FAST-TRACK CONSENT: LAKE PŪKAKI CONTINGENT STORAGE ACCESS AND ROCK ARMOURING WORKS

Landscape Assessment

November 2025

Meridian.

CONTENTS

Revision History

Revision No.	Prepared By	Description	Date
A	Kim Goodfellow	Substantive Application (SA) Final	05/11/2025

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1.0 Introduction

1.1 Waitaki Power Scheme

The Waitaki Power Scheme (WPS) is a nationally and regionally significant component of New Zealand's electricity supply infrastructure. It is New Zealand's largest and most flexible hydroelectricity power scheme and therefore has a critical role to play in the electricity system and economy. It consists of eight power stations (six owned by Meridian and two owned by Genesis), commissioned between 1936 and 1985, together having an installed capacity of 1,761 MW, being ~29% of New Zealand's installed hydro capacity.

Lake Pūkaki is a modified natural lake and is managed as part of the WPS. It is New Zealand's largest hydro storage lake and provides an average of 1,767 GWh of stored water in normal operating conditions, with an additional 545 GWh available during a national electricity shortage.

Meridian is currently authorised to dam the Pūkaki River to control and operate Lake Pūkaki between the levels of 518 m above mean sea level (m RL) (normal consented minimum lake level) and 532.5 m RL (maximum consented storage level).

1.2 Previous Plan Changes - Waitaki Catchment Allocation Regional Plan (WAP)

The WAP is a sub-regional plan and provides objectives, policies and rules for the use and development of water resources within the Waitaki Catchment. Prior to 2012, it was a prohibited activity in the WAP for Meridian to draw the lake level below 518 m RL.

1.3 Plan Change 1 (PC1)

In 2012, Meridian initiated Plan Change 1 (PC1) to the WAP which sought to introduce a new minimum lake level for Lake Pūkaki during circumstances when the System Operator (SO) had commenced an Official Conservation Campaign (OCC) in regard to electricity supply. PC1 allowed additional water from Lake Pūkaki to be used for generating electricity as a permitted activity when an OCC is declared by the SO.

When assessing the potential operation of Lake Pūkaki below 518 m RL for PC1, the duration of an entire event (time below 518 m RL) was considered likely to be between 4-7 months (this includes the time spent operating below 518 m RL, as well as the time required to restore the lake level to above 518 m RL once an electricity supply emergency ended). Supporting technical effects assessments were submitted as part of this plan change process. It was ultimately concluded that allowing access for electricity generation purposes to water stored between 513 and 518 m RL, as a permitted activity once an electricity supply emergency had been declared, was appropriate and promoted the sustainable management purpose of the RMA. PC1 was adopted by Environment Canterbury on 27 September 2012.

This report relies on the PC1 2012 effects assessments as being appropriate and focuses on both the changes that have occurred since 2012, and the differences between the activities permitted by PC 1 and the proposed activities. This is the 'Baseline' that is referred to throughout this report.

1.4 Plan Change 3 (PC3)

PC3 included a new rule regarding the use of Lake Pūkaki between 518 m RL and 515m RL. In addition to the PC1 Permitted Activity rule, at times of a Security of Supply Alert (SSA) initiated by the SO, the lake may be operated between the alert minimum control level of 515 m RL and 518 m RL as a discretionary activity. Meridian applied for and was granted resource consent in relation to this activity in 2018 (CRC185833). This consent expired on 30 April 2025 but has been granted a section 124 continuance while the new replacement consent (CRC240441) is being processed.

1.5 Meridan's Application

Meridian is seeking approvals under the Fast Track Approvals Act (FTAA), to enable access to water stored in Lake Pūkaki below 518 m RL as part of their normal operating framework and therefore allow for the better planning and utilisation of the available stored generating capacity. Further information on the

background to the proposal and the benefits of allowing access to additional water is provided in the Substantive Application[1] document that supports the FTAA application.

Meridian is proposing to access the additional storage for a time-bound period of three years, until the end of 2028. For the purpose of this report 'Eased Access', refers to the ability to use water from Lake Pūkaki between 513 m RL and 518 m RL without a SSA or OCC being initiated by the SO. The access to the stored water below 518 m RL will be incorporated into Meridian's electricity generation models and will be managed to supply the market. The three-year period is to allow for additional generation capacity that is currently being built, to come online. For further clarification, the existing lake operation framework and proposed activity is detailed below in Table 1.

Existing Framework	Proposed Activity
Operation of Lake above 518 m RL (CRC905321.7).	Operation of Lake above 518 m RL (CRC905321.7). UNCHANGED.
Operation of Lake between 515 m RL and 518 m RL as a discretionary activity at times of a Security of Supply Alert initiated by the System Operator (CRC185833).	Operation of Lake between 513 m RL and 518 m RL for a period of 3 years without a Security of Supply Alert or Official Conservation Campaign being initiated by the System Operator.
Operation of Lake between 513 m RL and 518 m RL as permitted activity during an Official Conservation Campaign initiated by the System Operator (Permitted Activity).	

Table 1: Proposed Activity – Eased Access

In addition to the temporary ability to lower the lake level, Meridian seeks consent for the installation of rip-rap on the upstream face of the Pūkaki dam and its left and right abutments to provide protection from wave erosion, when operating the lake at lower water levels. Rip-rap will be placed to a maximum depth of 510.5 m RL, with earthworks/site preparation activities extending to a maximum depth of 509.6 m RL. Rock armouring will take a total of 12-18 weeks to complete but is expected to be done over multiple stages over several years as lower lake levels permit, and works may be required to be completed beyond 2028.

1.6 Landscape Reports

This landscape report should be read in conjunction with the accompanying A3 volume entitled **'Graphic Attachments'** which contains the following information:

- Appendix A: a record of photographic viewpoints of Lake Pūkaki, compared with the original photo viewpoints contained in the 2012 (Rough+Milne) Graphic Attachments volume to determine if any landscape change has arisen over the last thirteen years.

- Appendix B: a comparative photo study of the southern area of Lake Pūkaki at two different water levels at the same locations: a water level of 531 m RL on 16 January 2025, and then a lower lake level of approximately 523 m RL on 15 September 2025.

[1] INSERT FOOTNOTE OF SA HERE

Appendix C: Visual simulations to assist the Panel to gain an understanding of what Lake Pūkaki would look like if the lake level was lowered to 518 and 513 m RL.

1.7 Purpose

This landscape assessment has been prepared to support the FTAA substantive application. The purpose of this report is to assess the landscape effects in regard to:

- Rock armouring (dam enhancement works): assessing any potential landscape effects[2] that may arise from the rock armouring and associated works which are proposed on the upstream slopes of the Pūkaki Dam adjacent to SH8.

- Changes since PC1: PC1 included a detailed Landscape and Visual Assessment (Rough+Milne, 2012)[3]. I consider the findings of this report adequately describe an acceptable baseline or starting point in terms of the baseline description and the assessment of effects. Moving forward from the 2012 assessment, this current report seeks to identify any landscape-related changes that have occurred in the environment since 2012 that might result in any additional potential effects not anticipated or allowed for under PC1. The Rough+Milne assessment included 21 photo viewpoints around Lake Pūkaki, and to help assess the visual changes since 2012, the **'Graphic Attachments'** include photo viewpoints from the same 21 locations taken in June 2025 as a comparison and discussion.

1.8 Environment Court Practice Note 2023

The qualifications and experience of the report lead author are set out in Appendix A. The lead author confirms that they have read the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note (2023) and agrees to comply with it. In that regard, the lead author confirms that this Landscape report is written within their expertise, except where stated that the author is relying on the assessment of another person. The lead author confirms that they have not omitted to consider material facts known to them that might alter or detract from the opinions expressed.

1.9 Plan Change 1 – Landscape Assessment Findings

As part of the PC1 application which proposed to include a permitted activity rule in the WAP allowing Meridian to reduce the minimum lake level from 518 to 513 m RL in circumstances where there is a security of supply emergency, a landscape and visual assessment[4] commissioned by Meridian considered the effects on natural character and landscape and visual amenity arising from the proposal. The assessment concluded '… *the effect of potential changes to the shoreline resulting from an additional 5 m lake level fluctuations on natural character, landscape and visual amenity values will be minor'.* The assessment also concluded that the proposed drawdown met the relevant provisions of the *Proposed Canterbury Regional Policy Statement* (RPS) and *Waitaki Catchment Water Allocation Regional Plan* (WAP).

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[2] 'visual effects are a subset of landscape effects' (page 135, Te Tangi a te Manu – Aotearoa New Zealand Landscape Assessment Guidelines, NZILA, 2022).

[3] 'Landscape and Visual Assessment' is language now out of date – instead 'Landscape assessment' is generally used.

[4] LVA by Rough and Milne Landscape Architects, April 2012.

The methodology and conclusion within the Rough+Milne assessment are considered robust, fair and reasonable and address all the relevant issues, where the findings of the PC1 application by Rough+Milne are adopted as a starting point for this report.

To support the present application, Meridian undertook modelling to inform the operational decisions of how it would likely manage the water stored in Lake Pūkaki in an eased access scenario over the next three years, based on 91 years of hydrological and meteorological data for the lake. The modelling5 concluded that the proposed drawdown would not result in a material change of any significance to that which was considered at the time of Plan Change 1. Details of the modelling are presented in other parts of the substantive application but are summarised in section 3.3 below.

1.10 Site Visit and Methodology.

An initial site visit was carried out on Thursday 15th and Friday 16th January 2025, to a range of public areas along Hayman Road, SH8 (Tekapo to Twizel Road), SH80 (Mount Cook Road), and included various tourist stops / viewing areas along these main routes. During the site visit, the lake level was at 531.37 m RL, which was close to its maximum level (532.5m RL).

Focused inspections were also made of lakeside or shoreline areas, where accessible, and around the power scheme infrastructure at the Lake Pūkaki main dam, including the outlet, Gate 19 and Pūkaki River. These are the areas where the rock reinforcing is proposed and the locations for potential stockpile areas which will be placed adjacent to SH8. The weather during the site visit was clear with good visibility.

Additional reference and background information was provided by GHD and Meridian, through desktop studies, online mapping and modelling of lake levels as described in Section 1.3. above and through the following specific reports:

- *'Interim Internal Memorandum – Rip-Rap Placement Construction Methodology dated August 1 2025'* by GHD
- *'Hydro Storage and Dam Resilience Works – Dam Protection Works'* 15 August 2025 by GHD
- *'Updated modelling summary' and 'Waitaki 2025 Discretionary Storage PPT'* by Meridian.
- 'Assessment of Environmental Effects of the Waitaki Power Scheme – lakeshore geomorphology and processes', by Dr Michael Single, 2022.
- *'Landscape Report – Waitaki Power Scheme Reconsenting'*, by Brown NZ, November 2022.
- *'Lake processes and geomorphology assessment' (GHD, 2025).*

A second site inspection was conducted on the 2nd and 3rd of June 2025 to obtain a photographic record of the same 21 viewpoints as the 2012 Rough+Milne assessment. Lake levels during this visit were just below 528 m RL. This updated photo record is contained in Appendix A of the 'Graphic Attachments'.

The water level of the lake changed during the period of this assessment. A third site visit was conducted on 15th September 2025, when water levels were at approximately 523 m RL, to inspect and document this change as illustrated in Appendix B of the 'Graphic Attachments'.

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[5] Meridian Energy, 2025: Waitaki catchment storage management, 2025-2027. Discretionary storage access. Prepared by G Telfar, March 2025. Pdf, pp. 1-10.

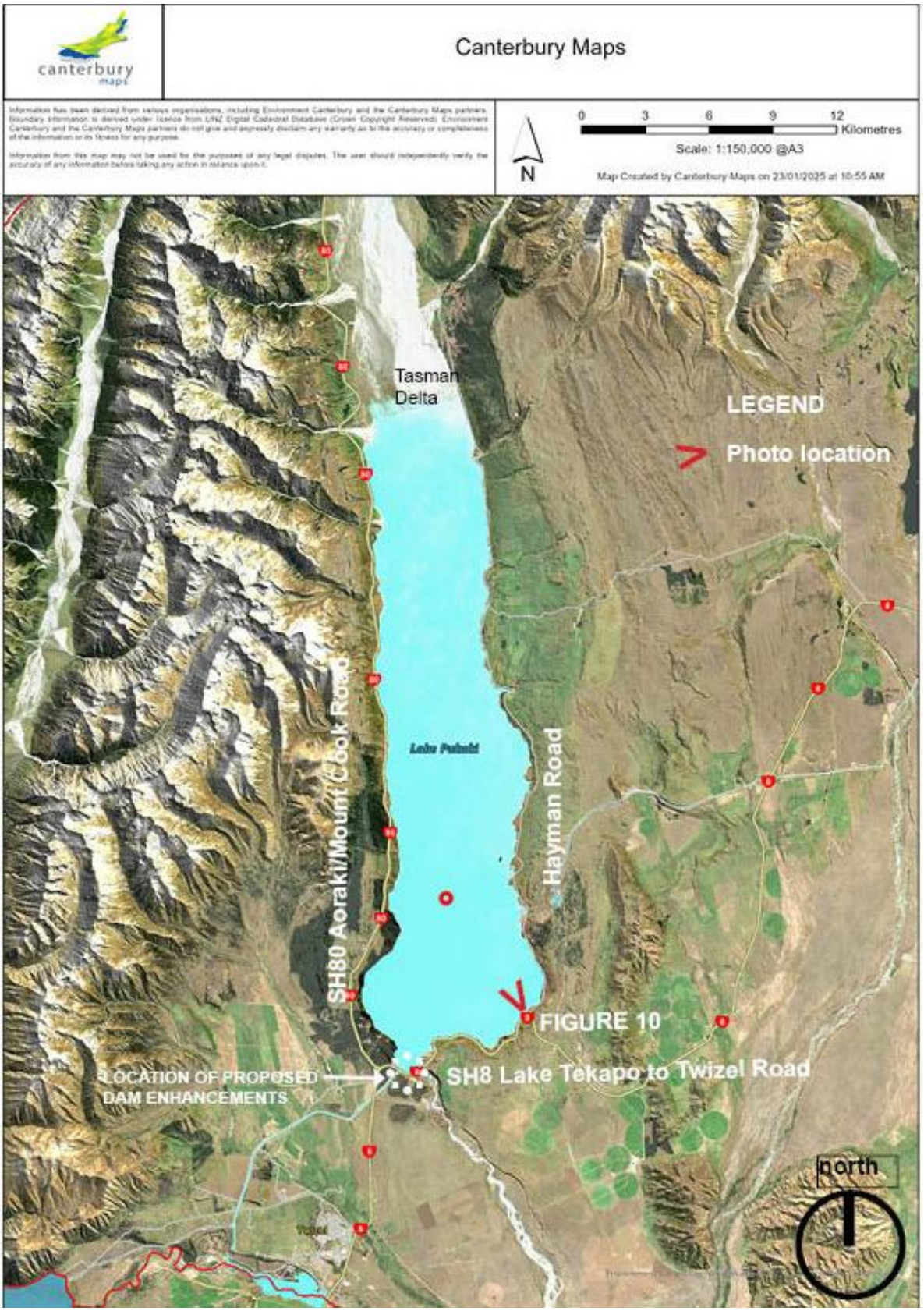


Figure 1: Location Map

1.11 Assessing Landscape Effects

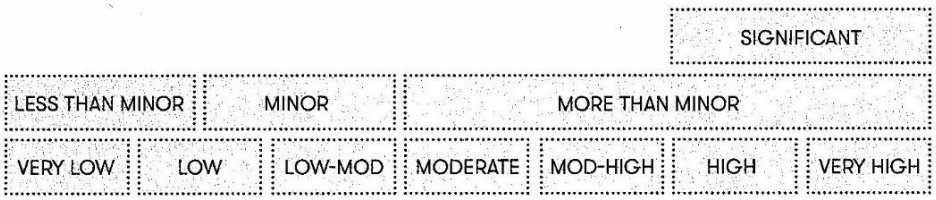
Change in a landscape does not, in itself, constitute an adverse landscape effect. Landscape is dynamic and is constantly changing over time in both subtle and more dramatic or transformational ways. These changes are both natural and human induced. Landscape assessments should differentiate landscape types that have high values, compared to industrial landscapes where effects of changes may be relatively

neutral. When managing change within high-value landscapes it is important that adverse effects are avoided or sufficiently mitigated. The aim is to provide a high amenity environment through appropriate design outcomes. Furthermore, landscape effects can be temporary or permanent, which informs the magnitude and significance of those effects.

In many cases, landscape change can bring about improvements to the quality of the existing environment. Therefore, the nature of landscape effects generated by any proposal can be:

- **Adverse (negative):** The activity would be out of scale with the landscape or at odds with the local landuse pattern and landform, which results in a reduction in landscape and / or visual amenity values.
- **Beneficial (positive):** The activity would enhance the existing landscape and / or visual amenity values through removal or restoration of existing degraded landscape activities and / or addition of positive elements or features.
- **Neutral (benign):** The activity would be consistent (or blend in) with the scale, landform and pattern of the landscape and existing land use activity, maintaining existing landscape and / or visual amenity values. The change is neither adverse nor positive.

An overall rating of the magnitude of landscape effect can then be provided using the widely recognised 7-point scale below[6] .



2.0 Landscape Context

2.1 Lake Pūkaki and the Waitaki Power Scheme

Lake Pūkaki is situated within the Mackenzie Basin, at the foot of the Southern Alps (refer Figure 1 Location Map). The mountains surrounding the basin include Aoraki/Mount Cook, the Ben Ōhau Range and the Two Thumb Range. The Mackenzie Basin includes Lake Ōhau, Lake Pūkaki and Lake Tekapō (among other smaller high country lakes), all of which accentuate the openness and vastness of this landscape. The braided Tasman River flows into Lake Pūkaki at its northern end, depositing large

[6] Te Tangi a te Manu – Aotearoa New Zealand Landscape Assessment Guidelines, NZILA (2022). Prepared by Gavin Lister, Rachel de Lambert and Alan Tichener

quantities of sediment and glacial flour at its headwaters, largely generated by the Tasman Glacier. The Pūkaki River and the Pūkaki canal exited south and southwest from the southern extent of Lake Pukaki.

2.2 Environment

Due to its geological and glacial origins, the landscape setting of Lake Pūkaki is massive in scale with an open character afforded by a relatively homogenous tussock grassland cover in the vicinity of the lake and a rural 'working character' including high country farming and forestry. The Ben Ōhau Range, Aoraki /Mt Cook and the main divide forma spectacular backdrop elements to the Lake, and with vast lateral moraine fields at the sides, adjacent high country stations, typical high country vegetative hardy landcover - largely tussock grassland, very occasional built forms, and hardy pines trees as a key landcover type. SH80 runs along the west side of the Lake, with SH8 skirting the southern edge / dam. Hayman Road runs along the east side of the lake and is more remote than the west side with few formal public stopping places, and this road is unsealed beyond the Tekapo B Substation. The Tekapo B power station is located on the east side of the lake. There is some commercial activity on the western lake side, notably the Glentanner Park Center and Glentanner Aerodrome. The original landcover has been modified since human occupation through fire, native vegetation clearance for farming, introduction of hieracium and rabbits, and the latter introduction of the WPS, the Mackenzie Basin retains a unique landscape character, encompassing many highly valued attributes. The foremost of these is its austere landscape character.

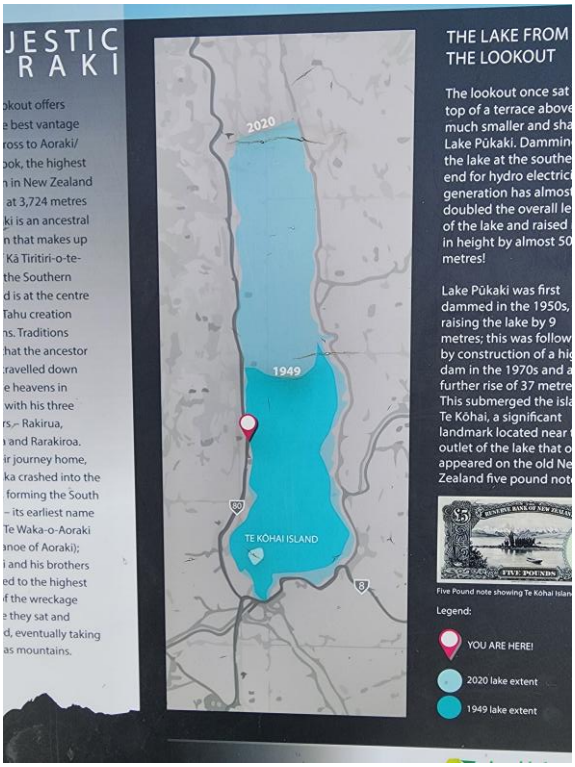


Figure 2: Lake Pūkaki lake levels (1949 and 2020): Image: Peter's Lookout visitor signage Mount Cook Road SH80.

The history of the lake filling and use as a hydro-electric storage dam is shown as part of the visitor information at Peters Lookouts (Figure 2) which underlines to those visiting the area that the lake has been altered over time by human interventions.

The figure is not to show the detail of the lake changes but to indicate that the information is made available to the public to inform them that it is not natural.

The Canterbury Regional Policy Statement (CRPS) identifies the entire Mackenzie Basin as an Outstanding Natural Feature and Landscape (ONFL14) within which modified Lake Pūkaki is contained. The CRPS is underpinned by the Canterbury Regional Landscape Study 2010 where the Mackenzie Basin in general, is recognized as an ONL at a regional scale. This is on the basis of its exceptional legibility, aesthetic, transient, shared and recognized values, very high natural science values and high Tangata Whenua and historic landscape values, and the recognition of ONLs in the Mackenzie District Plan.

Lake Pūkaki is a 15km long glacial lake that has been significantly modified, largely through the raising of the lake level by the introduction of the WPS. The WPS which includes Lake Pūkaki, does not detract from the scale or quality of the Mackenzie Basin. The Mackenzie Landscape Study[7] states under paragraph 3.5:

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

A similar observation is made by landscape assessor Stephen Brown[8] in regard to the ONL status and landscape modifications of the HEP: *'…major components of the Waitaki Power Scheme permeate the rest of the ONL, and such (ONL) status has been attributed regardless of their presence'.*

The natural level of Lake Pūkaki was altered when the first dam was constructed during the 1940's and completed in 1947. This raised the level of the lake by approximately 18m. In the 1970's the high dam was constructed, raising the lake level by a further 37 m to its present-day operating levels. Since being modified in the 1970's, lake levels vary between 532.5 at their maximum, to 518.0 at their minimum. As a result, the surface area of Lake Pūkaki is considerably more expansive, ranging between 178.7 – 154 km² compared with its natural 75.5 km² as illustrated in Figure 1. As a result of hydro-electricity generation in the upper Waitaki district, lake levels have been significantly increased, canals and other lakes formed, and river flows reduced or controlled. Most built development in the vicinity of Lake Pūkaki is located along the southern and western edges of the lake, with the exception of the Tekapo-B Power Station on the east side.

People largely experience the lake as an iconic setting for Aoraki/Mount Cook, with key views from SH8 at the Visitor Centre/Salmon Shop and large carpark area where there are fixed viewing locations, and from SH80 as it passes along the western edge of the lake. Recreational opportunities include the Alps to Ocean (A2O) cycle trail, and the Te Araroa Trail which follows the Tekapo canal and then Hayman Road free camping on the east side of the lake, and restricted boating activity. Swimming and fishing are activities that occur on the lake, although they are usually undertaken some distance from the HEPS infrastructure.

2.3 Lakeshore Processes and Geomorphology

Lake Pūkaki is essentially a modified natural lake. In his report Martin Single explains that the lake shoreline is young and still forming, in geological terms, and the lakeshores behind the WPS dams will continue to develop towards a geomorphological equilibrium form. The report suggests that future erosion is expected to occur for much of the Lake Pūkaki shore, however rates of erosion are difficult to predict.

2.4 Fluctuating Lake Levels

While preparing this assessment, the water levels of Lake Pūkaki changed as a result of inflows and the operation of the WPS. On 16 January 2025 the water level was recorded at 531 m RL, and then on 15 September 2025 a lower lake level of 523 m RL was recorded.

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[7] 'The Mackenzie Basin Landscape Study' by Graham Densem Landscape Architects (2007).

[8] 'Memo Waitaki Hydo-Electric Power Scheme Reconsenting', by Brown NZ, 29th March 2024.

A photographic record of this 8-metre change is provided in Appendix B. The photographic record includes key visitor destinations around the southern and western edges of the lake including Haymans Carpark, Lake Pūkaki Visitor Information Centre and Peters Lookout on SH80. Lake level change was visually discernable at the lake edges where lake shore material is exposed such as lake bed gravels, or the engineered slopes of rip-rap armouring around the Main Dam zone (refer Figure 3). This 8-meter fluctuation in water level is considered an inherent part of the pattern of acceptable and regular change which occurs, to varying extents, on a yearly and seasonal basis, and represents a normal part of the landscape character of the lake which is subject to variable inflows and management of lake levels for electricity purposes.

Reducing the lake level from 518 m to 513 m will result in approximately 9.55km² of reduced water surface area, or additional lake shoreline exposed area. Compared to the historical average lake level of 528 m RL, the current minimum lake level of 518.2 m RL exposes 17.2 km² of shoreline, which would increase to 27.1 km² for the proposed minimum lake level of 513 m RL.[i] The lake rarely gets drawn down to near 518 m RL under current operations, and the reduced level (below 518 m Rl) is more relevant to this assessment. Therefore, lake levels fluctuate constantly and over a wide range. As a consequence of this regular fluctuation, the variation in how much of the shorelines or beaches around the lake are visible is not likely to be particularly obvious unless one is very familiar with a specific area.

Climate change projections suggest warmer temperatures throughout the country, wetter conditions in the west and south, drier conditions in the east and north and heavier rain events[9]. As a result of these projections, the total annual headwater inflows to Lake Pūkaki is expected to increase by 10% through to 2050, and as a result the hydro storage levels within the lake are expected to increase and be more variable[10].

3.0 Proposed Activity

The proposed activity is considered in two parts: the dam resilience works and the eased access to hydro storage.

3.1 Dam resilience works

A key part of the consent application is the installation of rip-rap on the face of the Pūkaki dam and its left and right abutments to provide protection from wave erosion, when operating the lake at lower water levels. Refer to Figure 3 below. The armouring of these slopes will occur on a vertical depth between 517.3 to 510.5m RL.

[9] 'Assessment of Environmental Effects of the Waitaki Power Scheme – lakeshore geomorphology and processes', by Dr Martin Single, 2022.

[10] 'Landscape Report – Waitaki Power Scheme Reconsenting', by Brown NZ, November 2022.

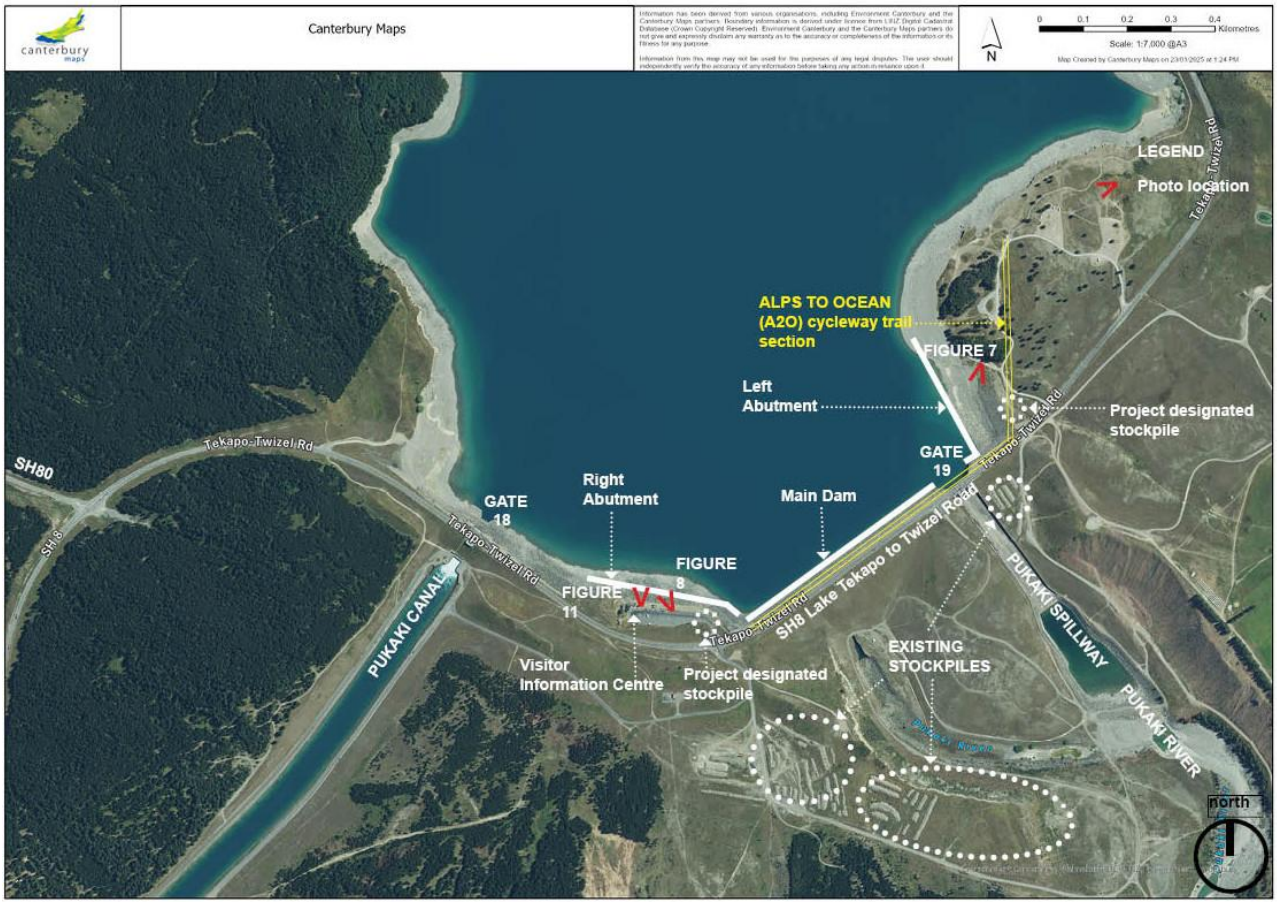

Figure 3: Map of the southern end of Lake Pūkaki, the dam slopes to be reinforced, and stockpile locations.

Construction will involve the following:

- Site establishment, including temporary building.
- Constructing access tracks from he stockpiles to the construction sites and ramps onto the dam face and abutments.
- Transporting rock armour from the existing stockpiles to a designated stockpile area close to the dam face.
- Constructing work benches.
- Constructing toe/key along High Dam.
- Rock placement on High Dam.
- Rock placement on abutments.
- Stockpile access for rock material.
- Decommission of site.

A more detailed description of the sequence of work can be viewed in the proposed Construction Methodology[11]. Figure 4 below provides an illustration of the proposed rock armouring works.

[11] 'Interim Internal Memorandum – Rip-Rap Placement Construction Methodology dated August 1 2025' by GHD.

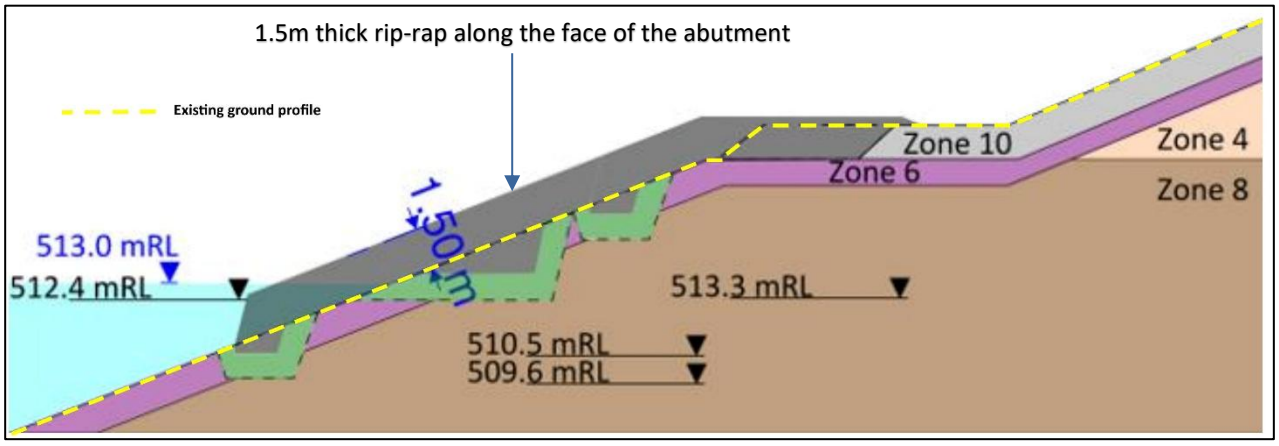

Figure 4: Main dam placement of rip-rap and backfilling of construction bench. Dashed yellow line indicates existing ground profile (excerpt from Pukaki Reservoir Hydro Storage and Dam Resilience Works – Dam Protection Works. GHD 2025).

3.2 Dam resilience works – construction programme

If the rip-rap placement programme is completed in a single stage, the estimated duration will be approximately 12 to 18 weeks. However, it is unlikely that the lake level will be able to be maintained below 518 m RL for an extended period allowing all works to be completed in one continuous phase.

Installing the armouring will require the installation of a number of temporary elements to enable construction. This will include fencing and a series of construction benches and groynes to be built as working platforms for 45-tonne and 20-tonne excavators. Transferring rock to site will be via 27-tonne road trucks. Figures 5 and 6 below illustrate the locations of the two proposed temporary building zones (image source: Rip-Rap Placement Construction Methodology).

Figure 5: Site layout during construction works

Figure 6: Site Layout during construction works – Left abutment

3.3 Modelling Data

Meridian undertook modelling to understand potential changes to lake levels from the proposed activity (Meridian, 2025). The modelling draws on 91 years of hydrological and meteorological data for the lake, and the current understanding of the NZ energy system (supply and demand analysis) resulting in forecasts of stored water (energy), which can be used to understand potential changes to lake levels (**Error! Reference source not found.**). The Meridian modelling indicates the following:

Modelled First Year of Eased Operation (2026)

- Under eased conditions of operation, lake levels are typically held lower, but still within the normal operating range above 518 m RL most of the time, only falling below 518 m RL on occasion.
- There is approximately a 3% probability that lake levels in any given week will be below 518 m RL. Therefore, on average the lake level will be below 518 m RL for approximately 1.5 weeks in the first year of operation.
- 23% of the modelled hydrological sequences dip below 518 m RL in the first year. However, most instances are short duration and not deep. Of the 91 hydrological sequences modelled, 21 sequences fall below 518.0 m and of these 21 sequences:
  - 9 fall between 518 – 517 m
  - 6 fall between 517 m – 516.5 m
  - 3 fall between 516.5 m – 516 m
  - 2 fall between 516 m - 515 m
  - 1 falls below 515 m

- In terms of duration, in the worst-case scenario, the lake level falls below 518 m RL in early September and does not return above 518 m RL until December (a duration of no more than 4 months). However, the likelihood of this scenario is extremely low – approximately 1% (1 of the 91 hydrological sequences modelled).

Modelled Subsequent Years of Eased Operation (2027 and 2028)

- The pattern is broadly the same in subsequent years although the probability of falling below 518 m RL in any given week increases very slightly to 3.5% in 2027 and 4% in 2028.

Based on this information, it is likely that:

- Construction activities may be short in duration (a few weeks) and occur over multiple stages.
- It may take multiple years to complete all the required work. This may extend beyond the three-year eased storage access period being considered as part of this application.
- The extent of use below 518 m RL is considerably more likely to be in the upper parts of the permissible range. Very low lake level use is very unlikely.

Based on this information, the assumed approach in this report for rip-rap placement is a multi-stage process with rip-rap being placed when lake levels allow.

During the short durations when the contractor is mobilised, the carpark, visitors centre, salmon shop and toilets will need to be closed to the public.

Construction periods will include mobilisation and site set up, and site decommissioning. In between construction periods, all construction equipment, temporary offices and security fencing etc. will be removed from the site and the site reinstated to its prework condition and made accessible to the public again. There is no intention of leaving anything on site when construction activities are not active (the access ramps will be left in place but likely protected with temporary rip-rap). For health and safety reasons, the existing carpark will be completely closed to all non-construction staff during the work periods.

Construction activities will be restricted to the following times:

- Daily: 6:00 a.m to 7:30 p.m.
- No work during the following periods: Good Friday to Easter Monday (inclusive), 24 December to 26 December (inclusive), 31 December to 1 January (inclusive) and New Zealand Public Holidays.

4.0 Landscape Matters – Key Findings

4.1 Dam enhancement works

The upstream dam slopes, where rip-rap is to be extended, – i.e. right abutment, main dam and left abutment, are located adjacent to:

- The SH8 corridor;
- A section of the Alps to Ocean cycle trail (A2O); and
- The visitor area and carpark at the Mt Cook Alpine Salmon Shop and Visitor Information Centre.

The dam slopes, which descend below the level of the road, are a relatively minor element in the overall landscape alongside the vast expanse of Lake Pūkaki within its surrounding mountainous setting, including Aoraki/Mount Cook and the Main Divide. Although the embankments are obvious visible elements in the foreground or midground of many viewpoints along the shoreline, (e.g. from the Visitor Information Centre, or from viewpoints along the A2O trail), these embankment slopes are generally perceived as an expected and therefore acceptable part of the road (SH8) and surrounding hydroelectric infrastructure such as Gate 19, the Pūkaki Spillway and Gate 18/Pukaki Outlet. These embankments do not obstruct the available scenic views to the surrounding landscape as illustrated in photo Figures 7 and 8 below.

The lake level during the January site visit was recorded at 531.37 m RL (as shown in Figures 7 and 8 below) which is understood to be at the upper end of storage levels (the maximum consented water level is 532.5m RL). The lake level during the later site inspection in September 2025 was at 523 m RL as presented in Appendix A of the Graphic Attachment. The proposed modifications to the dam slopes will occur between 517.3 to 510.5m RL which is substantially lower than the lake level observed during the site visit, where the changes would be concealed from view below water level.

Figure 7: View from A2O cycle trail looking southwest towards SH8, Left Abutment, Gate 19 and Main Dam on the right side of Gate 19.

Figure 8: View from the lakeside edge of Lake Pūkaki Visitor Information Centre showing Right Abutment (Aoraki / Mount Cook on right side of photo).

The proposed armouring will use rock materials consistent with the current rip rap material (large and small unit aggregate), ensuring the existing embankment maintains a high level of visual and physical consistency.

The necessary construction activity along the lake edge will be clearly visible for road users and other visitors in this popular tourist area (construction effects) and this change will represent a **'Moderate-high'**. effect during the period of construction.

While the construction may extend beyond the period of eased access being considered as part of this application, the landscape and visual effects that arise out of the construction activity are temporary in nature and do not represent a permanent change in the landscape.

On completion of the proposed works, the temporary structures and equipment will be removed. Upon completion of construction, 'Nil' permanent landscape effects are expected.

Alternative Construction Period:
Should the proposed works be undertaken in a single 12–18-week phase, the adverse landscape impacts outlined above would be further mitigated due to the reduced duration of activities. Conducting the project in one stage would minimise disruption for individuals accessing the Lake Pūkaki Visitor Centre and restroom facilities. In addition, such works are still regarded as standard and appropriate activities within the context of managing a working lake.

It is important to recognise that at the lowest operating level (513 m RL), the lake is significantly higher than its natural or original state (484.9 m RL) before the lake was altered by the WPS. Lake level fluctuations regularly occur as a result of natural processes (rainfall and snow melt), and as a consequence

of the water body being a 'working lake' i.e. artificially managed for hydro electricity generation. These water level fluctuations result in the regular raising and lowering of the position of the shoreline and consequently, the variable level of exposure of the dam slope.

It is assessed that there will be a negligible effect from the proposed armouring works. This change will be an appropriate and acceptable change to the existing artificial dam structure and broader 'working lake' – as part of an extensive hydro-electric power scheme. The lower-level armouring will be visibly indiscernible from the upper sections (i.e. same rock material) and will be visible at certain periods only (e.g. winter into spring when the structure becomes exposed during low lake levels) and therefore likely to be seen for intermittent periods only.

It is assessed that the effects from the lower-level armouring will be neutral or negligible.

Existing stockpile compounds at the southern end of the lake and on the south side of SH8 are proposed to be used for rock stockpiling for the dam armouring (Figure 3). There is only enough rock stockpiled here for about 3rd of the armouring works, and as it is used up it will be replenished from quarries to allow the rip-rap work to be completed. Once the rock piles are removed the intention is to reinstate the ground to a similar state of the surrounding area (no special landscaping).

These existing stockpile areas are not easily visible from SH8 and where seen, appear as part of the dam structure, adjacent to the Pūkaki Spillway and Pūkaki Canal. Being currently used for dam material storage, the continued use of these areas for construction laydown purposes is appropriate where no unacceptably adverse effects are anticipated to occur.

The position of a project-designated stockpile area on the lake side of SH8 and adjacent to the Left Abutment, conflicts with the existing A2O cycle trail route (Figure 3). The A2O is a popular walking and cycling route (also used by walkers on the national Te Araroa Trail). Meridian is planning to maintain access for the A2O trail by temporarily diverting the A2O around parts of the work site and having temporary traffic management controls in place for other sections. This is discussed in detail in the GHD Report *"Lake Pūkaki Fast Track Consent – Engineering Structures Assessment"*.

4.1.2 Dam enhancement works summary of effects

Construction activity for the dam enhancement works will likely occur over several years as and when lake levels allow. During construction periods, '**Moderate-high'** adverse effects on landscape character are anticipated. This will be a consequence of the visually 'busy' temporary elements such as security fencing, construction benches, site offices, and the active presence of heavy excavation equipment and transport vehicles moving about, juxtaposed with what is a very visually simple and austere landscape setting. However, this level of adverse effect will reduce markedly to 'Neutral' (or negligible) between the periods of construction as the fences, building and heavy machinery will be removed from the area.

Between the short duration construction periods, and with the construction benches remaining in place, a **'Low'** level of adverse landscape and visual effect will result (at the lower end of 'Low'). It is difficult to predict with any certainty when and for how long the benches will be visible – they may be partially or completely covered with water. However, the low-lying benches will be close to the lake shore, and it is likely these elements will be perceived only as a relatively minor constructed element within the overall vista and will not detract from the wider scenic views of the lake and distant Mount Aoraki.

Upon completion of construction, Nil permanent landscape effects will occur.

4.2 Eased access to hydro storage

4.2.1 Changes since PC1

Since PC1 (2012), the following changes have occurred to the physical environment at the edges of the lake shore (references below are illustrated on Figure 9):

- New and upgraded visitor parking and public amenity areas on SH8 (NZTA), including Hayman's Carpark with a range of amenities, completed 2023/2024 (Ref A).
- Installation of 'Peter's Lookout' on SH80 (NZTA) to better accommodate visitors, including parking, toilet facilities, seating and signage, completed 2020 (Ref B).
- Lake Pūkaki Visitor Centre (Meridian and Ngāi Tahu) opened in 2019, and redeveloped toilet block and adjoining carpark and visitor area on SH8, completed in 2024 (Ref C).
- Installation of the A2O (Alps to Ocean) cycle track section next to SH8/Lake Pūkaki (2018) and the Te Araroa Trail (Ref D).
- Removal of pine trees along the western lake side (to the north of Peter's Lookout, SH80, and on the lake shore by Hayman's Carpark SH8 (Ref E).

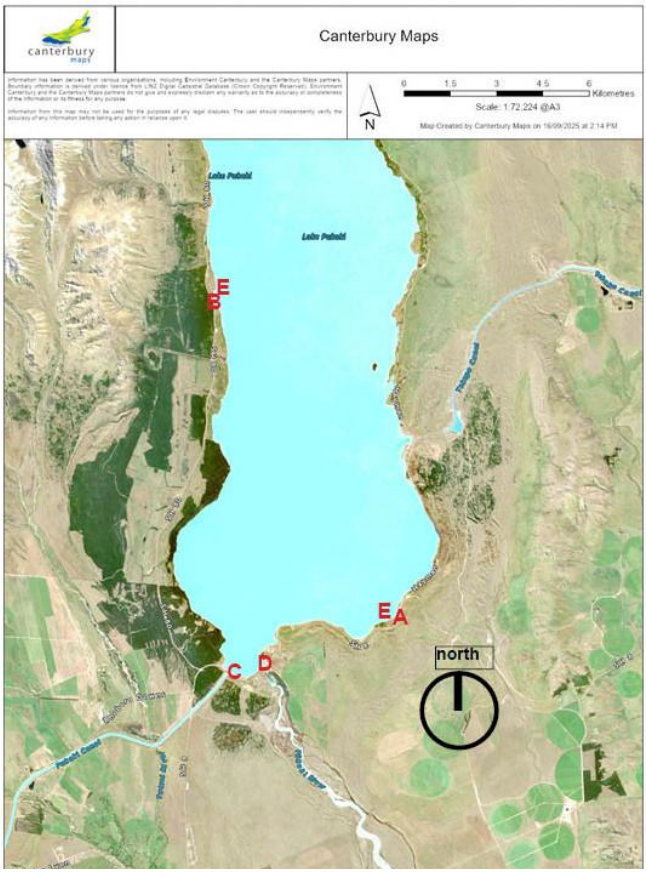

Figure 9: Notable areas of change around the lake foreshore since PC1.

More generally, normal changes to the vegetation around the margins of the lake have occurred as a usual and expected consequence of the process of growth/decay (e.g. windfall, further dispersion or removal of wilding pines and shrubs and spread of willow species), fluctuating lake water levels, and because of normal farming activities.

These changes have no material effect on the underlying landscape values of Lake Pūkaki, and the primary experience of the lake as an iconic foreground to Aoraki/Mount Cook remains intact. Lake Pūkaki retains a very high level of visual amenity. These values are particularly appreciated through the improvements in key visitor facilities which represents a positive change in how the public appreciate the landscape such as from points along SH8 and SH80, including the popular visitor stopping points at Hayman Road and from Peter's Lookout.

Since PC1, the physical shoreline will have changed slightly through natural erosional process such as wave action during high winds, and the deposition of material from streams and rivers. This assessment was not at such a fine-grained level of detail that could consider such changes.

Figure 10: View north to Aoraki/Mount Cook from the upgraded lake shore area at Haymans Carpark (SH8).

Figure 11: Outward view from the Lake Pūkaki Visitor Information Centre looking to Lake Pūkaki and Aoraki/Mount Cook.

4.2.2 Review of PC1 Viewpoints

A study was carried out to assess potential visual changes that may have occurred in the landscape since 2012.

A site inspection was carried out on 2 and 3 June 2025 to revisit the locations of the 21 viewpoints from the 2012 landscape assessment by Rough+Milne. The photographic record of this site inspection is provided in Appendix A of the **Graphic Attachment** volume, and the results of this review are provided below for each viewpoint:

Viewpoint 1: Panorama looking west across Lake Pūkaki from Pūkaki Canal Road.	
comments	visual change
Evidence of removal of wilding pines in the midground (i.e. looking southwest).	negligible

Viewpoint 2: Panorama looking southwest across Lake Pūkaki, towards Morgans Island from Hayman Road.	
comments	visual change
Reduction of wilding pines on the western edge of the lake shore.	negligible

Viewpoint 3: Panorama looking northwest across Lake Pūkaki from Hayman Road.	
comments	visual change
Removal of established pine and willow trees on western lakeshore. Incidence of new wilding pine seedling in the foreground.	negligible

Viewpoint 4: Panorama looking south across Lake Pūkaki from Hayman Road.	
comments	visual change
Removal/reduction in pine trees on the eastern side of Hayman Road.	negligible

Viewpoint 5: Panorama looking towards Tekapo B Power Station from Haymans Road.	
comments	visual change
No observable change.	none.

Viewpoint 6: Panorama looking southwest across Lake Pūkaki from Haymans Road.	
comments	visual change
Removal of established pine trees on the eastern portion of lake shore (midground). Some increase in low level shrub vegetation appearing on the edge of Hayman Road (foreground).	negligible

Viewpoint 7: Panorama looking southwest across Lake Pūkaki from a section of the Alps to Ocean Cycle Trail.	
comments	visual change
Removal of single tree next to the A2O trail, loss of A2O marker signpost, some minor growth of low level shrubs next to the cycle trail.	negligible

Viewpoint 8: Panorama looking west across Lake Pūkaki from State Highway 8.	
comments	visual change
Removal of scrub on the lower slope in front of viewpoint (foreground), and removal of established area of exotic tree planting on the southern edge of lake shore.	negligible

Viewpoint 9: Panorama looking southwest across Lake Pūkaki from the Alps to Ocean Cycle Trail.	
comments	visual change
Loss of A2O marker signpost, removal of established exotic trees on the southern lake shore (background), and removal of willow trees between the cycle trail and the lake edge (midground).	negligible

Viewpoint 10: Panorama looking towards the Pūkaki High Dam from State Highway 8.	
comments	visual change
No discernible changes.	none

Viewpoint 11: Panorama looking north across Lake Pukaki towards Aoraki Mt Cook from the Lake Pūkaki lookout carpark.	
comments	visual change
No discernible changes.	none

Viewpoint 12: Panorama looking east back towards the south end of Lake Pūkaki from the start of the Marker Bay Walkway.	
comments	visual change
Removal of cluster of pine trees in background.	negligible

Viewpoint 13: Panorama looking north across Lake Pūkaki from Peters Lookout, adjacent to State Highway 80.	
comments	visual change
Peters Lookout was not built in 2012 (built in 2020). Otherwise, growth of vegetative groundcover comprising of low height native and exotic grasses (foreground). Removal of large areas of established pine trees on the lake shore (foreground and midground).	negligible

Viewpoint 14: Panorama looking east over cutover pine plantation across Lake Pūkaki from State Highway 80.

comments	visual change
Growth of scrub vegetation between SH80 and foreshore (foreground).	negligible

Viewpoint 15: Panorama looking south across Lake Pūkaki from State Highway 80.	
comments	visual change
Growth of scrub vegetation on slopes between SH80 and the lake shore.	negligible

Viewpoint 16: Panorama looking north across Lake Pūkaki toward the Tasman Delta and Aoraki Mt Cook from State Highway 80.	
comments	visual change
Minor changes in shrub growth on the roadside margins.	negligible

Viewpoint 17: Panorama looking southeast across Lake Pūkaki from State Highway 80.	
comments	visual change
Removal of established pine plantation on the east side of the lake on private property. While this is an obvious change, the change is not considered to be adverse, but rather positive since the trees are replaced with a uniform vegetative grass cover - consistent with other privately owned farmland along the lake shore (such as Ferintosh Station).	obvious

Viewpoint 18: Panorama looking across Ferintosh Station towards Mt Aoraki from State Highway 80.	
comments	visual change
Some observable changes to growth of exotic trees on private land.	negligible

Viewpoint 19a: Panorama looking northeast across Twin Streams Delta towards the Tasman Delta.	
comments	visual change
Removal of wilding pines on eastern lake foreshore on private property.	negligible

Viewpoint 19b: Panorama looking east across Twin Streams Delta towards the Tasman Delta and head of Lake Pūkaki.	
comments	visual change
No discernible changes.	none.

Viewpoint 20: Panorama looking east towards the head of Lake Pūkaki from State Highway 80.	
comments	visual change
Some removal of wilding pine trees in foreground of view on private property. Views of lake unaffected.	negligible.

Viewpoint 21: Panorama looking east across the Tasman Delta from Glentanner Station.	
comments	visual change
Removal of some singular established pines trees around entrance area to Glentanner Park.	negligible

4.2.3 Review of PC1 Viewpoints - Summary

The reassessment of the 21 viewpoints originally identified in the 2012 Rough+Milne study shows that any visual changes to the Lake Pūkaki landscape since that time are minimal. The updated photographic

record and analysis confirm that most observed alterations relate to vegetation changes, such as the removal of wilding pines, harvesting plantation forestry or minor growth of low shrubs. Other change includes improvements to visitor facilities. Across all locations, the degree of perceived visual change has been consistently rated as either "none" or "negligible," (the single exception is viewpoint 17 although the change is considered to be positive). To summarise, no material effect has been identified on the overall landscape character or the iconic views of Aoraki/Mount Cook and the surrounding environment.

The 2012 Rough+Milne assessment concluded: *'Aesthetic coherence and memorability are obviously important components of visual amenity and largely conveyed by the unique combination of a large scale, highly legible landscape, comprised of a glacial lake with a distinctive turquoise colour with a backdrop of steep snow-capped mountains including Aoraki Mt Cook as the highest mountain in New Zealand. These broad scale components of the visual amenity attributed to Lake Pukaki will not change as a consequence of the increased drawdown'*. This conclusion remains current and correct given that the observed changes since 2012 are considered generally **negligible** and because some of the changes along the foreshore are considered **positive** such as the improvements to the different visitor areas at Haymans Road carpark, Peters lookout, and Pūkaki Visitor Information Centre.

5.0 Conclusions

This landscape assessment has considered the potential effects associated with Meridian's proposal to undertake rock armouring at the southern end of Lake Pūkaki and to seek temporary eased access to contingent hydro storage for three years. The review has also identified and discussed changes that have occurred since PC1 in 2012 and assessed whether these changes result in any new landscape effects of significance.

Based on site inspections, comparative photo studies, and updated landscape modelling, the temporary construction works will result in 'Moderate-high' adverse landscape effects, due primarily to highly visible activity and temporary structures contrasting with the landscape setting. However, these effects are not permanent, and the removal of all temporary elements will ensure the site is not left with any lasting adverse landscape effects. Any long-term change introduced by the armouring will be visually indiscernible from the existing rip-rap and will be wholly consistent with the artificial and infrastructural character of the lake's edge.

Changes since 2012, as recorded from 21 landscape viewpoints, are minimal overall. Most observed changes relate to vegetation management (especially pine removal) and improvements to visitor facility amenity, which enhance rather than detract from the landscape's visual and experiential qualities. The core landscape character and iconic values of Lake Pūkaki as the foreground to Aoraki/Mount Cook remain intact and if anything, are improved by recent modification.

The assessment findings of the 2012 PC1 report (Rough+Milne) are consistent with the assessment findings in this report and have been integrated into the present review. The PC1 assessment concluded that the effect of lowering the lake from 518 m RL to 513 m RL will be minor in terms of landscape and visual amenity values, with changes to the shoreline forming an incremental adjustment within a highly modified, working lake environment. Both reports note that Lake Pūkaki's character is marked by regular, substantial fluctuations in water level arising from its active and essential operation as part of the national hydro-electric power system. These fluctuations—and resulting shoreline changes—are both widely anticipated and largely accepted by visitors and residents as a norm, reflecting the utilitarian landscape character.

This assessment recognises that a lower operating lake level, such as 513 m RL, could increase marginal erosion for short periods and that the application is for a 3-year period only. The lake processes and geomorphology assessment for this project (GHD, 2025) concluded that the likelihood of adverse impacts on geomorphology associated with a lower lake level are low. The report also noted that should any minor changes in morphology occur because of a lower lake level, that subsequent storm events would likely result in a change back to pre-lowering conditions. Based on that assessment, during this 3-year period, the degree of morphological change and its corresponding impact on landscape values is considered to be negligible.

The proposed drawdown to 513 m RL is expected to occur only infrequently, typically during winter periods of high electricity demand and low inflow, and will be temporary, until lake levels are restored by subsequent hydrological conditions. The aesthetic coherence, memorability, and outstanding status of the Mackenzie Basin and Lake Pūkaki environment will persist, with no material effect on visual amenity values or the region's landscape significance, and this is portrayed in the visual simulations (Appendix C) that have been prepared to support this application.

On this basis, integrating the evidence and conclusions of the PC1 assessment, it is concluded that any adverse landscape effects associated with the temporary lowering of Lake Pūkaki's level to 513 m RL will be negligible. The anticipated changes to the lakeshore will be minimal given the size of the lake and will be consistent with both the ordinary pattern of lake level fluctuation and the established character of Lake Pūkaki as a functional, dynamic component of the national hydro system. The performance of all proposed landscape alterations will sustain the amenity and landscape values for the duration of the temporary consent period.

[i] Air Quality Assessment, GHD.