Boffa Miskell

Pukaki Village Zone Review

Landscape and Ecology Opportunities & Constraints Report

Prepared for George Ormond

10 August 2023

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Bibliographic reference for citation: Boffa Miskell Limited 2023. *Pukaki Village Zone Review: Landscape and Ecology Opportunities & Constraints Report*. Report prepared by Boffa Miskell Limited for George Ormond.		
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Status: Final	Revision / version: 2	Issue date: 10 August 2023

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1.0 Introduction

Boffa Miskell Limited (BML) have been engaged by George Ormond to establish the landscape and ecological opportunities and constraints of land currently zoned as Pukaki Village (referred to within this report as the Site) within the Mackenzie District Plan (MDP). As part of the Mackenzie District Council's (MDC) review of their District Plan, the council have requested that the landowner of the Pukaki Village Zone reviews the provisions and intent to develop this zone within the MDP and provide more bespoke and nuanced development outcomes, particularly focussed on landscape and ecology matters.

BML are aware that the current special zoning on the Site enables a reasonably permissive framework for future development to occur. In the review of the District Plan, MDC have highlighted a need for a more carefully considered outcome on the Site, through careful landscape and ecological mapping, noting constraints but also development opportunities.

This report therefore focusses on the landscape and ecological opportunities and constraints of the Pukaki Village Site, along with a range of recommendations for further work opportunities. It is anticipated that this work be presented to MDC who will then include this within their Stage 4 Review for consultation and engagement with the community.

1.1 Existing zoning provisions

Within the operative MDP, the Pukaki Village Zone (PVZ) is a special purpose zone applying to 19.34ha of land[1] located on the terminal moraine at the southern end of Lake Pukaki adjacent to State Highway 8. The PVZ has been established to provide for a modest tourist and holiday village with a maximum capacity of 1,000 people.

Within the operative MDP, the Environmental Results Anticipated for the PVZ include[2]:

- *Preservation of the open space and rural amenity (especially the visual amenity) of the zone with the zone being dominated by open landscaped areas, appropriate planting, unobtrusive buildings with uniform detailing and visage and the use of regional finishing materials.*
- *Preservation and enhancement of the recreational potential for the area at the same time as preserving the environmental values of the locality.*
- *Provision of a range of accommodation/tourist related facilities with supporting services while ensuring that the environmental quality of the area is maintained.*
- *The creation of a village that serves as a replacement for the old Pukaki village; one that complements the unique environment of the Mackenzie Basin both in its design and attention to environmental details such as visual appearance and waste disposal.*
- *The exclusion of or mitigation of activities causing adverse environmental effects such as excessive noise, glare, odour, visual distraction, traffic safety and other hazards through the use of performance standards, the use of covenants and controls on leasehold tenure.*

[1] This excludes the adjacent separate lots associated with 4589 SH8 (containing the lodge) and 4587 SH8 (containing the stone dwelling and vegetation).

[2] Mackenzie District Plan Section 9 Special Purpose Zones, 9-16.

- *The maintenance of the water quality of the lake and local wetland areas.*
- *Protection of traffic safety on State Highway 8.*

In terms of Assessment Matters, there are specific requirements around the height of buildings, ensuring that the extent to which the effects of any increase in height:

- *will adversely affect any view from neighbouring property, or public area, including the state highway and other public roads.*
- *can be mitigated by existing land forms or other factors (e.g. landscaping).*
- *will cause shading on other buildings or public areas.*
- *will reduce the open space and rural character of the Zone.*

Building design and appearance are also noted:

i. *Buildings are to be unobtrusive blending with and sympathetic to their environs.*

ii. *External cladding materials are to be predominately local stone, where practical, stained timber and with slate or tussock sod roofs. If plaster finishes are to be used they must be rendered to have the appearance of the local stone.*

iii. *While a variety of trim colours may be considered, predominant colours within the village area are to be creams, greys and earth tones in accordance with the colour palette of Twizel.*

iv. *Buildings are to follow a unified design theme generally with pitched roofs of over 20^{o} slope.*

v. *All car parking and garaging is to be unobtrusive and preferably below the natural ground level.*

vi. *The topography of the site, its vegetation cover and the opportunity to minimise the impacts of buildings or structures.*

vii. *The degree to which any buildings and other structures are visible from public roads and other sites adjoining the Zone, and proposals to integrate such buildings and structures into their landscape setting.*

Furthermore, within the MDP, the Site retains an Outstanding Natural Landscape overlay with the southwestern part of the Site also subject to a Site of Natural Significance. A Lakeside Protection Area that virtually surrounds Lake Pukaki does not apply to the Site, as illustrated below:

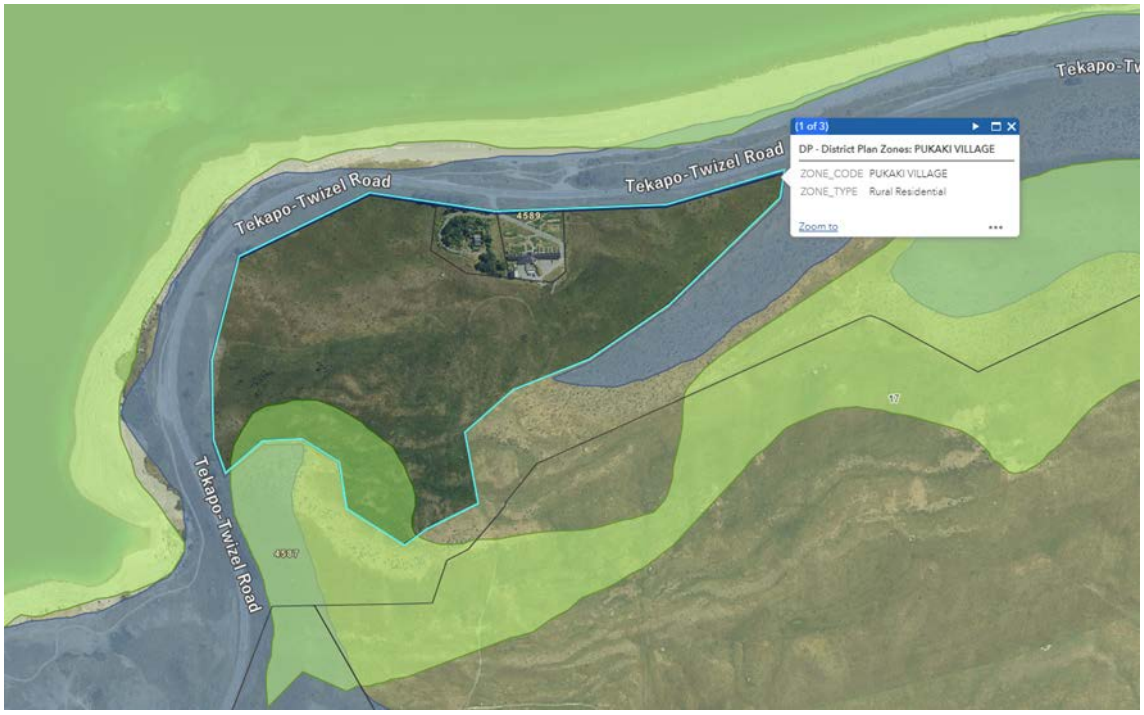

Image 1: MDP overlays associated with the Site (and immediate adjacent separate lots[3]): Green colouration (Sites of Natural Significance) and Blue colouration (Lakeside Protection Areas).

1.2 Site Visit

A Site visit took place on Tuesday 25 July 2023, attended by James Bentley (Landscape Planner); Katie Chilton (Landscape Architect) and Scott Hooson (Ecologist) from BML. James, Katie and Scott were accompanied on Site by Site Manager, George Ormond.

The weather was foggy initially, but eventually cleared to sunny conditions. Visibility improved considerably as the day progressed. A walk over the Site was undertaken by everyone, to understand its existing characteristics and available views to the wider area. Katie and James then undertook a broader visit to the local context to establish the setting of the Site on the shore of Lake Pukaki. This broader understanding assisted to establish the Site's wider visibility, from publicly accessible land viewpoints.

A number of Site Appraisal photographs (A-G) were also taken of the Site coupled with a number of Site Context Photographs (1-6) taken towards the Site in the surrounding landscape, and a selection of these are included within this report and the accompanying **Graphic Supplement**.

[3] Being 4589 SH8 (containing the lodge) and 4587 SH8 (containing the stone dwelling and vegetation).

2.0 Existing Environment

2.1 Broad Context

The Mackenzie Basin, located within the vast inland mountainous ranges of the Southern Alps and the expansive intermontane basins and sub alpine lakes, is an homogenous, highly legible landscape which expresses its formative glacial origins. The mountain ranges surrounding the basin include Aoraki/ Mount Cook and the basin contains Lake Pukaki and Lake Tekapo (and other high-country lakes), all of which accentuate the openness and vastness of this landscape.

The lakes are dominant features within the open grassland and mountainous landscape and were formed by the retreating of the glaciers during the waning of the last glaciation era, where glacial meltwater filled their abandoned troughs. To the south of the lakes are extensive fluvial outwash plains, kettle holes and terraces that, due to the harsh, dry climate and limited growing medium, are characterised by stony ground and tussock grasses. Occasional groups of pine, located within this landscape, assist in accentuating the openness. The braided Tasman River flows into Lake Pukaki at its northern end, depositing large quantities of sediment into the lake from the presence of glaciers at its headwaters.

SH8 is the principal highway which extends through the Mackenzie basin, connecting with Lake Tekapo to the north-east to Twizel in the south-west, passing Lake Pukaki. Immediately to the west of Lake Pukaki, and extending along its entire western side, is SH8 or the Aoraki/Mount Cook Road. This road extends northwards some 54 kilometres to Mount Cook Village. Parallel to SH80 on the eastern side of Lake Pukaki, is Hayman Road, which is partially sealed and accesses the Tekapo canal and the Mount Cook Station further northwards. The nearest settlement is Twizel, which is located some 10 kilometres to the south of the Site. There are a small number of sparsely located residences within the vicinity of the lake, including those at Rhoboro and Pukaki Downs to the west of the lake. There are also some areas within the basin that are extensively grazed with large irrigation pivots and barns.

2.2 The Site

The Site comprises a 19.34-hectare tract of land of undulating terminal moraine located on the southern banks of Lake Pukaki, adjacent to State Highway 8.

The topography ranges in height, from approximately 540masl close to the northern part (refer to **Site Appraisal Photograph A and C**) of the Site, adjacent to SH8 to approximately 580masl within the southernmost part of the Site (refer to **Site Appraisal Photograph E and F**). Essentially the topography follows the ancient terminal moraine deposits, where they ‘step up’ from the lake in a southerly direction. Immediately beyond the Site, to the south, the land rises further to form a steep ridge and local knoll, with numerous kettle holes (as illustrated on **Site Appraisal Photograph D**).

There are no buildings on the Site. The two buildings accessed off SH8 do not form part of the Site. They are associated with a separate landholding. The larger building is a lodge, built within the last 10 years, and the remaining building is a smaller stone dwelling, located amongst vegetation to the west of the lodge. The remaining Site is grassed, partially mown with occasional groups of matagouri and clumps of exposed moraine, primarily located towards the western part of the Site.

Open, panoramic views are obtained from within the majority of the Site, however the elevated parts of the Site associated with the upper terrace receive impressive views of the surrounding landscape, where views of the Ohau Range, Aoraki /Mt Cook and the broader Mackenzie Basin are obtained (refer to **Site Appraisal Photograph F**, for instance). Within the lowest elevated parts of the Site, views are broadly contained to the adjacent hillside and Lake (as illustrated in **Site Context Photographs 1 and 2**).

More broadly, the Site forms part of the tawny brown grassy elevated sequence of terraces south of the lake. In views looking eastwards towards the Site from the west, the Site appears relatively low in comparison to the adjacent knoll that is located immediately south of the Site (refer to **Site Context Photograph 5**). In this vantage point, from the Te Araroa Trail, only the steep northern faces of the Site are visible. At further distances, such as from **Site Context Photograph 4**, from the Pukaki Visitor carpark, the Site appears low on the horizon, where the mountains associated with the Mary Range and larger Two Thumb Range (near Tekapo) appear on the horizon. In very long-distance views, such as from the Peter's Lookout area off SH80 to Aoraki/ Mt. Cook, the Site is virtually undistinguishable from the land forming the southern part of the lake (refer to **Site Context Photograph 6**).

As a consequence of the topography of the Site, there are very limited views into the Site from drivers using SH8 and broadly from the wider landscape. Only the facing hillside flanking the road and the lake are evident.

2.2.1 Site Landscape Character Areas

Broadly, the Site can be divided into three Landscape Character Areas. These character areas broadly relate to the topography, or terracing created by the geomorphic processes by past glaciation. These character areas relate to the lower terrace (both east and west), middle terrace, and upper terrace. These Landscape Character Areas are illustrated on **Figure 4** of the Graphic Supplement.

2.2.1.1 Lower Terrace (east and west)

The lower terrace essentially abuts the northern part of the Site and is aligned with SH8. The elevation for this area ranges from approximately 540masl to 560masl and includes the land that rises to form the middle terrace, which faces the road.

This character area can be broadly defined into two sub character areas; east and west. Essentially the principal difference between the two areas is that the western part of this area is highly visible from the road, which includes the steeply rising land immediately behind it. The easterly area of land retains parts that are highly visible from the road, however, the rising land behind this area is much flatter in gradient, and extends over a much larger distance, mainly 'behind' the existing lodge. This means that the eastern part of this lower terrace retains some parts that are not highly visible from SH8.

All areas in this character area retain open long grass and occasional matagouri. There are also occasional rocks or boulders that protrude from the land. Some silver birches, located on the road reserve close to the western sub-character area boundary are the only grouping of trees associated close to the Site, other than those close to the stone dwelling.

In these areas, it is possible to gain views over Lake Pukaki towards the Ben Ohau Range and Aoraki Mount Cook, in good weather, apart from a section located to the southeast of the Lodge.

2.2.1.2 Middle Terrace

The middle terrace occupies essentially the central-western part of the Site, at an approximate elevation of between 560masl to 570masl. The westernmost part of this area extends west to form the steep slopes to SH8, which is located at an elevation some 20m below. This character area is partly mown, and partly left in unkempt grass, where patches of matagouri and exposed rocks/ moraine are evident. There is a defined cluster of matagouri and rocks towards the western part of the Site, and these are illustrated on **Figure 4** of the Graphic Supplement.

Extensive panoramic views are obtained of over Lake Pukaki towards the Ben Ohau Range and Aoraki Mount Cook throughout the majority of this area, with SH8 largely hidden from view.

2.2.1.3 Upper Terrace

The upper terrace is associated with the southernmost part of the Site and occupies an elevation of approximately 570masl to 580masl. Immediately to the south of the Site, and defining this area, is a large knoll landform, rising to 594masl, and a defined ridge, almost extending from this knoll, in an east-west orientation. The topography which extends beyond the Site, is managed by the Department of Conservation and assists to visually contain the Site and the upper terrace from SH8 below.

As with the remaining terrace areas, this area contains areas of mown grass, unkempt grass, and small patches of matagouri and exposed rocks/ moraine. Elevated views towards Lake Pukaki towards the Ben Ohau Range and Aoraki Mount Cook are obtained. There are limited to no views of SH8.

3.0 Landscape Feasibility Assessment

3.1 Landscape Values

The Site and its wider context are characterised by the ancient glacial and fluvial processes which formed the Mackenzie Basin. Features which are still legible within the landscape today include extensive ablation and terminal moraine, meltwater channels, outwash terraces, minor lakes, fans, meandering floodplains, back swamps, and glacially moulded hills and mountains. Therefore, the landscape remains highly expressive of its formative processes, albeit with modifications to landcover, and change in land use.

The Mackenzie basin is renowned for its highly legible outwash plains, vastness, starkness, austereness and openness, and impressive views of the several glacial valleys and enclosing mountain ranges, including views towards Aoraki (Mount Cook). Transient characteristics include snow during the winter months, the turquoise colour of the glacial lakes, and nor wester patterns and clouds which gather on the Southern Alps which frame the western extent of the basin. Often austere, the landscape holds strong, open and high naturalness values.

Although not all ‘natural’ in terms of lacking evidence of modification, the Mackenzie Basin displays a unique landscape encompassing both natural and visual qualities. Localised modification (such as that around the Site), does not detract from its scale. The Mackenzie Landscape Study states under paragraph 3.5:

'It thus has to be concluded that an element of the Mackenzie's landscape value is its distinctive forms of cultural modification and its different-ness from lowland New Zealand, and not solely its naturally-derived values'.

The Site and the wider Mackenzie Basin is an Outstanding Natural Landscape at both a regional and district scale. The basin's recognition as an Outstanding Natural Landscape has been tested through public processes for the Regional Policy Statement and District Plan, including Environment Court. Planning documents also show the agreed values of the basin as reflected in the Canterbury Regional Landscape Study, 2010, the values of which are contained within **Appendix 1**. The Site is also located within an area of medium to high visual vulnerability within the District Plan. It is an iconic South Island landscape and of national importance for tourism and recreation, as well as inspiration for several writers and artists. The recently completed Te Araroa trail extends parallel to SH8 to the immediate north and west of the Site.

3.1.1 Key landscape values associated with the Site

The following are key landscape related values associated with the Site:

- Forms part of an iconic South Island intermontane basin landscape containing highly legible features.
- Turquoise colour of Lake Pukaki coupled with enclosing mountain ranges form a dramatic and spectacular landscape.
- Elevated views from the Site provide panoramic views of Lake Pukaki and Aoraki Mt. Cook.
- Despite some modification to the land use aspect of the Site (where the Site would be covered by native tussocks and shrubland species), the Site retains high levels of aesthetic, naturalness and visual coherence due to its largely undeveloped nature and predominant grass cover.
- Evidence of rocky moraine debris are evident, which demonstrate the legibility of the Site's formative processes.
- The landscape contains no existing structures, contributing to the dramatic and highly memorable setting and high openness.
- Lake Pukaki is one of several lakes acknowledged in the Ngai Tahu Claims Settlement Act (1998).
- The broader area is of national importance for tourism and recreation.

3.2 Natural Character

Natural Character, under the RMA, specifically relates to 'the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development'. Therefore, the assessment of natural character in this report only involves examining the proposed changes to natural elements, patterns and process which relate to Lake Pukaki and its margins.

The natural character of this area has been significantly modified from its original natural state through the building of the Pukaki Hydro and creation of Lake Pukaki[4], and the construction of the state highway and lodge, but nonetheless, there are many characteristics and qualities apparent that contribute to the naturalness of the area. These include the turquoise water of the lake, its rocky shores, and the Pukaki River.

Overall, the degree of the site's natural character is considered to be **moderate** tending to **moderate to low** in parts due to the artificial operation of the water due to the hydro scheme, the presence of human modifications (dams, roads around the lake edge) and the effects to the area's natural patterns, elements and processes.

3.3 Landscape capacity – process

The assessment of landscape capacity is intended to adopt a clear and transparent process forming the basis from which professional judgements have been made and can be summarised as follows:

Diagram 1: Landscape Capacity, Sensitivity and Value

Landscape Character Sensitivity	**Visual Influence**	**Landscape Value**	**Current District Plan zoning: (Pukaki Village Zone)**
e.g. Physical • Geology • Hydrology • Landform • Soils • Climate • Flora • Fauna • Habitats • Structures • Land use Perceptual • Transient characteristics • Memorability • Coherence • Legibility • Vividness Associative • Shared and recognised • Tangata whenua cultural values • Historic and heritage values	e.g. General visibility • Landform influences • Tree and vegetation cover Population • Number and type of residents • Number and type of visitors Mitigation Potential • Scope for mitigating potential visual impacts	e.g. Landscape Classification • ONL / VAL • Physical, perceptual, and associative characteristics.	

→ **Landscape Capacity**

i.e.
the landscape capacity to absorb development.

[4] Which is managed between some 34-47m metres above pre-existing water levels (source: David JA Barrell & Stuart AL Read (2014) The deglaciation of Lake Pukaki, South Island, New Zealand—a review, New Zealand Journal of Geology and Geophysics, 57:1, 86-101, DOI: 10.1080/00288306.2013.847469)

It is recognised that the interrelationship and weighting of landscape and visual factors, along with consideration concerning the Site's underlying zoning, will influence the final judgement of **landscape capacity**. Whilst this process is illustrated by way of a simple equation, it is emphasised that professional judgement is ultimately required in drawing together the relevant factors that relate to a site's ability to accommodate a specific type of change, which in this situation, is a built development[5].

In applying the above judgement, the assessment of landscape capacity has adopted the following seven-point scale:

Table 1: Landscape Capacity

Landscape Capacity	Description
Very High	Very little/ no constraints to development.
High	The area is able to accommodate substantial new development, providing it has regard to the character and the sensitivity of adjacent landscape character areas and features.
Moderate High	The area is able to accommodate larger amounts of development, providing it has regard to the character and the sensitivity of adjacent landscape character areas. Certain landscape features and views in the area may require protection.
Moderate	New development may be accommodated provided it has regard to the character and sensitivity of adjacent landscape character areas. There are landscape constraints and therefore the key landscape and visual characteristics must be retained and enhanced.
Low Moderate	A minimal amount of development could be accommodated in limited situations, provided it has regard to the character and sensitivity of adjacent landscape character areas. There is potential for some significant adverse landscape or visual effects.
Low	Development would generate significant adverse effects on landscape character and/or available views. Occasional, very small-scale development may be possible, providing it has regard to the character and sensitivity of adjacent areas.
Very Low	Very little/ no capacity for development

To assess the feasibility of the Site for potential built development, the Site has been divided based on three landscape character areas, which are primarily dictated by topography and visibility from SH8. The assessment has considered the landscape and visual sensitivity of the Mackenzie Basin and the Site as well as the landscape values outlined above and within **Appendix 1.**

It is noted that the Site is located within the Mackenzie Basin Outstanding Natural Landscape (ONL) which is recognised at a regional and district scale. Therefore, landscape value is considered **very high**, as outlined in Section 3.1 of this report and this applies to the entire Site. Furthermore, the Site retains a current zone enabling of development. This current zone, along with the landscape sensitivity, visual influence and landscape value has been fully considered in this process.

[5] *5.34 It is more credible to treat landscape criteria as pointers than part of a mathematical formula. Ultimately, reasons and explanation in support of professional judgement are more important than prescribed criteria. 'Te Tangi a te Manu: Aotearoa New Zealand Landscape Assessment Guidelines', Tuia Pito Ora New Zealand Institute of Landscape Architects, July 2022.*

3.4 Landscape capacity - outcomes

The landscape capacity assessment has considered the landscape and visual sensitivity of the Mackenzie Basin and the Site as well as the landscape value and the current zoning. The landscape findings on a landscape character area basis are set out below and graphically on **Figure 4: Landscape and Ecology Constraints and Opportunities Plan**.

Landscape Character Area	**Assessment**	**Landscape Capacity**
Lower Terrace (West)	Landscape Character Sensitivity: High Formative processes are legible, especially as a lower terrace to the adjacent lake. This part of the Site is clearly visually related to the lake, which heightens its openness. This part of the Site also retains high level of visual coherence due to relatively consistent and open grass and shrub cover. Visual Sensitivity: Very High This part of the Site is highly visible to users on SH8. The steep embankment of backdrop to this area is open and frames the lower part closest to the road. All aspects of this area are visible. Landscape Value: Very High (ONL)	Very Low
Lower Terrace (East)	Landscape Character Sensitivity: Moderate to High Formative processes are legible, especially as a lower terrace to the adjacent lake. The eastern part of this area is very low, raising in elevation to the west, and immediate southeast of the lodge. Despite this, this part of the Site also retains a connection to the lake frontage however, is less defined and contained as the western lower terrace is. Visual Sensitivity: Very High easternmost part tending to Moderate towards the west (and immediately southeast of the lodge) The eastern and lower part of this area is highly visible to users on SH8. Due to the gently rising topography to the west, and to the southeast of the lodge, the land slightly flattens, where it is virtually screened from SH8. Landscape Value: Very High (ONL)	Low Moderate
Middle Terrace	Landscape Character Sensitivity: Moderate to High Whilst parts of this area are mown, there are parts that have been left unmown, and that support a range of grasses and matagouri shrubs. Towards the western part of this area are a number of ecological constraints, notably a north-western terrace containing noted endemic species and rock habitats for geckos. This area also	Moderate

Landscape Character Area	Assessment	Landscape Capacity
	contains clumps of matagouri and a mapped Site of Natural Significance overlay in the Operative District Plan. Exposed rock moraines are also evident throughout this area, notably within the unmown parts of the area. Visual Sensitivity: Low to Moderate Much of the area is not visible from SH8, however parts of the westernmost section of land, close to the ridge leading to SH8 are visible from the SH. In longer distance views, such as those from the Pukaki car park and Te Araroa trail to the west may experience views of built forms if they extend above the horizon. Apart from this, panoramic views are obtained from most locations in the area towards the lake, Aoraki/Mt. Cook, the Ben Ohau Range to the west and the Mary Range to the east. Landscape Value: Very High (ONL)	
Upper Terrace	Landscape Character Sensitivity: Moderate to High This is the most elevated part of the Site, backdropped by DOC land beyond the Site and a steep ridge that virtually contains this small southern area of the Site. This area also partly retains a mapped Site of Natural Significance overlay in the Operative District Plan. Much of this area is mown, however, similar to the middle terrace, contains areas of unmown grass, which typically also contain sporadic groups and individual exposed and partly exposed rock moraines. Visual Sensitivity: Low Virtually no part of this area is visible from SH8, apart from a very small part to the east. Due to the steep gain in elevation immediately beyond the Site to the south which effectively cradles this part of the Site, it is unlikely that built form in this area would be seen in many areas to the west of the Site. Apart from this, panoramic views are obtained from most locations in the area towards the lake, Aoraki/Mt. Cook, the Ben Ohau Range to the west and the Mary Range to the east. Landscape Value: Very High (ONL)	Moderate

3.5 Overall Landscape Outcomes

The proposed Site is located within the Mackenzie Basin ONL; therefore, the landscape values of the Site and the wider context are very high. The Site forms part of the highly legible glacial terraces and moraines that are evident throughout the broader landscape. This legibility is highlighted by the lack of structures evident on the Site and by its reasonably coherent cover of grass and clumps of matagouri. This contributes to the high levels of naturalness the Site retains.

The only forms of built development associated with the Site include the lodge and stone cottage to the immediate north of the Site and a recent house built on land associated with 4769 SH8 to the south of the Site, closer to the hydroelectric dam.

Overall, the Site retains some capacity for development, focussed predominantly within the middle and upper terrace landscape character areas. The lower terrace is visually open and retains a closer relationship to the lake than the more elevated terraces to the south. Despite the middle and upper terraces retaining higher elevation, the majority are unseen from the key viewing corridor of SH8. Any development in these areas would need to carefully respond to the Site's nuanced character and reflect natural materials contributing a local vernacular to built form. Further, it is expected that any earthworks would be limited, with built form and infrastructure being well located, and visually absorbed by the landform. Within the recommendations part of this report, some further detail around how development could be absorbed within this landscape is outlined.

Of key importance is the existing underlying zoning and special status of an activity zone within the District Plan which outlines provisions for development on the Site. Despite being within an ONL, the Site does have ability to absorb some form of development. Whilst this will change the characteristics and values to a degree, if well designed and sited, these effects will likely be largely internalised and should not adversely affect the broader landscape values that contribute to this very special and iconic New Zealand landscape.

4.0 Ecology Assessment

4.1 Methods and Limitations

4.1.1 Site Investigation

Scott Hooson completed a high-level walk-through survey of the Site over approximately 3.5 hours on 25 July 2023. The purpose of the high-level survey was to identify ecological constraints and opportunities (i.e. the purpose of the site investigation was not to complete detailed ecological surveys to comprehensively document all the ecosystems, habitats and flora and fauna on the Site).

During the survey:

- Vegetation communities and habitats were surveyed to broadly document and describe the vegetation cover and habitats within the Site and general notes were made on the condition of the vegetation communities and habitats present;

- Plant species, and their cover (using the DAFOR scale) were recorded in each of the main vegetation communities and the presence of nationally Threatened and At Risk and plant species was recorded.
- Incidental observations of fauna (particularly birds and lizards), and an assessment of habitat suitability for fauna was made. No formal surveys were undertaken for fauna.
- A handheld Garmin Global Positioning System (GPS) was used to mark features of interest; and
- Photographs were taken.

4.1.2 Assessing Ecological Significance

The significance of the terrestrial indigenous vegetation and habitats of indigenous fauna was assessed against the criteria for determining significant indigenous vegetation and significant habitat of indigenous biodiversity listed in Appendix 3 of the Canterbury Regional Policy Statement (CRPS) (Environment Canterbury 2013). The guidelines for the application of the CRPS criteria (Wildland Consultants 2013) were used to assist interpretation of the criteria. Following Policy 9.3.1(3), areas or habitats are significant under the CRPS criteria if they meet one or more of the criteria in Appendix 3 of the CRPS.

4.1.3 Limitations

A comprehensive ecological survey of the vegetation, habitats and fauna at the Site was outside the scope of this work, as were formal surveys for terrestrial fauna (birds, lizards and invertebrates).

The survey was undertaken at a time when some plant species had died off and many species were not flowering or fruiting (This timing generally makes identification more difficult). The implication of this is that some plant species which may be present at the Site may not have been not recorded during the survey and some species, particularly grasses could not be accurately identified.

The survey (which was undertaken in mid-winter) was outside the season when lizards and terrestrial invertebrates are generally more active. Incidental observation of these fauna groups was constrained by the timing of the site visit.

4.2 Ecological Context

The Site is within the Tekapō Ecological District (ED) in the Mackenzie Ecological Region and the inter-montane Mackenzie Basin.

The original vegetation of the Tekapō ED was strongly influenced by recent glaciation, a harsh inter-montane basin climate and infrequent natural fires. It is unlikely that forest was present, except perhaps for areas of low stature mountain toatoa-bog pine forest on moraines and mountain totara forest on lower range slopes. The district was probably dominated by short tussockland, tall tussockland (including copper tussockland), mountain toatoa – bog pine scrub and matagouri – *Coprosma* spp. scrub (Espie et al. 1984). Within the Tekapō ED, areas of wetland were probably relatively extensive along the numerous small rivers and lake margins (Harding 2009).

The existing (present day) vegetation reflects modification following human settlement. Following human settlement, particularly European pastoralism, the extent of scrub / low forest and tall tussock communities has been reduced, and the extent of short tussockland has increased as a result of an increased frequency of fire. However, existing short tussock grasslands have been degraded by years of grazing by sheep and rabbits, and the introduction and spread of exotic plants (particularly grasses and mouse-ear hawkweed). Sparsely vegetated cushionfield, herbfield, and short tussock grassland communities are present on shallow soils on outwash plains, and specialised turfland communities occur in the numerous kettlehole wetlands that occupy moraine hollows (Harding 2009).

In terms of the Threatened Environment Classification[6], the Site is almost entirely within land environment (E4.1b), where 20-30% indigenous vegetation remains nationally. Small areas of the Site are within land environment (N6.1b), where > 30 % indigenous vegetation remains nationally < 10% protected (Walker et al. 2015).

The Site is located on the Pūkaki terminal moraine on the southern shoreline of Lake Pūkaki at approximately 540- 580 m elevation. Geologically, the Site comprises Late Pleistocene glacier deposits of generally unweathered boulder till; mixtures of gravels, sands, silts and clays, in well-defined valley moraines.

Immediately south of the Site is the Lake Pūkaki Terminal Moraine Conservation Area[7] (Figure 2). The Mackenzie District Plan identifies and maps a Significant Natural Area (SNA 17) which is primarily to the south and east of the Site, but which extends into the south-western corner of the Site. This area was identified as a Recommended Area for Protection (RAP) by Espie et al. (1984). North of the Site is SNA 18 (Lake Pūkaki). These areas are shown on Figure 2 and descriptions from Appendix I of the District Plan are provided in Table 2 below.

Table 2: Significant Natural Area's in the vicinity of the Site identified in the Mackenzie District Plan

Site	Site Name	Description
17	Southern Pūkaki	RAP T-6 (Southern Lake Pūkaki Scrub): Native broom and prostrate kowhai on terminal moraine. Threatened plant site containing *Coprosma intertexta* and *Crassula multicaulis*. Dry north facing slopes provide good habitat for a large number of shrubland species in a fescue sward. Skink, gecko and insect populations observed. Habitat of three moth species endemic to Mackenzie Basin - *Gelechia lenis, Cremnogenes honesta and Ericotenes pūkakiense*. Conservation area.
18	Lake Pūkaki	RAP T-3; SSWI: Large deep glacial moraine dammed lake with numerous wildlife habitats. Drawdown for hydroelectric power generation during winter exposes Tasman River delta at north end and lake margins which provide overwintering areas for black stilt. Feeding and breeding area for black stilt and other waterfowl and waders. Habitat for three endemic moth species.

[6] The Threatened Environment Classification is a combination of three national databases: Land Environments of New Zealand, Land Cover Database (Version 2) and the Protected Areas Network. The Threatened Environment Classification shows how much indigenous vegetation remains within land environments, how much is legally protected, and how the past vegetation loss and legal protection are distributed across New Zealand's landscape.

[7] Conservation Unit No. H38009.

4.3 Ecological Values

4.3.1 Vegetation and Habitats

The main vegetation communities within the Site are exotic grassland, matagouri shrubland and vegetation on a dry north facing slope. These vegetation communities are described briefly in the following sections. There are no wetlands, ephemeral wetlands or tarns present. The only kettlehole found does not support wetland vegetation.

Exotic grassland

Ungrazed, dense exotic grassland covers almost the entire Site (Photos 1 and 2, Appendix 2) although much of the grassland in the elevated part of the Site had been mown (Photos 2 and 3, Appendix 2).

The exotic grassland was comprised of several ubiquitous exotic grass species including browntop, sweet vernal, Chewings fescue, cocksfoot and *Bromus* sp. and a range of exotic herbs including occasional yarrow, sheep sorrell, viper's bugloss, white clover and infrequent St John's wort, woolly mullein and mouse-eared hawkweed. Indigenous plants were present at very low densities within the grassland and included hard tussock, patotara, onion leaved orchid, creeping pōhuehue and grassland sedge. Shrubs were also very infrequent and generally widely scattered within the grassland across the Site and included the indigenous species porcupine shrub, matagouri, desert broom, scrub pōhuehue, mingimingi (*Coprosma propinqua*), one scented tree daisy (near the existing lodge) and the exotic shrub sweet briar. There was also very infrequent Russell lupin, Scotch broom and young (<0.5 m tall wilding pines).

Matagouri shrubland

Small patches of matagouri shrubland were present in the southern-western corner of Site (Photos 5 and 6, Appendix 2) and there was a small patch of matagouri towards the centre of the Site (Photo 7, Appendix 2). These shrublands support mature matagouri shrubs with a canopy height of 2 – 3 m. The understorey of the shrublands in the southern-western corner of Site were entirely dominated by exotic grasses, primarily cocksfoot, sweet vernal, Chewings fescue and browntop with occasional exotic herbs such as cleavers. The indigenous scrambling vine scrub pōhuehue was frequent in the smaller patch of shrubland at the centre of the Site.

The Site does not contain diverse indigenous shrublands such as those that occur within the Lake Pūkaki Terminal Moraine Conservation Area and SNA 17.

Dry north facing slope

A small area on the north-facing side of moraine hummock on the southern-western boundary of the Site (Photo 8, Appendix 2) has a lower cover of exotic grasses, more rocks and bare soil and a greater diversity of indigenous vascular and non-vascular plants. Although dominated by exotic grasses including *Rytidosperma* sp., browntop and sweet vernal and the invasive herb mouse-ear hawkweed, it also supports infrequent indigenous species. They include the moss juniper haircap, the sub-shrub patotara, hard tussock, the scrambling vine scrub pōhuehue and several shrubs including mingimingi, porcupine shrub, desert broom and matagouri. Two At Risk – Declining species, resurrection lichen (one small patch) and one plant of the scab weed *Raoulia australis* (also At Risk – Declining) were also recorded here.

4.3.2 Threatened and At Risk Plant Species

Four nationally At Risk plant species were recorded during the site visit. They are listed below in Table 3.

Table 3: Nationally Threatened and At Risk plant species recorded during the site visit

Species (scientific name)	Threat Status (de Lange et al., 2018)	Recorded distribution at the Site
Matagouri *(Discaria toumatou)*	At Risk – Declining	Small patches of shrubland, particularly in the southern-western corner of Site. Very infrequent, widely scattered mature shrubs across the remainder of the Site.
Desert broom *(Carmichaelia petriei)*	At Risk – Declining	Very infrequent, widely scattered mature shrubs across the Site.
Scab weed (*Raoulia australis*)	At Risk – Declining	One plant recorded on the dry north-facing slope at the south-western corner of the Site.
Resurrection lichen (*Xanthoparmelia semiviridis*)	At Risk – Declining	A small patch (0.5 x 0.5 m) was recorded on the dry north-facing slope at the south-western corner of the Site. Likely present elsewhere at the Site.

4.3.3 Indigenous Fauna

Birds

The open grassland and small patches of matagouri shrubland generally provide limited habitat for indigenous bird species. The only indigenous bird species observed during the site visit was New Zealand pipit, an At Risk – Declining species which likely use the Site intermittently[8]. Exotic species recorded were blackbird, dunnock, skylark, song thrush and yellow hammer.

There are no habitat types on the Site that provide important habitat for Threatened and At Risk species (such as tarns or wetlands).

Lizards

DOC Bioweb herpetofauna database records and surveys on nearby Simons Pass Station (Department of Conservation 2007, Tocher 2018) have recorded a total of five lizard species in the wider area (Table 4).

Table 4: Lizard species recorded in the wider area

Species (scientific name)	Threat Status (Hitchmough et al., 2021)	Habitat preference
McCann's skink (*Oligosoma maccanni*)	Not Threatened	Occupies open habitats, usually dry rocky environments, using rock

[8] New Zealand pipit are listed in Appendix 2 of the NPS-IB as specified highly mobile fauna. Policy 15 of the NPS-IB states that "areas outside SNAs that support specified highly mobile fauna are identified and managed to maintain their populations across their natural range, and information and awareness of highly mobile fauna is improved".

		outcrops. Montane grassland and herbs and shrubs
Canterbury grass skink (*O.* aff. *polychroma* Clade 4)[9] / **Southern grass skink** (*O.* aff. *polychroma* Clade 5)	At Risk – Declining (Taxonomically Unresolved)	Habitat generalist: wetlands, grassland, shrublands, forest edges, screes, talus slopes rocky and boulder areas, shrublands and tussocklands
Southern Alps gecko (*Woodworthia* "Southern Alps")	At Risk – Declining (Taxonomically Unresolved)	Inhabits talus slopes, screes and shattered outcrops in open lowland habitats. Common in dry riverbeds.
Scree skink (*O. waimatense*)	Threatened – Nationally Vulnerable	Inhabits dry rocky areas, including talus slopes, boulder river terraces and banks and montane shrubland / tussockland
Mackenzie skink (*O. prasinum*)	Threatened – Nationally Vulnerable (Taxonomically Indeterminate)	Inhabits open grassy areas, rocky river terraces, tussock grasslands, scree rock piles and fellfield habitats.

Southern Alps gecko and McCann's skink, which are both habitat generalists and relatively common species, have a wide distribution within the Mackenzie Basin. Taxonomically unresolved species of grass skink (Canterbury or southern grass skink) have been recorded in the wider area, but herpetofauna database records show they are less frequently recorded than Southern Alps gecko and McCann's skink. Observations of the distribution of this grass skinks in the Mackenzie Basin indicate that may be confined to stream margins and other damper, more humid habitats in this area. The nationally Threatened scree and Mackenzie skinks, which are larger bodied, relatively long-lived, habitat specialists are considered less likely to be present at the Site as they persist as scattered populations in a more limited range of habitats.

Southern Alps gecko and McCann's skink were both recorded during the site visit. Southern Alps gecko were found amongst refugia in boulders in several locations. McCann's skink is likely widespread in grasslands and stony areas within the Site.

4.4 Ecological Significance

The Mackenzie District Plan identifies and maps a Significant Natural Area (SNA 17) located primarily to the south and east of the Site, but which extends into the Site's south-western corner (Figure 2). This SNA was originally identified as a Recommended Area for Protection (RAP) by Espie et al. (1984). During the site visit, the boundary of SNA 17 was ground-truthed where it extends into the Site. The values described for the SNA 17 generally do not occur within the area of the SNA that is within the Site (diverse dry shrubland communities on the terminal moraine). Rather, they are on the immediately adjacent Lake Pūkaki Terminal Moraine Conservation Area.

However, we assessed the ecological significance of the vegetation and habitats within the Site using the ecological significance criteria listed in Appendix 3 of the CRPS (Environment Canterbury 2013). Table 5 (Appendix 3) details our evaluation of the Site against each of these criteria. In summary, the Site is ecologically significant under the criteria in Appendix 3 of the

[9] Two different clades of grass skink (Clade 4 (Canterbury grass skink) and Clade 5 (southern grass skink)) are likely to be present in the Mackenzie Basin, but the two clades can only be differentiated by genetic analysis.

CRPS. The small dry north facing slope meets the threshold for representativeness (criterion 1) and the Site (generally) meets rarity / distinctiveness criteria 4 and 6.

We also note that if assessed against the criteria for identifying areas that qualify as significant natural areas (SNAs) in Appendix 1 of the National Policy Statement for Indigenous Biodiversity (NPS-IB)[10], the Site would be ecologically significant under those criteria. Notably, under criterion (6)(e) an area qualifies as an SNA if it has indigenous vegetation or habitat of indigenous fauna occurring on naturally uncommon ecosystems. The Site, which supports indigenous vegetation, is on the Pūkaki terminal moraine and moraines are naturally uncommon ecosystems (Williams et al. 2007).

4.5 Ecological Constraints and Opportunities

4.5.1 Constraints

The key ecological constraints on the Site are shown in Figure 4. They include:

- Several patches of matagouri shrubland, primarily in the south-western part of the Site. Although widespread, matagouri is classified as a nationally At Risk – Declining species.
- The dry north-facing slope at the south-western corner of the Site which provides habitat for several indigenous plant species including the At Risk – Declining desert broom, *Raoulia australis*, matagouri and resurrection lichen. It also provides habitat for lizards.

Any future development will also need to consider potential effects on widely scattered indigenous shrubs, particularly matagouri and desert broom.

In addition, all of New Zealand's indigenous lizards are protected under the Wildlife Act (1953). The confirmed presence of Southern Alps gecko and McCann's skinks on Site means that development activities such as vegetation clearance or earthworks will need to comply with Wildlife Act provisions (i.e. a Wildlife Act Authority (WAA) and accompanying Lizard Management Plan (LMP) may be required) or the provisions of any successive legislation[11].

4.5.2 Opportunities

Ecological opportunities for the Site that could be considered include:

- Restoring indigenous shrublands in appropriate areas outside areas proposed for future development, including steeper north-facing slopes and moraine hummocks.
- Connecting and buffering the existing patches of matagouri shrubland, by planting appropriate indigenous shrub species.
- Connecting the existing patches of matagouri shrubland and the dry north-facing slope at the south-western corner of the Site with the more diverse indigenous shrublands of the adjacent Lake Pūkaki Terminal Moraine Conservation Area to the immediate south.

[10] The NPS-IB comes into force on 4 August 2023.

[11] The government has announced that the Wildlife Act 1953 is under review.

- Enhancing lizard habitat by planting appropriate “lizard friendly” indigenous plants that provide refugia and food for lizards around larger boulders and rocky areas.

It is recommended that any plantings use locally sourced indigenous plants from the Tekapō ED that are both ecologically and visually appropriate for the landscape. Appropriate species include, but are not limited to, prostrate kowhai, porcupine shrub, matagouri, desert broom, scrub pōhuehue, mingimingi (*Coprosma propinqua*), and scented tree daisy.

5.0 Conclusion and Recommendations

5.1 Landscape

The Site is located within Outstanding Natural Landscape and forms part of one of New Zealand’s iconic and celebrated landscapes. Formative processes are evident, along with some noted ecological areas that require protection. From a landscape perspective, and noting the existing special purpose zone, the Site has some ability to absorb development, however this would need to be carefully considered to protect recognised landscape values from inappropriate development. Below are a list of considerations that would need to be factored into any future, bespoke and carefully crafted Master Plan, Structure Plan or Outline Development Plan:

- The lower terraces retain the least ability to absorb development, due to their high level of openness and visual connection to the state highway and the panoramic views over Lake Pukaki. Some potentially carefully located development could be located within the western part of the Eastern Lower Terrace Character Area, close to the lodge.
- A greater level of development could be accommodated within the Middle and Upper Terrace Character Areas, however, some ecological constraints around the north-facing terrace and matagouri areas would need to be factored into any design.
- Acknowledgement of cultural heritage and values of Mana Whenua; and recognition of the importance of the Te Manahuna | Mackenzie Basin landscape setting will need to be woven into any design.
- Careful consideration of how the design should be configured to minimise the loss of, and enhance, local ecosystems and habitats.
- Respond to the local climatic conditions, such as prevailing winds and sun aspect. Orient built form for sunlight and warmth to improve energy efficiency.
- Cluster built form to reduce the impact of larger buildings which could have the ability of dominating the landscape.
- Consider near and distant views to prominent natural and built features.
- Respond to important landscape features or sites of cultural significance nearby, such as unique landforms, waterways or heritage and natural features.
- Use of simple materials palette of higher quality natural materials sourced locally with low light reflectivity values to complement the materials and tones found in the natural surroundings.

- Use of sympathetic or complementary colours and materials, including those that are locally sourced.
- Work with the natural characteristics of the local topography to reduce the extent of earthworks required or integrate level changes into the building design.
- Capture or treat stormwater runoff to conserve water and prevent pollution of waterways.
- Consider lighting in the context of the Dark Sky Reserve (AMIDR) area (unique to the Mackenzie Basin) and the associated requirements set out in the District Plan.
- Use of exclusively native species from alpine and riparian plant communities found locally.
- Consider well designed and appropriate signage to aid wayfinding which complements the highly valued landscape.

5.2 Ecology

The Site is ecologically significant under the criteria in Appendix 3 of the CRPS. However, much of the Site is relatively modified with infrequent indigenous plant species.

Key ecological constraints are:

- Patches of matagouri shrubland, primarily in the south-western part of the Site.
- The dry north-facing slope at the south-western corner of the Site which provides habitat for several indigenous plant species, including At Risk – Declining species.
- Due to the presence of indigenous lizards, future development activities will likely need to comply with Wildlife Act provisions or the provisions of any successive legislation.

There are opportunities to enhance the ecological values of the Site. Key opportunities include:

- Restoring indigenous shrublands in appropriate areas.
- Connecting and buffering the existing patches of matagouri shrubland and the dry north-facing slope at the south-western corner of the Site with shrublands in the adjacent Conservation Area.
- Enhancing lizard habitat by planting appropriate “lizard friendly” indigenous plants.

6.0 Ecological References

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Appendix 1: Mackenzie Basin ONL values

14. Mackenzie Basin

This ONF/L is located within the Intermontane Basins and Ranges and Semi Arid Mountain Ranges landscape types (see Section C for landscape character and value descriptions)

LOCATION

The area identified as an Outstanding Natural Feature and Landscape (ONF/L) includes the entire Mackenzie Basin with its valley floors and surrounding slopes and ridgelines.

The boundary proposed in the 1993 study has been amended to follow the ridgelines of the surrounding mountain ranges. Two areas were added to this ONF/L: The Upper Godley Valley and Lake Benmore with its surrounding mountain slopes. The Benmore Range, which lies between the Mackenzie and Benmore basins, was included, as it contains the visual catchments. The more modified part of the basin floor around and south of Twizel has been excluded, as it does not display the same outstanding qualities as the remainder of the basin. The exclusion extends further south (to the Ahuriri River) than in the 1993 study.

KEY LANDSCAPE VALUES

Natural Science Values

- The upper river valleys (such as the Godley and Tasman) are largely weed-free and have a high degree of naturalness.
- These river valleys support an array of unique and threatened native birds.
- Kettleholes in the basin floors are an important habitat.
- Numerous DOC-managed reserves, including scientific reserves are in the basin and valleys (linking with Aoraki/Mt Cook National Park).

Legibility Values

- Highly legible features such as moraines, rôches moutonnées, hanging valleys, terraces and fans.
- The outwash plains are highly legible features of the basin.
- 'Kame terraces' near Lake Pukaki are highly legible landscape features.
- Numerous geopreservation sites are located within the basin.

Aesthetic Values

- The vast basin, large river valleys and enclosing mountain ranges form a dramatic and spectacular landscape. While some parts of the basin have been substantially modified by residential, hydro and agricultural development, the basin as a whole retains its openness and largely coherent character.
- Impressive views up the wide U-shaped valleys to the snow and ice covered peaks of the Alps are experienced from the basin.
- Pukaki and Tekapo reflect a striking milky-blue colour in sunlight. They form an integral part of one of the most memorable landscapes in the country.
- The golden tussock-laden slopes which surround the basin have high aesthetic values.

Transient Values

- Snow coats the ranges and basin floors during much of the winter months.
- The distinctive turquoise colour of the lakes in sunny conditions is spectacular.
- Nowhere else in the country can the effects of 'norwester' weather patterns and the rainfall gradient from west to east be as vividly experienced as in the Mackenzie Basin.

Tangata Whenua Values

- Lakes Tekapo, Pukaki, Benmore and Ohau are acknowledged in the Ngai Tahu Claims Settlement Act (1998).
- The Mackenzie Basin lakes (Tekapo, Pukaki and Ohau) are all referred to in the legend of "Nga Puna Wai Karikari o Rakaihautu" which describes how the principal lakes of Te Wai Pounamu were dug by the rangatira (chief) Rakaihautu.
- Maori used the lakes in this area for mahinga kai (waterfowl).
- These lakes are part of a wider mahinga kai trail that ran from Lake Pukaki down the original path of Waitaki River to the coast.

Shared and Recognised Values

- Iconic South Island landscape.
- Inspiration for numerous artists and writers.
- The lakes and the basin are tourist icons.
- National importance for tourism and recreation.
- Lake Ruataniwha near Twizel has been developed as a national rowing venue.

Historic Values

- Historic features include homesteads, farm buildings, sheep yards, pack bullock & dray tracks, mustering huts, shelterbelts and fences.
- The Mackenzie Basin is named after the first European to discover the area, James Mackenzie. Mackenzie, convicted of sheep stealing, has a monument commemorating his capture.

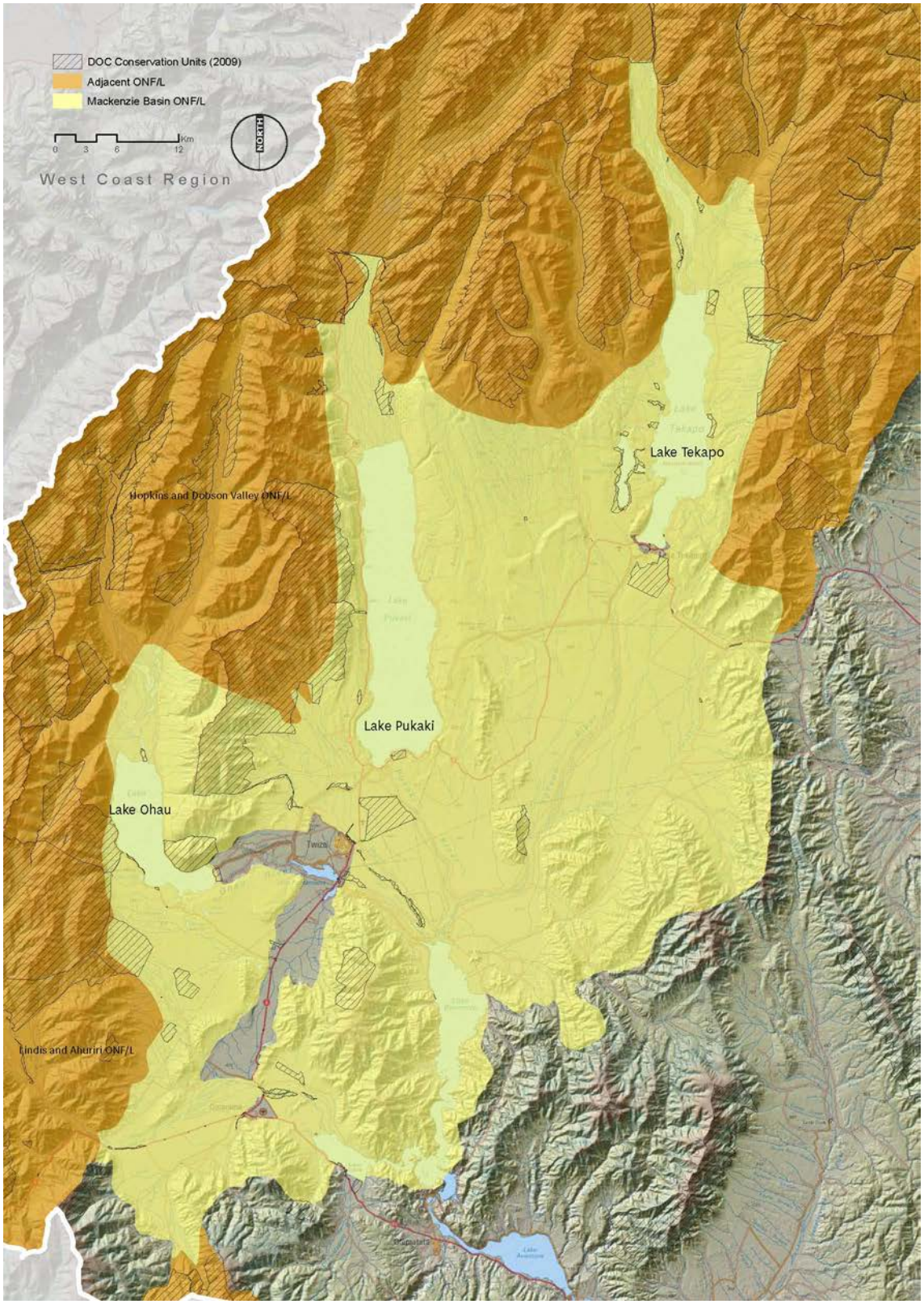
EVALUATION

The entire Mackenzie Basin, including the Godley Valley, has been identified as an Outstanding Natural Feature and Landscape. This landscape contains areas of exceptional legibility, aesthetic, transient, shared and recognised, very high natural science and high tangata whenua and historic landscape values. It is acknowledged that landscape qualities vary across an area of this size, which contains areas of human modification. Lake Benmore, while a man-made feature, has high aesthetic, shared and recognised and tangata whenua values, which warrant its identification as 'outstanding'.

The lakes and their basin setting are highly expressive of their formative processes and have high aesthetic values. The glacial origins of the basin landscape are expressed in many legible landscape features including moraines, rôches moutonnées, hanging valleys and terraces. The openness of the vast basin landscape and expansive views of the encompassing mountain ranges are spectacular and are widely celebrated.

The entire basin is of great importance to tangata whenua who used the lakes for mahinga kai. The basin was a part of a wider network of trails which linked the coast to the Alps. The basin is widely recognised throughout New Zealand for its high tourism and recreational values. It is a landscape which has provided inspiration for writers and artists for generations.

The Mackenzie Basin has an important place in high country history. Early pioneers established large remote stations, and traces of this history remain in the landscape today.


DOC Conservation Units (2009)
Adjacent ONF/L
Mackenzie Basin ONF/L
0 3 6 12 Km
NORTH
West Coast Region
Lake Tekapo
Hopkins and Dobson Valley ONF/L
Lake Pukaki
Lake Ohau
Lindis and Ahuriri ONF/L

Appendix 2: Ecology Photographs

Photo 1: *Mown grassland on the upper terrace.*

Photo 2: *Mown grassland on the upper terrace.*

Photo 3: *Unmown exotic grassland on the western side of the lower terrace.*

Photo 4: *Unmown exotic grassland on the eastern side of the lower terrace.*

Photo 5: *Small patches of mature matagouri shrubland in the southern-western corner of Site.*

Photo 6: *Patches of mature matagouri shrubland in the southern-western corner of Site.*

Photo 7: *A small patch of matagouri shrubland towards the centre of the Site.*

Photo 8: *Vegetation on a dry north-facing slope on the southern-western boundary of Site.*

Appendix 3: Significance Assessment

Table 5: *Evaluation of the Site against the Canterbury Regional Policy Statement (Environment Canterbury 2013) criteria for determining significant indigenous vegetation and significant habitat of indigenous biodiversity.*

Criteria	Criteria met?	Explanation
Representativeness		
1. Indigenous vegetation or habitat of indigenous fauna that is representative, typical or characteristic of the natural diversity of the relevant ecological district. This can include degraded examples where they are some of the best remaining examples of their type or represent all that remains of indigenous biodiversity in some areas.	Yes (in part)	Most of the Site is exotic grassland that is not representative, typical or characteristic of the natural diversity of the Tekapō ED. Patches of matagouri shrubland. Patches of matagouri shrubland are not considered representative either. They have a very low diversity of indigenous plant species and the understorey is almost entirely exotic grasses and herbs. The small dry north facing slope has a greater diversity of indigenous vascular and non-vascular species dry area and is more typical of less modified moraine communities.
2. Indigenous vegetation or habitat of indigenous fauna that is a relatively large example of its type within the relevant ecological district.	No	The Site does not support indigenous vegetation or habitat of indigenous fauna that is a relatively large example of its type within the Tekapō ED.
Rarity/Distinctiveness		
3. Indigenous vegetation or habitat of indigenous fauna that has been reduced to less than 20% of its former extent in the Region, or relevant land environment, ecological district, or freshwater environment.	No	None of the indigenous vegetation or habitats of indigenous fauna on the Site have been reduced to less than 20% of their former extent in the Region, or relevant land environment, ecological district, or freshwater environment. At the land environment scale, the Site is almost entirely within land environment (E4.1b), where 20-30% indigenous vegetation remains nationally.
4. Indigenous vegetation or habitat of indigenous fauna that supports an indigenous species that is threatened, at risk, or uncommon, nationally or within the relevant ecological district.	Yes	The site supports at least four nationally At Risk – Declining plant species: matagouri Desert broom, *Raoulia australis* and resurrection lichen and the At Risk – Declining Southern Alps gecko. The site may provide habitat for other Threatened or At Risk lizard species.

5. The site contains indigenous vegetation or an indigenous species at its distribution limit within Canterbury Region or nationally.	No	The Site is not known to not known to contain indigenous vegetation or indigenous species at their distribution limit within Canterbury Region or nationally. However, the adjacent SNA 17 provides habitat for three moth species endemic to Mackenzie Basin - *Gelechia lenis, Cremnogenes honesta and Ericotenes Pūkakiense*.
6. Indigenous vegetation or an association of indigenous species that is distinctive, of restricted occurrence, occurs within an originally rare ecosystem, or has developed as a result of an unusual environmental factor or combinations of factors.	Yes	The Site is on the Pūkaki terminal moraine. Moraines are naturally uncommon ecosystems (Williams et al. 2007). Indigenous vegetation on this Sit is significant under this criterion.
Diversity and Pattern		
7. Indigenous vegetation or habitat of indigenous fauna that contains a high diversity of indigenous ecosystem or habitat types, indigenous taxa, or has changes in species composition reflecting the existence of diverse natural features or ecological gradients.	No	The Site does not have vegetation or habitat of indigenous fauna that contains a high diversity of indigenous ecosystem or habitat types. The diversity of indigenous plant taxa is generally low and the diversity of indigenous birds is also low. The diversity of lizards is unknown, but likely to be typical of this habitat type. The Site is generally uniform and does not have changes in species composition that reflect diverse natural features or ecological gradients.
Ecological Context		
8. Vegetation or habitat of indigenous fauna that provides or contributes to an important ecological linkage or network, or provides an important buffering function.	No	The Site is part of the Pūkaki terminal moraine and is directly adjacent to the Lake Pūkaki Terminal Moraine Conservation Area. However, the vegetation and habitats are modified and dominated by exotic grassland. The limited extent of indigenous vegetation means the Site is not considered to provide or contribute to an important ecological linkage or network, or provide an important buffering function.
9. A wetland which plays an important hydrological, biological or ecological role in the natural functioning of a river or coastal system.	No	The Site is not a wetland and does not include any wetland habitats. It is not significant under this criterion.
10. Indigenous vegetation or habitat of indigenous fauna that provides important habitat (including refuges from predation, or key habitat for feeding, breeding, or resting) for indigenous species, either seasonally or permanently.	No	The Site provides habitat for a low diversity of indigenous bird species, Southern Alps gecko and indigenous skinks and but is not considered to be significant under this criterion (refer to Wildland Consultants 2013).

About Boffa Miskell

Boffa Miskell is a leading New Zealand professional services consultancy with offices in Whangarei, Auckland, Hamilton, Tauranga, Wellington, Nelson, Christchurch, Dunedin, and Queenstown. We work with a wide range of local and international private and public sector clients in the areas of planning, urban design, landscape architecture, landscape planning, ecology, biosecurity, cultural heritage, graphics and mapping. Over the past four decades we have built a reputation for professionalism, innovation and excellence. During this time we have been associated with a significant number of projects that have shaped New Zealand's environment.

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PUKAKI VILLAGE ZONE

GRAPHIC SUPPLEMENT

10 AUGUST 2023

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AORAKI / MT COOK VILLAGE

BEN OHAU RANGE

SH80

LAKE PUKAKI

LAKE TEKAPO

TEKAPO RIVER

MARY RANGE

SH8

INSET MAP
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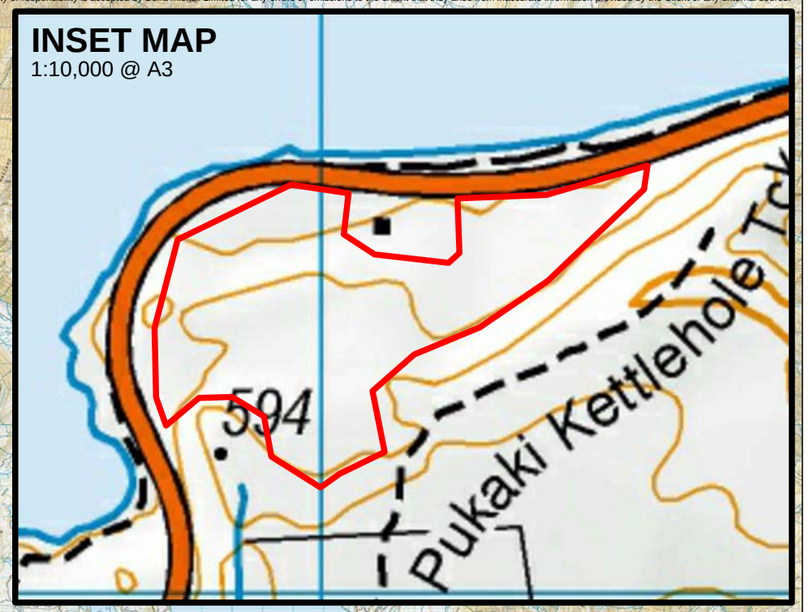

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Ground Floor, 4 Hazeldean Road 8024
PO Box 110, Christchurch 8140
New Zealand
Tel: +64 3 366 8891
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LEGEND
Project Boundary

REV	DATE	DESCRIPTION
A	31.07.23	FOR INFORMATION

CLIENT
GEORGE ORMOND

PUKAKI VILLAGE ZONE
TOPOGRAPHIC WIDER CONTEXT

0 1000 2000 3000 m

Design	JBe	Scale	1:100,000 @ A1	Date	31.07.23
Drawn	SEu		1:200,000 @ A3		
Check	KCh				
Appv'd	JBe				

Figure 1

Printed 31/07/2023 11:25:51 am

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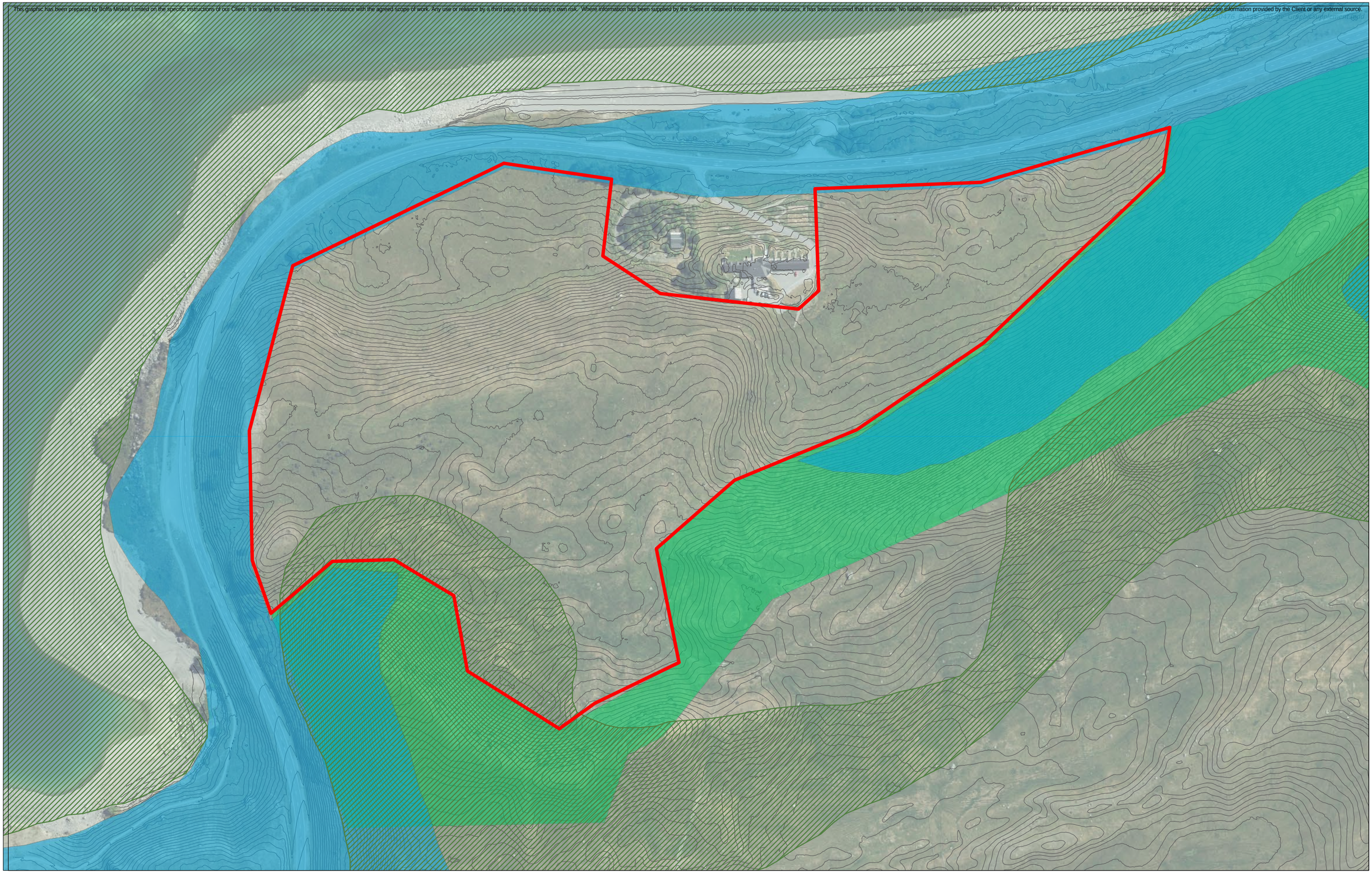

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LEGEND

- Project Boundary
- Lakeside Protection Areas
- Public Conservation Land (DOC)
- Sites of Natural Significance

REV	DATE	DESCRIPTION
A	31.07.23	FOR INFORMATION

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PUKAKI VILLAGE ZONE

DISTRICT PLAN OVERLAYS

0 10 20 30 m

Design	JBe	Scale	Date
Drawn	SEu	1:1,500 @ A1	31.07.23
Check	KCh	1:3,000 @ A3	
Appv'd	JBe		

Figure 2

Printed 31/07/2023 2:23:38 pm

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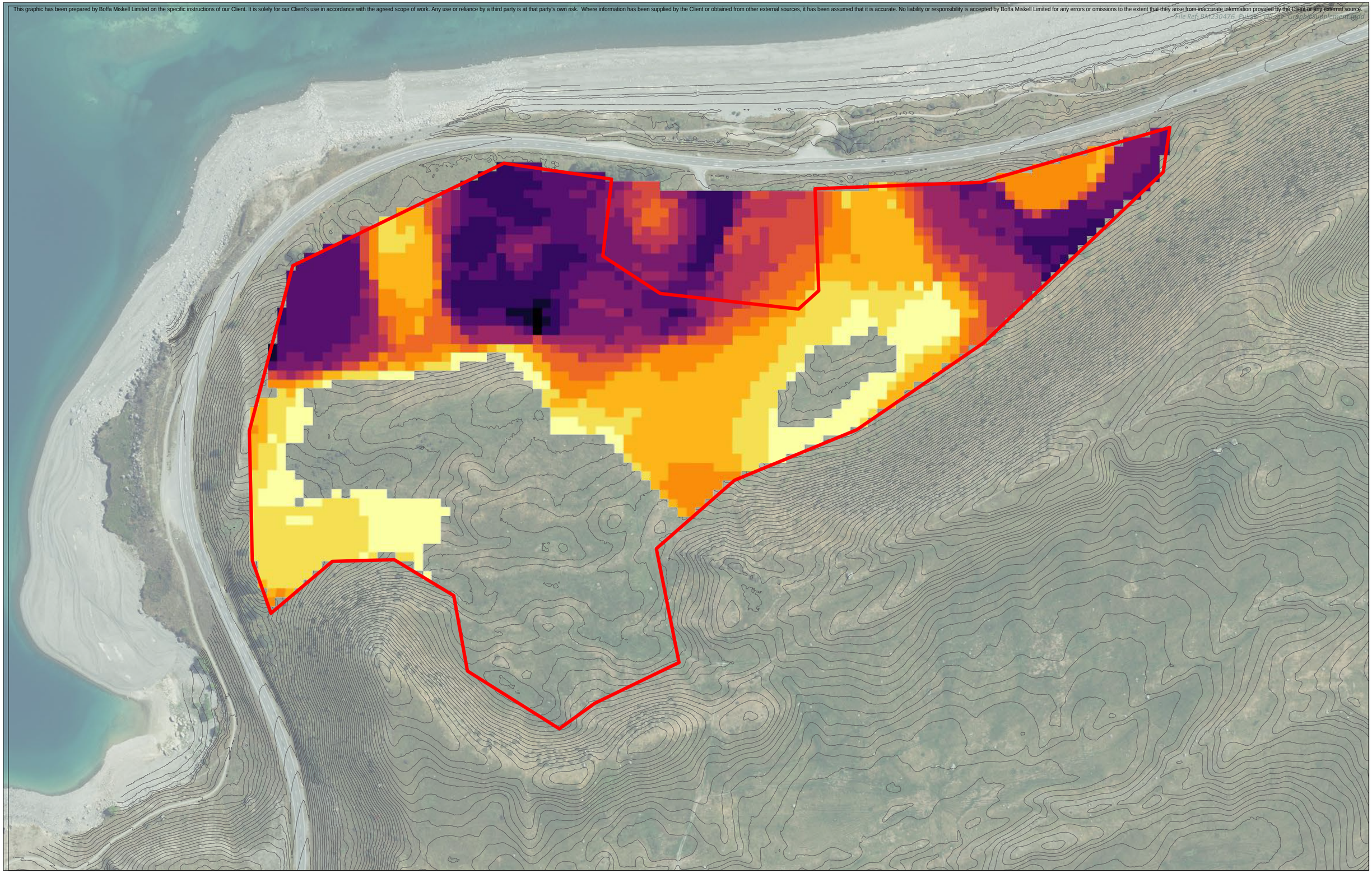
File Ref: BM230476_Pukaki_Village_Graphics_Supplement.mxd



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LEGEND

Project Boundary

Visible Observer Points
1
2
3
4
5
6
7
8
9
10
11
12
13

REV	DATE	DESCRIPTION
A	31.07.23	FOR INFORMATION

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PUKAKI VILLAGE ZONE

VIEWSHED FROM ROAD

0 10 20 30 m

Design	JBe	Scale	Date
Drawn	SEu	1:100,000 @ A1	31.07.23
Check	KCh	1:200,000 @ A3	
Appv'd	JBe		

Figure 3

Printed 31/07/2023 2:22:49 pm

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File Ref: BM230476_Pukaki_Village_Graphic Supplement.indd

LAKE PUKAKI

VIEWS TO AORAKI

VIEWS TO BEN OHAU RANGE

TE ARAROA TRAIL

SH8

VIEWS TO MARY RANGE

4587 SH8

4589 SH8

LOWER TERRACE (WEST)

LOWER TERRACE (EAST)

MIDDLE TERRACE

UPPER TERRACE

PUKAKI KETTLE HOLE TRACK

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LEGEND

- Project Boundary
- Key Views
- Kettle Hole Track

Landscape Character Areas

- Lower Terrace
- Middle Terrace
- Upper Terrace

Ecology Areas

- Dry North Facing Slope
- Matagouri Shrubland

REV	DATE	DESCRIPTION
A	31.07.23	FOR INFORMATION

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GEORGE ORMOND

PUKAKI VILLAGE ZONE

LANDSCAPE AND ECOLOGY CONSTRAINTS AND OPPORTUNITIES PLAN

0 10 20 30 m

Design	JBe	Scale	1:1,500 @ A1
Drawn	SEu		1:3,000 @ A3
Check	KCh	Date	31.07.23
Appv'd	JBe		

Figure 4

Printed 31/07/2023 2:22:00 pm

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0 400 m

1:12,000 @ A3

Data Sources:
Eagle Technologies, and LINZ Data Service.

Projection: NZGD 2000 New Zealand Transverse Mercator

LEGEND

- Site Boundary
- Site Appraisal Photos A - F
- Site Context Photos 1 - 6

PUKAKI VILLAGE ZONE

Photograph Location Plan

Date: 31 July 2023 | Revision: 0

Plan prepared for George Ormond by Boffa Miskell Limited

Project Manager: James.Bentley@boffamiskell.co.nz | Drawn: SCh | Checked: JBe

Figure 5

Site Appraisal Photograph A: Photograph taken from the northeast corner of the Site, looking in a westerly direction.

Site Appraisal Photograph B: Photograph taken from the southeast boundary of the Site, looking in a northern direction across the Site backdropped by Lake Pukaki and Aoraki/Mount Cook.

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Viewpoint Details

Horizontal Field of View	: 90°
Vertical Field of View	: 30°
Projection	: Rectilinear
Image Reading Distance @ A3 is 20 cm	

PUKAKI VILLAGE ZONE

Site Appraisal Photographs A - B

Date: 31 July 2023 | Revision: 0

Plan prepared for George Ormond by Boffa Miskell Limited

Project Manager: James.Bentley@boffamiskell.co.nz | Drawn: SCh | Checked: JBe

Site Appraisal Photograph C: Photograph taken from the western boundary of the Site, looking in a northeasterly direction.

Site Appraisal Photograph D: Photograph taken from the western boundary of the Site, looking in a southeasterly direction.

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Viewpoint Details

Horizontal Field of View	: 90°
Vertical Field of View	: 30°
Projection	: Rectilinear
Image Reading Distance @ A3 is 20 cm	

PUKAKI VILLAGE ZONE

Site Appraisal Photographs C - D

Date: 31 July 2023 | Revision: 0

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Site Appraisal Photograph E: Photograph taken from the southern boundary of the Site, looking in a northeasterly direction across the Site backdropped by Lake Pukaki.

Site Appraisal Photograph F: Photograph taken from the southern boundary of the Site, looking in a northeasterly direction across the Site.

Viewpoint Details

Horizontal Field of View	: 90°
Vertical Field of View	: 30°
Projection	: Rectilinear
Image Reading Distance @ A3 is 20 cm	

PUKAKI VILLAGE ZONE

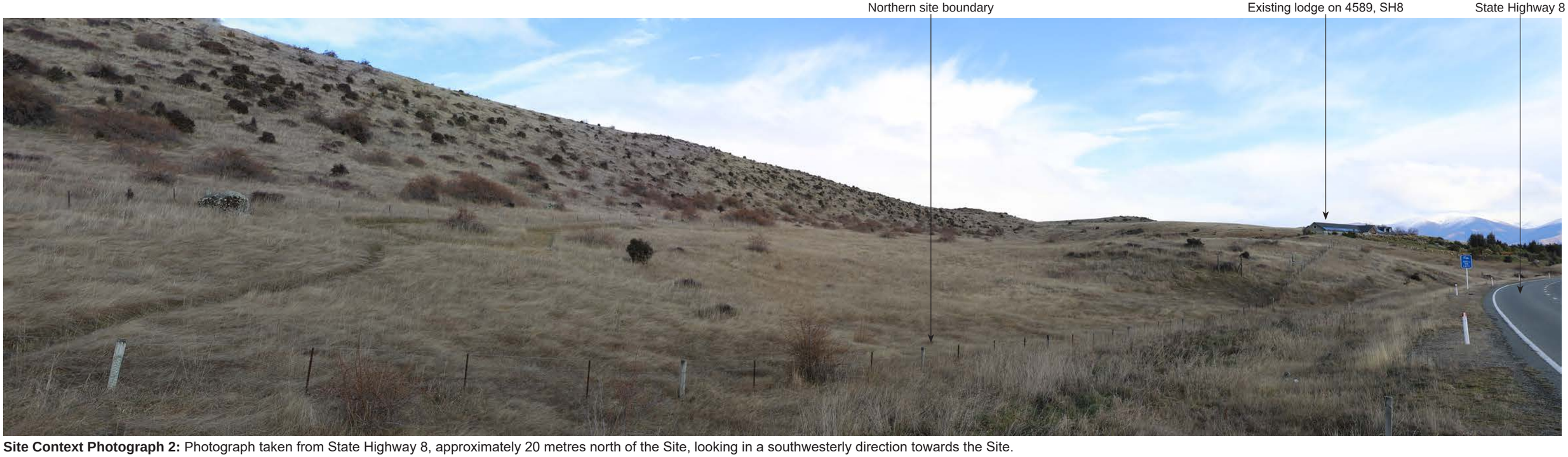
Site Appraisal Photographs E - F

Date: 31 July 2023 | Revision: 0

Plan prepared for George Ormond by Boffa Miskell Limited

Project Manager: James.Bentley@boffamiskell.co.nz | Drawn: SCh | Checked: JBe

Site Context Photograph 1: Photograph taken from State Highway 8, approximately 20 metres north of the Site, looking in a southwesterly direction towards the Site.



Site Context Photograph 2: Photograph taken from State Highway 8, approximately 20 metres north of the Site, looking in a southwesterly direction towards the Site.

Viewpoint Details

Horizontal Field of View	: 90°
Vertical Field of View	: 30°
Projection	: Rectilinear
Image Reading Distance @ A3 is 20 cm	

PUKAKI VILLAGE ZONE

Site Context Photographs 1 - 2

Date: 31 July 2023 | Revision: 0

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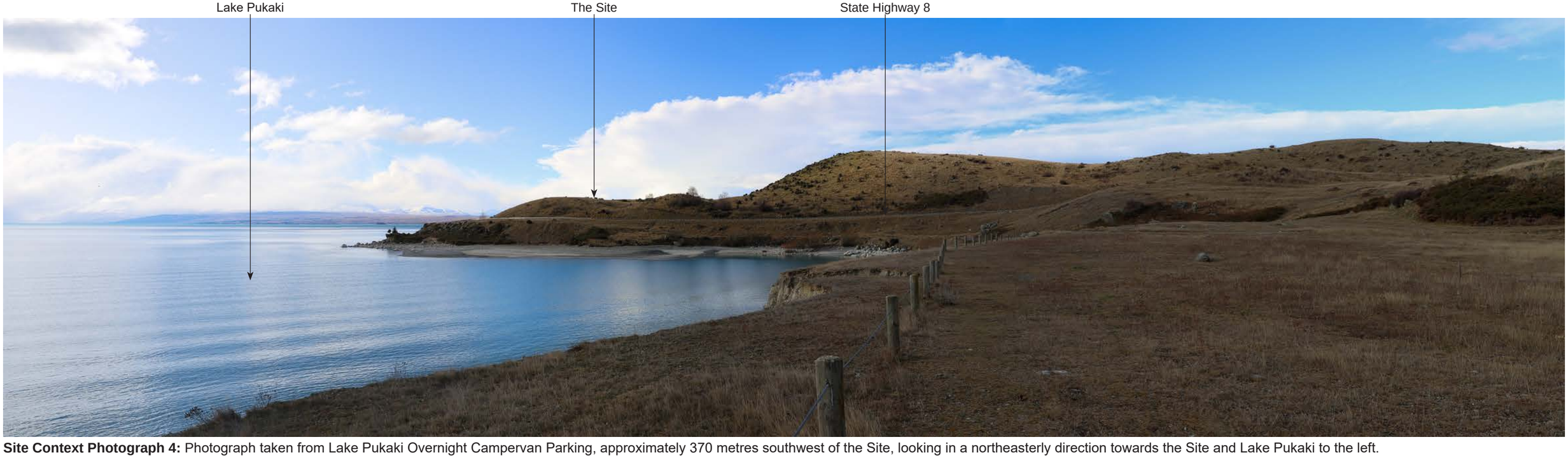
Site Context Photograph 3: Photograph taken from State Highway 8, approximately 380 metres northeast of the Site, looking in a southwesterly direction towards the Site and Lake Pukaki to the right.



Site Context Photograph 4: Photograph taken from Lake Pukaki Overnight Campervan Parking, approximately 370 metres southwest of the Site, looking in a northeasterly direction towards the Site and Lake Pukaki to the left.

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Viewpoint Details

Horizontal Field of View	: 90°
Vertical Field of View	: 30°
Projection	: Rectilinear
Image Reading Distance @ A3 is 20 cm	

PUKAKI VILLAGE ZONE

Site Context Photographs 3 - 4

Date: 31 July 2023 | Revision: 0

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Site Context Photograph 5: Photograph taken from Lake Pukaki Visitor Centre Carpark, approximately 1.8 kilometres southwest of the Site, looking in a northeasterly direction towards the Site and Lake Pukaki to the left.

Site Context Photograph 6: Photograph taken from Lake Pukaki Viewpoint on State Highway 80, approximately 10 kilometres northwest of the Site, looking in a southeasterly direction towards the Site with Lake Pukaki in the foreground.

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Viewpoint Details

Horizontal Field of View	: 90°
Vertical Field of View	: 30°
Projection	: Rectilinear
Image Reading Distance @ A3 is 20 cm	

PUKAKI VILLAGE ZONE

Site Context Photographs 5 - 6

Date: 31 July 2023 | Revision: 0

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About Boffa Miskell

Boffa Miskell is a leading New Zealand professional services consultancy with offices in Whangarei, Auckland, Hamilton, Tauranga, Wellington, Nelson, Christchurch, Dunedin, and Queenstown. We work with a wide range of local and international private and public sector clients in the areas of planning, urban design, landscape architecture, landscape planning, ecology, biosecurity, cultural heritage, graphics and mapping. Over the past four decades we have built a reputation for professionalism, innovation and excellence. During this time we have been associated with a significant number of projects that have shaped New Zealand's environment.

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