm was advertised for sale in 1892.²⁰ It was described as comprising Sections 30 and 66 (a total of just over 96 acres) 'with all buildings and implements thereon', including 9 acres of wheat, chaff-cutters, a plough, harrows, dairy utensils, 22 head of cattle, 4 draught horses, sheep and fowls.

The farm was sold at auction to John Butel²¹ at £2 British pounds and 10 shillings per acre, which was indicated at the time to be a 'bargain' price.

Interestingly, James Ogilvie's obituary in the Lake Wakatip Mail²² describes him as having taken up "the farming mania which raged in the district several years ago when wheat was selling at 7s 6d per bushel and oats at from 10s to 12s per bushel. But things did not prosper with him.....".

Conclusions from the historical record

- The description of Ogilvie's farm when it was advertised for sale does not give any specific details of the nature of the farm buildings there or exactly where they were located. However, it is clear there were buildings, which *probably* included a cottage, and it is likely, given the stock described in the advert, that the farm buildings would have included a barn, cow byre and some form of stabling.
- The advert gives no indication of where the buildings were located on the farm, but it would seem sensible to conclude that they would have been close to Hayes (Mill) Creek for a supply of water and therefore they would have been located within Section 66 rather than within Section 30. The witness statement of James Ogilvie at de la Perrelle's inquest also provides information to suggest that the farm buildings were located off the road to Miller's Flat (Malaghans Road).

¹⁹ Lake Wakatip Mail , Issue 1832, 14 August 1891, Page 3

²⁰ Lake Wakatip Mail, Issue 1858, 12 February 1892, page 2

²¹ Otago Witness , Issue 1984, 3 March 1892, Page 20

²² Lake Wakatip Mail , Issue 1832, 14 August 1891, Page 3

- It is interesting that James Ogilvie seems to have had a similar early start in Arrowtown to Elias, to have initially been involved in gold-mining and to have taken up farming at a similar time to Elias. Despite the reported money to be made in cereal crops, he seems to have not been a wealthy man – unlike the Butel brothers.

B.5 Section 56 – Bendix Hallenstein

Bendix Hallenstein is one of the most notable men of the early years of the Wakatipu Basin and the Encyclopaedia of New Zealand provides a detailed biography for him²³. He arrived in New Zealand in 1863 and set up business in Queenstown the following year.

In 1871 he purchased land at Speargrass Flat to create a country estate for himself. It was known as Thurlby Domain and the house was designed by the well-known architect, Frederick William Burwell (1846-1915), and was completed in 1873. The Heritage New Zealand Pouhere Taonga list entry²⁴ for the building describes it saying:

"Built of stone and cement, with stone and brick partitions, the homestead was Elizabethan in style. 'Part villa, part castle', the house had stone quoins, balconies, a veranda, and big bay windows. There were no fewer than 13 exits from the home into the magnificent pleasure grounds. The outbuildings were just as fine. These included two cottages and two stables, which have been described as impeccable examples of the 'old stonemason's art'."

In March 1874, Benedict Hallenstein announced²⁵ his intention to purchase a further 19 sections held under agricultural leases in Shotover District, including Section 56, Block VI. The purchase was confirmed in the Lake Wakatip Mail in May of that year²⁶ and extended Hallenstein's land holdings for his estate closer to Arrowtown.

The HNZPT list entry continues his story noting that:

"In 1875 Bendix Hallenstein moved to Dunedin from where his business prospered nationwide. He established the New Zealand Clothing Factory, later known as Hallenstein Bros, and the Drapery and General Importing Company of New Zealand Ltd (D.I.C.). Thurlby Domain was transferred to Herman Arndt, friend and colleague of Hallenstein's. It was at Thurlby that Arndt's daughter Mina (1885-1926) was born. She grew to become one of New Zealand's leading artists. Hallenstein's own great-grandson, Charles Brasch, became a poet, editor and philanthropist who never forgot the family's roots to Thurlby.

From 1890 Thurlby Domain passed through various hands and by 1946 the homestead had deteriorated beyond repair."

Following Hallenstein's purchase of Section 56 in 1874, no further records of the land have been found in local newspaper archives and the historic title is not currently available. From the Rates books held in Lakes District Museum, it is understood that Section 56 had been leased to a local runholder, William Patterson, by 1902.

Conclusions from the historical record

- Although the historical information on this section is sparse, there are no indications of there being any buildings on it pre-1900. William Patterson had a farm nearby and there are no suggestions that he used the land for anything other than agricultural purposes.

²³ <http://www.teara.govt.nz/en/biographies/2h6/hallenstein-bendix>

²⁴ <http://www.heritage.org.nz/the-list/details/2240>

²⁵ Lake Wakatip Mail , Issue 811, 20 March 1874, Page 3

²⁶ Lake Wakatip Mail , Issue 826, 12 May 1874, Page 2

B.6 The Butel Brothers

As mentioned above, the Butel brothers arrived in Otago in the early 1860s, having made their way to the province from California, via Boston and Alaska, and then on to Melbourne. Peter arrived first in 1862, followed by John in 1863. Rather than gold-mining, they were said to be interested agriculture and took up land north of Lake Hayes.

The first people to start growing wheat in the district were John Butel and William Paterson, who began experimental sowing in 1863 and who produced a crop of upwards of 70 bushels that 'exceeded all expectations'.

An 1864 survey plan ascribes Butel's name to two ten acre blocks, Lots 40 and 41, Block VII in the Shotover District. A later 1865 survey plan describes this area as a 'farm'.

Cynthia Balfour²⁷ provides a detailed account of the brothers' time in the District. They established 'two successful farms, a water course that would provide Arrowtown's water supply, a sawmilling business (at Miller's Flat beneath Coronet Peak), a very successful flour mill and a reliable electricity supply to Mill Farm.' Both men were very capable engineers and designed the town's first water race that started at Bush Creek and finished at the lagoon at the east end of Arrowtown. It was built by 1864 and remnants of it can still be seen today on the Millbrook Golf Course. Balfour also tells how, by 1867, the Butel brothers also had a dairy herd on their land. Following the passing of the Otago Waste Lands Act 1872 the brothers acquired freehold title to land they had previously leased and expanded beyond the original 20 acres they held to include a number of the surrounding lots. According to Balfour, the Butel's 'Arrow Mill' at Mill Farm was in operation by the end of 1874.²⁸

After 1880 the brothers farmed their properties separately. Peter Butel was operating the mill independently of his brother who by then devoted his time to livestock and crop farming. The mill was known as both P. Butel and Co. and Arrow Flour Mills. By 1886 it processed three quarters of the wheat produced in the Wakatipu district and flour was distributed south to Invercargill and Riverton, and to Clyde and Alexandra. Further expansion of the business was curtailed by the distance of the mill from a sea port, limiting the mill to the local market.

The success of the brothers can be judged by the value of their property and landholdings – John (Hayes Creek Farm) was listed as a farmer in 1881 with a holding of 249 acres with a rateable value of £2605, whilst Peter (Mill Farm) was a miller with 169 acres valued at £3044 and a property in Cromwell worth £30.²⁹ The flour produced by Peter's mill won first prize at the 1883 Dunedin Exhibition and second and third prizes at Melbourne and Sydney respectively. Grain growing in the Wakatipu district peaked around 1891 and declined thereafter. By the close of the nineteenth century, there was insufficient wheat produced locally to supply the District's mills and wheat was brought in from outside the area. Butel's mill became uneconomic and closed in 1902.

Peter Butel retired in 1908 and leased the farm to one of his neighbours, Michael Feehly, keeping only the 10 acre homestead block. He died in 1912 at the age of 75. The farm passed to Butel's nephews to be held for one of their sons, Peter, to inherit when he was old enough. Following expiry of Feehly's lease, the farm was managed by Jock Butel between 1916 and 1920, after which it was leased by Harry Scott until 1927. In that year, Peter Butel (Jnr) took over the farm as his great-uncle had wished. The farm remained in the family until it was sold to the government in 1947 for use as a 'rehab' centre for returning servicemen and the 83 year association with the Butels ended.

²⁷ Balfour Cynthia. 1990s. Millbrook – Farmlands to Fairways. Lakes District Museum – unpublished.

²⁸ Ibid. Page 3, Chapter 5

²⁹ Ibid. Page 8, Chapter 4

John Butel died in 1903 at his residence having been a very successful farmer. In 1886, the Otago Witness reported³⁰ "Mr John Butel has now retired from the firm (flour mill), and devotes his time and attention to farming his 500 acres of land, upon which he has effected many improvements. At present he is employed in chiefly rearing stock on account of the low value of grain. Nearly the whole of the land is under grass, and about 40 head of cattle and 500 sheep are grazing upon it, in addition a number of pigs from which upwards of a ton of hams and bacon are annually obtained. In 1891, the paper³¹ also reported that his "freehold comprises about 500 acres of arable land, and in addition he holds the lease of the Arrowtown endowment of about 1000 acres, upon which he runs a number of sheep, the whole making a very compact and valuable property. It may well be said that the farm ranks with the completest and best managed in New Zealand – indeed it may be asked whether it is excelled by any."

It continued "Mr Butel and family came to this district in its earliest days, and have grown with it, until the head of the family has surrounded himself with a home and property that may well be set up as a model farm, and which, indeed, has proved itself a practical working model. All the improvements have been made in the short space of 12 or 15 years; and passing over a substantial bridge leading to the farm under the shade of towering poplars one can hardly realise the fact that so short a time ago the site was a comparative wilderness, adorned only by matagourie and speargrass."

When John Butel died in 1903, his farm was transferred to his son, John Butel the younger. It was subsequently transferred to both of his sons, John Mills Butel and Hugh Augustus Butel in 1937, before being passed to his daughter Catherine Elliot in 1939³².

Conclusions from the historical record

- John Butel purchased the de la Perrelle's farm in 1882 and Ogilvie's farm in 1892 to extend his estate. It is likely therefore that he extended the landscape features of his estate to his new land-holdings.
- John Butel remained at and died in his own residence near Arrowtown, but he had a large family and outlying farmland, such as the de la Perrelle farm would have made an ideal location for a home for a family member.

B.7 Subsequent owners

As can be seen in the timeline in the section that follows, Sections 29, 30, 57, 62 & 63 Block VI Shotover District remained in the Butel family until 1939, when they were transferred to Catherine Elliot (nee Butel)³³. Catherine Butel married Matthew Elliot in 1920, whose profession was listed as a carrier³⁴. Matthew was 31 years old at the time, while Catherine was 19. Their son, George Elliot, whose maternal grandfather was John Mills Butel, acquired the farm in 1949 after his father died in 1948³⁵. Evelyn Dennison of Arrowtown has helped with some of her recollections of the farm during the ownership of George Elliot³⁶. George was her stepfather and Evelyn lived at the farm whilst in her teens in the 1950s.

Evelyn recalls the two room stone cottage well and that, at that time, it had a rear lean-to comprising a kitchen with a coal range and a laundry. The extension had been built by her Grandfather, Matthew Elliot. At the rear of the lean-to, a track led away from the house to a privy/long-drop on its southwest side. There were also the suggested remains of a cow byre

³⁰ Otago Witness, 16 July 1886

³¹ Otago Witness 24 April 1891

³² Certificate of Title, OT 60/291

³³ Certificate of Title, OT 60/291

³⁴ Wakatipu Anglican Marriage Register Book 4. No. 33

³⁵ Certificate of Title, OT 298/222

³⁶ Personal communication February 2015

to the southeast of the house (the byre had burnt down before she lived there) where the house water tank is today located.

The drive to the house, with its bridge over the creek, was the one that exists today, closest to the woolshed. There was a very rickety garage near the foot of the steps leading up to the front of the stone cottage. The garage was pulled down while she lived there.

Evelyn also remembers the rectangular barn/woolshed (without lean-to extensions) and sheep pens close to it. The farm was mainly concerned with sheep when she lived there although there were some cattle.

Alan Reid, whose family was associated with farming at Willowbrook, went to school with George Elliot, and was good friends with the family. He recalls when he heard the news that the 'cow shed' burnt down while he was at the pub in Arrowtown when they phoned in to report the fire in the 1940s³⁷. It was believed to be due to an electrical fault, and the building was not considered very old at the time. He also recalled that Matthew Elliot used to run a mix of sheep and cattle on the farm, and that George Elliot built the barn/woolshed sometime in the 1940s or early 1950s. After its construction, George Elliot started to run more sheep on the farm. The place was called Elliot's Farm when Alan was living at Willowbrook.

The property finally left the Butel/Elliot family in 1974 when it was sold to Peter Basil Sterling, a merchant from Australia. He and his wife Enid occupied the cottage and renamed the farm Dalgleish³⁸. Ian and Pip Macauley acquired the farm in 1981³⁹ and have provided information, which together with records held on the QLDC Edocs system and the interviews above, has established:

- The barn/woolshed was built by George Elliot in the 1940s or early 1950s.
- In 1981 there was a garage in front of the cottage and the timber shed/shearer's quarters was located close to the cottage.
- Water used to run down the gully on the west side of the cottage and down past the barn/woolshed. Ian dug the ditch between the barn/woolshed and present location of the shed/shearer's quarters to direct the water away.
- The bridge to the cottage over Mill Creek was in very poor condition and Ian re-built it. It had been damaged by film crews making a film called 'Race for the Yankee Zephyr' (1981).
- Ian and Pip built the existing extension to the stone cottage in 1991. Pip remembers the earlier 1940s rear lean-to;
- Ian had alterations carried out to the barn/woolshed, including closing up the large opening in the north wall and building the two extensions.
- There was a subdivision in 1995, which divided off the house and approximately 1 ha of land and which resulted in the alteration of the drive and the construction of a new bridge/culvert and access leading to the cottage.

The photograph in figure 4 has recently been added to the Lakes District Museum archives. It is believed to have been taken in George Elliott's time and close examination shows:

- A fenced garden around the cottage with two paths. One path leads around the west side of the cottage to the rear where a washing line and a timber store can be seen.
- The photograph does not include the barn/woolshed. It may be just outside of the photograph on the right and the photographer specifically wished to exclude it, but this cannot be said for certain.

The photograph in figure 5 shows the cottage from Malaghans Road before the existing rear extension was built. Close examination of the photograph shows a garage below and in front

³⁷ Personal communication February 2015

³⁸ McDonald, Bill. 2010. p 88.

³⁹ Certificate of Title, OT 8D/869

of the cottage and the shearer's quarters on the righthand side of the cottage. It also shows a section of drive in front of the cottage that no longer exists and what appears to be yards close to the woolshed. The front of the cottage is not obscured by the walnut tree that presently hides it from view and which was probably planted in the 1970s.



Figure 4 A photograph (EL 5282, Lakes District Museum) of the cottage taken from Malaghans Road. The photograph is undated, but probably dates from the 1950s.



Figure 5 A photograph (courtesy of Lakes District Museum) of the cottage taken from Malaghans Road. The photograph is undated, but probably dates from the 1970s.



Figure 6 A scene from 'Race for the Yankee Zephyr'⁴⁰ which is believed to show the barn/woolshed at Dalgleish Farm in about 1980. There was a small, old lean-to on the creek side. Without the modern extensions the barn/woolshed has a much more appealing, traditional Central Otago form.



Figure 7 A second scene from the same film showing the south elevation of the barn/woolshed with a lean-to but not the extension for the Wool Room.

⁴⁰ https://www.youtube.com/watch?v=M_b-cALHZkk

B.8 Timeline

The following timeline has been established from the current and historic title documents and other research:

1868 - 1881 Elias de la Perrelle (leased prior to 1880)
 1881 - 1882 Helen de la Perrelle (nee Lindsay)
 1882 - 1903 John Butel
 1903 - 1937 John Butel the younger
 1937 - 1939 John Mills Butel and Hugh Augustus Butel
 1939 - 1949 Catherine Elliot
 1949 - 1974 George Elliot
 1974 - 1981 Peter Basil Sterling and Enid May Sterling
 1981 - 1996 Philippa Anne Macauley and Ian Gordan Macauley
 1996 – Present (2014) Philippa Anne Macauley, Ian Gordan Macauley, Bruce Young Cunningham, John Steven Pritchard

B.9 Detailed description of the historic heritage elements of the farm

An inspection of the farm was undertaken on 9th January 2015, which involved a drive and walk around the land and interior/exterior examination of the house, woolshed and timber store/quarters.

Farmland

The early survey plans show access to the land from the Arthurs Point/Arrowtown road (now Malaghans Road) and from Mooney Road, which runs along the southern boundary of the farm and which the survey plans show as continuing to the northern end of Lake Hayes. It would seem most likely that the historic access to Elias de la Perrelle's land was from Malaghans Road and that the route into the property today is the 19th century one (except as altered by the 1995 subdivision and the formation of the new bridge and drive to the cottage).

This would mean that the western-most bridge, although altered and reconstructed in the 20th century, may retain pre-1900 abutments.

The pipework of the Arrow Irrigation Scheme is prominent feature of the landscape in Section 63. The pipework ends and becomes a water race as it reaches the higher ground and the race turns eastwards before entering another section of pipework followed by another section of open race, after which it leaves the farm. The following history and information on the Irrigation Scheme has been provided by Lakes District Museum:

"As early as 1912, local farmers had petitioned the government to provide an irrigation scheme to irrigate crop and pastoral land in the Wakatipu Basin. The scheme was started in 1923 and completed in 1930. It takes water from the Arrow River, five kilometres above Arrowtown where a dam was constructed. During the peak agricultural period of the district it was capable of irrigating 1400 hectares through 14 kilometres of pipe and 70 kilometres of races. The scheme splits in two directions extending as far as Frankton and Arrow Junction. Total cost for the project was £20,000 (about NZ\$2 million in 2006).

The pipes have the capacity of carrying 1700 litres of water per second and many of the original pipes survive today. The plates were cast in England and shipped to Dunedin where foundries rolled and riveted them before sending them by rail to Kingston and Cromwell where they were trucked or sent by lake steamer to Arrowtown. Trucks or horses and wagons were used to transport pipes, men and other materials up to the Arrow Gorge.

Using gravity and siphons to move water, the scheme crosses rivers, goes through tunnels and crosses steep terrain. It is a significant engineering feat built with limited resources.

With the benefit of irrigation, different farming methods were tried. Dairy farming, fat lamb production, the growing of grain and grass seed all added to the district's fortunes. In a cost cutting measure, the government of the day tried to shut the scheme down in 1984. This was successfully opposed by a group of local farmers. The 1999 floods caused major damage to the scheme, but that was successfully repaired. Today there are few agricultural subscribers to the scheme and much of the water goes to lifestyle blocks and golf courses."⁴¹

South of the race, on higher ground, there are a number of concrete pipes and a modern water storage tank. These pipes are believed to form part of a borehole for the water supply to the farm.

In Section 30, a long piece of iron/steel water pipe was found. This was positioned there as a jump for cross-country horse-riding and it is considered to be a 20th century feature, probably associated with the Irrigation scheme.

There are several trees of note in the vicinity of the stone cottage, including a walnut tree and two very large black poplars. The Encyclopaedia of New Zealand⁴² records:

*"Poplars were first grown in New Zealand in the 1830s. They were brought in as ornamental trees and for shelter. Lombardy poplar (*Populus nigra* 'Italica'), eastern cottonwood (*P. deltoides*) and silver poplar (*P. alba*) were among the early introductions. Lombardy poplar, with its column-like form, was especially favoured – it was often planted to mark boundaries and river fords as it could be seen from a distance.*

In the 1930s the New Zealand Forest Service imported more poplar species to investigate their timber potential."

The age of the two large poplars has been discussed with Paddy Baxter and he is of the view that they are at least 100 years old. He recalls similar large poplars at Millbrook, which would have been planted during the Butel brothers' time and therefore it would seem quite likely that the large Black Poplars at Dalgleish Farm were also planted by the Butels sometime after John Butel purchased it in 1882. See also the Otago Witness quote regarding poplars at Butel's farm – reference 31.

Landscape

The landscape of Dalgleish farm has evolved over the 150 years or so from an area of rolling hills that was once predominately covered in grey shrubland, to open arable pasture used for farming sheep. This evolution of the land has seen several changes to its use during this time. Its extensive historical use as a farm with the addition of trees to cultivate the ideals of an Arcadian landscape has resulted in several historical remnants of these early European outlooks.

In a little more detail, before human occupation by Maori, the landscape would have likely been extensive grey shrubland and tussock in the floor of the basin, with small pockets of wetlands. Following extensive burning of this area by both Maori and early European settlers, the initial plants to establish would have been bracken fern, matagouri and speargrass⁴³. This would have provided a challenge to the early settlers in their attempts to grow crops and raise stock, and would again have been cleared to seed exotic pasture grasses. This extensive clearing would have resulted in an open landscape, punctuated only by outcrops of schist and remnant vegetation, as is apparent in many early historic photos of the

⁴¹ 'The Arrow Irrigation Scheme', Lakes District Museum

⁴²<http://www.teara.govt.nz/en/trees-in-the-rural-landscape/page-4>

⁴³ Otago Witness, 16 July 1886

Wakatipu Basin. As already mentioned in section B.6, the early European settlers in the area would have begun to plant trees, such as poplars and willows, to provide both shelter for stock and for the European aesthetic in the form of an Arcadian landscape. Straight lines or avenues of well-proportioned trees were popular, as is currently evident in the The Avenue along the entrance road to Millbrook. Dalgleish Farm appears to have undergone a similar revegetation as was occurring at the Butel Farm (now Millbrook), with poplars (and possibly other species of trees) likely planted in an effort to extend the image of a settled European landscape.

Initial farming of the land was mainly in the form of growing of wheat, which would have retained the open nature of the landscape and reflected similar farming practices from adjacent farms. Following the decline in wheat prices at the end of the 19th century, the landscape would have been populated more economically by sheep and cattle, an image more reflective of how the land is used today. Again, this would have retained openness to the landscape, with uninterrupted views across the basin towards Lake Hayes and Arrowtown from high points on the farm.

Following the construction of a dwelling on the property, the area immediately around the building would have likely begun to reflect a more domestic use of the land, with the addition of a garden and associated outbuildings. Further use of the property for farming led to the establishment of a barn/woolshed and shearer's quarters, depicting a typical landscape of sheep farming that was common across the Basin in the mid-20th century.

House

The existing house on the farm lies within the historic Section 63. It comprises a single-storey, stone-built cottage with a quite substantial and overbearing 1990s extension at the rear. The layout of the 2 cell cottage with central passage way/hall indicates that it originally had another structure at the rear – probably a lean-to. Pip Macauley⁴⁴ has advised when they purchased the farm, the cottage had a lean-to at the rear which she thought probably dated from the 1940s. It was demolished when the present extension was added.

The stone cottage has a frontage of approx. 10.1m and a depth of 5.5m and is of traditional form having simple, east and west gables and two rooms divided by the central hall/corridor. It is constructed of stacked (rubble) schist walls measuring approx. 550mm in thickness above a projecting stone plinth/foundation. The north and east elevations have been painted white externally, whilst the west gable is undecorated. The front (north) elevation has a centrally positioned entrance with 4 panel, timber door (with fanlight over) and a single window either side. The windows are of timber, double sliding sash type with each sash having a central glazing bar giving a 2 over 2 pane arrangement. The windows and door have plastered reveals and surrounds and masonry sills.

The cottage roof frame could not be seen as there was no apparent access hatch inside the cottage and, hence, the age and form of the frame is unknown. Externally the roof has been reclad to match the extension and it is assumed therefore that this was done in the 1990s. The cottage has fascias, barge boards and spoutings of similar modern age & design.

Internally, the cottage ceilings are lined with tongue, groove and beaded timber boards and are quite plain, having only simple mouldings at the junctions with the walls and no roses. The walls are plastered and the east room and hall have a dado rail and timber panelling below. There are decoratively moulded skirting boards and tongue & grooved lined, suspended timber floors. The two rooms have old 4 panel doors, whilst there is a modern replacement at the end of the hall.

The east room has a plastered chimney breast, but the fireplace has been altered with a modern, decorative brick type surround added – which adds nothing to its character.

⁴⁴ Personal communication January 2015

The 'exterior' face of the south wall is finished in pointed stacked Schist, but there are holes where timber grounds have been inserted (and some grounds remain in place) indicating that this wall has had a lining in the past – probably timber panelling within the former lean-to.

As described earlier, historical research has not revealed the year of construction of the cottage, save that it was built after Helen de la Perrelle made an affidavit and inventory regarding her husband's estate on 21st March 1882. There are, however, a number of features of the cottage's construction that, stylistically, give an indication of its age:

- The sash windows are technologically quite well-advanced for the District, which suggests that they are of later rather than earlier date. For example, each upper 2 pane sash has horns, which were designed to strengthen to joints in the bottom of the sash once larger panes of glass were in use. Similarly, the lower sashes have sash cords on pulleys, whereas in earlier and more basic windows this mechanism was omitted. In addition, although some of the panes have been replaced with modern 'float' glass, there remain a few older panes. These latter panes are still of good quality glass, without the imperfections of, say, typical 1860s glass.
- Rendered reveals and surrounds to windows & doors.
- Much of the interior of the cottage is finished with old, but good quality, plaster.
- Its interior form and size.

Whilst it is difficult to be certain with the stylistic dating of rural buildings, these features suggest a date for the cottage's construction of 1890 or later.

It is interesting to consider that the marriage of John Butel the Younger to his wife Maria in 1894⁴⁵, and the birth of their son in 1896, may have led John Butel to construct the cottage for his growing family during the mid-1890s.

Remains of a 'cow byre'

Behind the cottage on the other side of the rear drive is a flat area upon which there is a modern water tank. The tank sits on a collection of concrete slabs with the edge of the slab closest to the rising ground having a concrete lip with a number of steel or iron flats embedded in it. The slabs are overgrown and could not be closely examined. The entire slab area measures roughly 8.6 metres by 3.6 metres, with an extension on the southwestern end that measures 5.2 metres by 1.5 metres.

Evelyn Dennison and Alan Reid referred to this as the remains of a cow byre or shed and this information has been passed down to Ian and Pip Macauley, who have been told the cows were milked there and the cream was taken to a dairy at Speargrass Flat. This seems an unusual location for a cow byre given the steep ground. No further information has been found to indicate its construction date, although, as mentioned previously, Alan Reid recalls when it burnt down in the 1940s.

Barn/woolshed

The 'woolshed' is a timber-framed building constructed on the sloping ground to the northwest of the stone cottage. As built, it was a rectangular structure, measuring approx. 6.1 x 12.2m, with a simple east-west gabled roof. This structure has lean-tos on the south side with one providing a wool room and the other a covered killing shed. On the north side is a large lean-to shed to which sheep pens adjoin. The wool room and north extensions date from 1980s. Accordingly, for the purposes of this historic heritage assessment, both extensions have been disregarded, but consideration has been given to the age and potential heritage values of the original rectangular structure and lean-to.

⁴⁵ Matura Ensign, 16 January 1894

The original structure sits upon rectangular, concrete piles, which increase in height with the slope of the ground. The eastern half of the building has a floor of bare timber boards of differing size, whilst the western half has a grated floor as expected of a woolshed. The walls are all timber-framed with 4" x 2" studs clad externally with painted, timber shiplap weatherboards and unlined internally. The roof comprises five timber trusses of 'Queen post'-type design and is clad with painted corrugated iron sheeting.

The building has undergone alterations, including the removal of a large section of the south wall for access into the wool room and the lines of nail holes in the roofing iron indicates that this is not an original roof covering, but rather a covering salvaged from another building. A lot of the shiplap weatherboards have been replaced, albeit some years ago, but those to the west elevation are the oldest (and the poorest in terms of their condition) - the east elevation of the building is almost completely covered with vegetation, which meant that the boards here could not be seen externally.

There are a number of characteristics of the building that raise questions about its provenance:

- The woolshed does not have traditional chutes for sheep to leave building after shearing, but instead there are sliding doors on steel tracks and rollers at the east and west ends of the north elevation. In between these, a large central opening has been closed-up and weatherboarded over. A section of the weatherboards below the eaves line to the west gable has also been affixed to the structure with a continuous, vertical joint suggesting a further alteration. It was possibly designed as a barn and the height of the floor above ground level adjacent to the north elevation probably helped loading/unloading. Alternatively, it was built for use as a woolshed and modified subsequently to improve functionality.
- The age of the 'woolshed' is *circa* 1940s or early 1950s.

Between the woolshed and the timber store/quarters is a water course overgrown with vegetation. After a discussion with Ian Macauley, it has been established that it was dug by Ian in the 1980s to alleviate issues with water runoff from the hill above.

Timber store/quarters

There is a small timber-framed and weatherboard clad store to the west of the woolshed. Pip Macauley has advised that when they purchased the farm it was located closer to the cottage, but they had it moved to its current location. Its age and provenance are unknown.

Section C – Assessment

The outcome of the historical research and the on-site investigations suggests the following historical provenance:

Element/Feature	Pre-1900 origin	20 th century origin	Summary of overall historic heritage value
Stone cottage	Likely, but possible turn of the century origin. Associated with the Butels.	Possible early 20th century	Moderate to high
Barn/woolshed	No	Yes. Associated with the Elliot's, 1940s/50s	Low to moderate
Store/Quarters	Not known	Likely	Low to moderate
Drive & possible remains of western-most bridge	Yes. Likely to be associated with de la Perrelle.	Alterations	Moderate
Eastern-most bridge	No	Yes	N/A
Irrigation pipework	No	Yes, but altered	Low to moderate
Watercourse between woolshed and Store/Quarters	No	Yes – post 1981	N/A
Remnants of cow byre	Possible	Likely	Low to moderate
Two Black Poplars	Likely	Possible early 20th century	Moderate
Other trees around the cottage	No	Yes – walnut tree dates circa 1970s.	Low

EVALUATION OF HERITAGE VALUES

Historic and Social

Dagleish Farm has high historical and social value for its associations with a number of the early pioneers of the District - Elias de la Perrelle, John Butel and Bendix Hallenstein - in terms of their ownership/occupation of parts of the present farm and their working of the land.

The farm is also an example of the historical development of farming in this part of the District as the use and productivity of the land changed from uncultivated land, to cereal crops and cattle and sheep farming.

Whilst the exact age of the stone cottage, barn and other structures/remains uncertain, the longevity of the ownership of the majority of the farm (1882 – 1974) by the Butel/Elliot family means that they are undoubtedly associated with the Butels. It is also likely that the stone

cottage was built during the ownership of John Butel himself, although it was most likely constructed for a family member or possibly an employee (a farm manager, perhaps). The marriage of John Butel the Younger to his wife Maria in 1894⁴⁶, and the birth of their son in 1896, may have led John Butel to construct the cottage on the estate for his growing family during the 1890s.

Cultural and Spiritual

Dalgleish Farm has no known notable spiritual significance to Maori (Ngai Tahu have been contacted by John Edmonds & Associates and it is understood that nothing of significance has been identified), nor does it have any spiritual significance with local residents of the area. Its cultural significance lies in its ties to some of the earliest and most prominent residents in Arrowtown's history. Elias de la Perelle, the Butels, and James Ogilvie were all important early farmers and members of society and were associated with different aspects of the farm during the 19th century. The early farmers' efforts to grow crops for both feeding the booming population and to provide an alternative source of income early in the town's formation, became instrumental in aiding the settlement's survival and growth. In particular, the Butel name became prominent within the area, but also regionally and even to some extent internationally. The continued use of the land for farming for over 150 years provides a strong cultural continuity to the surrounding landscape and its history of farming.

Architectural

The stone cottage is of traditional simple, gabled form and is representative of a typical late 19th/early 20th century form of rural dwelling in the District.

Including its original lean-to, it would have made a reasonable-sized farm cottage of two 'cells' and central hall/passageway leading to the rear service accommodation. The width of the gable ends is quite generous; so providing good proportions to the parlour and bedroom.

The arrangement of the front (north) elevation with central entrance door and single window either side is again a typical characteristic of this age and type of dwelling.

Although the roof has been reclad and it is not known the extent to which the historic roof frame remains, the rest of the stone cottage retains a high degree of historic architectural authenticity.

The extension at the rear of the stone cottage is about 25 years old now. It has a dominating effect on the historic cottage and is considered to have an adverse/negative effect of the historical architectural value of the stone cottage.

The barn/woolshed is of functional, agricultural design and is not considered to have particular architectural significance, but it does have overall value to some degree to the significance of the farm. The barn/woolshed has been adapted for shearing use rather than being built for the purpose. This is not uncommon in the case of smaller woolsheds in the District.

Townscape and Contextual

The stone cottage plays a limited role in relation to any of the surrounding historic settlements. Its relative isolation and use in a rural area precludes any visual contextual associations with the Arrowtown townscape. It is, however, an important element of the Miller's Flat/Speargrass Flat landscape, which historically comprised small farmsteads dotted throughout the flats.

⁴⁶ Maitauru Ensign, 16 January 1894

The siting of the cottage, barn/woolshed and shearer's quarters together has importance in terms of their 'group' value. The nature of the buildings, as a group, defines their most recent 20th century use, although not the earlier nature of the farming activities on the land.

As mentioned before, the shearer's quarters building is understood to have been moved from a position closer to the stone cottage and is, in any case, quite likely to have been relocated to Dalgleish Farm from another site at any earlier date.

Rarity/scarcity and Representative

The stone cottage is representative of a small historic farmhouse in the District. It is not a particularly unusual historic building for the Wakatipu Basin, but buildings of this type are a diminishing heritage resource in the District. Accordingly, its continued guardianship will play an important role in the future well-being of the heritage of the District more generally.

Woolsheds and barns are common features of the Wakatipu landscape, but many buildings are in poor condition as is the case with the woolshed at Dalgleish Farm. Again, they are a diminishing heritage resource and repair and reuse is encouraged.

Technological

Although relatively plain in architectural terms, the quality of construction of the stone cottage is considered to be good and reasonably technologically advanced for a small, rural domestic building. Particular elements/features of technological value in the cottage include:

Good quality stacked (rubble) Schist; and
Sliding timber sash windows with sash cords, pulleys and weights.

The barn/woolshed and shearer's quarters are both considered to be of low technological value.

Archaeological

Dalgleish Farm is considered an archaeological site under the Heritage New Zealand Pouhere Taonga Act 2014. An archaeological site is classified under section 6 of the Act as a place in New Zealand, including any building or structure (or part of a building or structure), that was associated with human activity that occurred before 1900.

Pre-European occupation of the Wakatipu Basin was in the form of temporary camps to allow a variety of resources to be gathered. Marshy areas were particular points of interest to Maori as they provided ideal sources of food and game. It is very unlikely that any material remains of these activities survive in the area, but if they did, they are likely to be concentrated around the marshy areas surrounding Mill Creek.

The use of Dalgleish Farm extends back to at least 1867 by Elias de la Perrelle, and was in continuous use as a farm through the later 19th century. Historic documentation notes the presence of a single room stone shed that was constructed before 1882, and was utilised by de la Perrelle. This structure appears to have been subsequently demolished or removed at an unknown date. Its location is uncertain, but is likely to have been within either section 62 or 63, and with a higher probability that it was near the current extant cottage.

The stone cottage dates to *circa* 1890s and would have had a domestic focus. Therefore, there is a high likelihood that artefactual evidence in the form of domestic refuse (ceramic, glass, bone, etc) would have been deposited in the area. Refuse was generally discarded out the back of the dwelling. Additionally, a 19th century privy or long-drop would have been used, and would again likely have been situated at the rear of the house. Excavations for the 1991 extension may have removed all potential trace of these archaeological remains, but

there is still a possibility that they survive in the surrounding area. Based on oral histories and photographs, a garage was constructed near the front of the cottage. Its construction date is unknown, but likely dates to the first half of the 20th century.

The existence of a concrete slab above and behind the stone cottage on a terraced slope is understood to have been the foundation for a cow byre. The building burnt down sometime in the 1940s, and is unlikely to have been constructed in the 19th century. The shearer's quarters and woolshed/barn were both likely constructed in the early to mid-20th century. Other farm buildings may have been constructed late in the 19th century when the property was acquired by John Butel. If any additional farm buildings were constructed, their subsurface footprint was likely to have been minimal, but cannot be altogether discounted from potential archaeological remains.

The bridge that crosses Mill Creek to the west of the modern driveway/access road may be situated on the original crossing point of the creek when the area was farmed by de la Perrelle, and later by Butel. It is possible that there are remnants of an early bridge or ford at this crossing. This area may include remaining archaeological features such as stone abutments.

Archaeological material encountered on Dalgleish Farm would provide beneficial information on the farming practices and late 19th century rural domestic life in the Wakatipu Basin.

LANDSCAPE SUMMARY

The landscape of Dalgleish Farm is best characterised as open arable farmland with views of the surrounding basin. The heritage landscape value of Dalgleish Farm lies in its connection to the historic farming of the basin and the landscape created by the Butels. While the property did not achieve the same early historical prominence as the main neighbouring Butel or Hallenstein properties, it does reflect the nature and historical endeavour of early farming exploits. The early planting of European trees, which are now well established, was an attempt to install an Arcadian feel to the landscape. The property's continued use as a farm over the 20th century has allowed significant aspects of this European established landscape to be retained. Similar historic farming properties still exist in the Wakatipu Basin, but are declining in number and size.

KEY VULNERABILITIES

The historic heritage values of Dalgleish Farm are considered to be vulnerable to:

- Loss through lack of maintenance and neglect;
- Loss through lack of use and purpose; and
- Insensitive development in the locality – both small and large scale.

MITIGATION RECOMMENDATIONS

The proposals

Reference to the drawing by Baxter Design Group entitled "Millbrook Resort Zone – Structure Plan 2423-SK32-34" dated 11 February shows the following proposals for Dalgleish Farm:

- I. The proposed development being contained almost entirely within historic Sections 29, 30, 57, 62 and 63.
- II. The only elements of the proposals to affect Section 56 are that parts of the 6th and 7th fairways project into the eastern side of Section 56.
- III. A new 9 hole golf course will be created with holes 1 to 7 being established within Sections 29 and 57 and the southern half of Section 30.
- IV. Holes 8 & 9 will be formed within Section 62 and the northern half of Section 63. This will involve the eradication of the existing access road to the farm.
- V. Residential sections and associated access roads will be developed amongst holes 1 to 7, together with areas of native re-vegetation and small ponds.
- VI. Similar residential development with new access roads is proposed for the southern half of Section 63. Mill Creek will be widened/flooded to form larger water features with native re-vegetation along the northern banks. This residential development will extend through to the land below the existing stone cottage and the barn/woolshed. The client has verbally indicated that the woolshed is likely to be relocated to the north of the 9th fairway adjacent to Malaghans Road.
- VII. Higher density 'Millbrook House and Land' – type dwellings will be built close to the southern boundary of Section 63 on the rising ground behind the existing stone cottage and the farm track that leads into Sections 57 & 30. Native re-vegetation will take place in the area between the existing cottage and barn/woolshed and follow the rising ground southward.
- VIII. Residential development (R12) is proposed for the northern-most end of Section 30.

In terms of the historic heritage features and values identified earlier in this report, these proposals are likely to affect the following:

- I. Item I. means that the majority of the proposed development is contained within the early farm of Elias de la Perrelle and part of the farm of James Ogilvie. Both of these farms were subsequently incorporated into the farm of John Butel.
- II. Very little of the development affects the land held by Bendix Hallenstein and which is believed to have been part of his Thurlby Domain estate.
- III. The larger part of the golf course development lies within the higher ground farmland of de la Perrelle and Ogilvie where no historic building/structures or likely archaeological features have been identified to date. The presence of archaeological features here cannot be discounted, but generally speaking this area is well away from the existing historic structures and the likely locations of associated structures and infrastructure.
- IV. The creation of fairways 8 & 9 will affect the present access to Dalgleish Farm. Although it cannot be said with certainty, this may well also be the early access to the farm of Elias de la Perrelle. The golf course here will affect the developed landscape of this part of the farm.
- V. The same comments apply as for III. above.
 - I. The principal historic heritage and heritage landscape values of Dalgleish Farm lie within Sections 62 & 63. The proposals will affect the setting of the historic stone cottage and of the barn/woolshed. They will also affect the developed landscape values of this part of the farm and alter the existing character of historic Mills Creek within the farm. The proposal to relocate the barn/woolshed will affect its contextual mid-20th century relationship with the stone cottage.
 - II. The 'Millbrook house & land' dwellings will impact upon the setting of the historic stone cottage (but not of the barn/woolshed assuming it is relocated). They also

have the potential to affect archaeological features in the vicinity, such as the remains of any privies, water pipes, paths and fencing as well as features relating to the structure said to be a 'cow byre'.

- III. No historic buildings have been identified in the northern-most end of Section 30. The Arrow Irrigation Scheme either passes through the area planned for development or close to it.

Mitigation recommendations and other heritage conservation comments

The Roman numericals in brackets relate to the numbered 'proposals' and 'affects' outlined above.

1. Archaeology

Once the proposals (I - VIII.) have been developed sufficiently it will be necessary to prepare a detailed archaeological assessment and apply for an Archaeological Authority under the Heritage New Zealand Pouhere Taonga Act 2014. Assuming an Authority is granted, there will be conditions to be followed, including conditions for archaeological monitoring of earthworks and the preparation of a report(s) on the findings. The proposals in IV, VI and VII are likely to have the greatest effects on the archaeological values of the farm and may be mitigated, to some extent, by the detailed recording (drawn plans, photographs and written descriptions) of the built/archaeological features therein. This information should be lodged with a suitable, recognised archive(s).

2. General

Whilst it is obvious to say, it is still worth emphasising strongly that the general effects of the residential development (V, VI & VII) within the farm may be mitigated by the careful placing of building platforms, height controls and general good, sympathetic architectural design and the use of natural and recessive building materials and colours. The part of the Residential Activity Area that surrounds the stone cottage and its curtilage (R17 on the Structure Plan) should have particular design controls that take account of the heritage values of the stone cottage and the historic 'Butel landscape' that has developed here.

3. Stone cottage

As part of the proposals (VI), the client has indicated that the historic stone cottage will be repaired and improved, including possibly replacement of the existing rear extension with a more sympathetic extension. This is recommended and encouraged. Repairs should retain as much of the historic building fabric as possible and should follow the principles of the ICOMOS New Zealand Charter 2010. Examples of where heritage conservation repairs may be effected at the cottage are:

- Removal of the light green Colorsteel roof cladding and its replacement with galvanised steel sheeting which is more representative of the earlier unpainted galvanised iron cladding;
- Careful removal of the white paint applied to the stonework of the north (front) elevation and east gable and reinstatement of the stonework and pointing to its earlier appearance (as seen on the unpainted west gable); and
- Repair and refurbishment of the sash windows, parts of which are heavily decayed.

Improvements to the cottage could take the form of demolition of the existing extension and the creation of a new extension which is 'subservient' (rather than dominant like the present one) to the historic cottage and separated from it by say a glazed link. The new extension should also help to lessen the impact of the existing cut bank behind the cottage. The client proposes to retain the Walnut tree in front of the cottage and improvements could be undertaken to reinstate the cottage garden as can be seen in the 'George Elliott' photograph (figure 4).

4. Barn/woolshed

The barn/woolshed's association with the stone cottage dates back to the about mid-20th century and therefore its 'group value' with the cottage is not as strong as it would be if the two had been built together at the same time as the cottage. The repair and continued use of the barn/woolshed for agricultural purposes will help mitigate the effects of its relocation to the northern edge of the farm. Its location here will also ensure that it remains visible and will help to maintain something of an agricultural feel to the landscape along Malaghans Road.

5. 'Millbrook House and Land' – type dwellings

The proposed location of these dwellings close to and behind the stone cottage will affect the setting of the stone cottage and would seem to necessitate removal of the two very old Black Poplar trees that would appear to have an association with the Butel family and the trees that John Butel planted at the (now) Millbrook Resort.

It is recommended that consideration be given to the establishment of a view-shaft and 'curtilage' area around the historic cottage where no development is permitted to take place. This will help mitigate the visual impact on the cottage, particularly in terms of the most prominent views of it from the Malaghans Road side of the farm. In addition, it is recommended that the R17 development area in the locality of the cottage has increased design controls for new buildings that lessen their impact on the setting of the cottage.

An appropriate curtilage area is shown in Appendix D.

6. Plantings/landscaping

Within the area of the existing buildings and Mill Creek, landscaping should reflect the historic landscape features of the Butel estate. The existing poplars should be retained where it is practicable and safe to do so.

As a final word, in heritage conservation terms, the impact of the proposed development on the heritage values of Dalgleish Farm cannot be fully mitigated against. Where a positive heritage outcome can be achieved is in ensuring the long term survival of the farm and its old/historic buildings. Small farms like Dalgleish are under threat, particularly if they are unviable economically, and once they fall in to disrepair it can be very difficult to regenerate them and retain any element of heritage value. The proposed development does provide the opportunity for the repair and continued of the barn/woolshed, the improved re-use of the stone cottage and the continuation in some form of the 'Butel' landscape. The heritage success of the project will, however, depend upon the way in which the proposed future changes are managed and effected from the heritage conservation point of view.

Robin Miller

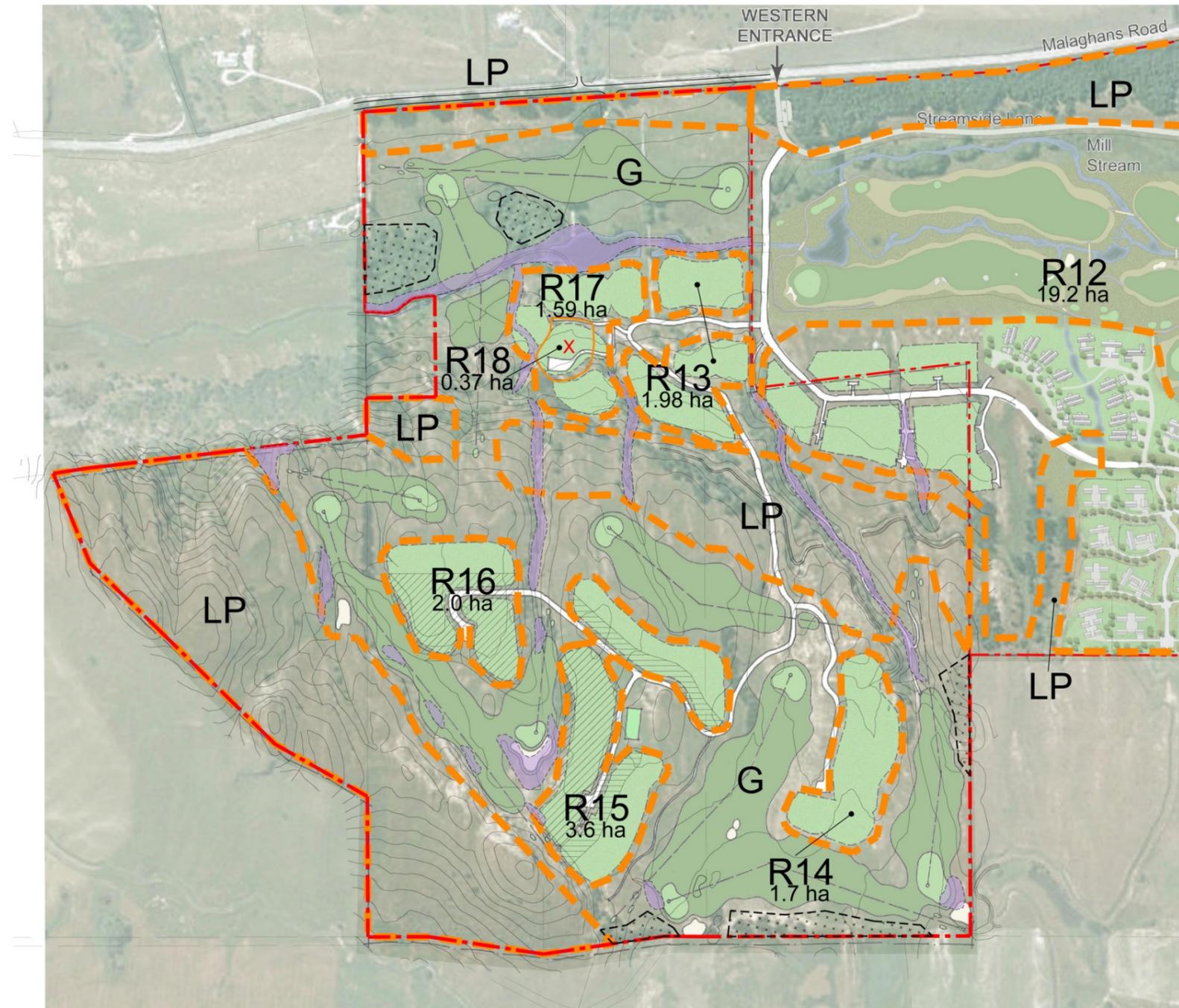
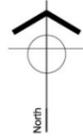
Director

For and on behalf of Jackie Gillies + Associates Ltd

PO Box 213

Queenstown

23rd February 2015

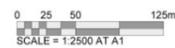


OVERLAYS

Building Height Restrictions
Within 'R' residential Areas,
Refer Rule X

-  5.5m on R14, R15, R16
-  6.5m on part R15, R16
-  5.5m with 6.5m where shown
at road side of lot on part R15

-  Amenity mitigation
-  Ecological protection
and restoration
-  Protected feature



MILLBROOK RESORT ZONE - STRUCTURE PLAN - OVERLAYS

REFERENCE 2423-SK34 - SCALE = 1:2500 AT A1 - 1:5000 AT A3 - 23 Feb 2015

\\server01\jobs\2423 - millbrook_macaukey\cad\2423-sk34 - millbrook_macaukey - structure plan - overlays.dwg - SK34

MILLBROOK



1501

BLOCK N° 6
SHOTOVER DISTRICT
G. M. HARRIS, Surveyor.
Decr 1888

1501



21 - F.B. 110

Net area in sections	1765.182
square	687.527
acres	27.621
per centum add	10.000
	3046.200

1501

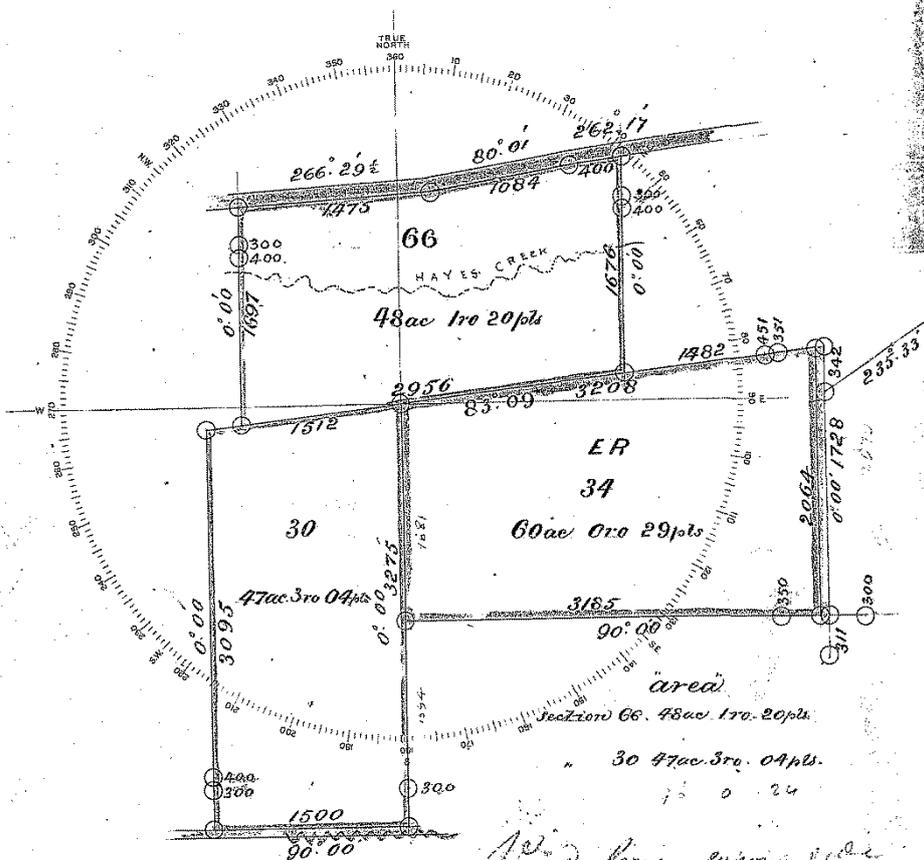
1501 150

Date when received
From Surveyor

22/1/57

Survey Department of Otago.

PLAN of EDUCATIONAL RESERVE,
and land applied for as an
agricultural area by James Ogilvie



Scale 10 chains to an inch

Wood line wrong side
of cut line
J. A. none

R. M. 10/13
18/8/57
22.6.10.1868

Field Sketch of Sections 34, 30 & 66, Block 6 SHOTOVER District,

Surveyed by *R. M. 10/13* Public Surveyor

Date *7th* April 1868

NOTE - All unmeasured and calculated lines to be dotted only. Plans to drawing the land to be noted on the back hereof and any other remarks the Surveyor may think necessary to make.

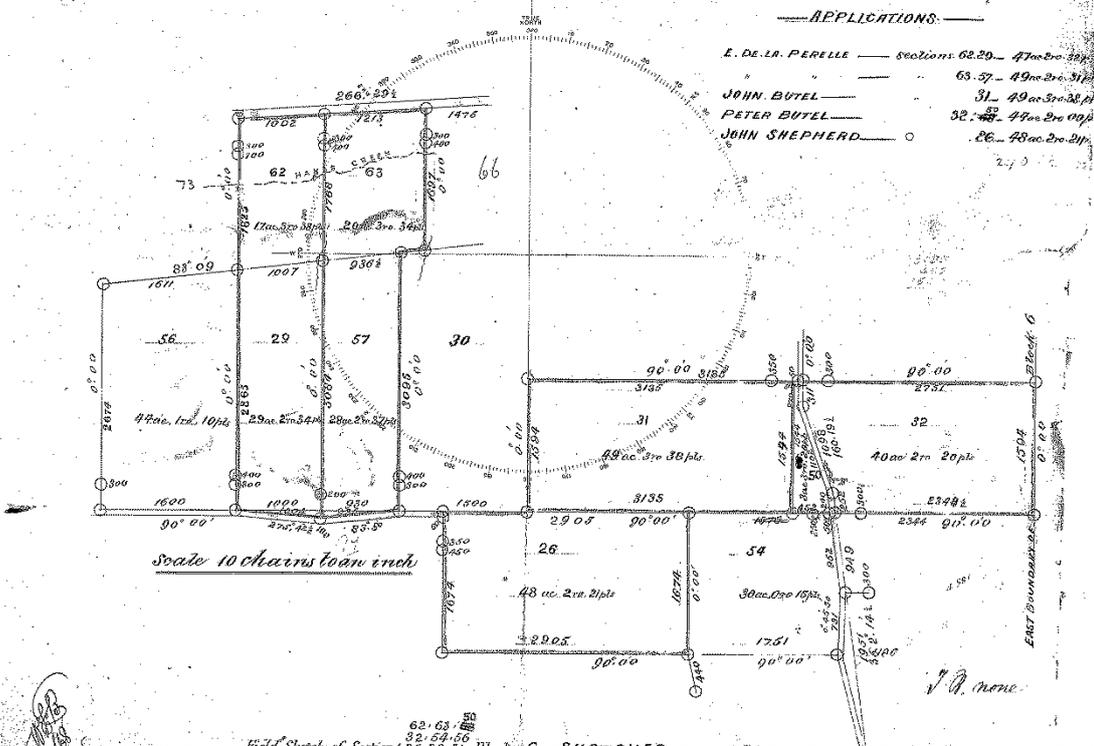
6411

Date when Returned
From Surveyor
1872

Survey Department of Otago.

— REPLICATIONS. —

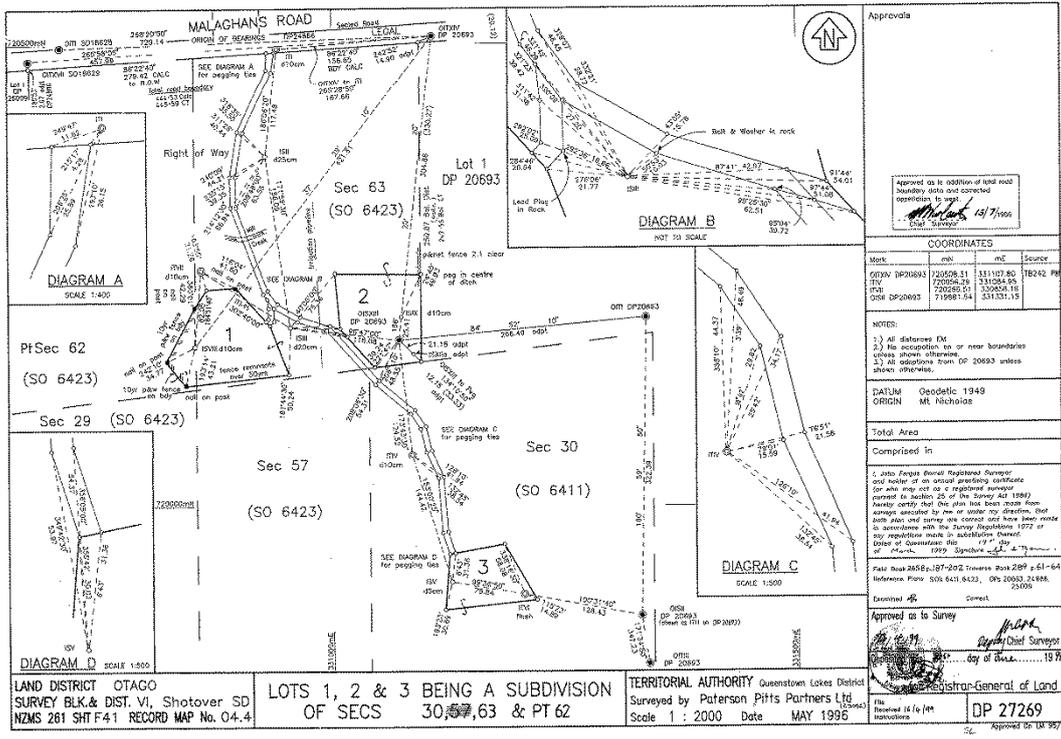
E. DE LA PERELLE — sections 62, 29, 47 ac. 2 ro. 38 p.
 63, 37, 49 ac. 2 ro. 31 p.
 JOHN BUTEL — 31, 49 ac. 3 ro. 38 p.
 PETER BUTEL — 32, 48, 49 ac. 2 ro. 09 p.
 JOHN SHEPHERD — 26, 48 ac. 2 ro. 21 p.



Scale 10 chains to an inch

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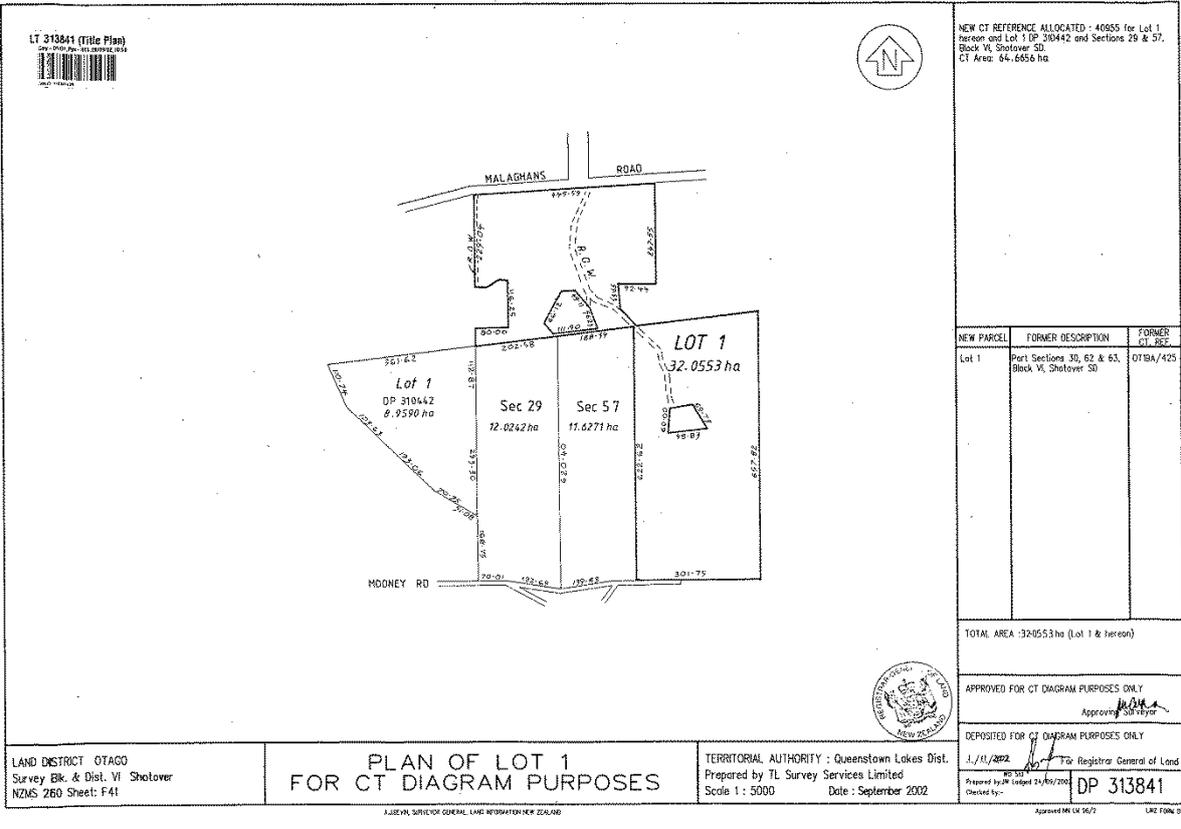


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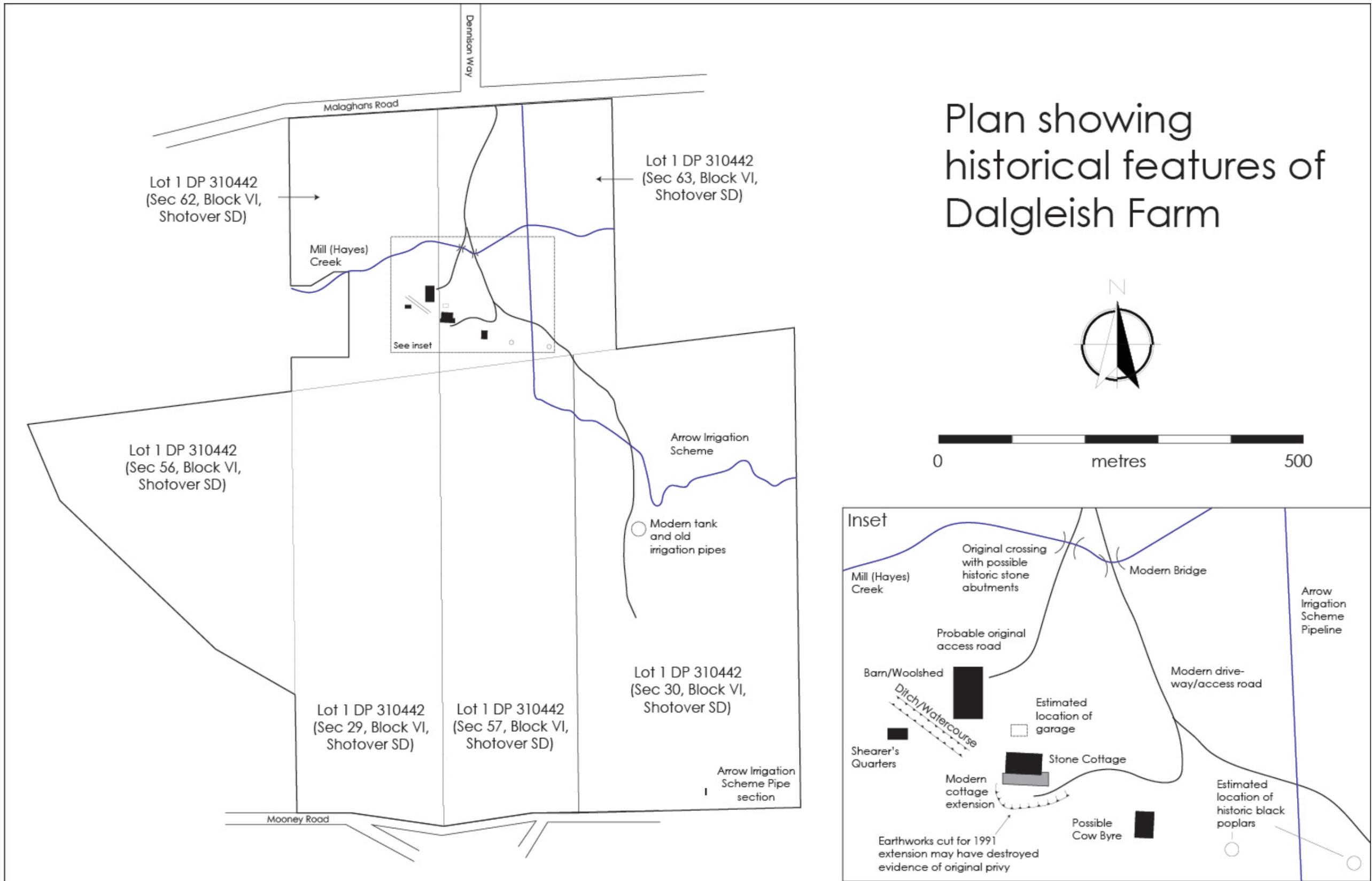
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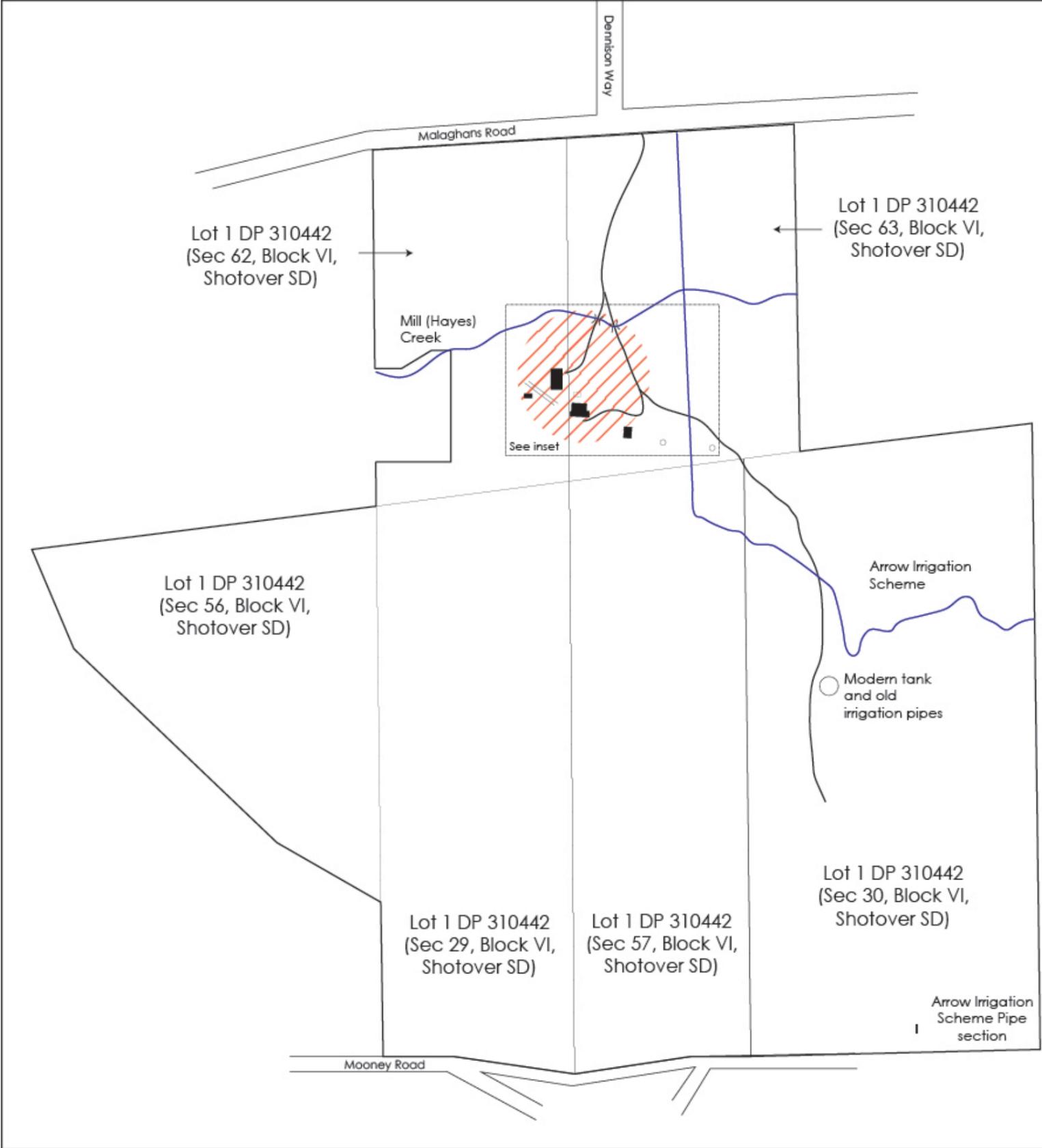
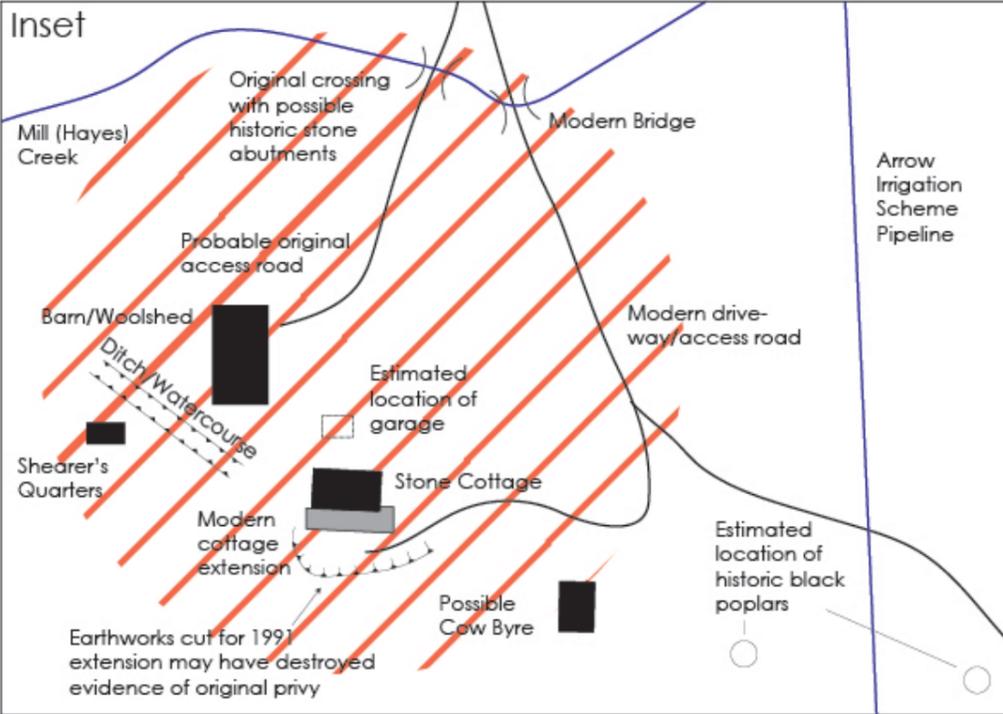
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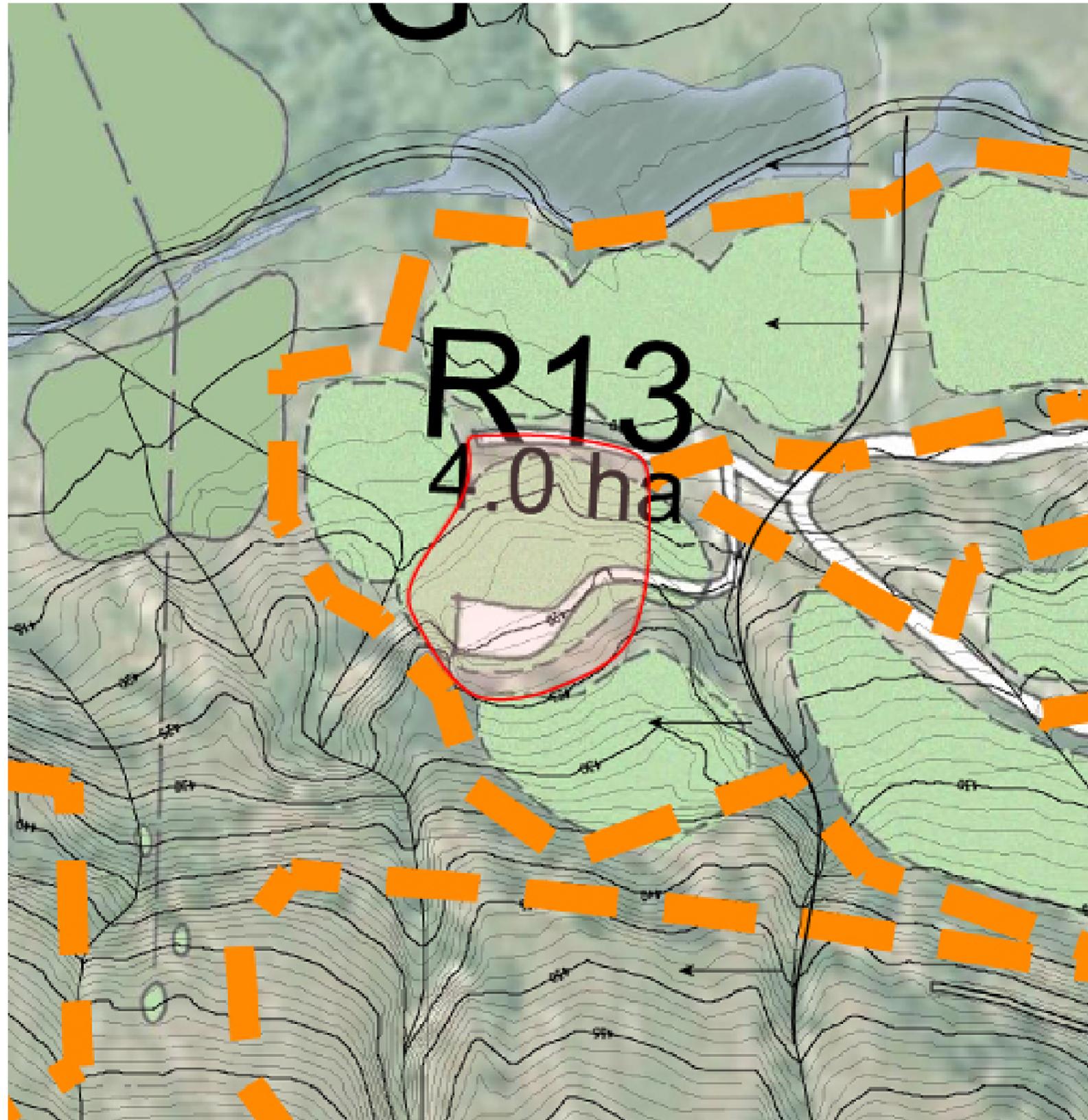


Appendix C – Maps of historic features



Plan of area with elevated likelihood of archaeological material





Suggested historic curtilage area

Review of Ecological Values and Restoration Opportunities for Dalglish Farm

For

Millbrook Country Club Ltd

February 2015



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Ecological Assessment of Plan Change for Dalgleish Farm

Document Status

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1.0 INTRODUCTION

Millbrook Country Club Ltd (MCC) has recently purchased Dalgleish Farm to the west of Millbrook Resort and is undertaking investigations to support a plan change that would enable the development of up to 50 residential houses and nine golf holes over an area of 66.8 hectares. As part of the redevelopment, Millbrook proposes to undertake ecological restoration work in order to support existing ecological values and make a contribution to improving the natural heritage on the property and the wider Wakatipu Basin. In order to examine the risks and potential ecological benefits of the proposed development, MCC commissioned consulting ecologists Davis Consulting Group Limited (DCG) to undertake a detailed assessment of the existing values and explore the ecological restoration opportunities for the site.

This ecological review is set out as follows:

- Section 2: Documents the ecological context of the study area and the existing ecological values;
- Section 3: Examines ecological restoration opportunities, presents a plan showing a possible ecological restoration concept for the site and discusses the ecological benefits for the site and the Wakatipu Basin; and
- Section 4: Conclusions and recommendations.

2.0 EXISTING ENVIRONMENT

The study area for the ecological review is presented in Figure 1 and encompasses a north-eastern portion of the Wakatipu Basin described as the Wharehuanui Resource Study Area. The ecological context of this study area is described herein. The existing ecological values of the wider Arrowtown Basin are also described in order to inform the assessment of the biodiversity that is present in close proximity to the site and how restoration activities on the site can play a supporting role in maintaining and improving the natural heritage of the Wakatipu Basin.

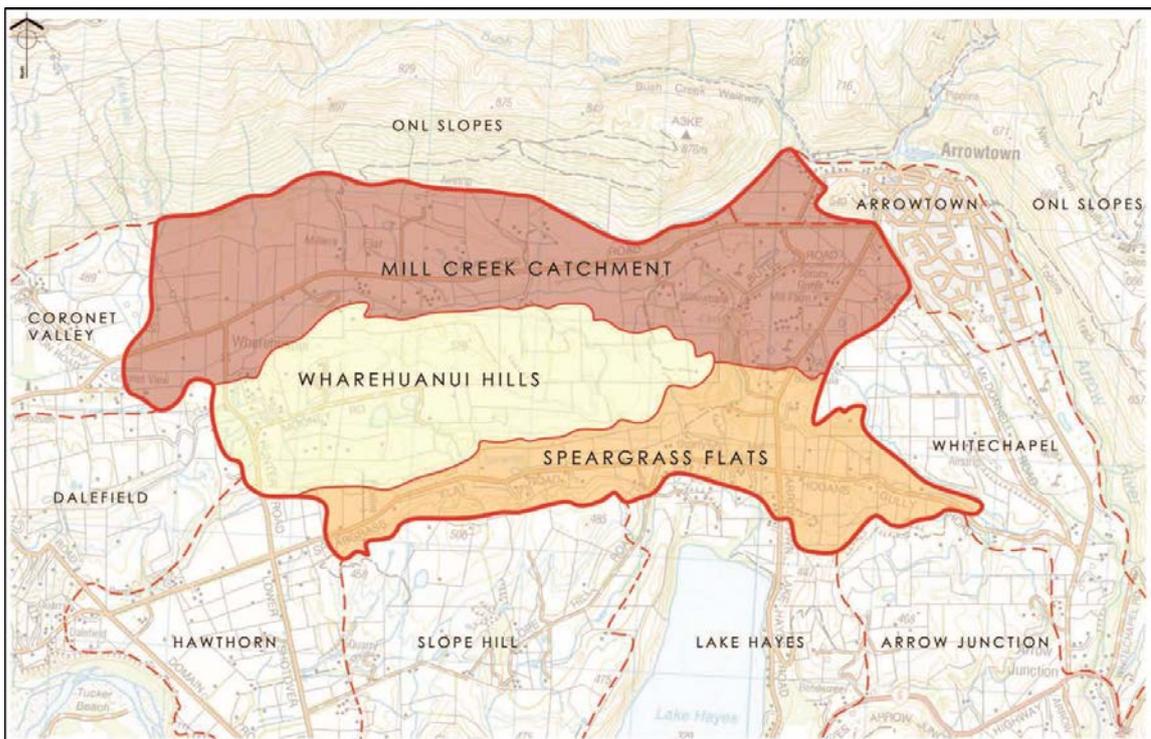


Figure 1: Wharehuanui Resource Study Area (reproduced from Baxter Design Group, 2015)

2.1 Physical Environment

2.1.1 Climate

The Wakatipu Basin has an almost continental climate due to its inland location and experiences the associated climatic extremes of relatively cold winters and hot summers (Meurk, 1997). The basin experiences high sunshine hours in the summer, while during winter the ground can be frozen, with snow falling but not settling for more than a few weeks (Meurk, 1997). Based on information provided on the GrowOtago website there is no strong seasonal variation in rainfall, with annual rainfall ranging from 700 – 900 mm/year.

The growing season is relatively short in comparison to more coastal locations. Frost events can still occur in late October/early November, while the high temperatures during summer

(December to February) allow for a short but productive growing season. The growth and survival of plants can be affected by drought conditions that, while unusual, can occur during summer months, and frost-thaw activity during winter (Meurk, 1997).

2.1.2 Landform and Geomorphology

The study area lies within an east-west trending glacially sculptured valley and ridge system. The valley floors are represented in Figure 1 as the Mill Creek catchment and Speargrass Flats with the Wharehuanui Hills representing the ridge system that was resistant to erosion from glacial activity.

The Wharehuanui Hills are bisected by numerous gullies, some of which are deeply incised. The erosion of these gullies has resulted in the development of alluvial fans that extend into the flood plain of Mill Creek. Figure 2 shows the range of landforms that are present within Dalglish Farm. These landforms are representative of the geophysical environment of the wider Wharehuanui Resource study area.

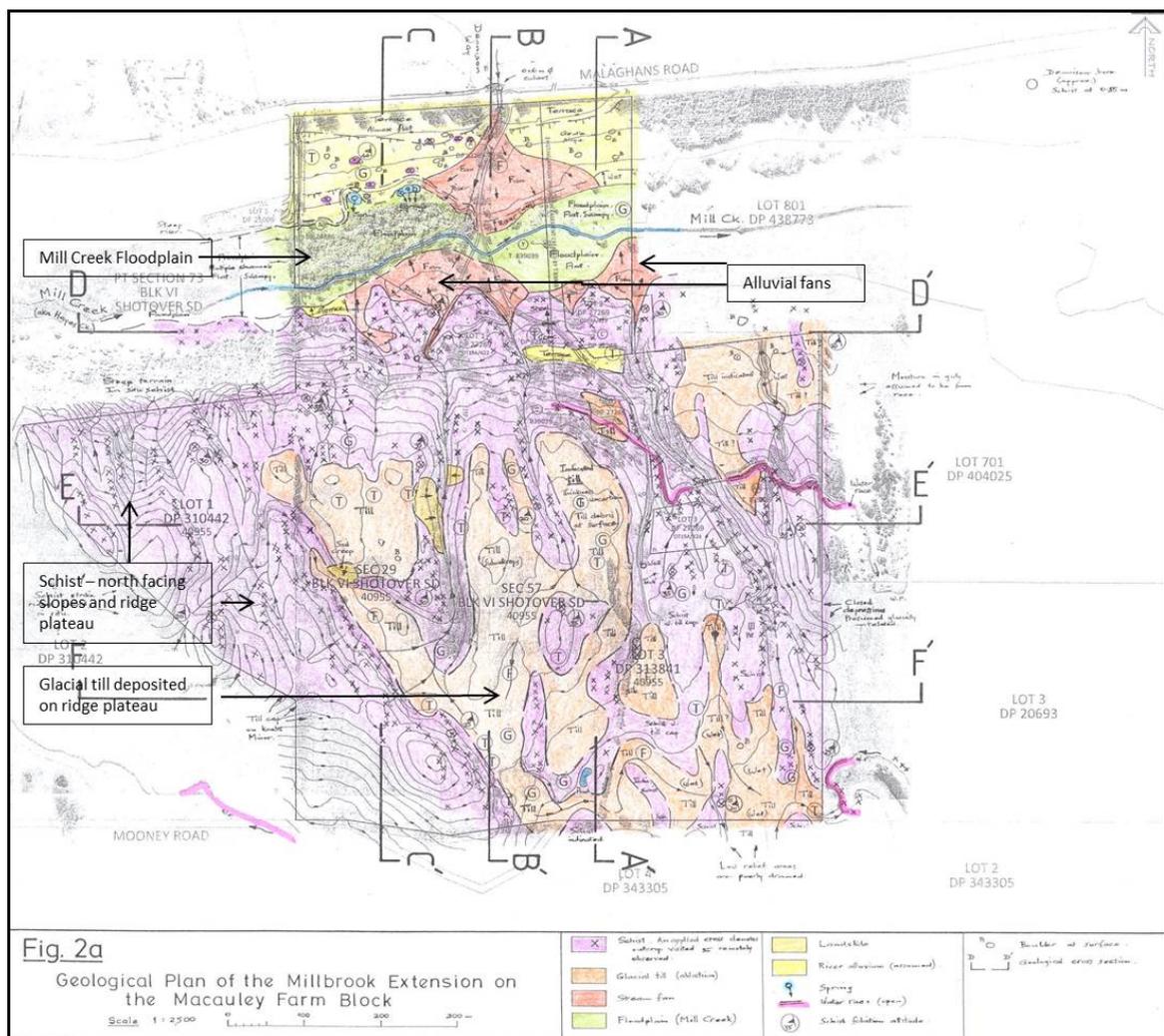


Figure 2: Landforms of Dalglish Farm (reproduced from Roydon Thompson Report 2015)

2.2 Biological Environment

2.2.1 Flora and Vegetation

Historical Vegetation

The Wakatipu Basin has had a long history of pastoral activity that has resulted in almost the complete loss of indigenous ecosystems. Prior to human settlement the vegetation cover of the study area would have consisted of beech forest, shrubland, tussock grassland and wetland communities (Meurk, 1997). Within the study area DCG understands the gentle sloping ridge plateaus and slopes extending to the valley floor would have had a vegetation cover dominated by short tussock grassland consisting of hard tussock, silver tussock and *Elymus* spp., with shrubland communities of kowhai, coprosmas, tree daisies and matagouri present within gullies and around rocky outcrops. A number of small wetlands would also have been present in depressions on the higher ground, while the valley floor would have supported wetland systems dominated by sedges, rushes, toetoe and flax and shrubland consisting of tree daisies, coprosmas, kowhai, matagouri, native broom and manuka.

The significant loss of indigenous ecosystems within the Wakatipu Basin and other similar environments throughout the South Island has been recognised in the New Zealand threatened environment classification (TEC). Figure 3 presents the threatened environments within the Wakatipu Basin and shows the study area has less than 20% indigenous vegetation cover remaining. The TEC lists the remaining vegetation within these environments as chronically threatened, as biodiversity loss has been shown to accelerate when the area remaining reduces to below 20% of its original extent (Walker *et al.*, 2008).

Historical activities in the basin have resulted in the biological environment now being dominated by exotic pasture grasses and hedgerows within the rural zoned land. There are however small degraded remnants of indigenous communities that persist. The remnants that are present within the study area are described below.

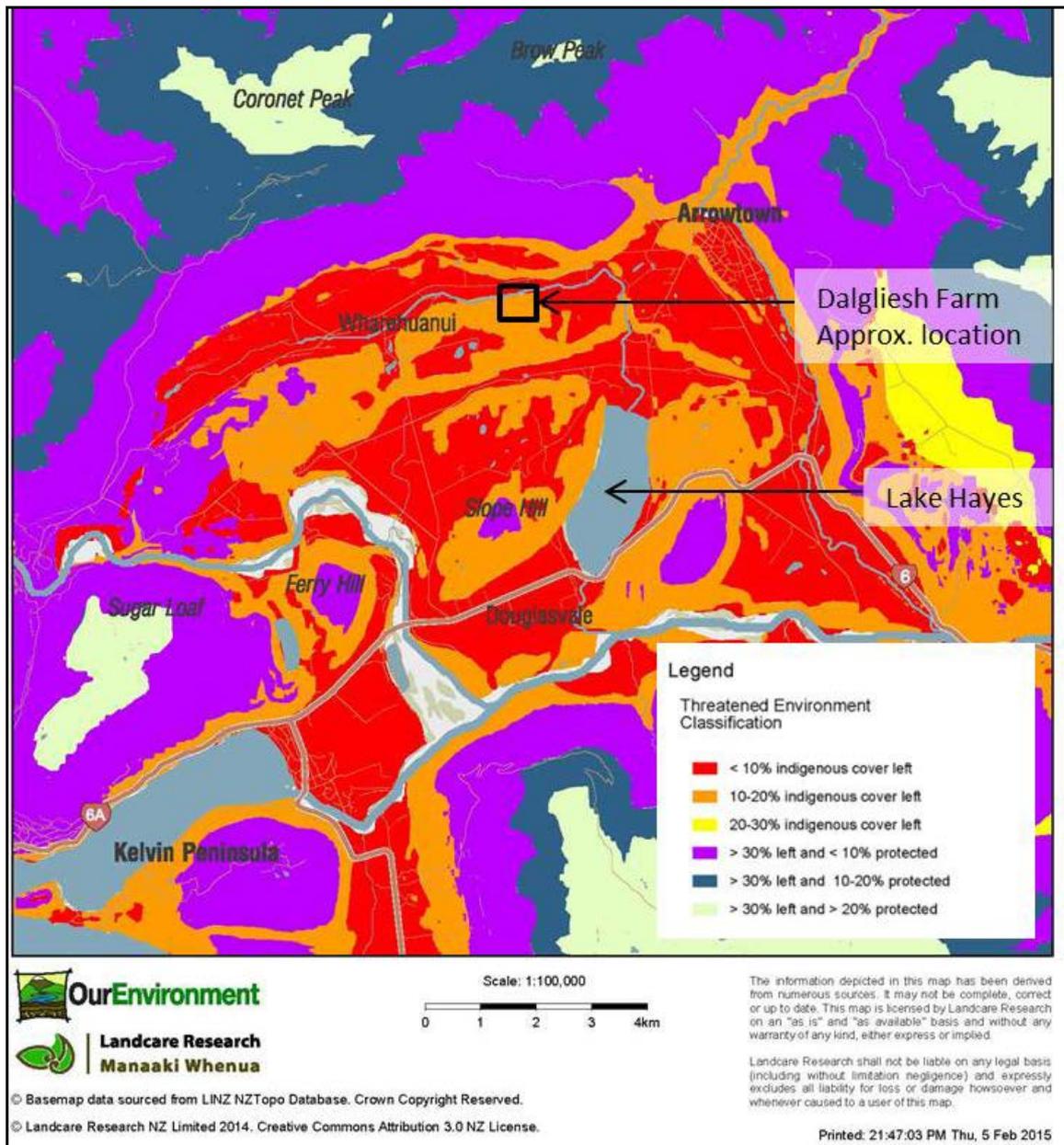


Figure 3: Threatened Environment Classification (reproduced from “Our Environment” website (www.ourevironment.scinfo.org.nz))

Existing Indigenous Vegetation and Habitat

Existing indigenous vegetation and habitat within the study area and neighbouring areas are shown in Figure 4. The largest indigenous ecosystem in the vicinity of the study area consists of beech forest remnants on the lower south facing slopes of Coronet Peak and shrubland communities within the catchment of Bush Creek. These areas house the greatest biodiversity values in the vicinity of the study area and support bird populations that will utilise habitat in the Wakatipu Basin largely for feeding purposes.

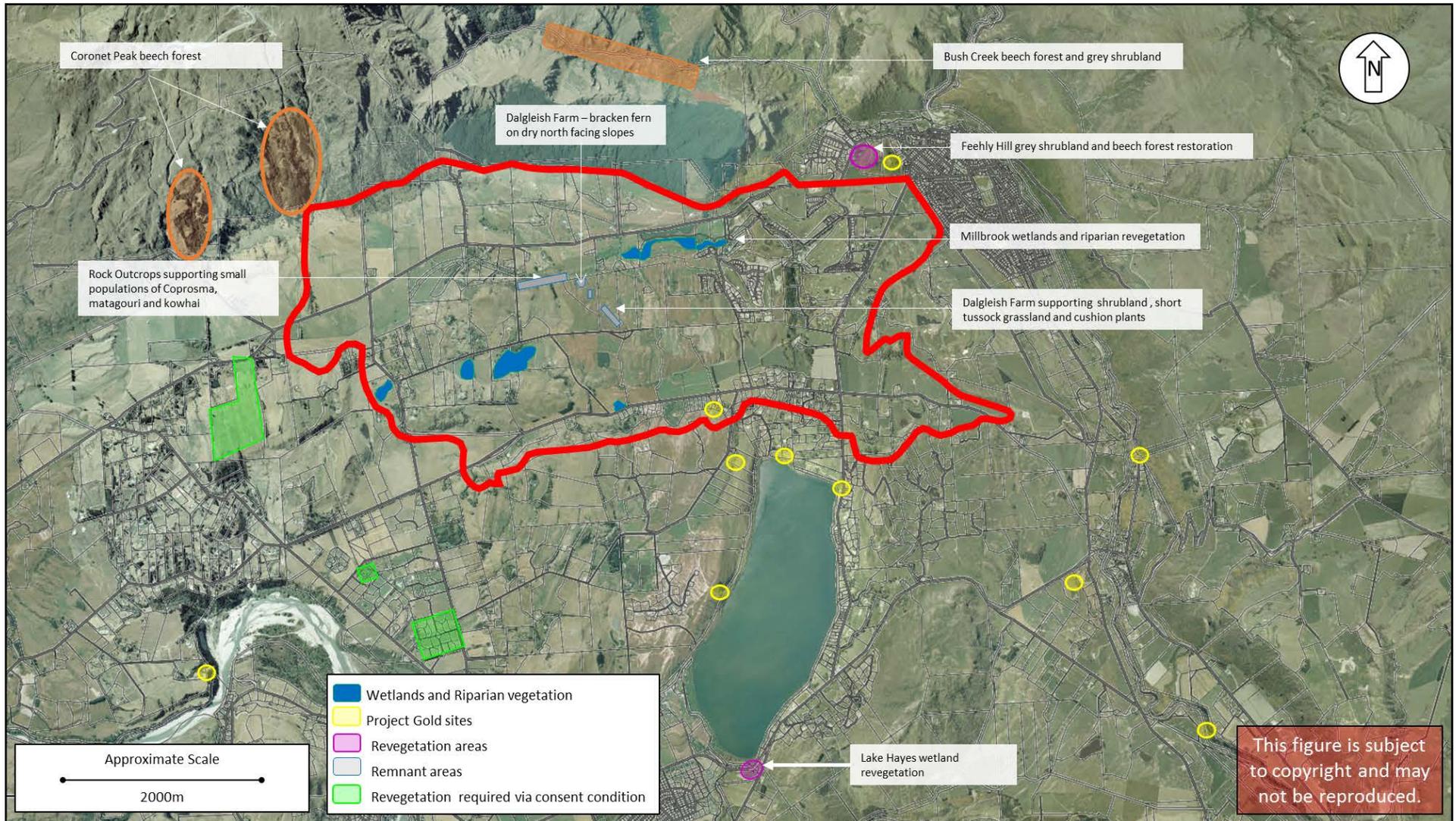


Figure 4: Wharehuanui Resource Study Area – Indigenous Vegetation and Habitat

Note: Figure 4 is a schematic spatial representation of indigenous ecological values only – the plan is not a detailed plan of the extent of the identified sites.

Bold red line shows the extent of the Wharehuanui Resource Study Area

Rock Outcrops and Dry North Facing Slopes

Rock outcrops situated on the ridge plateau and north facing slopes of the study area have provided some protection from historical disturbance with indigenous shrubs, short tussock and cushion plants persisting on some of these sites. Plate 1 presents photographs of existing indigenous species and communities on these dry sites that generally have thin skeletal soils.



Plate 1: Indigenous flora and vegetation values on rock outcrops and north facing slopes

Indigenous plant species that have been recorded on the rocky outcrops and north facing slopes are provided in Table 1.

Table 1: Indigenous Plant Species and Associated Threat Status (de Lange *et al.*, 2013).

Common Name	Scientific name	Threat Classification
Bracken Fern	<i>Pteridium esculentum</i>	Not threatened
Blue wheatgrass	<i>Elymus solandri</i>	Not threatened
Blue tussock	<i>Poa colensoi</i>	Not threatened
<i>Raoulia apicinigra</i> (cushion plant)	<i>Raoulia apicinigra</i>	Not threatened
<i>R. australis</i> (cushion plant)	<i>R. australis</i>	Not threatened
Scented tree daisy	<i>Olearia odorata</i>	Not threatened
Porcupine shrub	<i>Melicytus alpinus</i>	Not threatened
Small-leaved pohuehue (climber)	<i>Muehlenbeckia complexa</i>	Not threatened
Bush lawyer (climber)	<i>Rubus</i> species	Not threatened
Red woodrush	<i>Luzula rufa</i> var. <i>rufa</i>	Not threatened
Matagouri	<i>Discaria toumatou</i>	Not threatened
Dwarf mingimingi	<i>Leucopogon fraseri</i>	Not threatened

Wetlands and Riparian Vegetation

Historically a range of wetlands would have been present in the study area, mainly associated with poor drainage sites and landscape depressions on the ridge plateau and the flood plain of Mill Creek. Plate 2 shows an example of a wetland to the west of Hunter Road that has open water habitat fringed by pedestal tussock (*Carex secta*). Whilst viewing this wetland from the road DCG recorded a range of wildlife present in and around the wetland including Canada geese, pukeko, mallard ducks and black swans.



Plate 2: Hunter Road Wetland.

There are a number of wetlands located within landscape depressions on the ridge plateau (see Plate 3) These wetlands are dominated by the introduced soft rush (*Juncus effusus*), however sedgeland are also present that contain the indigenous sedge *Carex gaugichaudiana* within a sward of introduced grasses.



Plate 3: Sedgeland on ridge plateau to the west of Dalglish Farm

Wetlands and riparian margins associated with the flood plain of Mill Creek (see Plate 4) are largely dominated by introduced species including the soft rush (*Juncus effusus*) and introduced grasses browntop (*Agrostis capillaris*), cocksfoot (*Dactylus glomerata*) and sweet vernal (*Anthoxanthum odoratum*). In addition willow trees are also a significant element of the vegetation adjacent to Mill Creek.



Plate 4: Wetland and riparian vegetation adjacent to Mill Creek on Dalglish Farm

Figure 5 presents a plan showing the layout of the Dalgleish Farm and also provides representative photographs of the areas of the farm that have been identified to have some ecological value.

2.2.2 Fauna

The vegetation communities that remain within the study area and the wider Wakatipu Basin are all small in scale, highly degraded from their original condition and isolated. The loss and degradation of habitat has resulted in a significant loss of both flora and fauna diversity. Notwithstanding this point, remnants do persist that provide habitat for indigenous wildlife.

Skinks and Geckos

The vegetation and rocky outcrops provide habitats that may support the Otago large gecko (*Woodworthia* 'Otago large'), the cryptic skink (*Oligosoma inconspicuum*), McCann's skink (*O. maccanni*) and the common skink (*O. polychroma*) (Whitaker *et al.*, 2002), of which the Otago large gecko and cryptic skink are both listed as 'At Risk – Declining' (Hitchmough *et al.*, 2013).

Invertebrates

New Zealand invertebrate species have a high level of endemism, in particular within the Wakatipu Basin (Lucas Associates, 1995). The isolated areas of native vegetation may provide habitat for native invertebrates and allow their use of the surrounding exotic grassland (Derraik *et al.*, 2005). Increased areas of indigenous vegetation on site would be beneficial to native invertebrate populations (Derraik *et al.*, 2005).

Avifauna

There are at least 18 native bird species present within the Wakatipu Basin that may already visit the site (Robertson *et al.*, 2013; eBird, 2015). These bird species and their threat status are provided in Table 2 below. Four of the 18 species are classified as 'At Risk': the eastern falcon, NZ pied oystercatcher, the black shag and the pied stilt.

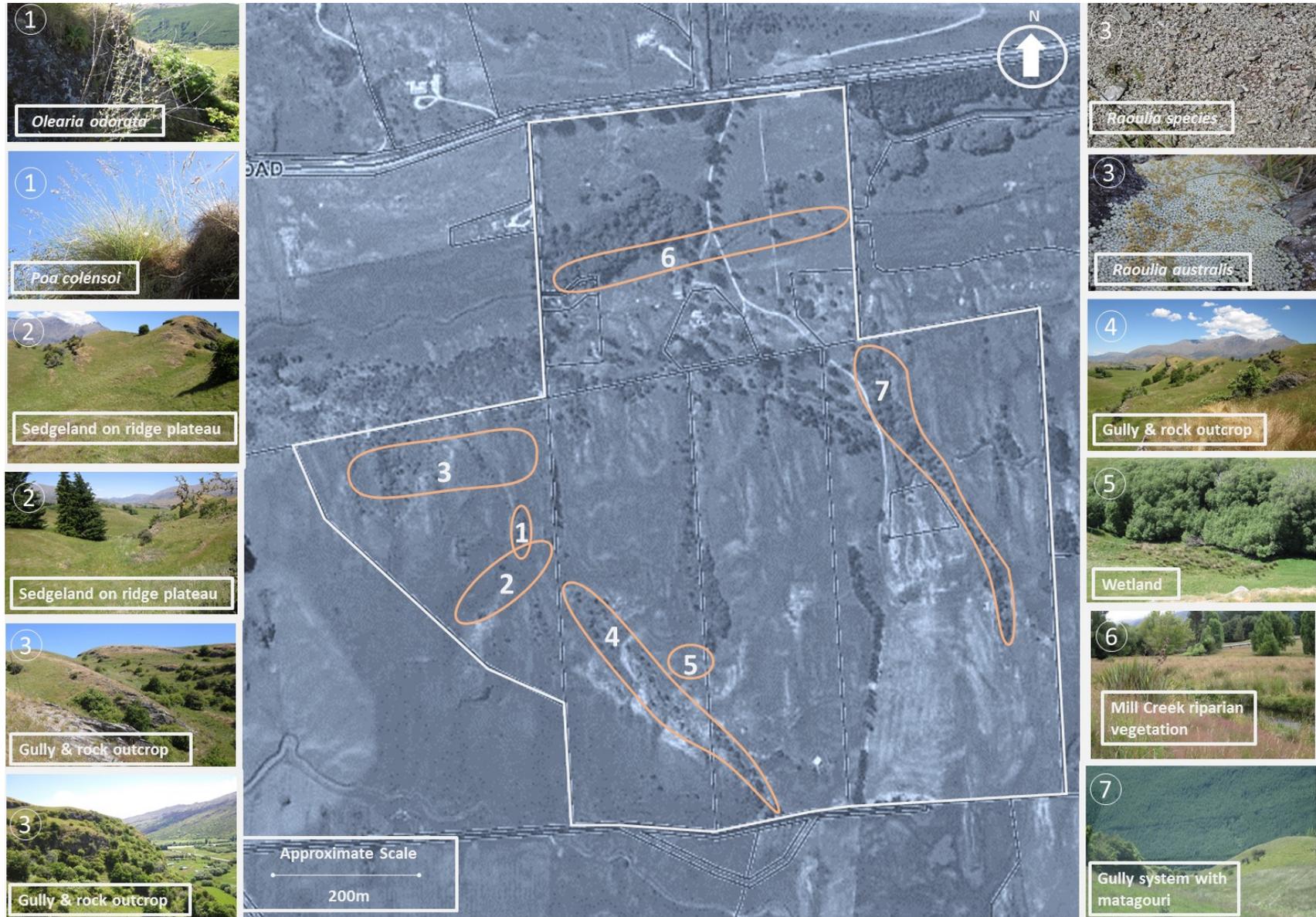


Figure 5: Ecological Values of Dalgleish Farm

Table 2: Indigenous Bird Species and Associated Threat Status (Robertson *et al.*, 2013).

Common Name	Scientific Name	Threat Classification	Associated Habitat
Eastern falcon	<i>Falco novaeseelandiae</i> 'eastern'	At Risk - Recovering	Forest, tussock grassland & shrubland.
NZ pied oystercatcher	<i>Haematopus finschi</i>	At Risk – Declining	Riverbeds, farmland & grassland.
Black shag	<i>Phalacrocorax carbo novaehollandiae</i>	At Risk – Naturally Uncommon	Streams, lakes, ponds.
Pied stilt	<i>Himantopus himantopus leucocephalus</i>	At Risk - Declining	Wetlands.
Fantail	<i>Rhipidura fuliginosa fuliginosa</i>	Not Threatened	Forest & shrubland.
NZ bellbird	<i>Anthornis melanura melanura</i>	Not Threatened	Forest & shrubland.
Harrier hawk	<i>Circus approximans</i>	Not Threatened	Farmland & wetlands.
Welcome swallow	<i>Hirundo neoxena neoxena</i>	Not Threatened	Wetlands
Grey warbler	<i>Gerygone igata</i>	Not Threatened	Shrubland & forest.
Paradise shell duck	<i>Tadorna variegata</i>	Not Threatened	Farmland, grassland, ponds.
Tui	<i>Prothemadera novaeseelandiae novaeseelandiae</i>	Not Threatened	Forest & shrubland.
Southern black-backed gull	<i>Larus dominicanus dominicanus</i>	Not Threatened	Farmland & tussock grassland.
Spur-winged plover	<i>Vanellus miles novaehollandiae</i>	Not Threatened	Wetlands, farmland & grassland.
NZ woodpigeon	<i>Hemiphaga novaeseelandiae</i>	Not Threatened	Forest & shelterbelts.
Sacred Kingfisher	<i>Todiramphus sanctus vagans</i>	Not Threatened	Farmland & lakes.
Pukeko	<i>Porphyrio melanotus melanotus</i>	Not Threatened	Wetlands, farmland, grassland & scrub.
Shining cuckoo	<i>Chrysococcyx lucidus lucidus</i>	Not Threatened	Forest & shrubland.
Silvereye	<i>Zosterops lateralis lateralis</i>	Not Threatened	Widespread.

2.3 Ecological Values Summary

The existing ecological values on Dalglish Farm are associated with the rocky outcrops and dry north facing slopes located to the west of the property. All vegetation is highly degraded, isolated and generally small in scale and threatened species are highly unlikely to be present on the site. Notwithstanding the nature of the ecological values, the development footprint of the golf course and proposed residential housing is removed from the remnant vegetation and it is highly unlikely the development would disturb the ecological values that persist today. Furthermore, MCC proposes to support ecological values and undertake restoration and revegetation activities to promote the values of the site and also support restoration activities that are occurring throughout the basin.

3.0 ECOLOGICAL RESTORATION OPPORTUNITIES

3.1 Overview

As discussed, the long history of pastoral activity on Dalgleish Farm and the wider study area has resulted in the almost total conversion of the landscape to an ecology dominated by exotic pasture grasses, hedgerows and woody weeds. Indigenous terrestrial ecology values can now only be found within wetlands and on sites that have been protected by rock outcrops. Consequently, DCG considers the proposed development of Dalgleish Farm is highly unlikely to result in negative effects on the indigenous ecology of the property. There are, however, some existing values that can be supported and included into the development of the site that can provide significant ecological benefits to Dalgleish Farm and the Wakatipu Basin.

In 1997 The Wakatipu Environment Society engaged ecologist Colin Meurk to examine the natural heritage of the Wakatipu Basin and provide advice on restoration opportunities. The outcome of this investigation "*Rediscovering & Restoring Natural Heritage in the Wakatipu Basin*" has been one of the cornerstone pieces of work that has provided a philosophy and guidance for restoration activities across the basin. Meurk (1997) suggests that recovery of indigenous vegetation would include enhancement of waterway function, protection of remnant natural habitat, re-establishing larger more viable populations of indigenous plants and wildlife, and thus establishing improved visual and biological linkages in which sustainable heritage elements are integrated within the productive activities of the basin.

The path towards the vision set out by Colin Meurk is in progress and is clearly shown in the following:

- Establishment of Project Gold by the Department of Conservation with the objective to encourage Otago people to grow and look after their own kōwhai trees and strengthen enthusiasm for dryland forest restoration.
- Acceptance by council that ecological restoration can be a positive benefit under the Resource Management Act, with these benefits often integral in the granting of subdivision consents such as the Walter Peak, Threepwood, Littles Stream, Jacks Point, Hawthorn and Highground subdivisions.
- Establishment of the Wakatipu Reforestation Trust that has attracted significant funding to construct a native plant community nursery for the Wakatipu.
- The Wakatipu Restoration Trust is also involved in maintenance of existing sites and identification of further sites for restoration.

3.2 Restoration Opportunities

Using the principles set out in Meurk (1997), DCG has identified a number of ecological restoration opportunities for the development of the Dalgleish Farm. The opportunities include:

- Supporting existing ecological values including indigenous plants, invertebrates, lizards and birds in the vicinity of rock outcrops and wetlands;
- Assist successional processes that are currently in their infancy to ensure a successional trajectory dominated by indigenous species rather than woody weeds;
- Riparian planting and control of willows along Mill Creek;
- Planting into sites that provide the conditions for good growth rates and easier establishment, such as the bottom of gullies and wetlands; and
- Promoting native plantings within gardens associated with residential development.

Working with landscape architects Baxter Design Group, DCG has prepared an ecological restoration concept plan for Dalgleish Farm to incorporate the opportunities detailed above. Figure 6 presents this concept with detail associated with these opportunities provided below.

3.2.1 Support for Existing Ecological Values

Areas of existing terrestrial ecological values are predominantly found around the rocky outcrops to the west of Dalgleish Farm. DCG recommends the pocket planting of shrubland species to provide a food source for invertebrates, lizards and birds in these areas. The rock outcrops are lacking some key species known to support lizard species such as coprosmas and porcupine shrub (*Melicytus alpinus*) and these species along with kowhai and tree daisies should be utilised to support these existing values. An example of similar planting at a Project Gold site on Whitechapel Road is provided in Plate 5.



Plate 5: Project Gold shrubland restoration, Whitechapel Road

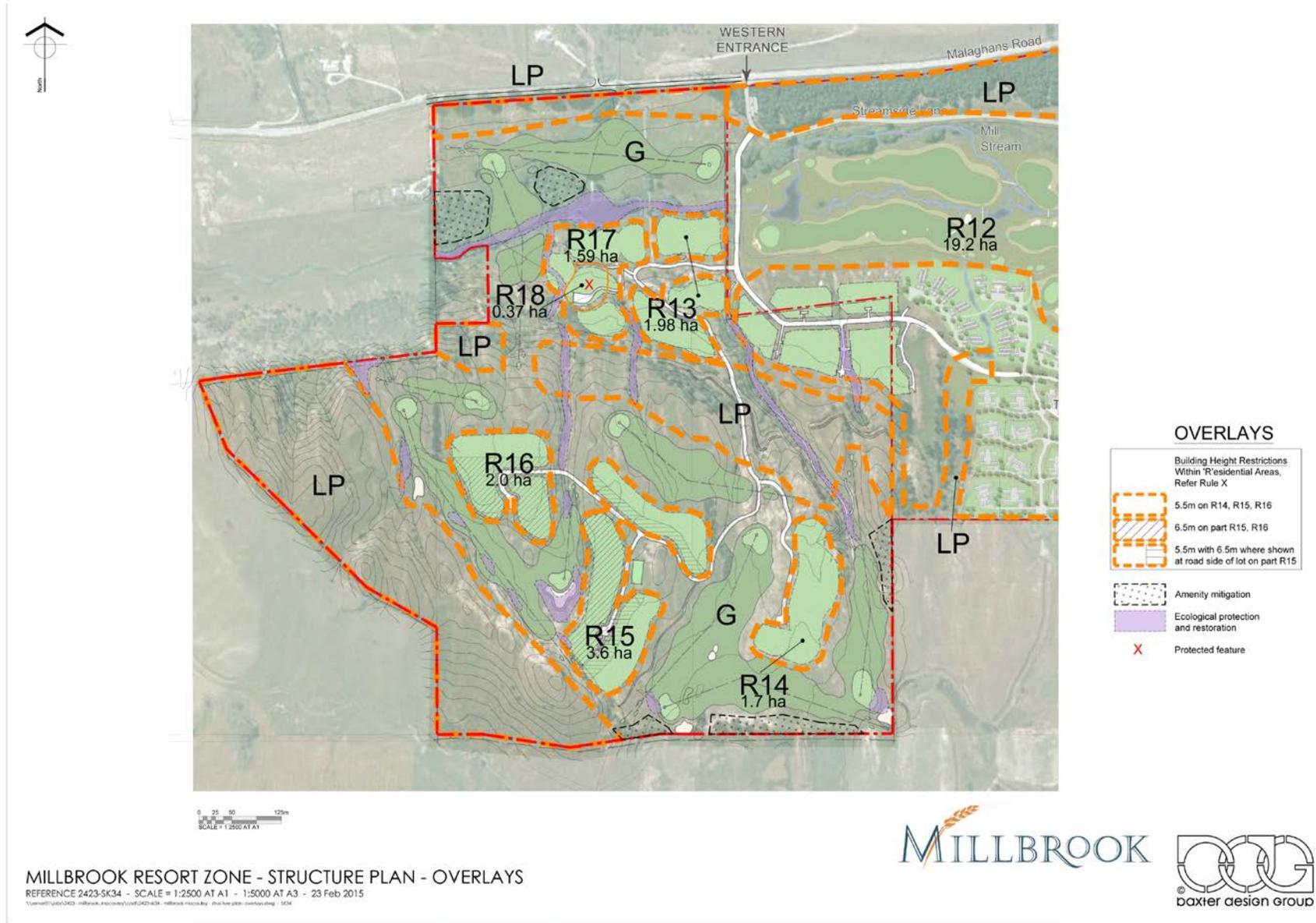


Figure 6: Dalglish Farm Ecological Restoration Concept Plan

3.2.2 Support for Successional Processes

Bracken fern has established strongly on the dry steep north facing slopes of the Dalgleish Farm. In the Lakes Ecological Region, bracken fern is the dominant early successional species that provides the environment for later successional shrubland species to regenerate within. Currently the surrounding area has a lack of indigenous species with the ability to disperse seed into the bracken fern and thus woody weed species such as hawthorn and briar are likely to establish within the bracken fern over time.

In order to support the natural successional process DCG recommends the pocket planting of kowhai, coprosmas, tree daisies and matagouri in favourable locations adjacent to the bracken fern so that a seed source is provided that can ultimately seed into the bracken fern. Woody weed control will also be required if briar, hawthorn, and broom invade these sites.

3.3.3 Restoration of Wetlands and Mill Creek Riparian Planting

Four wetlands on the ridge plateau of Dalgleish Farm have been located on the site that are currently dominated by exotic rushes and pasture grass species. Restoration of these sites by planting into the wetlands with indigenous species such as *Carex*, *Juncus*, toetoe and flax and supported with shrubland species tolerant of periodic saturation such as *Coprosma propinqua* and kowhai, will significantly improve the function and habitat quality of these wetlands.

MCC has completed some quality riparian planting adjacent to Mill Creek as shown in Plate 6. A continuation of this planting along the length of Mill Creek in addition to the control of willow trees will enhance the habitat values of Mill Creek.



Plate 6: Established Riparian Planting of Mill Creek completed by MCC.

3.3.5 Planting into new areas

A total of four gullies that bisect the ridge plateau and drain towards Mill Creek have been identified as excellent sites for planting of shrubland species. Historically DCG understands these gullies would have supported shrubland communities but are now dominated by pasture grasses and woody weeds (particularly hawthorn). The gullies do contain some isolated mature matagouri shrubs and DCG considers these areas are ideal for re-establishing shrubland that can make an important contribution to the natural heritage of the site. Plate 7 shows a tree daisy dominated shrubland in the Bush Creek catchment (see Figure 4). DCG considers the natural regeneration of a tree daisy and coprosma dominated shrubland that is ongoing within the Bush Creek catchment can be used as a guide for restoration work within the gullies.

The planting of a range of tree daisy species, coprosmas and kowhai into these gullies will provide habitat for invertebrates and a food supply for native birds. Furthermore, it will also be possible to connect the gully plantings with Mill Creek that will support the movement of invertebrates and birds through the site.



Plate 7: Tree Daisy (*Olearia odorata*) dominated shrubland in Bush Creek

3.3.5 Residential Development

DCG understands approximately 50 house sites are proposed as part of the golf course and residential development of Dalglish Farm. Landscaping of the house sites and possibly some of the golf course will result in the planting of significant quantities of plants for amenity and screening value. Baxter Design Group has recommended that the species predominantly utilised for planting on the golf course and on the house sites will be indigenous species that are

consistent with the original vegetation of the Wakatipu Basin. Adopting this initiative for the plan change will provide additional habitat for invertebrates and a food supply for birds and further enhance the natural heritage values of Dalgleish Farm.

3.3.6 Pest Control

Willow Control

The low lying area of Dalgleish Farm where Mill Creek enters the property is dominated by mature willow trees. In this area the willow trees have heavily infested the riparian margin of Mill Creek and also extend into the adjacent low lying areas. MCC proposes to undertake significant willow control to remove the willows from the riparian margin and to open the canopy in the adjacent areas to allow light into the area. This will support the restoration activities along the riparian margin of Mill Creek.

Willow trees are also present in some of the gullies that bisect the ridge plateau. Willow control will also be implemented in these areas to support restoration planting works.

Wilding Pine Control

Landscape Protection Areas (LPAs) have been identified on the Dalgleish Farm that MCC propose to manage by grazing stock. The LPAs are areas where wilding pine trees can establish on the property. In order to minimise the risk of wilding pine establishment, MCC will monitor the LPAs and ensure all seedlings that establish are removed from the property.

Woody Weed Control

Woody weeds that are currently present on Dalgleish Farm include broom, gorse, hawthorn, briar, rowan and elderberry. MCC will implement a broom and gorse control program and will also remove other woody weeds to support restoration planting activities.

Rabbit Control

The Otago Regional Council has been approached for comment on MCCs proposal for Dalgleish Farm. The ORC have noted that the Central Otago and Lakes Districts are areas of concern due to the level of development in these areas affecting the available methods for effective rabbit control. In order to address this concern MCC proposes to rabbit proof fence the boundaries of Dalgleish Farm and undertake rabbit control across the site to ensure populations on Millbrook are controlled effectively and are consistent with the requirements of the ORC Pest Management Strategy for Otago. Current control measures used by Millbrook Resort, which will be extended to the Dalgleish Farm, include:

- Rabbit shooting away from residential areas;
- Engagement of a rabbit control contractor; and

- Pindone drops, away from residential areas.

3.3.7 Summary and Recommendations

In summary, the restoration opportunities discussed herein can provide a major contribution to the ecology of Dalgleish Farm and the Wakatipu Basin. Together with restoration projects associated with other subdivisions, Project Gold sites and a growing awareness of the basins natural heritage, the building blocks to support the vision of local conservationists to restore and enhance indigenous biodiversity are slowly establishing.

In order for the restoration opportunities described herein to be implemented DCG recommends provisions in the plan are included to provide for the preparation of an Ecological Management Plan. The EMP would provide specific detail on the implementation of the restoration concept plan described above.

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12 MILLBROOK RESORT ZONE**12.1 Resort Zone Purpose**

The purpose of the Millbrook Resort Zone is to provide for a visitor resort of high quality. The Zone provides for recreational activities (including golf), commercial, residential and visitor accommodation together with support facilities and services. The general amenity of the Zone is one of development enclaves located in the open rural countryside with well landscaped grounds. Well located and designed development is expected throughout the Zone. To achieve this, integrated planning in accordance with a Structure Plan is required.

The Millbrook Structure Plan includes several 'Activity Areas' which correspond with rules. The purpose of the various Activity Areas is summarised as follows:

- Village Activity Area (V) – to provide for residential and visitor accommodation activities and commercial activities associated with a resort
- Golf / Open Space Activity Area (G) – To provide for outdoor recreation activities and open space
- Residential Activity Area (R) – to provide for residential activities (different areas are individually numbered so as to correspond with rules)
- Recreational Facilities Activity Area (F) – to provide for recreational activities
- Landscape Protection Area (LP) – to manage sensitive landscape areas in a manner which prevents inappropriate development
- Resort Services Area (S): To provide for service and maintenance activities which support the functioning of a resort
- Helicopter Landing and Takeoff Activity Area (H) – to enable the consideration of applications for helicopter landings and take offs from this location

The Structure Plan also includes the following overlays which apply in addition to the Activity Areas that cover the same areas. The purpose of these overlays is summarised as follows:

- Amenity Management Overlay (AM) – to identify those locations where it is considered appropriate for measures to be undertaken to avoid unreasonable adverse amenity effects on neighbouring properties outside of the Millbrook Resort Zone
- Ecological Protection and Restoration Overlay (E) – to identify those locations where either existing ecological values are to be protected or ecological restoration is anticipated.
- Height Restriction Overlay (HR) – used to specify locations where corresponding height rules apply.

The potential of the Millbrook Resort to contribute to visitor and economic development within the District through increased employment and visitor activity generated by the resort is recognised. Millbrook Country Club Limited has already paid financial contributions for water and sewerage for demand up to a peak of 5000 people. The 5000 people is made up of hotel guests, day staff, visitors and residents. Should demand exceed this then further development contributions will be levied under the Local Government Act 2002.

12.2 Other Relevant Provisions**12.2.1 District Wide Provisions**

Attention is drawn to the following District Wide provisions that may apply in addition to the Millbrook Resort Zone section. Objectives and policies from these sections are applicable as relevant to the Millbrook Resort Zone. If District Wide Rules are not met then resource consent will be required in respect of that matter.

MILLBROOK RESORT ZONE 12

12.2.1.1	Transport	Refer Section 14
12.2.1.2	Subdivision, Development and Financial Contributions	Refer Section 15
12.2.1.3	Hazardous substances	Refer Section 16
12.2.1.4	Utilities	Refer Section 17
12.2.1.5	Signs	Refer Section 18
12.2.1.6	Relocated Buildings and Temporary Activities	Refer Section 19
12.2.1.7	Earthworks	Refer Section 22
12.2.1.8	Noise	Refer Section Xxx
12.2.1.9	Heritage	Refer Section Xxx

12.3 Objectives and Policies

Objective

12.3.1 *Objective 1 – Visitor, residential and recreation activities developed in an integrated manner with particular regard for landscape, heritage, ecological, water and air quality values.*

Policies

12.3.1.1 *Require development and activities to be located in accordance with a Structure Plan so as to promote orderly and integrated development and prevent the inappropriate development of sensitive parts of the site.*

12.3.1.2 *Require the external appearance of buildings to have appropriate regard to landscape and heritage values.*

12.3.1.3 *Protect valuable ecological remnants and promote the enhancement of ecological values where reasonably practical.*

12.3.1.4 *Control the take-off and landing of aircraft.*

12.3.1.5 *Control air emissions for visual amenity purposes.*

12.3.1.6 *Reduce nutrient levels and other pollutants generally and within Mill Creek and improve and protect the water quality of Lake Hayes.*

12.4 Rules

MILLBROOK RESORT ZONE 12

12.4.1 Activity Tables

Clarification

- (a) Refer to the definitions in Section X for the clarification of terms.
- (b) The activities detailed in Table 1 apply to all sites within their respective Activity Areas as shown on the Structure Plan, unless expressly stated otherwise.
- (c) Applications for building approval for permitted activities shall include information to ensure compliance with these standards.
- (d) The following abbreviations are used in the tables.

P	Permitted	C	Controlled
RD	Restricted Discretionary	D	Discretionary
NC	Non Complying	PR	Prohibited

- (e) Any activity listed as a permitted activity is subject to compliance with the performance standards detailed in Table 2 and any relevant District Wide provisions.

Table 1 – Activity Table

	Activities – Millbrook	Status
12.4.1.1	Any activity which complies with the rules for permitted activities and is not listed as a controlled, discretionary, non-complying or prohibited activity	P
12.4.1.2	Farm buildings in all activity areas aside from the Landscape Protection Area as set out in rule 12.4.1.13 * Council shall exercise control over effects on heritage and landscape values	C*
12.4.1.3	Buildings in: <ul style="list-style-type: none"> - the Village Activity Area; or - R1, R2, R3, R4, R5, R6, R7, R8, R9, R10, R11, R12 and R13 of the Residential Activity Area; or - The Recreational Facilities Activity Area except for: <ul style="list-style-type: none"> - sites for which a requirement to comply with approved design guidelines is secured via a subdivision condition or consent notice * With the exercise of Council’s control limited to: <ul style="list-style-type: none"> - the external appearance of the building and - the effect of visual values of the area including coherence with the surrounding buildings. 	C*

MILLBROOK RESORT ZONE 12

	Activities – Millbrook	Status
12.4.1.4	<p>Licensed Premises in the Village Activity Area:</p> <p>Premises licensed for the consumption of alcohol on the premises between the hours of 11pm and 8am, provided that this rule shall not apply to the the sale and supply of alcohol:</p> <ul style="list-style-type: none"> • to any person who is residing (permanently or temporarily) on the premises; • to any person who is present on the premises for the purpose of dining up until 12am. <p><u>*Control is in respect to consideration of:</u></p> <ul style="list-style-type: none"> (a) The scale of the activity (b) Car parking and traffic generation (c) Effects on amenity (including that of adjoining residential zones and public reserves) (d) The configuration of activities within the building and site (e.g. outdoor seating, entrances) (e) Noise issues and hours of operation. 	C*
12.4.1.5	<p>Buildings in R14, R15 and R16 of the Residential Activity Area, <u>except for:</u></p> <ul style="list-style-type: none"> - sites for which a requirement to comply with approved design guidelines is secured via a subdivision condition or consent notice <p>* With the exercise of Council's discretion limited to:</p> <ul style="list-style-type: none"> - the external appearance of the building; and - associated landscaping controls; and - the effect of visual values of the area including coherence with the surrounding buildings and landscape values. <p>Assessment matter: In R14, R15 and R16 the following are anticipated:</p> <ul style="list-style-type: none"> - dark and recessive building materials; and - a range of vegetation which is predominantly indigenous including shrub and tree species that contribute to the mitigation of potential adverse effects - particular attention to accessway designs 	

MILLBROOK RESORT ZONE 12

	Activities – Millbrook	Status
12.4.1.6	<p>Buildings in R17 of the Residential Activity Area, except for:</p> <ul style="list-style-type: none"> - sites for which a requirement to comply with approved design guidelines is secured via a subdivision condition or consent notice <p>* With the exercise of Council’s discretion limited to:</p> <ul style="list-style-type: none"> - the external appearance of the building; and - the effect of visual values of the area including coherence with the surrounding buildings and heritage values <p>Assessment matter: The location, height and bulk of buildings should be assessed with particular attention to maintaining or creating viewshafts to the historic cottage in R18 which allow the appreciation of the historical configuration of that building and the plantings and signs of domestication that surround it. Materials and designs of buildings in R17 shall also integrate with the heritage values of that site.</p>	RD*
12.4.1.7	Buildings in the Golf Course and Open Space Activity Area, except for utilities, service and accessory buildings up to 40m ² in gross floor area.	D
12.4.1.8	Residential activity in the Resort Services, Golf / Open Space or Recreational Facilities Activity Areas, except for residential activity ancillary to a permitted or approved activity.	D
12.4.1.9	Visitor Accommodation outside of the Village Activity Area	D
12.4.1.10	<p>Commercial and Community Activities, except for:</p> <ul style="list-style-type: none"> - Commercial recreation activities; or - offices and administration activities directly associated with the management and development of Millbrook or ancillary to other permitted or approved activities located within the Resort Services and Village Activity Areas; or - Bars, restaurants, theatres, conference, cultural and community facilities in the Village Activity Area; or - retail activities which comply with rule 12.5.1.8 (retail sales) 	D
12.4.1.11	<p>Commercial Recreation Activities, except for:</p> <ul style="list-style-type: none"> - golf courses (aside from the Landscape Protection Area); or - Within the Recreation Facilities Activity Area or Village Activity Area 	D
12.4.1.12	Golf courses in the Landscape Protection Activity Area	NC

MILLBROOK RESORT ZONE 12

	Activities – Millbrook	Status
12.4.1.13	<p>Buildings the Landscape Protection Activity Area, except for:</p> <ul style="list-style-type: none"> - utility buildings up to 25m² in gross floor area; and - farm buildings in the in that part of the Activity Area which fronts Malaghans Road. 	NC
12.4.1.14	<p>Helicopter landing and take-off areas in the Helicopter Landing and Take-off Activity Area</p> <p>* With the exercise of Council’s control limited to:</p> <ul style="list-style-type: none"> - safety - effects on amenity values - confirmation that no more than one helicopter landing and take-off area shall be in operation at any given time. 	RD*
12.4.1.15	<p>Airports, aside from:</p> <ul style="list-style-type: none"> - Helicopter landing and takeoffs approved under rule xxx (above); or - the use of land and water for an emergency landings, rescues and fire fighting. 	NC
12.4.1.16	<p>Mining</p>	NC
12.4.1.17	<p>Service Activities, except for:</p> <ul style="list-style-type: none"> - activities directly related to other approved or permitted activities within the Zone; and - located within the Resort Services Activity Area; or - located within the Golf / Open Space Activity Area and which have a gross floor area of no more than 40m² 	NC
12.4.1.18	<p>Industrial Activities; except for:</p> <ul style="list-style-type: none"> - activities directly related to other approved or permitted activities within the Zone; and - activities located within the Resort Services Activity Area 	NC

MILLBROOK RESORT ZONE 12

	Activities – Millbrook	Status
12.4.1.19	<p>Licensed Premises outside of the Village Activity Area</p> <p>Premises licensed for the consumption of alcohol on the premises between the hours of 11pm and 8am, provided that this rule shall not apply to the the sale and supply of alcohol:</p> <ul style="list-style-type: none"> • to any person who is residing (permanently or temporarily) on the premises; • to any person who is present on the premises for the purpose of dining up until 12am. 	NC
12.4.1.20	Panelbeating, spray painting, motor vehicle repair or dismantling except for activities directly related to other approved or permitted activities within the Zone and located within the Resort Services Activity Area.	NC
12.4.1.21	Forestry Activities	NC
12.4.1.22	Fibreglassing, sheet metal work, bottle or scrap storage, motorbody building or wrecking, fish or meat processing (excluding that which is ancillary to a retail premises such as a butcher, fishmonger or supermarket), or any activity requiring an Offensive Trade Licence under the Health Act 1956.	PR
12.4.1.23	Factory Farming	PR

12.5 Rules

- 12.5.1 The rules detailed in Table 2 apply to all sites within that Activity Area of the Resort Zone, unless expressly stated otherwise.
- 12.5.2 The rules detailed in Table 2 apply to Permitted activities and activities that require Resource Consent.
- 12.5.3 Permitted activities that do not achieve the standards listed in Table 2 result in the status categories as shown in column 3 of the tables.

Table 2 – Rules – Millbrook Subzone

	Rules – Millbrook	Non-compliance status
12.5.1.1	<p>Setbacks</p> <p>No building or structure shall be located closer than 6m to the Zone boundary, and <u>in addition</u>:</p> <p>No building shall be located closer than 10m from Malaghan Road or the Arrowtown Lake Hayes Road</p>	RD
12.5.1.2	<p>Residential Density</p> <p>In the Millbrook Resort Zone the maximum number of residential units shall be limited to 450.</p>	NC

MILLBROOK RESORT ZONE 12

	Rules – Millbrook	Non-compliance status																
12.5.1.3	<p>Residential density in R14, R15, R16 and R18</p> <p>In the following parts of the Residential Activity Area the total number of residential units shall not exceed:</p> <table border="1" style="width: 100%; margin-top: 10px;"> <tr> <td style="width: 30%;">R14</td> <td>6 residential units</td> </tr> <tr> <td>R15</td> <td>15 residential units</td> </tr> <tr> <td>R16</td> <td>6 residential units</td> </tr> <tr> <td>R18</td> <td>1 residential units</td> </tr> </table>	R14	6 residential units	R15	15 residential units	R16	6 residential units	R18	1 residential units	NC								
R14	6 residential units																	
R15	15 residential units																	
R16	6 residential units																	
R18	1 residential units																	
12.5.1.4	<p>Building Height</p> <p>The maximum height of buildings shall be:</p> <ul style="list-style-type: none"> - Visitor accommodation, clubhouses, conference and theatre facilities restaurants, retail and residential buildings (except in R14, R15, R16 and R17)- 8m - Filming towers - 12m - All other buildings and structures (except in R14, R15, R16 and R17)- 4m 	NC																
12.5.1.5	<p>Building Height in R14, R15, R16 and R17</p> <p>In the following parts of the Residential Activity Area (as annotated on the Structure Plan) the following maximum building heights shall apply:</p> <table border="1" style="width: 100%; margin-top: 10px;"> <tr> <td style="width: 30%;">R14</td> <td>5.5m</td> </tr> <tr> <td>R15</td> <td>6.5m except within those parts subject to the Height Restriction Overlay where the height limit shall be 5.5m.</td> </tr> <tr> <td>R16</td> <td>6.5m except within those parts subject to the Height Restriction Overlay where the height limit shall be 5.5m.</td> </tr> <tr> <td>R17</td> <td>5.5m</td> </tr> </table> <p style="margin-top: 10px;">And <u>in addition</u> no part of a building shall be situated above the following heights above sea level:</p> <table border="1" style="width: 100%; margin-top: 10px;"> <thead> <tr> <th style="width: 30%;"></th> <th>Datum (masl)</th> </tr> </thead> <tbody> <tr> <td>R14</td> <td>465.5m</td> </tr> <tr> <td>R15</td> <td>478.5m</td> </tr> <tr> <td>R16</td> <td>483m</td> </tr> </tbody> </table>	R14	5.5m	R15	6.5m except within those parts subject to the Height Restriction Overlay where the height limit shall be 5.5m.	R16	6.5m except within those parts subject to the Height Restriction Overlay where the height limit shall be 5.5m.	R17	5.5m		Datum (masl)	R14	465.5m	R15	478.5m	R16	483m	NC
R14	5.5m																	
R15	6.5m except within those parts subject to the Height Restriction Overlay where the height limit shall be 5.5m.																	
R16	6.5m except within those parts subject to the Height Restriction Overlay where the height limit shall be 5.5m.																	
R17	5.5m																	
	Datum (masl)																	
R14	465.5m																	
R15	478.5m																	
R16	483m																	

MILLBROOK RESORT ZONE 12

	Rules – Millbrook	Non-compliance status
12.5.1.6	<p>Glare</p> <p>(a) All fixed lighting shall be directed away from adjacent roads and properties.</p> <p>(b) Any building or fence constructed or clad in metal, or material with reflective surfaces shall be painted or otherwise coated with a non-reflective finish.</p> <p>(c) No activity shall result in a greater than 3.0 lux spill, horizontal and vertical, of light onto any property located outside of the Zone, measured at any point inside the boundary of the adjoining property.</p>	NC
12.5.1.7	<p>Nature and Scale of Activities</p> <p>Except within the Village and Resort Services Activity Areas:</p> <p>(a) No goods, materials or equipment shall be stored outside a building, except for vehicles associated with the activity parked on the site overnight.</p> <p>(b) All manufacturing, altering, repairing, dismantling or processing of any materials, goods or articles shall be carried out within a building</p>	NC
12.5.1.8	<p>Retail Sales</p> <p>(a) No goods or services shall be displayed, sold or offered for sale from a site except:</p> <p>(i) goods grown, reared or produced on the site; or</p> <p>(ii) goods and services associated with, and ancillary to the recreation activities taking place (within buildings associated with such activities) within the Recreation Facilities Activity Area; or</p> <p>(ii) Within the Village Activity Area</p>	NC
12.5.1.9	<p>Maximum Total Site Coverage</p> <p>The maximum site coverage shall not exceed 5% of the total area of the Zone. For the purposes of this Rule, site coverage includes all buildings, accessory, utility and service buildings but excludes weirs, filming towers, bridges and roads and parking areas.</p>	NC
12.5.1.10	<p>Fire Fighting</p> <p>A fire fighting reserve of water shall be maintained. The storage shall meet the New Zealand Fire Service Firefighting Water Supplies Code of Practice 2008.</p>	NC

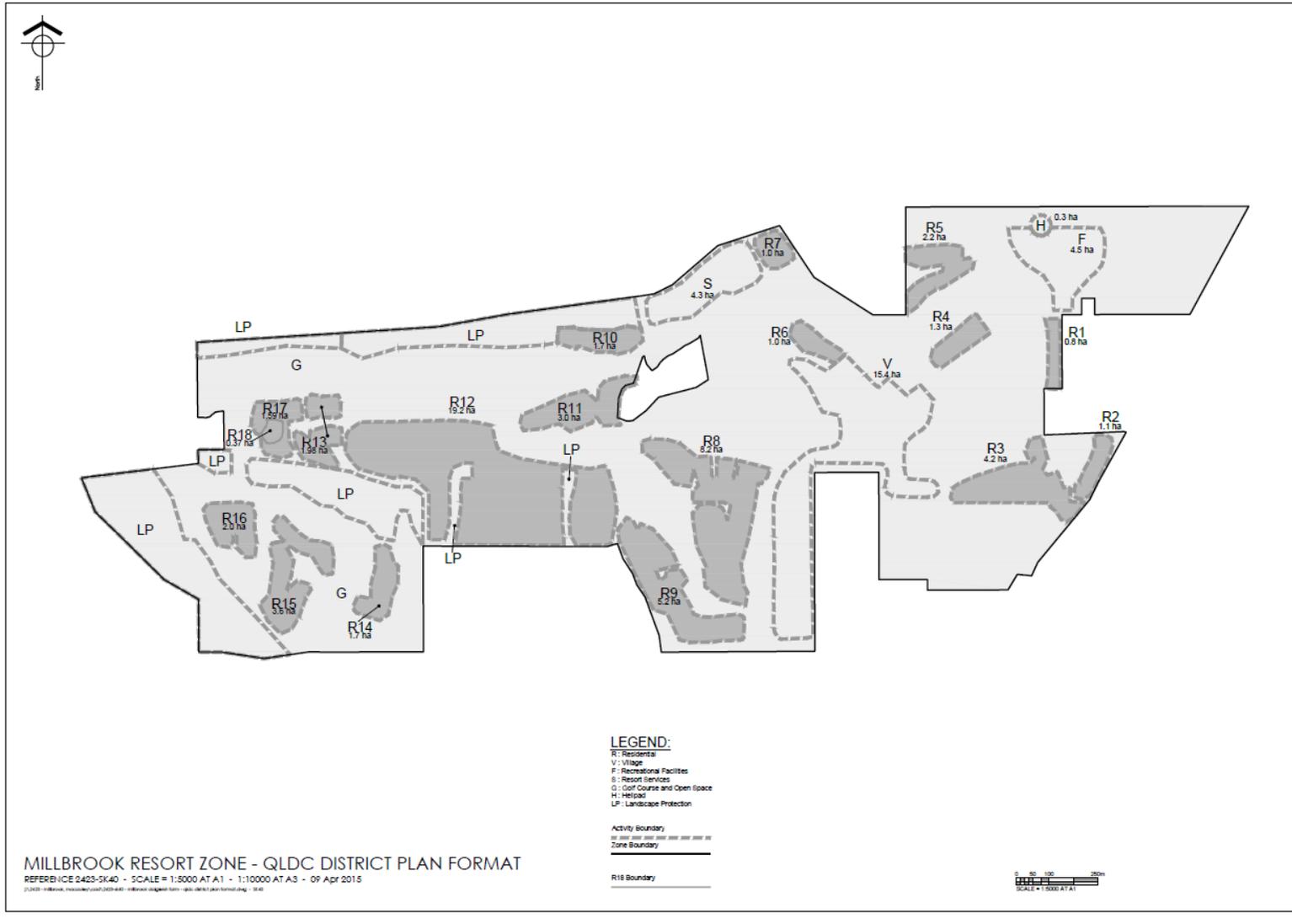
MILLBROOK RESORT ZONE 12

	Rules – Millbrook	Non-compliance status
12.5.1.11	<p>Golf Course development</p> <p>Development of more than more than 27 holes of golf shall not take place without a plan being approved by Council and its implementation secured via a condition of consent or consent notice, which addresses the following:</p> <ul style="list-style-type: none"> - practical and reasonable protection and restoration of ecological values in those areas identified within the Ecological Protection and Restoration Overlay; and - Practical and reasonable measures within the Amenity Landscaping overlay to mitigate or avoid adverse effects on the amenity values enjoyed within properties beyond the Zone boundary; and - An overview of measures that shall be employed to maintain or enhance the quality of water within Mill Creek and Lake Hayes. 	NC
12.5.1.12	<p>Atmospheric Emissions</p> <p>There shall be no indoor solid fuel fires, <u>except for</u>:</p> <ul style="list-style-type: none"> - feature open fireplaces in the clubhouse and other communal buildings including bars and restaurants. <p>Note – Council bylaws and Regional Plan rules may also apply to indoor and outdoor fires.</p>	NC
12.5.1.13	<p>Helicopter Landing Areas</p> <p>There shall be no more than one permanent helicopter landing area approved via resource consent at any given time within the Zone.</p>	NC

12.6 Non-Notification of Applications

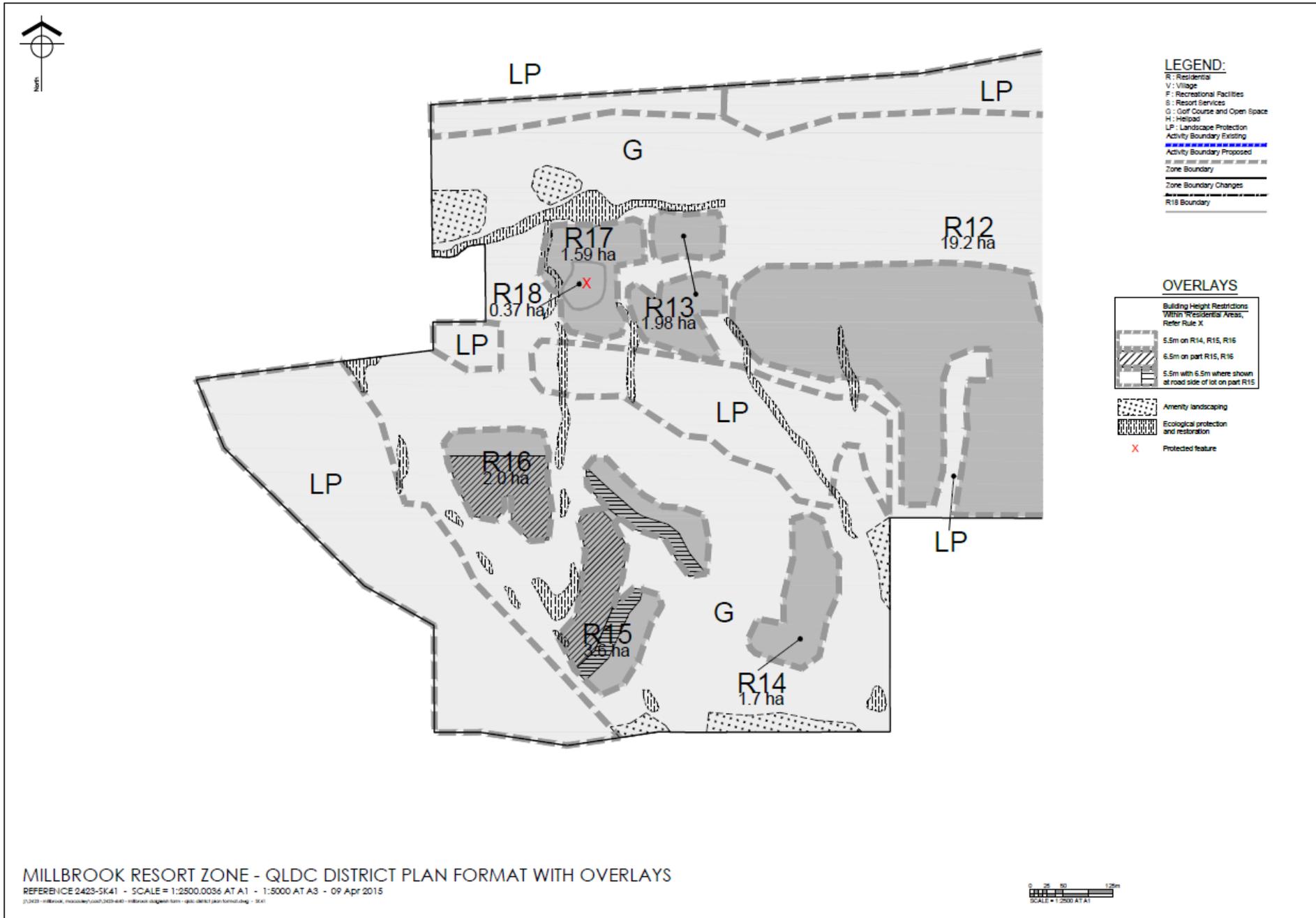
12.6.1 Except as provided for by the Act, all applications for controlled activities and restricted discretionary activities will be considered without public notification or the need to obtain the written approval of or serve notice on affected persons.

MILLBROOK RESORT ZONE 12



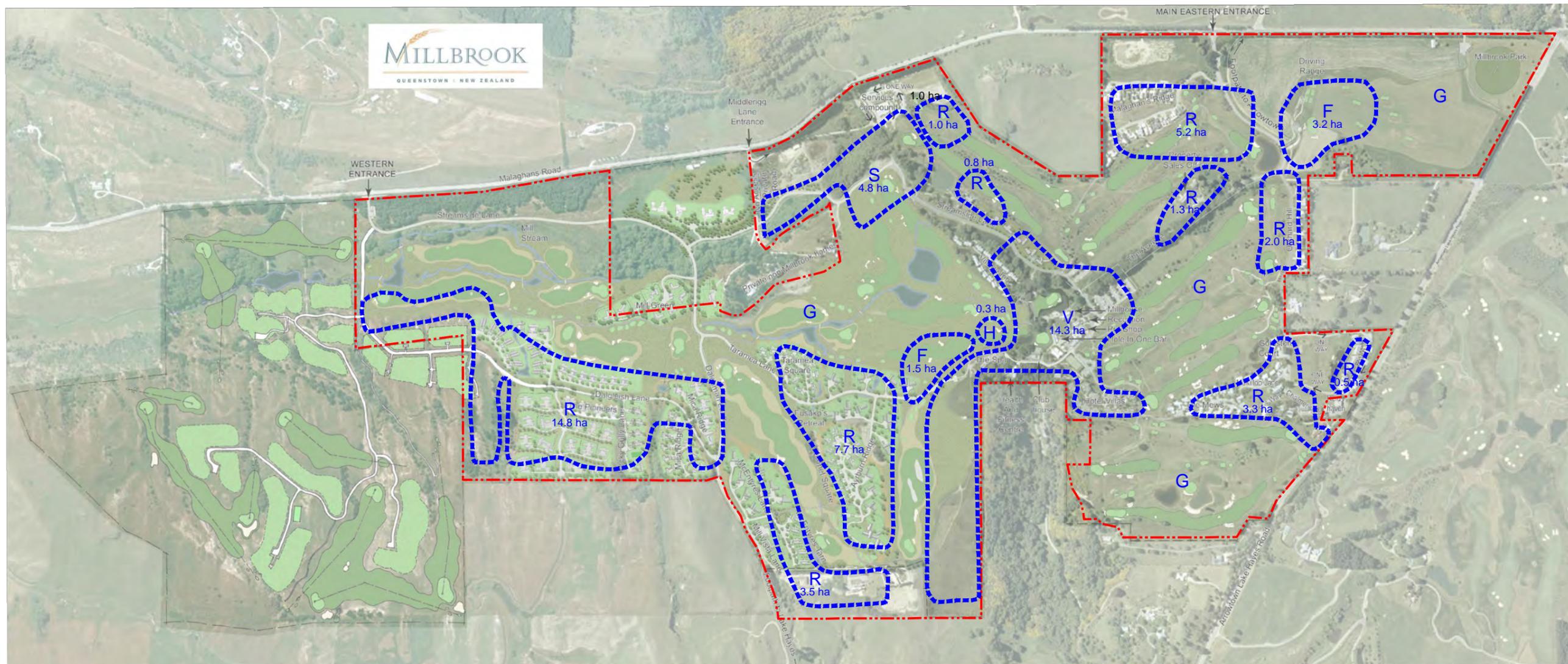
Note – see higher resolution versions of maps in accompanying documentation.

MILLBROOK RESORT ZONE 12



MILLBROOK RESORT ZONE 12

MILLBROOK RESORT ZONE 12



LEGEND:

- R : Residential
- V : Village
- F : Recreational Facilities
- S : Resort Services
- G : Golf Course and Open Space
- H : Helipad

Activity Boundary Existing



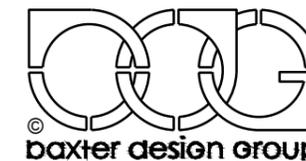
Zone Boundary

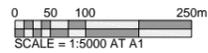
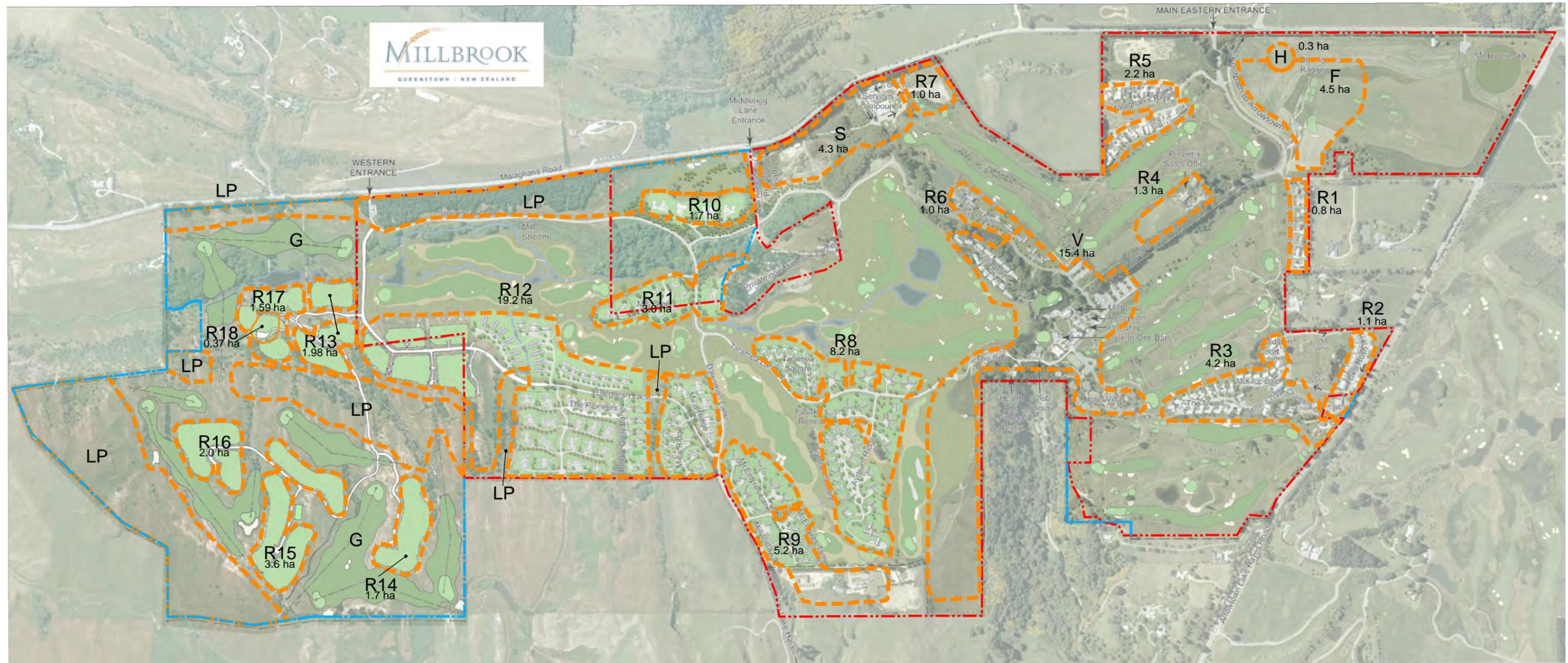
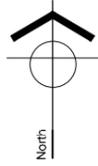


MILLBROOK RESORT ZONE - EXISTING STRUCTURE PLAN

REFERENCE 2423-SK31 - SCALE = 1:5000 AT A1 - 1:10000 AT A3 - 23 Feb 2015

\\server01\jobs\2423 - millbrook, macauley\cad\2423-ak31 - millbrook dalgleish farm - existing structure plan.dwg - SK31





LEGEND:

- R : Residential
- V : Village
- F : Recreational Facilities
- S : Resort Services
- G : Golf Course and Open Space
- H : Helipad
- LP : Landscape Protection

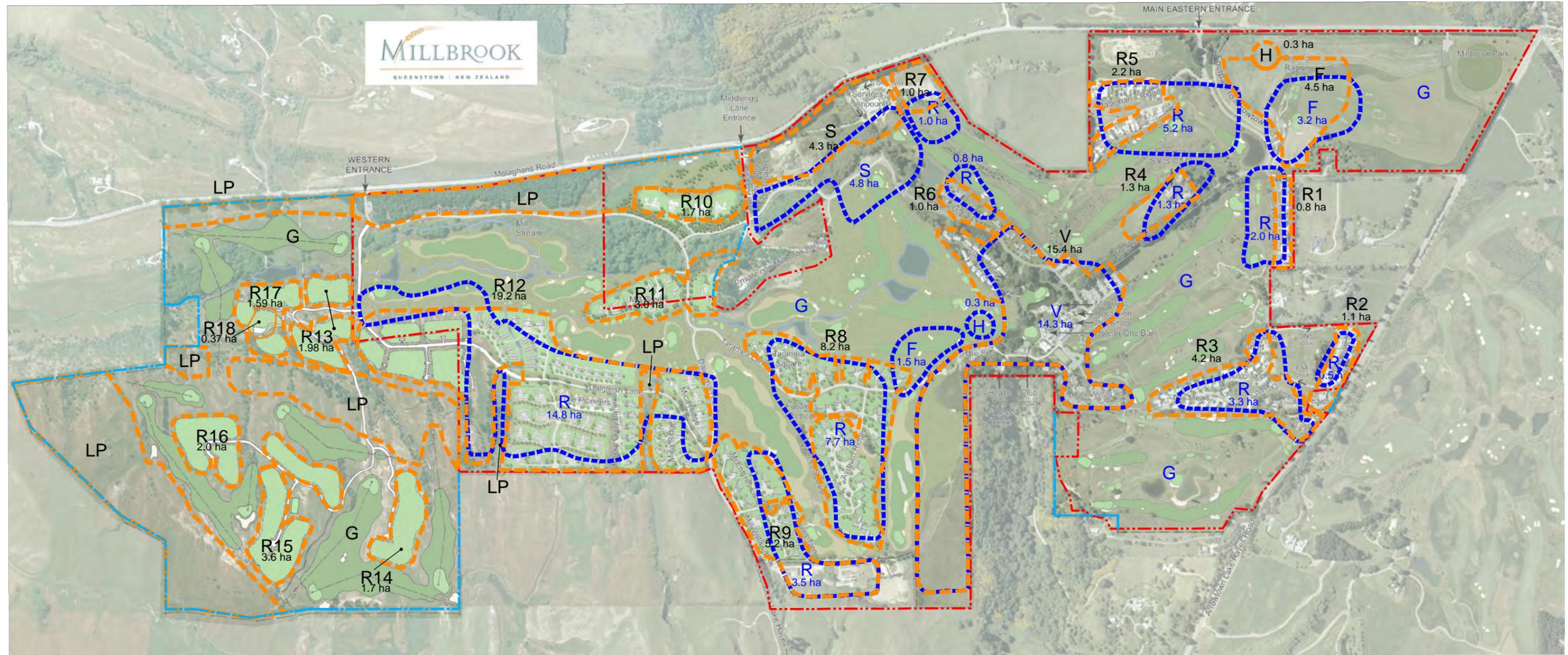
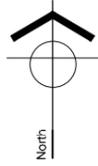
- Activity Boundary Proposed
- Zone Boundary
- Zone Boundary Changes
- R18 Boundary

MILLBROOK RESORT ZONE - PROPOSED STRUCTURE PLAN

REFERENCE 2423-SK32 - SCALE = 1:5000 AT A1 - 1:10000 AT A3 - 23 Feb 2015

\\server01\jobs\2423 - millbrook_macaulay\cad\2423-sk32 - millbrook dalgleish farm - proposed structure plan.dwg - SK32





0 50 100 250m
SCALE = 1:5000 AT A1

LEGEND:

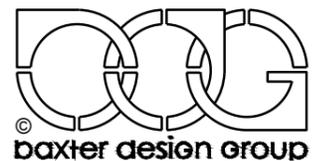
- R : Residential
- V : Village
- F : Recreational Facilities
- S : Resort Services
- G : Golf Course and Open Space
- H : Helipad
- LP : Landscape Protection
- Activity Boundary Existing
- Activity Boundary Proposed
- Zone Boundary
- Zone Boundary Changes
- R18 Boundary

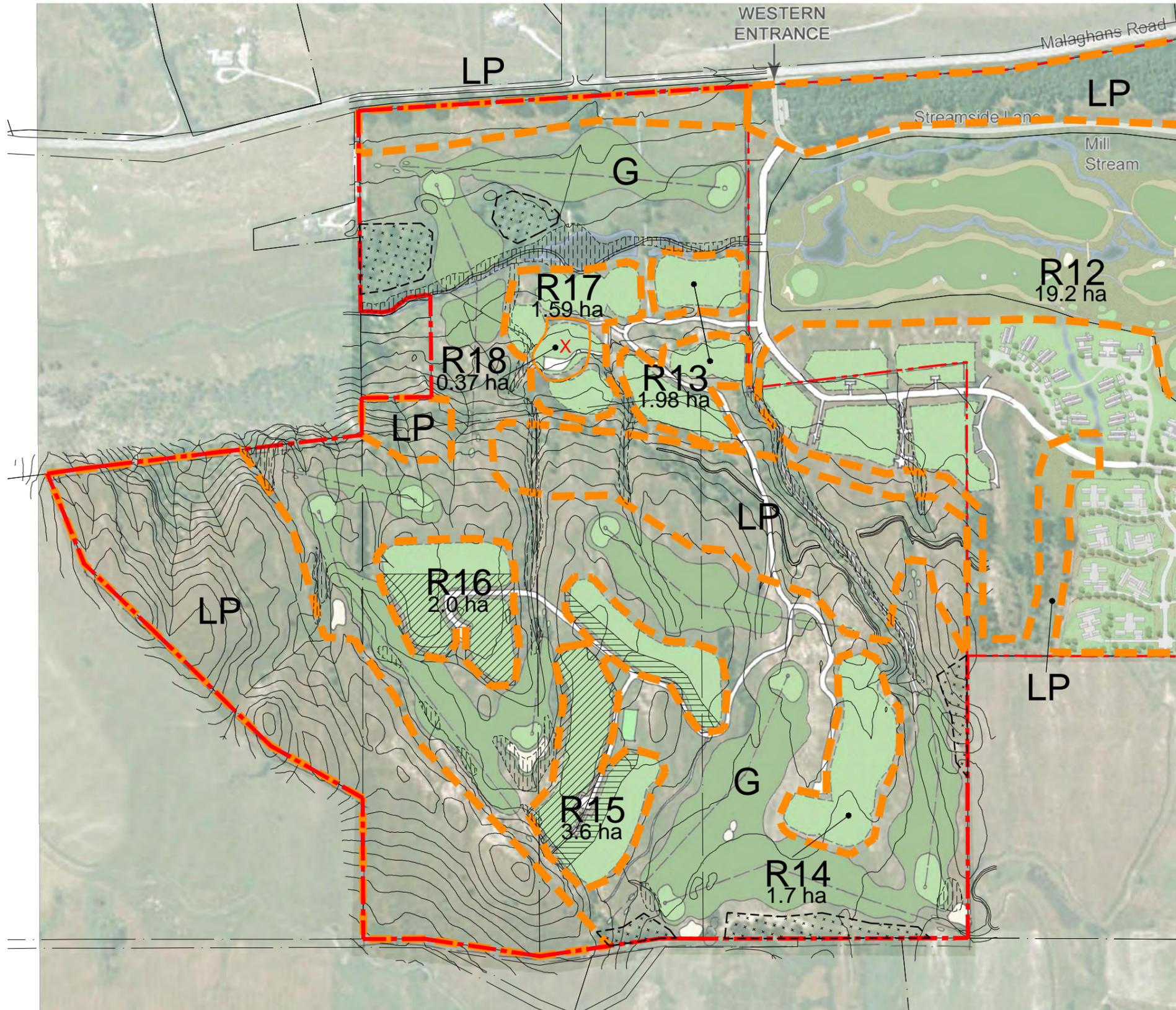
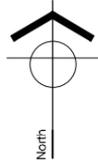
MILLBROOK RESORT ZONE - COMBINED STRUCTURE PLANS

REFERENCE 2423-SK33 - SCALE = 1:5000 AT A1 - 1:10000 AT A3 - 23 Feb 2015

\\server01\jobs\2423 - millbrook_macaulay\cad\2423-sk33 - millbrook dalglish farm - combined structure plans.dwg - SK33

MILLBROOK



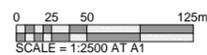


OVERLAYS

Building Height Restrictions
Within 'Residential Areas,
Refer Rule X

-  5.5m on R14, R15, R16
-  6.5m on part R15, R16
-  5.5m with 6.5m where shown
at road side of lot on part R15

-  Amenity landscaping
-  Ecological protection
and restoration
-  Protected feature



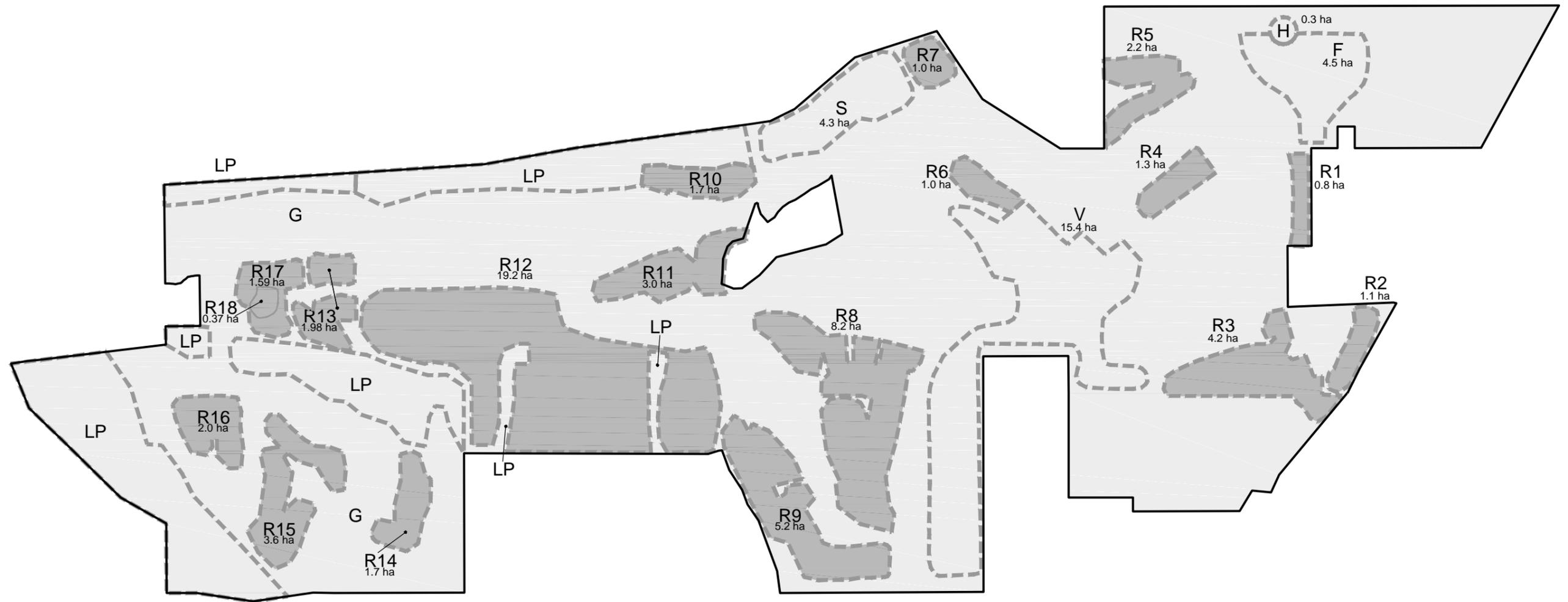
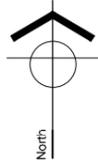
MILLBROOK RESORT ZONE - STRUCTURE PLAN - OVERLAYS

REFERENCE 2423-SK34 - SCALE = 1:2500 AT A1 - 1:5000 AT A3 - 09 Apr 2015

J:\2423 - millbrook.macauley\cad\2423-sk34 - millbrook dalgleish farm - structure plan - overlays.dwg - SK34

MILLBROOK





LEGEND:

- R : Residential
- V : Village
- F : Recreational Facilities
- S : Resort Services
- G : Golf Course and Open Space
- H : Helipad
- LP : Landscape Protection

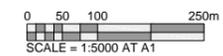
Activity Boundary
Zone Boundary

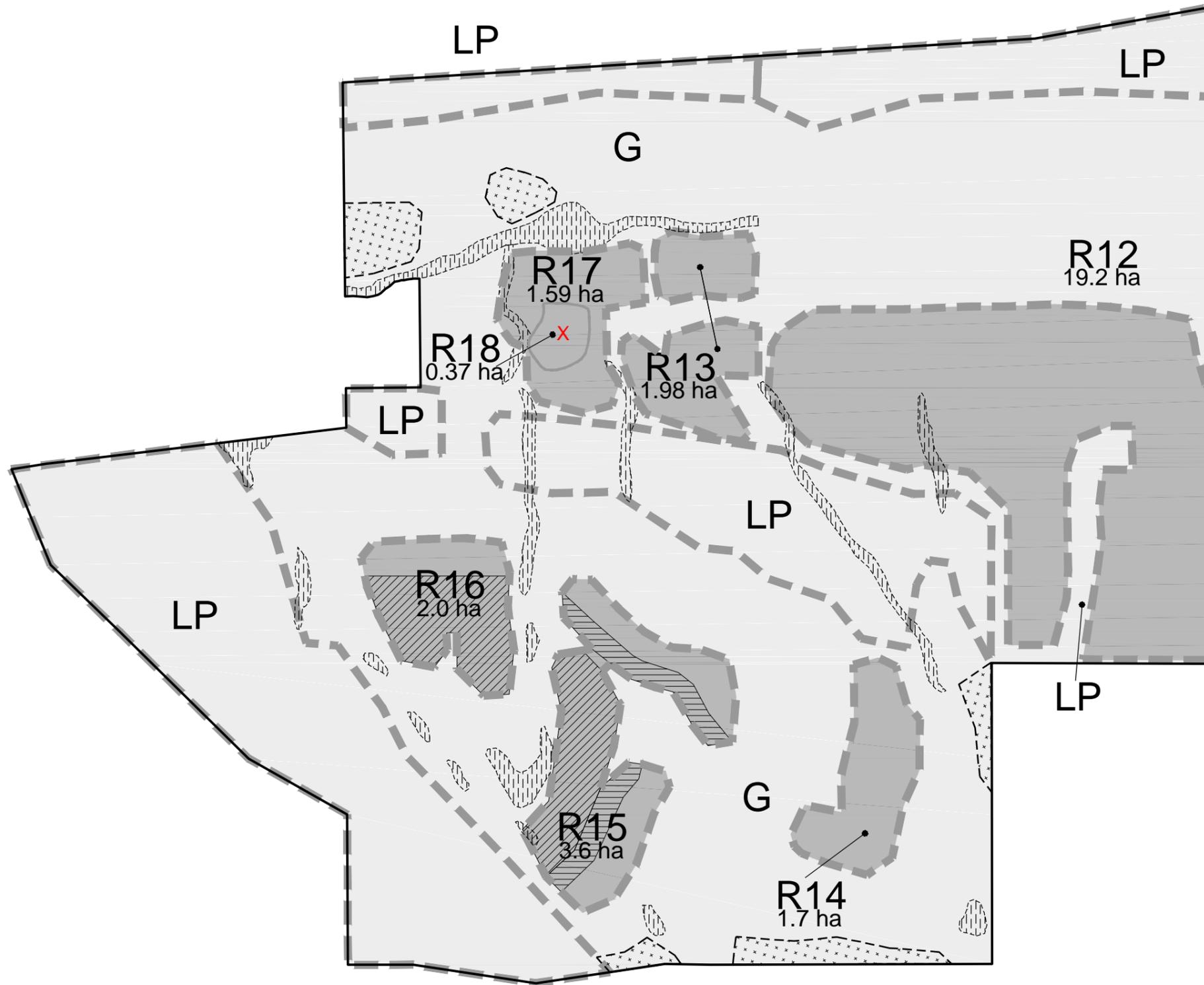
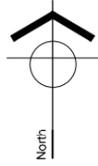
R18 Boundary

MILLBROOK RESORT ZONE - QLDC DISTRICT PLAN FORMAT

REFERENCE 2423-SK40 - SCALE = 1:5000 AT A1 - 1:10000 AT A3 - 09 Apr 2015

J:\2423 - millbrook.macauley\cad\2423-sk40 - millbrook dalgleish farm - qldc district plan format.dwg - SK40





LEGEND:

- R : Residential
- V : Village
- F : Recreational Facilities
- S : Resort Services
- G : Golf Course and Open Space
- H : Helipad
- LP : Landscape Protection
- Activity Boundary Existing
- Activity Boundary Proposed
- Zone Boundary
- Zone Boundary Changes
- R18 Boundary

OVERLAYS

- Building Height Restrictions**
Within 'R' Residential Areas,
Refer Rule X
 - 5.5m on R14, R15, R16
 - 6.5m on part R15, R16
 - 5.5m with 6.5m where shown
at road side of lot on part R15
- Amenity landscaping
- Ecological protection
and restoration
- Protected feature

MILLBROOK RESORT ZONE - QLDC DISTRICT PLAN FORMAT WITH OVERLAYS

REFERENCE 2423-SK41 - SCALE = 1:2500.0036 AT A1 - 1:5000 AT A3 - 09 Apr 2015

J:\2423 - millbrook.macauley\cad\2423-sk40 - millbrook dalgleish farm - qldc district plan format.dwg - SK41

