Lake Pūkaki Hydro Storage and Dam Resilience Works

Socio-economic Impact Assessment

Meridian Energy Limited

24 October 2025

The Power of Commitment

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1. Introduction

Meridian Energy Limited (Meridian) have engaged GHD Limited (GHD), to assist with obtaining consents to authorise the operation of Lake Pūkaki below the current normal minimum level of 518.0 m above mean sea level (m RL), for a three-year period, and for civil works at Pūkaki Dam to improve the structures resilience to wave action during lower lake operational levels.

1.1 Project Background

1.1.1 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 (two owned by Genesis Energy and six owned by Meridian Energy), commissioned between 1935 and 1985, together having an installed capacity of 1,761 MW, being ~32% 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 518.0 m RL (normal consented minimum lake level) and 532.5 m RL (maximum consented storage level).

1.1.2 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 518.0 m RL.

1.1.2.1 Plan Change 1 (PC1)

In 2012, Meridian initiated Plan Change 1 (PC 1) 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 518.0 m for PC1, the duration of an entire event (time below 518.0 m RL) was considered likely to be between 4-7 months (this includes the time spent operating below 518.0 m RL while the OCC was in place, as well as the time required to restore the lake level to above 518.0 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 513.0 and 518.0 m RL, as a permitted activity once an OCC had been declared, was appropriate and promoted the sustainable management purpose of the RMA. PC1 was adopted by Environment Canterbury on 27 September 2012.

The technical studies completed for this project have relied on the PC1 2012 effects assessments as being appropriate and have focused on both the changes that have occurred in the environment 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.

1.1.2.2 Plan Change 3 (PC3)

PC3 included a new rule regarding the use of Lake Pūkaki between 518.0 m RL and 515.0 m 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 515.0 m RL and 518.0 m RL. The rule is not a permitted activity and to implement this, Meridian applied for and was a granted resource consent 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.

1.1.3 Meridian's Application

Meridian is seeking approvals under the Fast Track Approvals Act (FTAA) to enable access to water stored in Lake Pūkaki below 518.0 m RL, without the currently applicable security of supply triggers, thereby enabling 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 513.0 m RL and 518.0 m RL without a SSA or OCC being initiated by the SO. The ability to access stored water below 518.0 m RL will be incorporated into Meridian's electricity generation models and water stored in Lake Pūkaki (both above and below 518.0 m RL) will continue to be managed to supply the market. The three-year period is to allow for additional generation capacity and additional security of supply measures, 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 518.0 m RL (CRC905321.7).	Operation of Lake above 518.0 m RL (CRC905321.7). UNCHANGED.
Operation of Lake between 518.0 m RL and 515.0 m RL as a discretionary activity at times of a Security of Supply Alert initiated by the System Operator (CRC185833).	Operation of Lake between 518.0 m RL and 513.0 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 518.0 m RL and 513.0 m RL as permitted activity during an Official Conservation Campaign initiated by the System Operator (Permitted Activity).	

Table 2 Proposed Activity – Eased Access

Meridian has undertaken modelling to inform operational decisions regarding the management of water stored in Lake Pūkaki, comparing the current restricted operating regime (which is controlled by the SO), to the proposed eased access regime which allows Meridian access to the water stored without the SSA and OCC triggers.

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 future changes to lake levels.

The modelling shows that under the restricted access conditions, Meridian identifies few instances of the discretionary storage being used, reflecting a risk adverse approach to operations. Under the eased access conditions, a wider operating range of storage is used, and the lake level is anticipated to drop below 518.0 m RL

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following prolonged low inflows. This is estimated to occur 3% of the time, with a 5% probability of the duration below 518.0 m RL exceeding 12 weeks in any one year.

In addition to the temporary ability to lower the lake level, Meridian seeks consent for 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 below 518.0 m RL. 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 and works may be required to be completed beyond 2028.

Meridian has stockpiled rock for this purpose on its land adjacent to the Pūkaki dam since 2014, but the rock armouring has not been undertaken due to the existing supply triggers never being initiated by the SO, with the result that the lake level has not been low enough over that period to allow the works to be completed.

1.2 Purpose of this report

This Socio-economic Impact Assessment (SEIA) has been developed to support the Fast-track application for eased access to water between 518.0 m RL and 513.0 m RL at Lake Pūkaki and for civil works at the Pūkaki Dam to improve its resilience to climate change effects. The purpose of this SEIA is to assess the potential social and economic impacts of the proposed project in the local community.

More specifically this report has been prepared to meet the following objectives:

- Prepare a community profile of the community within the Project's area of social influence, this includes a review of social and recreation infrastructure.
- Undertake an analysis of tourism and recreation use of Lake Pūkaki.
- Assess social and economic impacts incorporating findings from the technical studies to identify changes (positive and negative) to people's way of life, their livelihood, amenity and character of the area; social and recreational infrastructure; and health and wellbeing.
- Develop measures that can be undertaken to avoid, remedy or mitigate adverse effects (where relevant).

1.3 Report Author and Contributions

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

1.4 Scope and limitations

This report has been prepared by GHD Limited on the instructions of Meridian Energy, in accordance with the agreed scope of work. It is intended to support Meridian's application under the Fast-track Approvals Act 2024 and may be relied upon by the Expert Panel and relevant administering agencies for the purposes of assessing the application.

While GHD Limited has exercised due care in preparing this report, it does not accept liability for any use of the report beyond its intended purpose. Where information has been supplied by the Client or obtained from external sources, it has been assumed to be accurate unless otherwise stated.

1.5 Assumptions

The following assumptions apply to the scope of this SEIA:

– This SEIA considers the potential social impacts at the local community, regional and national level. It has not investigated impacts associated with the individual/household level.

- This SEIA considers the potential economic impacts at the local community only, in terms of impacts on local livelihood, people's way of life and/or ability to provide for themselves. This SEIA does not cover regional or national economic impacts. Although it mentions the broader economic benefits on national electricity prices, it has not undertaken any detailed analysis of the social or economic impacts of these benefits on the broader regional or national population.
- This SEIA does not seek to assess the cultural effects of the Project, or potential impacts on mana whenua values. It is anticipated these would be identified and assessed separately by mana whenua.
- Engagement has been undertaken by Meridian as outlined in section 2.3 and outcomes from the engagement have been provided to GHD for inclusion in this report.

2. Methodology

2.1 Definition of socio-economic impact

Social impact assessment (SIA) is the most accepted and recognised framework used in New Zealand and internationally to assess and manage social impacts. The International Association for Impact Assessment defines social impact assessment as:

'…the processes of analysing, monitoring and managing the intended and unintended social consequences, both positive and negative, of planned interventions (policies, programs, plans, projects) and any social change processes invoked by those interventions' (Vanclay, 2003)."

The definition of a social impact according to Vanclay (2003) is a positive or negative change to one or more of the following:

i. People's way of life – that is, how they live, work, play and interact with one another on a day-to-day basis.

ii. Their culture – that is, their shared beliefs, customs, values and language or dialect.

iii. Their community – its cohesion, stability, character, services and facilities.

iv. Their political systems – the extent to which people are able to participate in decisions that affect their lives, the level of democratisation that is taking place, and the resources provided for this purpose.

v. Their environment – the quality of the air and water people use, the availability and quality of the food they eat, the level of hazard or risk, dust and noise they are exposed to, the adequacy of sanitation, their physical safety, and their access to and control over resources.

vi. Their health and wellbeing – health is a state of complete physical, mental, social and spiritual wellbeing and not merely the absence of disease or infirmity.

vii. Their personal and property rights – particularly whether people are economically affected, or experience personal disadvantage which may include a violation of their civil liberties.

viii. Their fears and aspirations – their perceptions about their safety, their fears about the future of their community, and their aspirations for their future and the future of their children.

In addition to the above categories of social impact, this SEIA has incorporated the potential economic impacts that could occur. The assessment has considered the impact on livelihood taking into consideration potential impacts the project could have on local businesses.

GHD understand a key objective of the project, in light of security of supply challenges, is providing certainty of electricity supply to minimise impact on electricity pricing. Although this key objective of the project will have broader regional and national economic benefits, it is not considered as part of this SEIA which considers the economic impacts at the local level only, focussing on the businesses in proximity to and affected by the project. An Economic Benefits and Costs Report has been prepared by Futures Consultants Ltd and has analysed in more detail the broader regional economic benefits of the proposal.

2.2 SEIA Industry Guidelines

This SEIA has been prepared in accordance with the industry accepted guidelines listed below. A complete reference list of documents referred to in this report is also provided in Section 9.

- Environmental and Social Impact Assessment Good Practice Statements prepared by Environment Institute of Australian and New Zealand (2013)
- Social Impact Assessment: Guidance for Assessing and Managing the Social Impacts of Projects prepared by the International Association for Impact Assessment (2015)
- People, Place and Environment Series: Social Impact Guide prepared by Waka Kotahi (2016)
- Social Impact Assessment Guidelines for Thriving Regions and Communities (Taylor and Associates, 2022)
- Social Impact Assessment Guideline for State Significant Projects prepared by NSW Department of Planning, Industry and Environment (2021).

2.3 Methodology

The methodology outlined in Table 3**Error! Reference source not found.** below provides an overview of the steps taken to prepare this report. The approach has been developed in accordance with the industry accepted guidelines outlined in section 2.2.

Table 3 Methodology to prepare the SEIA

Determine the area of influence	The site and its surrounds were analysed to identify the area of influence. The communities that live, work and undertake social, recreation and business activities in this area, as well as those who visit the area, are considered most likely to be impacted. For this reason, the area of influence comprises three communities relative to the level of impact anticipated for the collective population: - **Local Study Area** – This is determined to be the geographical area where the project may have the highest direct and indirect impacts on surrounding residents and community members (e.g. amenity, access and connectivity, community values). For the purposes of this SEIA, the area surrounding Lake Pūkaki as well as the town of Twizel was determined as the local area of influence. - **District Study Area** –This comprises areas surrounding the site that would have wider indirect impacts such as traffic movements, community values and tourist areas. Given Lake Pūkaki is a significant feature within the Mackenzie Basin, the Mackenzie District Council area has been defined as the district study area. - **Regional Study Area** – The local and district communities have been compared to the wider Canterbury Region. It is also acknowledged that the benefits of the project will be at a national scale.
Review of relevant policies	A review of the relevant policies, strategies and plans was undertaken to understand the high-level socio-economic context for the project. Consideration was also given to the impact that the project could have on tourism and economic development. Section 6 presents an overview of the relevant policies, strategies and plans.

Preparation of community profile	The community profile provides a baseline assessment against which to assess the potential social and economic impacts. It provides the basis for predicting and assessing the likely socio-economic impacts of the project. The profile was developed through a review of relevant data sources. The baseline is described with reference to: – Demographic analysis of current and future population using the 2023 census data. – Analysis of recreation data from Sport NZ. – Place analysis including surrounding land uses, transport connections and location of key infrastructure. – Review of policies including local and regional council policy with a focus on tourism, recreation and social infrastructure planning. – Information regarding tourism in the region including volume and spend. – Audit of social and recreation infrastructure including open space and recreation facilities, tourism facilities, emergency services, marae and iwi sites and medical facilities.
Review of engagement undertaken by Meridian	Engagement with the community and key stakeholders was undertaken by Meridian. Engagement included correspondence and meetings with the following key stakeholders: – Waitaki Rūnaka: • Te Rūnanga o Moeraki • Te Rūnanga o Arowhenua • Te Rūnanga o Waihao – Environment Canterbury – Mackenzie District Council – Department of Conservation – Fish and Game – Land Information New Zealand (LINZ) – Ministry for the Environment – Alps2Ocean Trail Manager – Te Araroa Trail, Trail Manager – NZTA – Mt Cook Alpine Salmon – Catherine Fields A summary of all consultation undertaken is included in the Substantive Application. Where available, GHD has reviewed a summary of the feedback provided by these stakeholders.

Review of technical reports	A review was undertaken of relevant technical reports that have been prepared as part of the resource consent application, to provide a technical base and understanding of the relevant actual and potential environmental effects of the project. The following technical reports were reviewed to inform the project details and history: – Ecology Impact Assessment prepared by Tonkin and Taylor and dated August 2025 – Air quality assessment – Lake Shore Wind Erosion prepared by GHD October 2025 – Air quality assessment – Rip Rap Placement prepared by GHD October 2025 – Landscape Assessment prepared by Goodfellow Group, April 2025 – Economic Benefits and Costs Report prepared by Futures Consultants, September 2025 – Pūkaki Dam Rip-Rap Design and Construction Methodology, prepared by GHD, October 2025 – Engineering Structures Assessment, prepared by GHD, October 2025 The following technical reports were considered through a 'social lens' to inform the overall assessment of the social and economic effects of the project. The following technical reports were reviewed in detail for this purpose: – Ecology Impact Assessment prepared by Tonkin and Taylor and dated August 2025 – Air quality assessment – Lake Shore Wind Erosion prepared by GHD October 2025 – Air quality assessment – Rip Rap Placement prepared by GHD October 2025 – Landscape Assessment prepared by Goodfellow Group, April 2025
Impact assessment	Potential impacts have been identified and described based on a review of the community profile including demographic analysis and review of recreation and tourist infrastructure, stakeholder and community consultation undertaken, and a review of technical studies.

2.4 Impact assessment scale

The socio-economic impacts for the project have been assessed using the scale of impact within the Waka Kotahi Multi-Criteria Assessment Risk Magnitude Assessment (Waka Kotahi, 2020), as provided in Table 4. The Impact Scale has taken into consideration the following impact factors:

- Likelihood
- Consequence
- Severity
- Timing and duration
- Permanence of the impact

Table 4 Impact scale and definition as applied to the socio-economic impact assessment

Impact scale	Definition
Large positive	Major positive impacts resulting in substantial and long-term improvement or enhancements to the existing environment that have a socio-economic or recreation impact.
Moderate positive	Moderate positive impact, possibly of short, medium or long-term duration. Positive outcome may be in terms of new opportunities and outcomes of enhancement or improvement.
Slight positive	Minimal positive impact, possibly only lasting over the short term. May be confined to a limited area or small population.
Neutral	Neutral – no discernible or predicted positive or negative impact.
Slight negative	Minimal negative impact, possibly only lasting over the short term and able to be managed or mitigated. May be confined to a small area.
Moderate negative	Moderate negative impact. Impacts may be short, medium or long term and are highly likely to respond to mitigation or management actions.
Large negative	Impacts with serious long term and possibly irreversible effect leading to serious damage, degradation or deterioration of the social or recreational environment.

3. Project context and site description

3.1 Study area

Lake Pūkaki, located approximately 10 km north of Twizel in the Mackenzie Basin, is a modified natural lake and is the largest hydroelectricity storage lake in New Zealand. The lake is the largest of three alpine lakes in the catchment, sitting alongside Lakes Tekapo and Ohau. The lake has a striking turquoise colour due to the glacial water flowing from the Tasman River. Its unique colour is a part of what makes this location a tourist attraction within the region.

The Lake is an important gateway to Aoraki Mount Cook National Park. Aoraki Mount Cook provides a scenic background to the lake and is a major tourist attraction. Mount Cook Road, State Highway 80 runs along the western side of the lake's edge. It is considered one of the most scenic drives in New Zealand because of the panoramic views of the lake and the Southern Alps.

Lake Pūkaki is a key component of the WPS. The lake is dammed to increase water volume and is connected via manmade canals to Lake Ohau and Lake Tekapo. These canals feed into hydro stations that contribute to nearly one third of New Zealand's electricity supply (See section 1.1 for more information). Infrastructure to support the hydroelectricity function of the Lake includes the Pūkaki Dam located at the southern end of the lake and the Pūkaki Canal and associated infrastructure.

The Lake is surrounded by farmland, conservation activities and tourism sites. To the west is the Ruataniwha Conservation Area that extends from the lake through the Ben Ohau range and into the Southern Alps. To the north is the Aoraki Mount Cook National Park. The northeast of the site connects to the Mount Cook Conservation Area. There are tourist and recreation activities that occur within the wider area around Lake Pūkaki. However, active recreation on Lake Pūkaki itself is relatively low due to restrictions imposed by the Mackenzie District plan.

The nearest residential dwellings are located to the northeast of the Pūkaki Dam, approximately 1.3 km away. The Punatahu Visitor Centre, public toilets and Mt Cook Alpine Salmon (MCAS) shop, are located on the dam and adjacent to State Highway 8. This shop is situated on land owned by Meridian and will need to be temporarily relocated off the site during the construction works (refer section 3.3.3 below). The car park adjacent to this building is also on Meridian owned land and is used as a viewing area across Lake Pūkaki and on a clear day, offers views of Aoraki/Mount Cook.

3.2 Wider project benefits

The national benefits of allowing eased access to contingent storage as identified in the Economic Benefits and Costs Report prepared by Futures Consultants Ltd and the Substantive Application prepared by GHD include:

- Making stored water available, providing approximately 545 GWh of realisable energy and 13.9% in increased storage (noting that Lake Pūkaki represents 45.5% of the country's total controlled hydro storage).
- Reduced need for demand response to reduce energy consumption (157 GWh or 59% lower per year).
- Lower wholesale prices (an average reduction of $10/MWh or 7%) and lower price volatility in the market.
- Lower overall costs for electricity consumers (a reduction of $437 million per annum or 7% lower per year).
- Reduced carbon emissions (196 kT CO2 equivalent per annum or 9% lower) as hydroelectric power is utilised over thermal generation.
- Lower hydro spill (on average it would be 346 GWh or 23% lower per year).

3.3 Rock armouring at Pūkaki Dam

Lowering the lake level to 513.0 m RL will expose sections of the upstream areas of infrastructure that are currently submerged at a depth where they are not exposed to wave action. To protect the dam from erosion when operating at lake levels below 518.0 m RL, Meridian proposes targeted dam protection works. These works will involve the placement of additional rip-rap along the newly exposed upstream face of the Main Dam and

abutments, extending wave protection coverage to allow a revised minimum operating level of 513.0 m RL. The main work areas are shown in Figure 1.

Figure 1 Placement of the rip rap abutments

It is anticipated that the duration of the rock armouring works, if completed in a single stage, would be approximately 12 to 18 weeks. However, works can only occur when the lake level is lowered to below 518.0 m RL. It is therefore unlikely that there will be an extended period with the lakes at this low level to enable the work to be completed in one continuous phase.

It is likely that construction will need to be undertaken over multiple years with works occurring when the lake is at a suitable level. The works will be undertaken using a multi-staged process based on the following programme assumptions:

– Construction activities will be short in duration (a few weeks) and occur over multiple stages. Given the time required to mobilise and demobilise from the site, contractor guidance indicates that the minimum duration for any construction stage is 3 weeks.
– Historical data indicates that low lake levels at Lake Pūkaki most frequently occur during mid to late winter and early spring. These conditions are advantageous for accessing the upstream dam face for rip-rap placement. Construction activities will most likely be undertaken during this period.

Construction activities will be restricted to the following schedule:

– Daily: 6:00 a.m to 7:30 p.m.
– No work during the following periods:
  - Good Friday to Easter Monday (inclusive)
  - 24, 25, 26 and 31 December and 1 January
  - New Zealand Public Holidays.

The construction methodology is anticipated to be as follows:

– Rock is currently stockpiled at two locations to the south of SH8 (Figure 2).
– Rip-rap rock will be transported via truck from these existing stockpiles to the Project Designated Stockpiles for temporary storage prior to placement (Figure 2).
– Rip-rap placement will occur from the two Project Designated Stockpiles. Works will occur on the left and right abutments and the upstream face of the main dam.
– Truck movements are likely to be in the order of 20 to 30 per day[2] from the existing stockpiles to the project designated stockpiles. Light vehicle movements associated with the construction works will also occur.

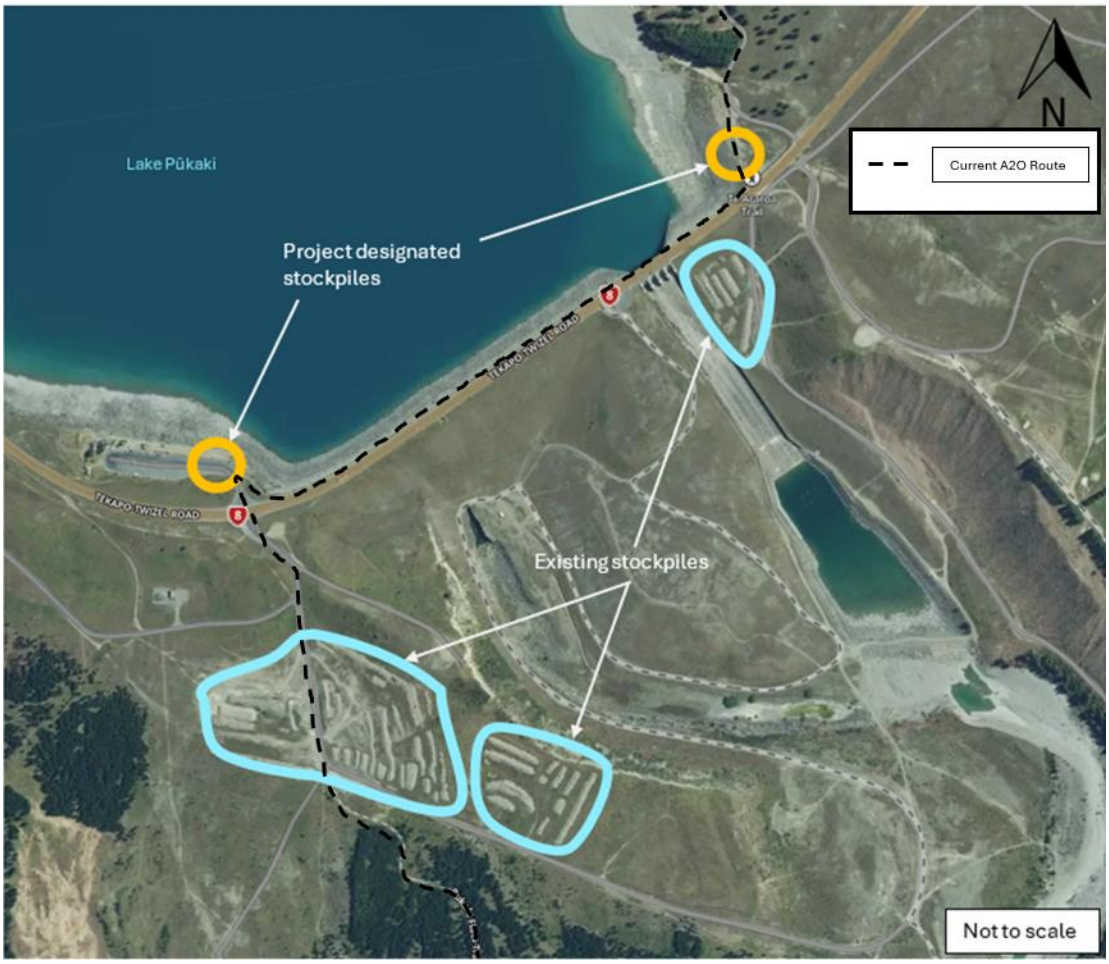


Figure 2 Rip-Rap Existing Stockpiles, proposed work areas and Alps2Ocean Route

[2] This includes outgoing and returning truck movements for on average 11 deliveries per day of rock to the project stockpiles.

3.3.1 Sites for rock armouring works

During each construction period, two work zones will be established either side of the Lake Pūkaki Dam to construct the left and right abutment access. The work zones will be established and dis-established at the commencement and completion of each construction period.

The dam and right abutment will be constructed from a work zone established in the Lake Pūkaki Car Park, as illustrated in 3. During each construction period, access to the car park will be closed at the entrance to Pūkaki Canal Road. This will prevent use of the car park as well as access to the MCAS shop, Punatahu Visitor Centre and Lake Pūkaki Car Park public toilets. MCAS are considering temporary relocation options.

Figure 3 Dam and right abutment - security fencing, closed access, access ramps and temporary buildings

The second work zone will use part of the area to the east of the dam to enable construction on the left abutment. The southern entrance to the carpark will be closed, as indicated in Figure 4. This road will be closed to the roundabout within the carpark. Access to the campground will still be available through the northern entrance enabling access to the toilets located within the Pines freedom camping area which will remain open for use. However, overnight camping may need to be temporarily prohibited, dependent on dust observations.

Figure 4 Left abutment - security fencing, closed access and access ramp

4. The surrounding community

To undertake the SEIA, it is important to understand the local community, particularly their demographic information, travel choices and recreation activities. The following section has used information from the NZ Census conducted in 2023 as well as recreation trends from Sport NZ. Given the large number of visitors to the region, an analysis has also been undertaken of the visitor population using data from Mackenzie Tourism.

4.1 Twizel

The township of Twizel is located 10 km to the south of Lake Pūkaki. The town originally founded in 1968 was established as a temporary hydro construction town connected to the Upper Waitaki hydroelectric scheme. According to the Twizel Spatial Plan (2024), following the conclusion of the hydroelectric programme, the population declined. It was through the lobbying of residents that the town was saved from removal in 1983. Today the town is the largest town in the Mackenzie District and a popular tourist destination offering retail and hospitality services. The town often triples in population during the summer holiday period.

4.2 Population

Lake Pūkaki is within the Mackenzie Lakes 2023 Statistical Area (SA2) illustrated in Figure 5. This SA2 surrounds both Lake Pūkaki and Lake Tekapo, encompassing an area of 5,129km^2. Because the SA2 includes large areas of conservation land, it has a very small population relative to area. In 2023 the population was 1,131 residents. This population area and SA2 has been included in the analysis because it is the population centre that is closest to the proposed rock armouring works (approximately 10 km from the Lake Pūkaki car park). The Twizel SA2 has an area of 15.54 km^2 and residential population of 1,674 residents. Analysis of the population for Mackenzie Lakes and Twizel has been compared to the Mackenzie District Council Area, Canterbury Region and broader New Zealand Region.

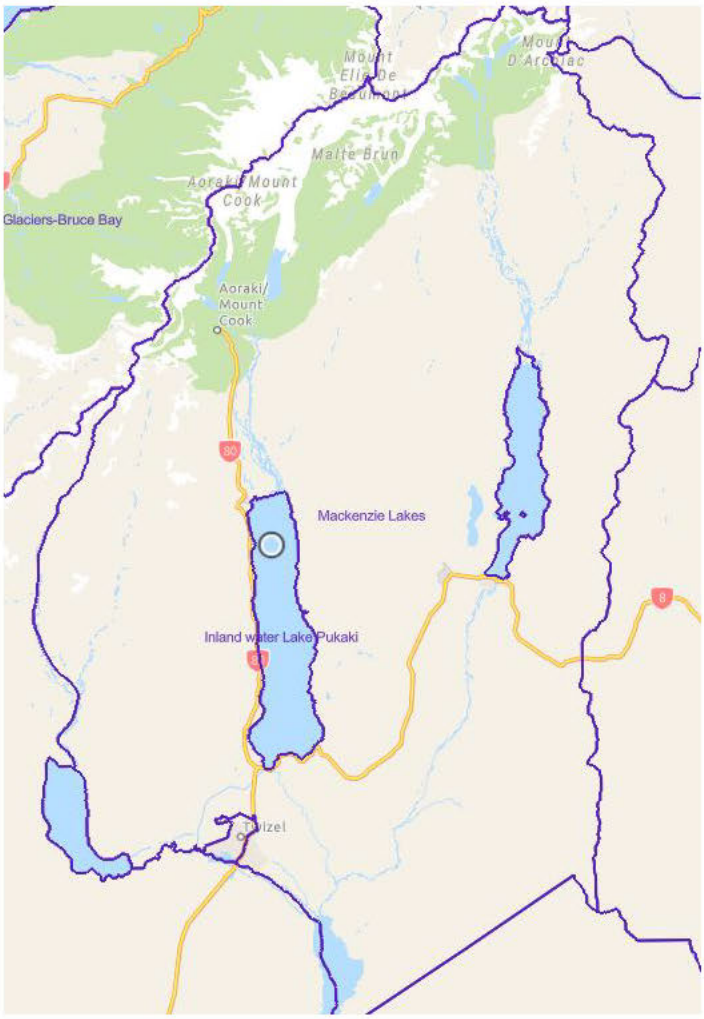


Figure 5 SA2s including in the Study Area (base map from Stats NZ 2023 SA2 boundary)

The population analysed as part of this SEIA is predominantly located to the southwest of Lake Pūkaki within and around the Twizel township. There are some rural properties located around the edge of the lake along either Mount Cook Road to the West or Haymen Road to the East.

Population growth between 2018 and 2023 has varied as shown in Table 5. There has been almost no population growth in Mackenzie Lakes (1%) which reflects its remote nature and the amount of land that is dedicated conservation area. The township of Twizel has increased by 9% which is slightly higher than the Canterbury region of 8%. Both areas are higher than the average for New Zealand at 6%.

Table 5 Population increase by statistical area

Study area	Statistical Area	2018	2023	% change
Local area	**Mackenzie Lakes (SA2)**	1,119	1,131	1%
Local area	**Twizel (SA2)**	1,515	1,674	9%
District	**Mackenzie District Council**	4,866	5,115	5%
Regional	**Canterbury Region**	599,694	651,027	8%
Regional	**New Zealand**	4,699,755	4,993,923	6%

Within the township of Twizel, the median age (44.2) is higher than the New Zealand median (38.1), this is also higher than Mackenzie District (41.1), as illustrated in Figure 6. In comparison, Mackenzie Lakes District has a much lower median age of 35.8. In Twizel the higher median age is due to the percentage of residents aged 65 years and over. This age group comprises 22% of the Twizel population, in comparison to 17% on average for New Zealand. In contrast, Mackenzie Lakes only has 13% of the population over the age of 65 years. Within this area, over 50% of the population are aged between 30-64 years.

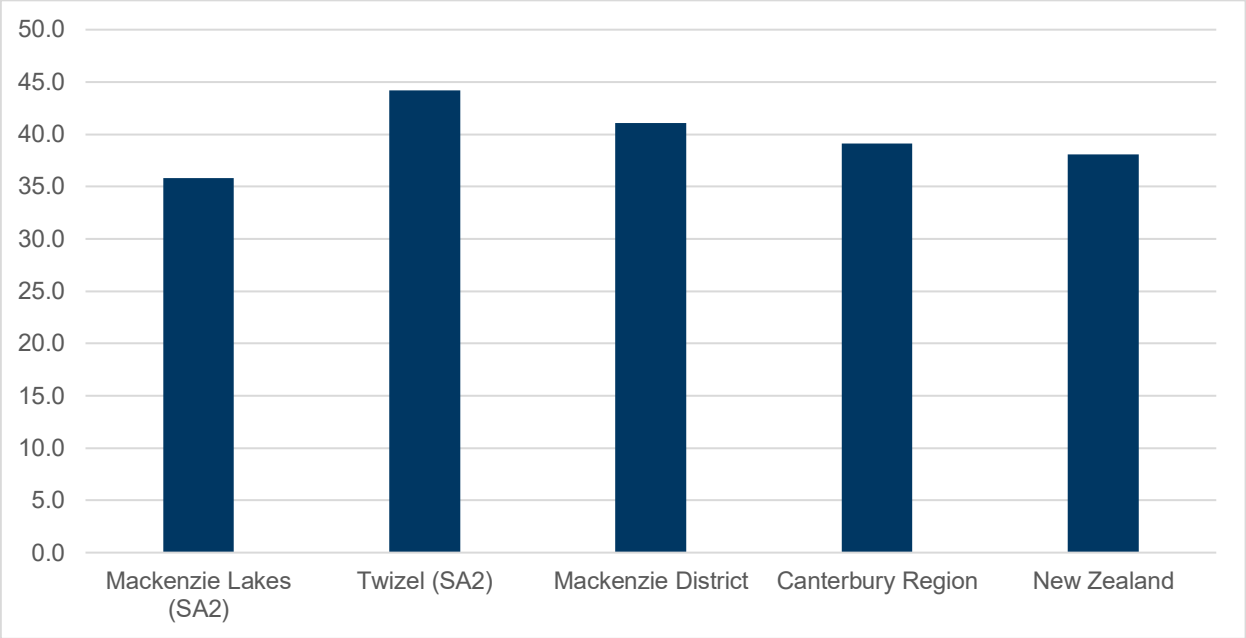


Figure 6 Median age of residents with the statistical areas compared to district, regional and national statistics

Mackenzie District is a tourist area with the population changing depending on the season. Consequently, the number of dwellings used seasonally is significantly higher than other areas of New Zealand. This is reflected in the number of unoccupied dwellings recorded on Census night, which in 2023 was held on the 7th of March. Over half of the dwellings in Twizel (55%) were recorded as unoccupied, in Mackenzie Lakes this was 46% and 42% in Mackenzie District, as illustrated in Figure 7. These numbers are significantly higher when compared to the New Zealand average of 11%.

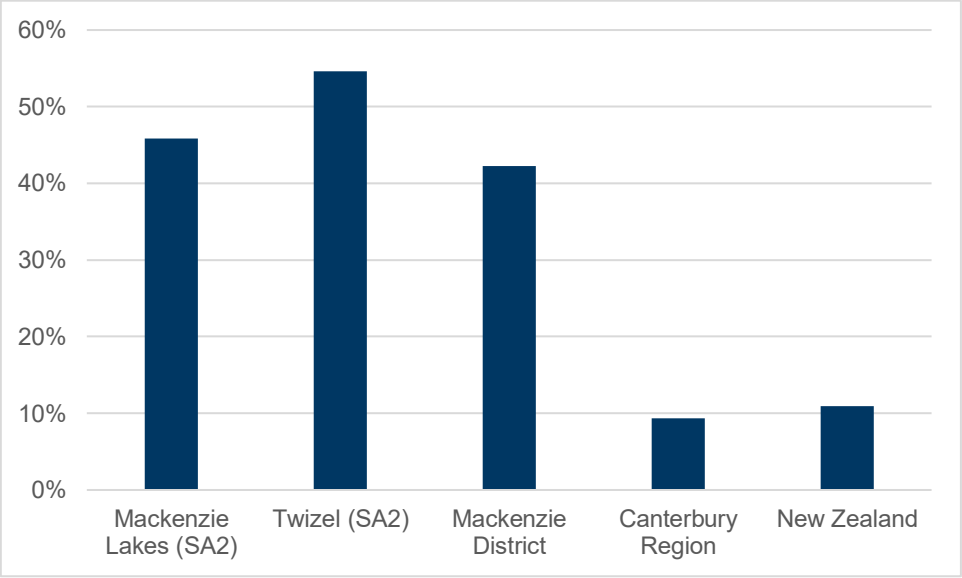


Figure 7 Percentage of unoccupied dwellings across the statistical areas compared to district, regional and national statistics

Regarding employment, the tourism industry is not identified as a specific employment sector within the 2023 Census data. Nevertheless, the impact that tourism has on the local economy can be identified through the employment sectors of accommodation and food services and arts and recreation, as identified in Table 6. Employment within the sector of accommodation and food services is significantly higher in Mackenzie Lakes (39%) when compared to the rest of New Zealand (6%). This is also much higher than other areas in the region such as Twizel (16%) and the Mackenzie District (18%). Arts and recreation services are also higher in Mackenzie Lakes (8%) and Twizel (5%) when compared to the Canterbury Region and New Zealand, both were 2%.

Employment in the sector of agriculture, forestry and fishing were also significantly higher, with 17% in Mackenzie Lakes, 15% in Twizel and 18% in Mackenzie District, which compares to 6% in the Canterbury Region and 6% in New Zealand. These numbers are reflective of the large areas of conservation and agricultural land.

Tekapo is the township and population centre in the district with the largest tourism focus, Twizel is more mixed, and the balance of the district is strongly rural, used for primary production and a large proportion of the catchment in crown ownership, LINZ, pastoral lease, Department of Conservation and NZ Defence.

Table 6 Percentage of employment across sectors within the statistical areas

Employment sector	Mackenzie Lakes (SA2)	Twizel (SA2)	Mackenzie District	Canterbury Region	New Zealand
Accommodation and Food Services	39%	16%	18%	6%	6%
Agriculture, Forestry and Fishing	17%	14%	22%	6%	5%
Construction	4%	13%	10%	11%	10%
Arts and Recreation Services	8%	5%	4%	2%	2%
Administrative and Support Services	6%	6%	4%	4%	4%
Retail Trade	6%	7%	7%	9%	9%

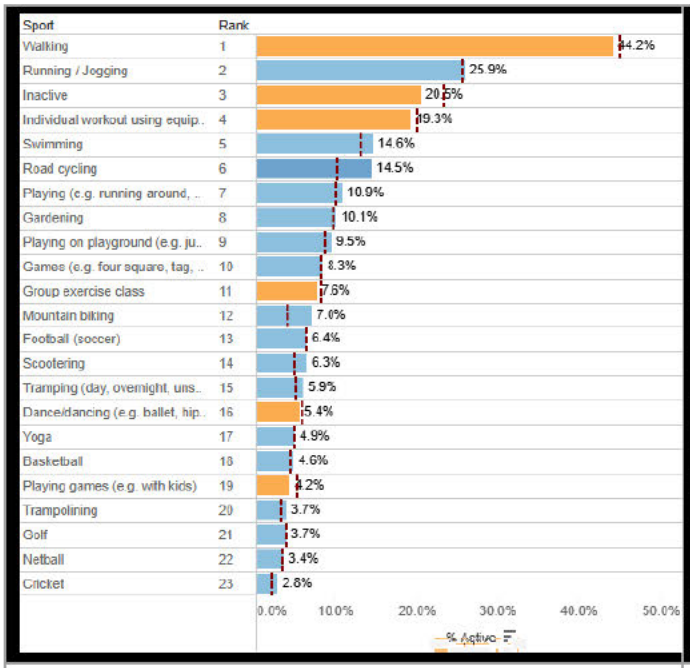
4.3 Recreation trends

Sport New Zealand have undertaken modelling on recreation activities to provide an indication of participation in sport and recreation categories across New Zealand. Data has been collated from:

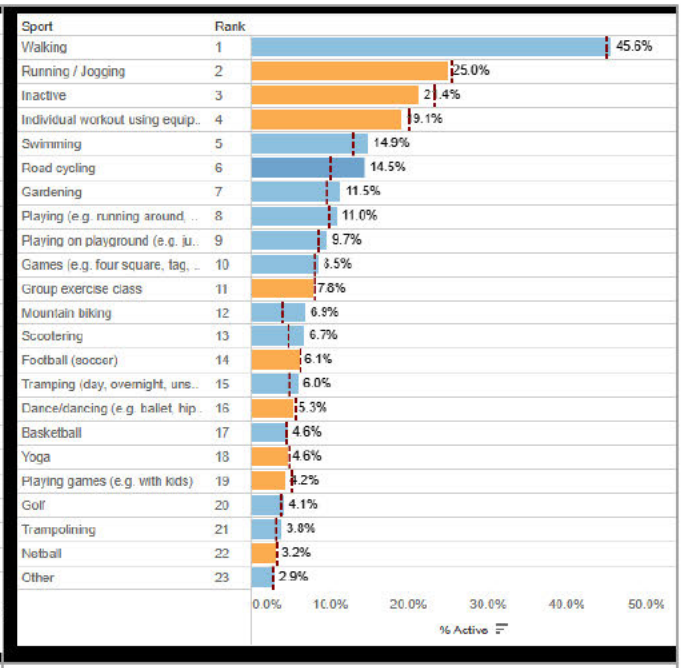
- Statistics NZ
- Active NZ survey (Sport NZ)
- School Sport New Zealand sports participation data
- Ministry of Education
- Ministry of Health
- Nielsen Research

Table 7 presents the recreation trend data for Mackenzie Lakes SA2 and Twizel SA2 that has been collated by Sport New Zealand. Sports highlighted in orange mean that participation is below the national average and sports highlighted in blue are above the national average. Walking is the most popular recreation activity in the two SA2 areas of Mackenzie Lakes and Twizel. Within Twizel, participation is above the national average, whereas for Mackenzie Lakes this is slightly below. Both SA2 areas have higher rates of participation in road cycling, tramping and mountain biking than the national average, and this is reflective of the various walking and cycling trails within the region.

Table 7 ***Recreation trends for Mackenzie Lakes (SA2) and Twizel (SA2) Sports in orange are below the national average and in blue are above the national average***



Mackenzie Lakes (SA2)



Twizel (SA2)

Trail counters were used from 2014 to 2021 to count pedestrians and cyclists using the various trails across New Zealand. The last count was made in June 2021. A counter was located at Lake Pūkaki. It counted both cyclists using the Alps2Ocean trail and pedestrians using the Te Araroa Trail. A review of count data shows seasonal variation in the use of the trails with peak periods occurring during the summer season of December through to April and an off-peak season in winter extending from May through to November. Figure 8 presents data from the 2019 calendar year. This year was selected because the annual data for both 2021 and 2020 were impacted by Covid travel restrictions.

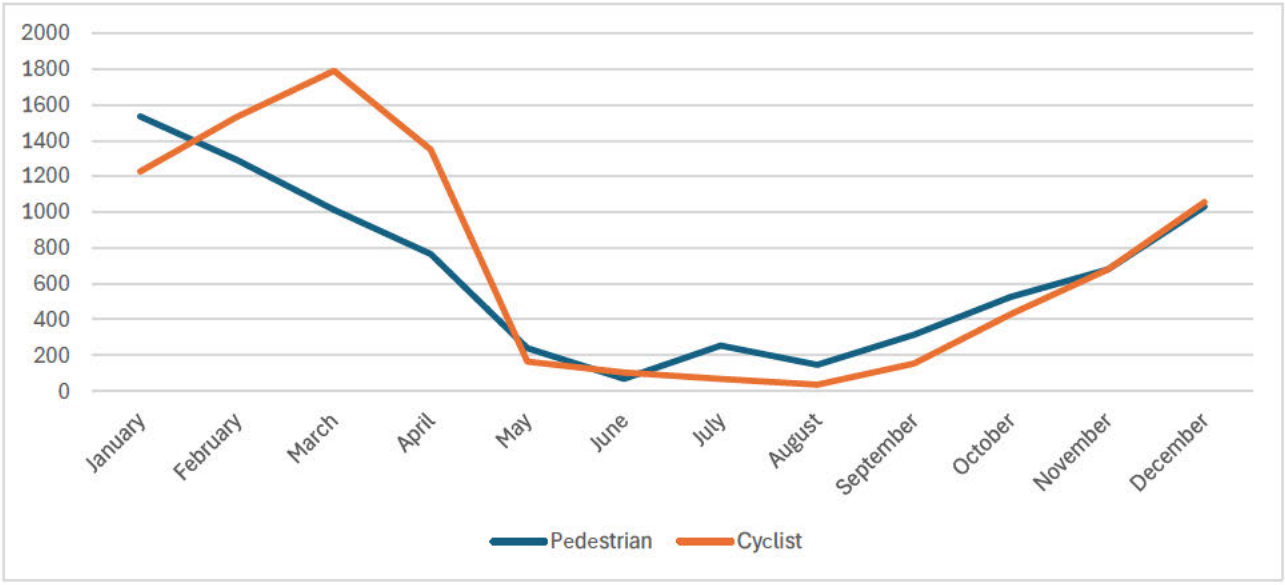


Figure 8 Alp2Ocean Pedestrian and Cycling Counts for 2019 (Alps2Ocean Cycle Trail, 2021)

4.4 Visitor information

Visitors to the Mackenzie District are a critical contributor to the local economy. Mackenzie Tourism was collecting data on visitors to the region at monthly intervals. Unfortunately, since November 2023, this data collection has been under review and there has not been any recent data since this period. The information collected prior to this review, demonstrates the cyclical nature of visitation, see Figure 9.

During peak tourist season, in the summer months, such as December and January, daily visitors are close to 200,000 with numbers reaching 201,000 in January 2023. In the off-peak season, which is during the winter months, these numbers almost halve, the lowest level of visitation was in May 2023 with 71,000 visitors.

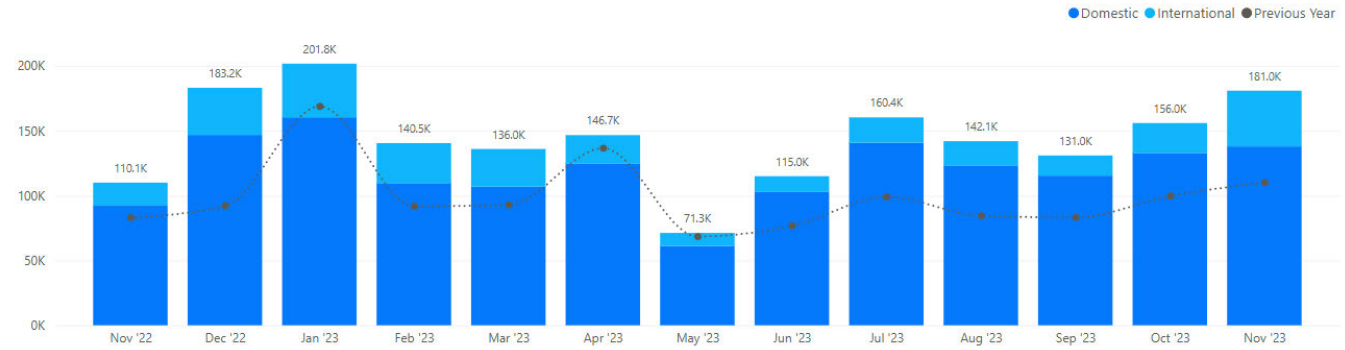


Figure 9 Monthly trends of visitor days to the Mackenzie Region November 2022 to November 2023 (Mackenzie Region, 2025)

An analysis has been undertaken of some relevant economic data available from January 2023 to May 2025, as illustrated in Figure 10. Electronic transactions showed that in the month of January 2023 visitors spent $14.9 million in the region, $9.4 million from domestic tourists and $5.5 million from international tourists. Food and beverage received over $7 million of this spend, fuel almost $3 million and accommodation over $2 million. In contrast, in May 2023, which had the lowest level of visitation in the 12-month period, $5.3 million was spent by visitors comprising of $3.2 million from domestic tourists and $2.1 million from international tourists.

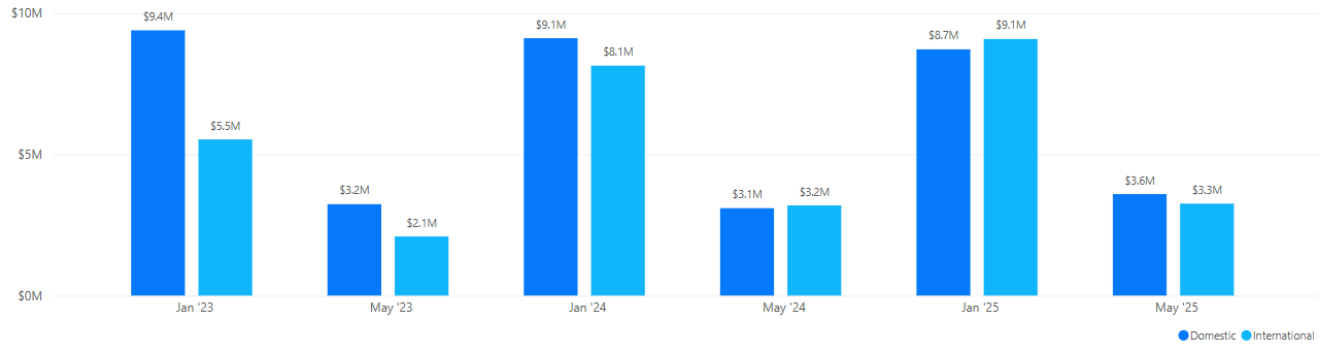


Figure 10 Visitor Spend data for domestic and international visitors for the months of January and May from 2023 to 2025 (Mackenzie Region, 2025)

4.5 Community sentiment

In early 2025, Mackenzie Tourism (part of Mackenzie District Council) conducted a survey to understand the community's perception about tourism. The survey found that 93% of Mackenzie residents surveyed agreed that tourism is good for the region. The benefits sited by the survey respondents included opportunities for employment/income and more local businesses opening or being able to stay open (Angus and Associates, 2025).

Almost all (99%) of survey respondents stated that they had been adversely impacted by tourism in their local area. Adverse impacts include litter and waste generation, less safe driving, increased pressure on community infrastructure, decreased availability of housing and greater difficulty finding a car park.

Suggestions made by survey respondents of most relevance to the project include:

– Improved litter and waste management. This means regular removal of rubbish from public bins and an increase in the number of bins.
– Making more toilet facilities available and improved maintenance of these facilities.
– Improved road signage and land markings to help tourists who are unfamiliar with the area.

4.6 Cultural significance

According to the Te Manahuna Pou Whenua Roadmap (Mackenzie District Council, 2025), Lake Pūkaki is the largest of the lakes that were dug by Rakāihautū in Te Manahuna. Multiple kāika mahika kai sites were situated around the lake and near the two awa – Te awa Whakamau (Tasman River) and Te Awaure (Jollie River). Animals such as the weka, pūtakitaki (Paradise Duck), āruhe, tuna,and tīkumu (common mountain daisy) were gathered and harvested here.

The geographical features surrounding Lake Pūkaki, including the alpine ranges and waterways, reflect cultural narratives including early accounts of the waka Araiteuru and its passengers.

Under the Ngāi Tahu Claims Settlement Act 1998, 72 sites within Te Wai Pounamu have been identified as Nohoanga. The term 'Nohoanga' refers to the seasonal occupation sites which were part of the mobile lifestyle of Ngāi Tahu Whānui as they moved around the South Island. Land designated as Nohoanga are specific areas of Crown owned land adjacent to lakeshores or riverbanks. They have been identified to provide Ngāi Tahu with an opportunity to experience the landscape as their tipuna did.

A Nohoanga site has been identified in the Lake Pūkaki Reserve as indicated in Figure 11. The Nohoanga designation provides Ngāi Tahu Whānui with temporary and exclusive rights to occupy the site for up to 30 days between 16 August and 30 April each year.

Figure 11 Location of Nohoanga within the Lake Pūkaki Reserve (Ngāi Tahu, 2023)

4.7 Summary of community profile

Lake Pūkaki and its surrounds is a popular tourist destination. The population predominantly lives in the town of Twizel, however there are significant fluctuations during peak tourist season in the summer months and off peak season in the winter months. The local economy capitalises on the tourism industry through the provision of hospitality and retail businesses. Conservation areas and various walking and cycling trails are a key attractor in the region as are the 4 local ski fields. They are used by both tourists and local residents.

There is strong support for the tourism industry because it is a major employer across the region. There are however some adverse impacts on the local community which need to be managed. The project will need to consider the impacts on tourist facilities such as toilets, waste facilities and pathways. Consideration will need to be given to items of cultural significance, particularly the Nohoanga located in the Lake Pūkaki Reserve.

5. Tourism and Recreation facilities

Land uses surrounding the lake are predominantly conservation and tourism activities associated with the Aoraki Mount Cook National Park and farming. It is important to understand the tourism and recreation facilities surrounding the lake that have the potential to be impacted by the rock armouring works and lowering of the lake.

5.1 Walking and cycling trails

The conservation areas surrounding the Lake as well as the roads and trails that connect Lake Pūkaki to Lakes Tekapo and Ohau are tourism attractions in and of themselves. The following section provides a summary of the walking and cycling trails including tourist scenic viewpoints.

5.1.1 Alps2Ocean Cycle Trail

The Alps 2 Ocean Cycle Trail (A2O) is the longest of the 23 Ngā Haeranga Great Rides of New Zealand, extending over 300 km. The ride commences at either Aoraki Mount Cook or alternatively Tekapo. Both routes then meet at Lake Pūkaki where the trail then continues to the Pacific Ocean completing at Oamaru. Although targeted at cyclists, the trail is also used by walkers and runners. Some parts of the Trail from Tekapo to Ohau share the same route as the Te Araroa Trail discussed in 5.1.2.

Section 1 of the Cycle Trail starts at the White Horse Hill Campground, 2 km north of Mount Cook Village. The Trail extends to Mount Cook Airport where riders make a short helicopter flight across the Tasman River to Rotten Tommy. The Trail then follows the track alongside Lake Pūkaki extending down to Braemar Road, as illustrated in Figure 12.

The Tekapo route avoids the helicopter flight and commences at the Tekapo township near Hamilton Drive. The track continues along Aorangi Crescent and then continues past the Tekapo A Power Station continuing along Tekapo Canal Road. Both routes then connect along Haymen Road which follows the Lake Pūkaki Shoreline.

The trail passes over the Pūkaki Dam entering the Lake Pūkaki Visitor Centre and the Lake Pūkaki Information Centre. The trail crosses over the highway across the Pūkaki Flats which is an area of dry grasslands characteristic of the Mackenzie landscape. This route then continues to the town of Twizel.

The A2OTrail will be impacted by the operation of the two work zones described in 3.3.1 (see GHD 2025A – Lake Pūkaki Engineering Structures Assessment for more information). The transportation of the rip-rap rock from the existing stockpiles to the project designated stockpiles potentially impacts the A2O route in several locations. In addition, creating a safe construction work zone will require the closure of the existing carpark to the west of the dam and the western most access route to the Pines freedom camping area. These closures will also potentially impact the A2O route.

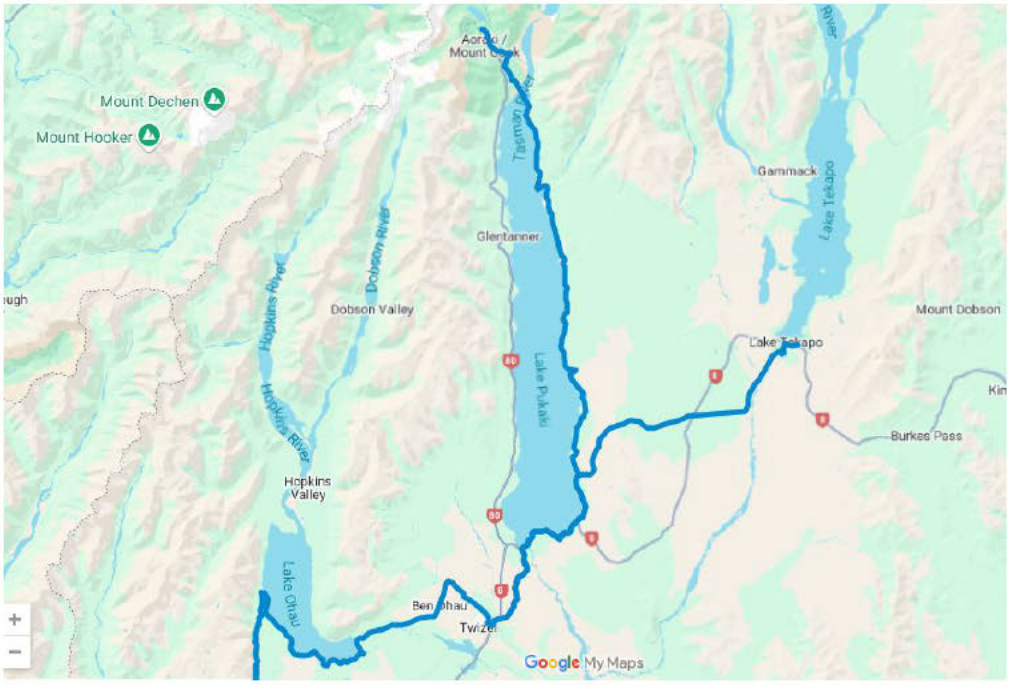


Figure 12 Alps2Ocean Cycle Trail route in relation to Lake Pūkaki (Waitaki District Council and Mackenzie District Council, 2025)

5.1.2 Te Araroa Trail

The Te Araroa Trail spans the length of New Zealand, extending from Te Rerenga Wairua to Motupōhue. It is one of the world's most diverse long distance walking trails covering 3,000 km. It is estimated that 2,000 walkers a year complete the trail in one continuous journey with many more walking the various local sections.

Lake Pūkaki is in the Tekapo to Lake Oahu section of the Te Araroa Trail. The route here commences in Tekapo following a similar route to the A2O Cycle Route by following Aorangi Crescent and continuing past the Tekapo A Power Station to then continue along Tekapo Canal Road. The trail then branches off the road through farmland following the Tekapo Canal until it connects to Hayman Road on the shore of Lake Pūkaki.

From Hayman Road, the trail continues along Lake Pūkaki until it meets the Lake Pūkaki Information Centre. Following the route of the A2O cycle way, the trail crosses State Highway 8 and heads into the Department of Conservation Pūkaki Flats. Similar traffic management and diversions will be required for the walkers as for the cyclists. Details of these are included in the Methodology Report and in the Substantive Application.

5.1.3 Walking and hiking trails

The Department of Conservation manages walking and hiking trails along the shores of Lake Pūkaki these range from short family friendly walks to longer hikes. A summary of the walking and hiking trails surrounding Lake Pūkaki is provided in Table 8.

Table 8 Walking and hiking trails in proximity to Lake Pūkaki

Trail name	Detail
Tasman River Track	3 hours, 10 km The walk starts at the Jollie River car park and finishes at Tasman Point near Chop Creek. The track is popular with cyclists because it is part of the Alps 2 Ocean Cycle Trail.
Jollie Hut	2 hours, 3 km Park your vehicle in the signposted car park off Braemar Mount Cook Station Road and continue on foot to Jollie Hut. Please keep to the track (public access easement). This area is popular with hunters looking for tahr and chamois further up valley
Braemar Road to Landslip Creek	3 hours, 10 km

Trail name	Detail
	A farm track leads to Landslip Creek and the public conservation land boundary. Keen walkers can hike uphill towards the trig station on point 1230 m. This is a further 3 km uphill and is a marked public access easement through Ministry of Defence land
Pūkaki Kettle Hole Track	1 hour circuit, 4 km This walk starts just north of the Pūkaki River spillway. From the car park the walk follows a track into the Pūkaki Scenic Reserve through moraine hummocks and leads to a distinct kettle hole. This kettle hole was formed by melting glacial ice—interpretation signage on site provides information about this. The 360° views experienced along this track on a fine day are spectacular
Lake Pūkaki foreshore	2 hours, 6.5 km It's certainly worth taking a short stroll (or cycle) along the Lake Pūkaki foreshore. Seeing the view across Lake Pūkaki to the Southern Alps/Kā Tiritiri o Te Moana on a fine day is not to be missed. This walk is a small section of both Te Araroa (The Long Pathway) and Alps 2 Ocean Cycle Trail
Marker Bay	20 minutes, 1 km Marker Bay walk starts on the southern edge of Lake Pūkaki just off SH8. It traverses an area where Lake Pūkaki village once stood, before the lake levels were raised in 1979. Part of the track leads through pine trees and is a good stroll on a hot day
Baikie Hut	3 hours, 9 km The track follows a 4WD road and is suitable for walkers, mountain bikers, runners and horse riders. Baikie Hut, resting on grassy flats beside Twizel River, has four bunks and provides a great overnight or picnic venue.
Pūkaki Boulders	10 minutes Access is along the Aoraki/Mt Cook highway approximately 5 km from the SH8 turnoff. A short track leads up to the Pūkaki boulders. These boulders are called erratics and were deposited by the huge glacier that dominated the area over 12,000 years ago. Tibetan prayer flags are a memorial to several climbing guides from the local climbing fraternity. The boulders are popular with rock climbers and mountaineers driven away from Aoraki/Mt Cook National Park due to bad weather.

The Pūkaki Kettle Hole Track is the trail in closest proximity to the proposed construction compound for the left abutment, with the start of the trail marked from the carpark in The Pines freedom camping area. The trail may not be directly impacted by the proposed construction compound but hikers currently typically park in the carpark and commence the walk from here. As illustrated in Figure 3, from the car park, the walk follows a track into the Pūkaki Scenic Reserve through moraine hummocks and leads to a distinct kettle hole.

Figure 13 Map of the Pūkaki Kettle Hole Track (Department of Conservation (2015)

5.2 Driving

The scenery surrounding Lake Pūkaki is world renowned. Mount Cook Road (SH80) located along the western edge of Lake Pūkaki is identified as one of the most scenic drives in the world. According to Algie (2022) *"In a country full of scenic roads, the road to Mount Cook stands out as one of the most spectacular. The Southern Alps, including Mount Cook, are on full view as you skirt the bright blue waters of Lake Pūkaki."* The area has been used as the backdrop in major location scenes in movies such as the Lord of the Rings and The Hobbit Trilogy.

The road is approximately 55 km long extending from just outside Twizel to the Mount Cook village. Although it takes around 45 minutes to drive, most tourists stop along the way to take photos of the view of Mount Cook and the lake. Although many visitors take photos by the side of the road there are some formal viewing points these include:

– Lake Pūkaki Beach Look out
– Tapataia Mahaka Peter's Lookout – this includes parking, toilet facilities and signage
– Reflecting Mountain View
– Pūkaki Boulder
– Lake Pūkaki Visitor Centre (Punatahu) – this includes parking and toilet facilities

Although not as popular as Mount Cook Road, the Lake Tekapo to Twizel Road (SH8) is used by tourists traveling from Lake Tekapo enroute to Aoraki Mount Cook. The road also has a scenic viewpoint at the Lake Pūkaki Viewpoint at the intersection of Haymen Road and SH8. This location also has public toilets.

5.3 Fishing

Lake Pūkaki is identified as a lake open for fishing all year around. The lake is known for brown trout, rainbow trout and salmon. There is a bag limit of four sports fish per person. There is no minimum length for trout. Salmon has a 25 cm minimum. Access to the Lake is shore access from State Highway 8.

Glentanner Station, located at the north of Lake Pūkaki towards the Tasman River, is a popular fishing location for trout. Fishing in the Tasman River is only permitted from 1 November to 30 April. A fishing license is required.

5.4 Hunting

Hunting is permitted through the Ben Ohau Range within the Ruataniwha Conservation Park. The area is known for tahr and chamois hunting. Access to the conservation land is from SH80, turning off near the Boundary Stream.

5.5 Bird watching

Lake Pūkaki is known for bird watching, particularly for spotting the rare Black Stilt bird (also known as the Kaki). The best place to see them is near the Tasman River delta where it meets the lake around the Glentanner Area. The Lake Pūkaki Information Centre is also listed as a bird spotting area on the eBird website.

5.6 Tourism activities

In addition to the various recreation activities, there are activities and facilities around the Lake popular with the tourists coming through the area. These are listed in Table 9.

Table 9 Tourism activities around Lake Pūkaki

Facility	Detail
New Zealand Alpine Lavender Farm	Located at 657 Mount Cook Road (SH80), the Lavendar Farm is a tourist attraction inviting visitors to spend time in the farm. The site includes a lavender shop, café and accommodation.
Mt Cook Alpine Salmon Shop	Located in the Lake Pūkaki Car Park alongside the visitor centre. It is a popular place for tourists to stop and eat. In addition to selling salmon, to takeaway or eat in, the shop has a café and sells tourist items. It is open every day including public holidays except for Christmas and New Years Day.
Punatahu Visitor Centre	The visitor centre is located in the Lake Pūkaki Car Park alongside the Mt Cook Alpine Salmon Shop. The centre has information about the local area and provides a place to stop and enjoy the view of the lake.

5.7 Tourist accommodation

Tourist accommodation is located at various locations along the edge of Lake Pūkaki and within Twizel. Table 10 lists accommodation in proximity to Lake Pūkaki. These are classified as accommodation including hotels, lodges and luxury accommodation. The table also includes a list of camping grounds. These are sites that provide facilities for self-contained travellers.

Table 10 Accommodation in proximity to Lake Pūkaki

Name of facility	Address	Suburb	Description of accommodation
Accommodation			
Lakestone Lodge	4589 Tekapo-Twizel Rd	Lake Pūkaki	Luxury accommodation comprising of five villas
Mt Cook Lakeside Retreat	86 Mount Cook Rd	Lake Pūkaki	6 rooms, max 12 guests
Grand Suites Lake Tekapo	14 Greig Street	Lake Tekapo	Villas for 2–4 guests each
Pūkaki Air Lodge	10 Avro Avenue	Twizel	Multiple suites, up to 4 guests per suite
Sky Suites – Lake Pūkaki, Mount Cook	2 Swallow Drive	Twizel	Apartments for 2–4 guests
Rosedale Cottages	25 Glencairn Road	Twizel	Cottages for 2–5 guests
Mount Cook Station Huts & Quarters	1580 Braemar Mount Cook Station Road	Twizel	Shared huts, 2–6 guests per unit
Galaxy Boutique Hotel	53 D'Archiac Drive	Lake Tekapo	Rooms for 2–3 guests
Camping Grounds			
Lake Pūkaki Reserve – The Pines	Free Campgrounds	Mackenzie	50 camping sites. Self-contained vehicles only, 3-night max stay, toilets available.
Lake Wardell Free Campground	Near Lake Pūkaki Canal	Lake Pūkaki	Quiet, scenic, suitable for campervans
Glentanner Park Centre	State Highway 80	Glentanner	Budget options, tent sites, shared facilities
Twizel Holiday Park	122 Mackenzie Drive	Twizel	BBQ, tent sites, near lakes and mountains

Name of facility	Address	Suburb	Description of accommodation
Lakes Edge Holiday Park	2 Lakeside Drive	Lake Tekapo	Tent sites, glamping, cabins, lakeside views
Lake Ruataniwha Holiday Park	53 Freda Du Faur Ave	Twizel	Tent sites, fishing, laundry, basic amenities

The Lake Pūkaki Reserve is the location of the proposed compound for the construction of the left abutment (see Section 3.3.1. This site is the location of The Pines Campground illustrated in Figure 14. This site is a freedom camping site located on the shores of the Lake Pūkaki and has approximately 50 camping sites. The site is owned by LINZ but managed by Mackenzie District Council. Camping on the site is free but limited to three nights per stay. Camping grounds managed by Mackenzie District Council operate in accordance with their Responsible Camping Policy and the Responsible Freedom Camping Bylaw 2023.

Figure 14 Site map of The Pine Camping Ground with camping areas highlighted (Mackenzie District Council, 2025)

5.8 Summary of tourism and recreation facilities

The scenery surrounding Lake Pūkaki is world renowned. Mount Cook Road (SH80) located along the western edge of Lake Pūkaki is identified as one of the most scenic drives in the world. The Conservation areas and various walking and cycling trails are a key attractor in the region. Lake Pūkaki is valued for its landscape, stunning scenery and the natural environment. The impact that the lowering of the lake level will have on these aspects has been considered in the Landscape Visual Assessment prepared by Goodfellow Group.

The A2O Cycle Trail and the Te Araroa Trail are in proximity to the construction compounds that are proposed to be established during works to install the rock armouring. Consideration has been given to how the construction works and ongoing trail access will be managed as described in the Engineering Structures Assessment prepared by GHD. This includes a combination of trail diversions and shared use with traffic management plan controls.

The Lake Pūkaki car park will be closed during each period of construction, which is anticipated to be a minimum period of three weeks for each period of construction. This could occur over multiple years but is unlikely to occur every year. This has the potential to impact the visitor experience because of the temporary closure of amenities such as parking, the public toilets and visitor centre.

6. Policy context

This section provides an overview of the local policy of relevance to this SEIA.

6.1 Mackenzie District Council Policies

A comprehensive review of Mackenzie District Council's plans and strategies was conducted. The documents examined for this SEIA outline the council's future goals for development and growth in the district over the coming years. These goals encompass tourism, heritage, economic, and infrastructure development. Understanding these objectives offers valuable insights into the potential impacts of the project.

A brief description and purpose of each document has been provided in Table 11 and references to them have been made throughout this assessment.

Table 11 Summary of policies relevant to this SEIA

Policy	Detail and relevance to this SEIA
Mackenzie Spatial Plans 2021	The Mackenzie Spatial Plans provide a plan for each of the District's towns and settlements to determine the zoning that will support the management of growth and development infrastructure. Of most relevance to the Project is the spatial plan for Twizel. Challenges identified in the Plan include: • Improved housing choices with affordability and availability. • A town centre that meets everyone's needs • Enhancing and protecting the environment, landscapes and mana whenua values • Enhancing transport connectivity and mobility for all modes and users. The Plan supports growth in Twizel by providing the opportunity for residential infill. Commercial visitor accommodation is to be provided near the town centre and close to SH8.
Te Manahuna Ki Uta – Destination Mackenzie	This is the strategy to manage tourism within the Mackenzie District. The document sets the vision "*Te Manahuna's wonder and treasures are restored, protected and thriving – to be loved and valued while sustaining us, our visitors, and those who come after us.*" One of the Tier 1 Projects identified within the strategy is to create a hydro tourism experience. The document identifies the potential to leverage the Meridian and Genesis sites for hydro tourism experiences. These could include self-drive tours to the various hydro facilities, online information along with profiling sites of significance or the creation of a drive or cycle trail to visit sites around the hydro lakes and linked waterways. The action in the strategy is to identify experiences that showcase the importance of the two major hydro generating companies and leverage these for unique tourism experiences to better understand the hydro story. Other actions in the strategy relevant to this project include: – Development of view corridors & parking bays to Aoraki/Mount Cook. – Additional public toilet facilities throughout Te Manahuna. – Improved highway signage to Twizel. – Improved pedestrian connectivity & walkability
Economic Development Strategy 2021-2025	This strategy sets out the criteria that Council used to guide decision making relating to the District's economic and business sector development. One of the economic development priorities within the plan is with renewable energy and focussing on globally innovative solutions to solve local problems. Although there are many

	advances in the renewable energy industry, the hydro scheme is a significant contributor to New Zealand's energy supply. This is recognised in the strategy with the action to build on the District's renewable hydro energy heritage to attract new renewable energy projects. The project aligns to these objectives in the Economic Development Strategy.
Waitaki Iwi Management Plan 2019	This Plan describes the values of the Te Papatipu Rūnaka (Te Rūnanga o Arowhenua, Te Rūnanga o Waihao and Te Rūnanga o Moeraki) in relation to the Waitaki River and the wider catchment that provides a life source to the river (Aoraki/Mount Cook to the sea). The Plan identifies the issue of the Waitaki River being a waterway of national importance for hydroelectric generation and irrigation, expressing concerns that mana whenua interested in the rivers and its tributaries are marginalised. It recommends that policy provide for Kā Rūnaka partnership in planning and decision making on freshwater management to ensure that iwi interests are represented in areas including the establishment of the operation range for the hydroelectric lakes. Concern is also raised in the Plan that hydrological alteration of Lake Pūkaki has altered its natural character. The Plan includes a policy to oppose further hydrological alteration of Lake Pūkaki where it would have adverse effects on the mana whenua cultural reference condition of these lakes. One of the actions of the plan is to negotiate with the hydro generation companies to seek further improvements to eel migration as well as making sure mana whenua Mahika kai interests are progressed. It is important in seeking approval for any change in the operating range of the lakes, that consultation be undertaken with mana whenua. A cultural impact assessment should be prepared to understand if there are any impacts on the mana whenua cultural reference conditions.

6.2 Summary of the statutory and policy context

The WPS is nationally and regionally significant, playing a critical role in the electricity system and economy. The scheme is part of the history of the area, particularly given its connection to the town of Twizel. The Mackenzie District Council policy documents acknowledge the contribution that the hydro system has made to the region and recognise its role in its future, suggesting opportunities for the creation of a hydro tourism experience. The policy documents provide guidance to mitigate adverse impacts to tourism, this includes the provision of public toilet facilities and wayfinding signage. Consideration to matters raised in the Waitaki Iwi Management Plan regarding the cultural impact of lowering levels within Lake Pūkaki is outlined in the Substantive Application dated October 2025.

7. Consultation

Meridian has consulted with key stakeholders, as outlined in Section 2.3, to understand potential concerns or impacts of the proposal. The following presents an overview of feedback and/or concerns raised by stakeholders during these meetings:

– Potential impacts to fauna within Lake Pūkaki, this includes the potential loss of both upstream and downstream migration for sockeye in several tributaries.
– Peak season for cyclists is November to February. Winter is the least busy time of year, and this is the preferred and most likely period for works to occur.
– The trail around The Pines campground / toilet facility has recently shifted closer to the lake and the trail map on the A2O website is not up to date.
– Re-routing sections of the A2O trail onto the highway is not an option due to safety concerns. There is a safe crossing point over the highway located near the carpark entrance.
– Management of cyclists through work areas could include stop/go or temporary traffic lights and the use of temporary signs to inform cyclists of any detours.

Feedback from NZTA during consultation included the following advice:

- If a short worksite, you can ask cyclists to dismount and workers / spotters can escort them past the worksite (i.e. halt truck movements to allow peds to pass).
- If a longer length of trail is impacted you could provide crossing points or provide a temporary cycle lane on the carriageway cone separated from traffic.

Meridian, during the consultation with A2O and Te Araroa Trail, committed to the following:

– Before work starting, Meridian and the contractor will develop a safe re-routing plan for cyclists and walkers.
– Meridian will consult with the manager of the A2O trail and the Trail Manager for Te Araroa Trail to ensure re-routing and/or traffic management is acceptable.
– Ensure any change to the route is well communicated on the A2O website, the Te Araroa Trail App, and with signage.

In addition, with regard to the MCAS shop, this facility is located on land owned by Meridian. Mackenzie District Council has a Licence to Occupy the land and MCAS has a sub-lease for the shop. The Agreements include an understanding that these facilities will need to vacate during construction works. Meridian is continuously monitoring lakes levels and inflow forecasts and will notify MDC and MCAS as early as possible if it is looking likely that construction works will begin and the carpark will require closing. Meridian will work with MCAS to help find an appropriate alternative site and will support the MCAS shop and Punatahu Visitor Centre in communicating any change to operating location to the community.

8. Review of technical studies

A review was undertaken of relevant technical reports that have been prepared as part of the resource consent application, to provide a technical base and understanding about the socio-economic impacts of the project. This is because the project involves a variety of environmental effects, some of which have social and economic consequences. However, separate and specific technical assessments have been completed for these environmental effects, and it is acknowledged that the relevant specialists have considered the social consequences relevant to their discipline. The findings, recommendations and mitigation measures presented in those technical assessments are therefore referred to and relied on, as relevant, for this SEIA. The following section provides an overview of findings from this review.

Table 12 Summary of technical assessments and relevance to SEIA

Technical assessment	Information of relevance to SEIA
Ecology Impact Assessment prepared by Tonkin and Taylor and dated August 2025	Recreation activities such as bird watching, hunting and fishing, rely on a healthy ecosystem. A review of the Ecology Impact Assessment was undertaken to understand whether the lowering of the lake and the rock armouring works would have any impacts on flora and fauna that would impact these recreation activities. Key findings of relevance to this SEIA include: – There will be no net loss of indigenous biodiversity or indigenous biodiversity values because of the proposed activities. – The lowering of the lake levels will result in 'no change' of impact on other tributaries such as the Tasman River and the alpine and hill fed tributaries and their associated fauna. – The lowering of the lake levels will have a low level of effect on fish passage. The assessment concluded that with the implementation of proposed management measures such as the preparation a Lizard Management Plan, that the proposal is not expected to result in significant adverse ecological effects.
Air quality assessment – Lake Shore Wind Erosion prepared by GHD October 2025	Visitors to the region have an expectation for good air quality particularly if they are hiking or cycling through the area, although dust storms do currently occur in certain areas during high wind events and dry conditions. The various businesses surrounding the Lake including agriculture as well as accommodation providers (including campgrounds) may have concerns regarding potential increase of dust in the atmosphere caused by lowering of the lake levels. The purpose of this air quality assessment was to assess dust generated by wind erosion from a greater amount of exposed lake shore surface due to the lowering of the lake level. The report found that while there may be a small increase in dust potential, given the short duration of the proposed lowering, any effects on receptors at the southern end of the lake will be minimal. Furthermore, the assessment notes that active dust suppression is not practicable for newly exposed shoreline and Tasman/river delta areas. All of the impacts identified were during the periods that the lake levels are lowered and are not anticipated to be for an extended period of time. Overall, the assessment indicated that there are unlikely to be any adverse effects on people or the environment. Although there is a likelihood of increased potential for dust events, it is anticipated that this would impact areas along the lake and near the delta which is away from any sensitive receivers.
Air quality assessment – Rip Rap Placement prepared by GHD October 2025	This air quality assessment provides a specific assessment of air quality during installation of the rock armouring at the Pūkaki High Dam. Dust impacts will only occur during the construction periods which will be a few weeks in duration, over several years. During construction periods it is anticipated that: – Without mitigation there could be dust impacts to areas that the public can access in and around the works on the left abutment. – Only the Pines freedom camping area immediately to the north of the left abutment construction zone) has been identified as having the potential to exceed a health-based criteria. However, the short duration of the rock armouring works means dust may not be detectable if it is managed well and dust deposition observations are enacted. If health effects are appropriately managed and mitigated, the amenity effects associated with dust will also be managed and effects are expected to be low. One of the mitigations of most significance from a social perspective is the recommendation to consider the temporary closure of The Pines Camping Ground. This would be to avoid potential health impacts from the dust generated during construction activity. If a closure is required, then

	this will have potential recreation, and livelihood impacts as discussed in chapter 9. Other mitigations proposed in the report include: – During construction works, a water truck for the spraying of water on haul roads is recommended. – Speed limits for vehicles – Complaint response procedures.
Landscape Assessment prepared by Goodfellow Group, April 2025	The scenery across Lake Pūkaki towards Aoraki/Mount Cook is a significant tourist attraction. Any potential change to the environment that could impact the visual aspect of the Lake should be considered, particularly if it would in turn adversely affect the tourism experience. The Landscape Assessment analysed the potential change to landscape values as a consequence of the rock armouring and lowering of the lake levels. The study found that: – For SH8 road users, the rock armoured dam slopes which descend below the level of the road, are a relatively minor element in the overall landscape alongside the expanse of Lake Pūkaki and surrounding tussock hills and mountains, including Aoraki/Mount Cook. – Although the dam slopes 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 slopes are expected to be generally perceived as an acceptable part of the road and surrounding hydroelectric infrastructure. – It is considered that no adverse effects will result from the lower lake level (possibly neutral or negligible) and the associated changes to the shoreline are expected to be perceived as a normal and temporary occurrence given the existing pattern of fluctuations in water level. – Installing the rock armouring will require a series of temporary construction benches and groynes to be built as working platforms for construction plant. On completion, these structures will be removed, and no permanent landscape effects are expected to occur from these temporary measures. Overall, it is considered that any landscape effects associated with the lower lake level and rock armouring will be an acceptable and appropriate change to the operation of the existing hydroelectric power scheme and will be consistent with the lake's landscape character as a 'working lake'.
Engineering Structures Assessment, GHD, October 2025	This report provides a summary of potential impacts on existing lake structures when the lake levels are lowered. Of interest to this SEIA are the anticipated impacts to the A2O cycle trail and the Te Araroa Trail that cross the Lake Pūkaki dam adjacent to State Highway 8 and pass through the area of proposed works associated with rip-rap placement on the upstream face of the dam. The report also investigates impacts to SH8 which is a major transport route through the area and has the potential to impact how people move through the area. For the A2O and the Te Araroa Trail, the report confirms that the approach is to maintain the existing route with appropriate traffic management controls. During periods of construction work there will be a need to reroute the A2O and Te Araroa Trail however, the temporary route will interface with construction traffic. This route will be closed to all other than A2O, Te Araroa Trail and construction traffic. The report also makes a series of recommendations to be included in a Traffic Management Plan so that the safety and efficiency of the transport network is maintained. A Corridor Access Request is also required to remediate any damage to the sealed highway. This will include highway surface inspections before and after a period of construction activity.

9. Socio-economic impact assessment

There are two components to the Project. The first relates to the lowering of lake levels when required during winter and early spring over the next three years. The second relates to the permanent installation of rock armouring at Pūkaki Dam to ensure the structure's resilience to wave erosion when operating the lake at lower levels (below 518.0 m RL). The two components of the application are anticipated to have different socio-economic impacts, relating to the type of impact and the potential duration. They have been assessed separately in this chapter so that mitigation methods can be tailored to the specific element of the project.

The following key themes have been identified for potential impacts, they have been developed following an analysis of the of the project, supporting technical studies and community and recreation. The key themes are:

Access and connectivity - Changes to how people move about an area for personal (including recreational) or business purposes. Changes to access can impact people's way of life, their access to and use of community services, community and recreational facilities and social networks.

Amenity and character - Changes to amenity can impact people's way of life, and what people value about their community. This includes the impact to tourist features that attract visitors to the area.

Recreation impact - Access and level of provision of recreation facilities. It also relates to the qualities and characteristics of an area that contribute to people's appreciation of its recreational function, pleasantness, and sense of place i.e. those factors which make recreation activities valuable or desirable. It also includes the infrastructure that supports recreation activities.

The environment - The impact that the proposal could have on the environment including impacts to the quality of the air, water and noise. This category also considers potential impacts to the flora and fauna which are valued by the community.

Livelihood - Impacts on the local and regional economy, including business development and employment. This includes how local businesses may be impacted by the proposal.

9.1 Lowering of the lake levels

The proposal is to temporarily operate Lake Pūkaki below the current normal minimum level of 518.0 m RL. This operational adjustment is proposed for a defined period of three years, concluding at the end of 2028. From a social perspective, Lake Pūkaki is valued for its landscape, stunning scenery and the natural environment. Investigations into the potential impact of the lowering of the lake level have considered the impact this will have on the visual environment and natural environment including flora and fauna, and the potential consequential impacts on the visitor experience.

The following sections provide an overview of the anticipated social and economic impacts from the lake lowering, acknowledging that this is anticipated to occur only in Winter and early spring.

9.1.1 Access and connectivity

Lowering of the lake levels will have no impact on access and connectivity within the Lake Pūkaki area. There is no physical change to the environment outside the boundary of the lake. Access to the lake for fishing is by shore access from State Highway 8. The change in lake levels is not anticipated to impact this – access will be maintained.

9.1.2 Amenity and character

Lake Pūkaki is an important gateway to Aoraki Mount Cook National Park. Aoraki Mount Cook provides a scenic background to the lake and is a major tourist attraction. Mount Cook Road, State Highway 80 runs along the western side of the lake's edge. It is considered one of the most scenic drives in New Zealand because of the panoramic views of the lake and the Southern Alps. From a SEIA perspective, the assessment has considered whether the visual aspect of the lake will be impacted by the proposed reduction in lake levels.

The landscape assessment, in considering this potential impact, acknowledges the existing fluctuations in water level. It states that the change in lake levels will most likely be perceived as a "normal and temporary occurrence". Lowering of the lake levels will be seasonal, typically occurring over the winter period, and not for extended periods of time. The lower lake levels will occur when tourism levels are relatively low, as indicated by Figure 8.

In addition to its role as a tourist attraction, Lake Pūkaki is New Zealand's largest hydro storage lake and part of the WPS. Infrastructure surrounding the lake supports this function and lowering of the lake level may expose this other supporting infrastructure. The landscape assessment does not view this as an adverse impact but accepts it as consistent with the Lake's character as 'working lake'.

The lowering of the lake levels is therefore assessed by this SEIA as **Neutral**. Although there will be changes to the visual aspect of the lake, the conclusions of the landscape assessment are accepted – this is likely to be perceived as normal due to existing/current level fluctuations and consistent with the hydro storage function of the lake.

9.1.3 Recreation

Lake Pūkaki provides for a range of recreational activities that depend on a healthy ecosystem including bird watching, hunting and fishing, as outlined in section 5. In addition, the ability of the lake and surrounding rivers to support Mahika kai is of interest to iwi as outlined in the Waitaki Iwi Management Plan 2019. The Ecology Assessment undertaken for the project considers the impact of the lowering of the lake level on flora and fauna.

The findings from the Ecology Assessment are of broad interest to this SEIA including that:

- There will be no net loss of indigenous biodiversity or indigenous biodiversity values because of the proposed activities. This indicates Mahika Kai opportunities in and around the lake will be maintained.
- The lowering of the lake levels will have 'no change' in impact on other tributaries such as the Tasman River and the alpine and hill fed tributaries and their associated fauna. This indicates wildlife in and surrounding the lake will be maintained.
- The lowering of the lake levels will have a low level of effect on fish passage. This indicates that fish populations in the lake will be maintained.

Overall, the potential impact to recreational activities is assessed as **Neutral**. Consultation with Iwi is being undertaken to understand effects from a cultural perspective.

9.1.4 Environment

Visitors to the region have an expectation for good air quality particularly if they are camping, hiking or cycling through the area. Lowering of the lake levels has the potential to create an increase in dust events due to a greater amount of lake shore surface being exposed to wind erosion. This has the potential to cause health impacts as well as a nuisance effect for those in proximity to the lake.

The Air Quality Assessment has investigated the potential for dust generation during periods of lower lake levels. The assessment found that the lowering of lake levels will increase the dust generation potential during windy conditions. However, the impacts are mostly concentrated to the northern end of the lake which is away from the majority of identified sensitive receptors. The assessment concludes that there will be negligible difference in effect between what is enabled under the existing framework and what is proposed.

Overall, dust impacts would only occur during the periods that the lake level is lowered which is expected to be infrequent and for short duration, thus limiting the potential for a change in effect from existing. This impact is therefore assessed by the SEIA as **Slight Negative**.

9.1.5 Livelihood

A key objective of the project is to increase the resilience of electricity provision in order to provide certainty with pricing. This will have a positive economic impact at a regional and national level. This SEIA has not investigated these economic benefits in detail as it is covered in other work undertaken by Meridian.

This SEIA has investigated the potential impacts that the lowering of the lake levels could have on livelihood particularly regarding impacts on local businesses. Chapter 5, and in particular sections 5.6 and 5.7 have identified tourism businesses that have the potential to be impacted by changes in the environment and amenity of Lake Pūkaki. These businesses thrive from tourists visiting the area and adverse changes to the tourism experience have the potential to reduce the number of tourists visiting which would reduce the amount of money spent within the region.

Tourist activities within the region are predominantly recreation. The lowering of the lake level will not impact on recreation activities such as fishing, bird watching or hunting. The amenity of the lake, that is enjoyed by hikers and cyclists using the trails will also not be impacted. Section 9.1.2 has assessed the potential impact of the lowering of the lake levels on the amenity and character of the area. Given that the lowering of the lake levels will typically occur during the 'quiet season' that is the months when visitor numbers to the region are at the lowest, it is anticipated that there will be no impact on the number of tourists and their spend. The impact on livelihood is determined to be **Neutral**.

9.2 Rock armouring at Pūkaki Dam

Installation of the rock armouring is required to protect the Pūkaki Dam against wave erosion when the lake is operated at the lower levels (below 518.0 m RL). The proposal is to install additional rip-rap on the upstream face of the Pūkaki dam and its left and right abutments as illustrated in Figure 1.

Construction of the riprap can only be undertaken when the lake level is lowered to below 518.0 m RL. Historical data has indicated that low lake levels at Lake Pūkaki most frequently occur during mid to late winter and early spring. It is anticipated that the work will need to be undertaken over multiple years when the lake is at a suitable level. Each construction period is anticipated to be a minimum of three weeks.

Two work zones will be established during each construction period. Construction of the dam and right abutment will be from a work zone established in the Lake Pūkaki Car Park. This car park will be closed and there will be no access to the public toilet or waste facilities. The MCAS Shop will be temporarily relocated, although a location is yet to be determined.

The work zone for the left abutment will use part of the Lake Pūkaki Reserve. The southern entrance to the carpark will be closed with access to the Pines freedom camping area available through the northern entrance. The camping ground will be able to remain open although with some reduction in area. The toilets located within the camping ground will remain open for use. Trail diversions will be required to provide a safe pathway of travel for the A2O Cycle Trail and the Te Araroa Trail.

9.2.1 Access and connectivity

Construction of the rock armouring and the establishment of the work zones will not require any change in the road network. Vehicles travelling through the area will be able to continue their travel uninterrupted. Changes to access will relate to the closure of the Lake Pūkaki Car Park, and closure of the southern entrance to the Lake Pūkaki Reserve car park. Both of these car parking areas are located off the State Highway.

The Lake Pūkaki Car Park is a popular roadside rest stop enabling visitors to take pictures of the lake and make use of the amenities including the toilet, rubbish bins, information centre and the MCAS Shop. The exact number of parking spaces in the car park is not known; however it is a large space designed to accommodate a steady flow of tourists. In addition to cars and campervans, the car park can accommodate tour buses. The car park is used by multiple guided tours and shuttle buses as a scheduled stop on their itinerary.

The car park will be closed during each stage of construction which is anticipated to be when the lake levels are at their lowest which is typically during mid to late winter and early spring. This timing is outside of the tourism peak season.

There are other roadside rest stops available for tourists to park and take photos of the lake. These include areas of the Lake Pūkaki Reserve that will remain open, with access only from the northern entrance. Other roadside rest stops include Lake Pūkaki View Point Car Park, Lake Pūkaki Beach Look out and other designated rest stops along SH 80. Signage should be installed at the Lake Pūkaki Car Park with directions to the northern entrance of the Lake Pūkaki Reserve as this is the closest car park with a view of the lake that will remain open during each construction period. Information about the temporary car park closure should be placed on websites including Mackenzie District Council and Department of Conservation. An email should also be sent to tourism operators so that they can amend their itinerary accordingly.

Outside of the construction periods, the work zones will be removed and both car parks (Lake Pūkaki Car Park and Lake Pūkaki Reserve) will return to their regular usage. Given the temporary nature of this impact and that it will typically occur during the tourism off-season, the impact associated with the loss of access is assessed by this SEIA as **Slight Negative**. There will be no impact to access and connectivity once construction is complete.

9.2.2 Amenity and character

The Lake Pūkaki Car Park and the Lake Pūkaki Reserve are popular rest areas for tourists and visitors. The sites are used by motorists as well as hikers and bike riders. Both sites are located on the A2O Cycle and the Te Araroa Trail. Lake Pūkaki Reserve is also the site of The Pines campground, a popular freedom camping site that is managed by Mackenzie District Council.

The Lake Pūkaki Car Park includes the MCAS shop, Punatahu Visitor Centre and Lake Pūkaki Car Park public toilets. The car park also has waste bins. Visitors to the car park use the amenities to have a meal, obtain information about the area, take photos of the lake and use the bathroom facilities. Closure of this car park will impact access to these facilities. In 2024, when lake levels were low, and it looked likely that Meridian would need to start armouring the dam, MCAS were actively exploring relocation plans to allow them to continue shop operations while rock armouring works were being undertaken. As detailed in Section 7, Meridian will endeavour to give as much notice as possible if it is looking likely that rock armouring works will commence and relocation of facilities is required.

The toilets within the Lake Pūkaki Reserve will remain in operation, these are the closest public toilets to the Lake Pūkaki Car Park. It is recommended that signage be provided at the Lake Pūkaki Car Park to redirect visitors to these facilities.

The Lake Pūkaki Reserve also includes a designated Nohoanga site. Meridian have confirmed that the construction compound will be located away from this area to avoid any potential impacts. Ngāi Tahu Whānui will still have exclusive rights to occupy the site for up to 30 days between 16 August and 30 April each year, regardless of the construction works. Construction impacts will avoid this area as much as possible.

The construction compounds will only be required during the construction period which is anticipated to be a minimum of three weeks typically in mid to late winter and early spring. The peak season for cyclists and walkers on the A2O/AT trail is November to February with the most likely time scheduled for construction (winter/early-spring) being the least busy time of year, as illustrated in Figure . Therefore, it is expected there will be reduced demand on amenities in the area during the scheduled construction periods.

Although the construction compounds will be established during the quieter months for tourism, there is the risk that there will be increased pressure on other amenities such as toilets and waste facilities in the area. The Mackenzie Tourism survey, discussed in section 4.5, found that 99% of survey respondents had been adversely impacted by tourism in their local area. Recommendations were made to improve litter and waste management. The temporary closure of the Lake Pūkaki Car Park will decrease the availability of toilets and waste facilities. Visitors will be directed to use facilities in the Lake Pūkaki Reserve. Usage of these facilities during this period should be monitored to enable an appropriate level of cleaning. Consideration may need to be given for additional amenities such as a temporary toilet facility or additional waste bins if significant demand results in poor maintenance of the amenities or if visitors begin to soil or leave waste in the surrounding environment.

In addition to signage on site, notifications should be placed on the various trail websites including A2O, Te Araroa and Department of Conservation. This will enable visitors to plan their visit in advance of commencing their cycle or hike.

Once construction is completed the rock armouring will be considered part of the infrastructure that supports Lake Pūkaki as one of New Zealand's largest hydro storage lakes. As discussed in section 9.1.2, the landscape assessment does not expect this infrastructure to have an adverse impact on visual amenity and character as the rock armouring is consistent with the lake's existing character as a 'working lake'.

The SEIA has assessed the impact of the rock armouring, particularly during the construction phase, to be **Slight Negative.** This is due to the loss of access to amenity facilities within the Lake Pūkaki Car Park. Signage and website updates will need to be provided to direct visitors to alternate facilities. Additional cleaning of these facilities may be required.

9.2.3 Recreation

Surrounding Lake Pūkaki are walking and cycling trails as identified in section 5.1. There will be some impacts to the hiking and cycling experience during the installation of rock armouring. Facilities in the Lake Pūkaki car park will be temporarily unavailable. The impact on visitors has already been discussed in 9.2.2. To manage this impact, so that visitors can plan their visit accordingly, it is recommended that notifications be placed on the various trail websites including A2O, Te Araroa and Department of Conservation. The other impacts to recreation relate to how the construction activities will impact the various trails.

The establishment of the work zones and the movement of rip-rap from the project designated stockpiles to placement will impact the A2O and Te Araroa route in a number of locations, as illustrated in Figure 3. The proposed approach to mitigate this impact as outlined in the Engineering Structures Assessment prepared by GHD, October 2025, is as follows:

- To the extent possible, maintain the existing route with appropriate traffic management controls. Any proposed diversions will only be in place during the construction period. Outside of this period the route will not be impacted.
- In Area 1, as identified in Figure 3, the A2O/Te Araroa route currently traverses through the middle of the western stockpile. In discussion with A2O and Te Araroa Trail, a temporary route has been proposed that will circumvent the stockpile.
- In Area 2, the route currently goes through the middle of the eastern work zone and the temporary stockpile area. The recommended approach is to re-route the trail as shown on Figure 3, noting that this route will interface with construction traffic. This route will be closed to all traffic other than walkers, cyclists and construction traffic.
- Areas 2 and 3 will be impacted by relatively low traffic movements (likely 3 to 4 heavy trucks per hour plus light vehicle movements). It is recommended that this be managed through the Traffic Management Plan.

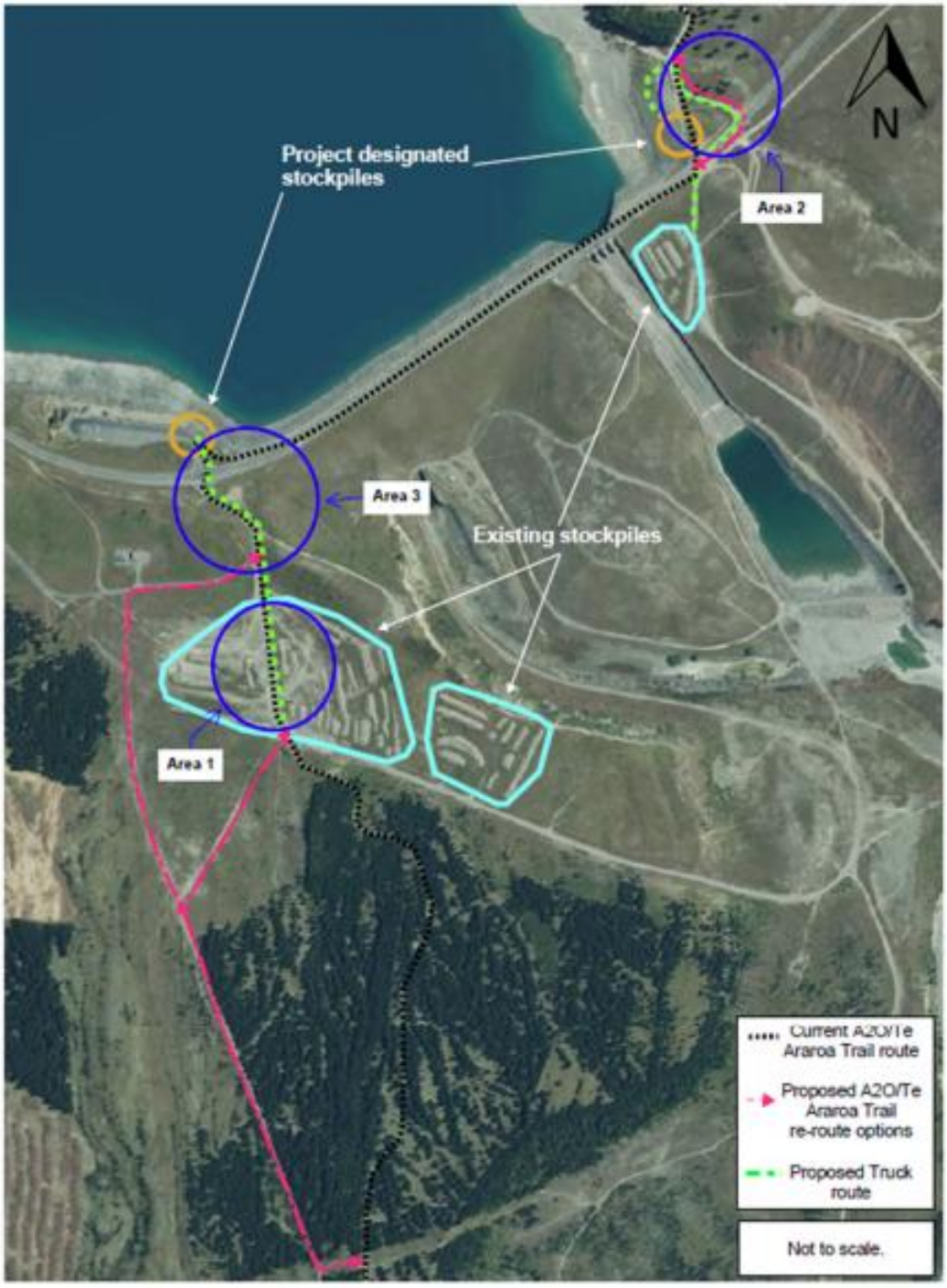


Figure 3 Construction Traffic Routes and Proposed Diversions for the A2O Trail

To minimise impacts to cyclists using Area 2 and hikers on the Te Araroa, it is recommended that notifications regarding the route diversions be made on the various trail websites including Alp2Ocean, Te Araroa and

Department of Conservation. Notifications should also be placed on the Mackenzie District Council website. An email should also be sent to cycle and hiking tourism operators.

There are some safety concerns with cyclists and pedestrians being in proximity to the construction compound and sharing routes. Safety management practices should be in place as part of a Traffic Management Plan and this should include stop/go or temporary traffic lights and the use of temporary signs to inform cyclists of any detours.

Vehicular access to the southern entrance of the Lake Pūkaki Reserve will be closed. Vehicles will still be able to access the site through the northern entrance. There is a roundabout inside the camping ground and this will enable vehicles to easily turn around to exit the site.

Dust impacts from installation of the rock armoury has the potential to impact The Pines freedom camping area, as discussed in 9.2.4. Regular observations will need to be undertaken to make sure that dust levels do not exceed health requirements. If dust levels do increase to this level, then consideration may need to be given to closing the campground during the construction periods. Facilities such as toilets will still be available for day use, however overnight camping if required would be unavailable. This is only for a minimum three-week period each year that work is required. The camping ground can accommodate 50 sites, however given this period is the off-peak tourism season, it is not anticipated to have that number of visitors during the construction period. Campers will be able to be accommodated in other nearby camping sites identified in section 5.7. These include the Twizel Holiday Park and Lake Wardell Free Campground that are not too far from the Lake Pūkaki Reserve. If such a closure is required, then notifications should be place on the Mackenzie District Council Camping website. This will enable visitors to plan their overnight stays in advance.

Figure 16 Alps2Ocean and Te Araroa Trail (blue) in relation to the Lake Pūkaki Camping Work Zone showing the extent of road closure and location of temporary fencing

Outside of the construction periods and once the rock armouring is in place, the construction compounds will be removed. Access to the trails will be reinstated and any restrictions within the camping grounds will be removed. It is therefore anticipated that there will be no adverse impacts once construction is complete. Overall given that construction is for a short duration and during the off-peak tourist season, the impacts to recreation activities is assessed as **Slight Negative.**

9.2.4 Environment

During construction activities, noise and dust may impact the amenity of the surrounding area. Given the absence of nearby sensitive noise receptors, a noise assessment has not been undertaken and is not considered necessary. Visitors to the area who have the potential to experience the noise will not typically stay in the area

long enough for it to be a significant nuisance. There are no other sensitive receivers in proximity to the construction compound that will be adversely impacted.

As previously noted, dust impacts will only occur during construction which is a few weeks in duration, likely over several years. According to the dust assessment, only the camping area immediately to the north of the left abutment construction zones has the potential to exceed the health-based criteria. Regular observations of dust at the camping ground will be undertaken, a temporary closure may be required if dust impacts exceed the health criteria. This closure would only be for the duration of the construction works. Campers will be able to be accommodated at other facilities in the region, as discussed in section 9.2.3. To reduce the impact of dust, the air quality assessment has made recommendations including the use of a water truck to spray water on haul roads and the placement of temporary stockpile spraying along the dam work zones if increased dust is observed.

This SEIA supports the recommendations made in the air quality report to mitigate the impacts of dust if required this includes water spraying of the haul roads and the temporary stockpile. Support is also given to observing dust impacts of the camping ground. Only if dust levels exceed the health-based criteria will a temporary closure be required. This SEIA has assessed the environmental impact as **Slight Negative** because the dust effects will have an impact on the environment.

9.2.5 Livelihood

The livelihood impacts relate to the business impacts associated predominantly with the construction period of the rock armouring. The short duration of construction (weeks), over a number of years will be disruptive particularly to the MCAS Shop.

The MCAS Shop is in the Lake Pūkaki Car Park. Aside from The Moraine Fine Dining Restaurant, it is the only food provider located on the lake. It is a popular food provider due to its location and the views it offers with the Lake and Aoraki Mount Cook in the background.

During the construction periods with the closure of the Lake Pūkaki Car Park, the MCAS shop will need to relocate. Although relocation will enable the business to continue operating during the construction period, there will still be disruption to business particularly as relocation will need to occur every time construction occurs. In addition, the location identified may not have the same views or aspect as the current location which could decrease the number of clienteles.

If dust impacts are significant then there may need to be a temporary closure of The Pines Camping Ground during the construction period. The Pines Camping Ground is a freedom camping site on crown land and operated by Lake Mackenzie District Council. There is no direct economic impact as Council does not charge for this facility. There are potential secondary impacts with visitors not spending money locally because they are not staying in the area. However, it is anticipated visitors will stay nearby so the impact to the local economy, particularly in Twizel will be minimal.

Overall, the assessment for livelihood is assessed as **Slight Negative**. Meridian will support MCAS to identify a suitable site for the temporary relocation prior to the commencement of each construction period.

10. Conclusion

Meridian is seeking approval under the Fast-track Approvals Act 2024 to temporarily ease access restrictions on Lake Pūkaki contingent storage, allowing it to operate between 518.0 m RL and 513.0 m RL for the next three years, without SSA or OCC triggers. Additionally, Meridian is seeking approval to permanently install rock armouring at Pūkaki Dam to ensure the structure's resilience to wave erosion when operating the lake at lower levels (below 518.0 m RL).

The rock amour work can only be undertaken when the lake is lowered to below 518.0 m RL. This is most likely to occur during mid to late winter and early spring, and only for a number of weeks. Consequently, to undertake the work, construction needs to be staged over a number of years with each construction period being a minimum of three weeks. To support the construction, two work zones will be established. The first in the Lake Pūkaki Car Park requiring its closure preventing access to facilities in the car park including the MCAS shop, Punatahu Visitor Centre and Lake Pūkaki Car Park public toilets. The second work zone will be located in the Lake Pūkaki reserve.

Lake Pūkaki and its surrounds is a popular tourist destination. The population predominantly lives in the town of Twizel, however there are significant fluctuations during peak tourist season in the summer months and off peak season in the winter months. The local economy capitalises on the tourism industry through the provision of hospitality and retail businesses. The Conservation areas and various walking and cycling trails are a key attractor in the region.

This SEIA, in assessing the impacts of the lowering of the lake levels and the installation of the rock armouring, has considered how the proposal will impact the activities surrounding the lake, particularly the recreation and tourist activities, what visitors value about the area and consequential economic effects on livelihood.

This SEIA has determined that the lowering of the lake levels has a **neutral** socio-economic impact. The only category where there is a slight potential for an adverse impact relates to the environment. The air quality assessment determined that the lowering of lake levels will increase the dust potential for wind and dust storm events, however impacts are most concentrated to the northern end of the lake which is away from majority of identified sensitive receivers.

There are adverse social impacts associated with the installation of the rock armouring. These impacts relate predominantly to the establishment of the work zones in the Lake Pūkaki Car Park and Lake Pūkaki reserve. Adverse effects include:

- Business disruption particularly for the MCAS shop which will need to be relocated sporadically for a number of weeks over a number of years, during construction periods for the rock armouring.
- Vehicles restricted from accessing the Lake Pūkaki Car Park (which will be closed) during rock armouring construction periods.
- Loss of public amenities associated with closure of Lake Pūkaki Car Park during rock armouring construction periods, resulting in inconvenience and potential litter and waste and cleanliness issues at other facilities.
- Safety of cyclists and pedestrians travelling around the Lake Pūkaki Car Park construction compound during rock armouring construction periods associated with construction traffic and potential for conflicts between construction vehicles and recreational trail users.
- Temporary diversion of the A2O and Te Araroa Trail during rock armouring construction periods.
- Dust impacts may require monitoring. If they exceed health requirements then a potential temporary closure of The Pines freedom camping area may be required during the construction periods. This will occur in consultation with MDC.

To mitigate these adverse impacts, it is recommended that the following be implemented:

- Consultation with MCAS to identify suitable temporary location.
- Signage provided at road closure points to direct vehicles to the northern entrance of the Lake Pūkaki Reserve which is the nearest carpark.
- Information about the temporary car park closures, relocation of MCAS and location of public amenities should be placed on websites including Mackenzie District Council, Department of Conservation. An email should also be sent to tourism operators so that they can amend their itinerary accordingly.
- Usage of public amenities such as toilets and waste facilities should be monitored to enable an appropriate level of cleaning. Consideration may need to be given for additional amenities such as a temporary toilet facility or additional waste bins if significant demand results in poor maintenance of amenities or visitors begin to soil or leave waste in the surrounding environment
- Consultation with A2O and Te Araroa to understand when route diversions will be required. Notifications of the change in route should be made on the various trail websites including A2O, Te Araroa and Department of Conservation. Notifications should also be placed on the Mackenzie District Council. An email should also be sent to cycle and hiking tourism operators.

With these mitigations in place the installation of the rock armoury is considered to have a **Slight Negative** impact. Once installed the rock armoury is considered to have a **Neutral impact.**

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Appendices

Appendix A

Impact assessment table

SEIA Theme	Impact	Project component(s)	Area of influence	Timing and duration	Consequence	Likelihood	Mitigation	Impact rating (post mitigation)
Amenity and character	Change to the visual aspect of the lake detracting from its natural beauty – associated with exposure of a greater amount of lake shore surface, and rock armouring, during times of lower lake levels.	Lower lake level Rock armouring	Local	Short	Insignificant	Possible	N/A	Neutral
Environment	Dust generated by greater area of exposed lake shore surface during times of lower lake levels, resulting in adverse amenity impacts including reduced visibility during a dust storm event or having a 'nuisance effect' due to residue left on personal property.	Lower lake level	Local	Short	Insignificant	Likely	N/A	Slight negative
Recreation	Dust impact to the Pines freedom camping site in Lake Pūkaki Reserve could require a temporary closure of the camping grounds during the construction period.	Rock armouring	Local	Short	Minor	Likely	Ongoing observations of dust on the camping ground. Only if dust cannot be managed will a closure be required.	Slight negative
Livelihood	Decrease in number of tourists and the amount of money spent on tourism in the area – associated with adverse changes to the tourism experience e.g. availability and accessibility of tourism activities, tourist accommodation.	Lower lake level	Local	Short	Insignificant	Unlikely	N/A	Neutral
		Rock armouring	Local	Short	Insignificant	Unlikely	Consultation with MCAS and Visitor Centre. Relocate MCAS and Visitor Centre Signage, updates to websites and apps to direct tourists to the right place.	Neutral
Livelihood	Business disruption particularly for the MCAS Shop which will need to be relocated sporadically for a number of weeksover a number of years, during construction periods for the rock armouring.	Rock armouring	Local	Short		Likely	Consultation with MCAS Relocate MCAS Signage, updates to websites and apps to direct tourists to the right place.	Slight negative
Access and connectivity	Nil	Lower lake level	-	-	-	-	-	Nil
	Vehicles restricted from accessing the Lake Pūkaki Car Park (which will be closed) during rock armouring construction periods. Car park at Lake Pūkaki Reserve will remain open but the southern entrance will be closed (access only from northern entrance with turn around point provided).	Rock armouring	Local	Short	Minor	Likely	Signage provided at road closure points to direct vehicles to the northern entrance of the Lake Pūkaki Reserve which is the nearest carpark. Information about the temporary car park closure should be placed on websites including Mackenzie District Council and Department of Conservation. An email should also be sent to tourism operators so that they can amend their itinerary accordingly.	Slight negative

Amenity and character	Loss of public amenities associated with closure of Lake Pūkaki Car Park during rock armouring construction periods, resulting in inconvenience and potential litter and waste and cleanliness issues at other facilities.	Rock armouring	Local	Short	Minor	Likely	Signage provided at the Lake Pūkaki Car Park, updates to websites and apps (including those associated with recreation activities) to advise of the closest alternative amenities in the Lake Pūkaki Reserve. Usage of alternative facilities should be monitored to enable an appropriate level of cleaning. Consideration may need to be given for additional amenities such as a temporary toilet facility or additional waste bins if significant demand results in poor maintenance of amenities or visitors begin to soil or leave waste in the surrounding environment.	Slight negative
Recreation	Loss of public amenities associated with closure of Lake Pūkaki Car Park during rock armouring construction periods, resulting in litter and waste and cleanliness issues at other facilities.	Rock armouring	Local	Short	Minor	Likely	As above	Slight negative
Recreation	Safety of cyclists and pedestrians travelling around the Lake Pūkaki Car Park construction compound during rock armouring construction periods associated with construction traffic and potential for conflicts between construction vehicles and recreational trail users.	Rock armouring	Local	Short	Minor	Possible	Incorporate measures into Construction Traffic Management Plan e.g. contractors to be briefed to look for cyclists and pedestrians, safety controls around the work zones to include signage and fencing/hoardings.	Slight negative
Recreation	Temporary diversion of A2Oand Te Araroa Trails around the Lake Pūkaki Reserve construction compound during rock armouring construction periods – potential to result in reduced safety and disorientation if suitable alternative route not provided.	Rock armouring	Local	Short	Minor	Likely	Consultation with Alps2Ocean and Te Araroa to identify a suitable route diversion. Signage, updates to websites and apps to direct tourists in the right direction.	Slight negative
Environment	Noise associated with construction.	Rock armouring	Local	Short	Insigificant	Unlikely	N/A	Neutral
Environment	Dust impacts associated with construction creates health impacts	Rock armouring	Local	Short	Moderate	Likely	Ongoing observations of dust effects on The Pines freedom camping site if dust exceeds health standards then a temporary closure may be required.	Slight negative

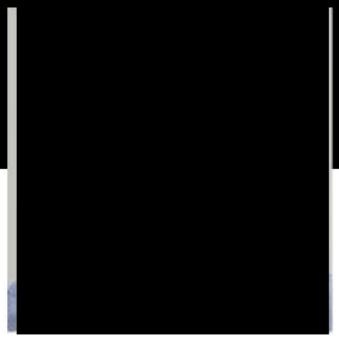
Appendix B

CV – Alex Jepsen

A GHD Associate

Alex Jepsen

Social Impact Assessment



Location
Auckland, New Zealand

Experience
18 years

Qualifications/Accreditations
- Master of Legal Studies (Environmental Law) (Hons), 2013
- Bachelor of Planning (Hons), 2007
- New Zealand Diploma in Te Reo Māori (Level 5), 2024

Key technical skills
- Social Impact Assessment
- Stakeholder Engagement
- Resource Consent and AEE Preparation
- Environment Court expert
- Project Management
- Team management

Memberships
- MNZPI
- RMLA
- NZPI Auckland/Northland Branch Chair

Relevant experience summary

Alex's experience has focussed on preparing environmental assessments, statutory planning approvals and expert planning evidence for a range of major infrastructure projects. Alex also has experience in social impact assessment and community engagement. She has a comprehensive knowledge and understanding of the Resource Management Act, the Fast-track Approvals Act, the International Association for Impact Assessment (IAIA) principles for Social Impact Assessment and NZTA's Social impact guide. Alex is skilled in the evaluation of projects and interventions in terms of their effects on the social environment. She is able to draw on the outcomes of consultation, and her experience of assessing how projects and interventions can affect populations, to develop mitigation and management strategies.

Experience demonstrating capability

Manawatu Gorge Detailed Business Case

NZ Transport Agency | Manawatu | 2017
Social Impact Specialist

GHD completed a Detailed Business Case for an alternative route to State Highway 3 through the Manawatu Gorge. Alex was involved in the assessment of alternative options, using multi-criteria analysis, from a social (including businesses) impact perspective. Her findings were that the Manawatu Gorge closure affected the accessibility between Palmerston North (the key employment and social service centre for the region) and surrounding towns/districts such as Ashhurst and Woodville. It affected the way people travel, their frequency of travel and the duration of travel – consequently affecting the way they go about their day-to-day lives. Reinstating a safe an efficient alternative route, as soon as possible, was therefore a key anticipated outcome. For Woodville in particular, a key concern was that some of the options would result in a bypass effect and negative impacts on businesses in Woodville. Modelling was done and indicated that travel patterns through Woodville would remain the same as the current situation. However, from a social perspective a recommendation was made to work with the community to implement mitigation strategies to continue to encourage through-traffic and patronage to businesses in the town.

Petone to Grenada Link Road

NZ Transport Agency | Wellington | 2015 – 2018
Social Impact Specialist

Alex participated in a series of MCA workshops for this project and prepared a preliminary social impact assessment as part of the assessment of alternatives report which evaluated more than 30 possible routes and identified one preferred alignment. The various options passed through or adjacent to a number of well-established residential communities. One of the main challenges was the location of several established and tight knit communities in the project area. A number of the alignment options went through one or other of these, affecting social connectedness and community character. As a result, active

engagement of the community and stakeholders was of paramount importance to this project and careful evaluation of options was critical to gaining community buy-in. This project demonstrated Alex's ability to draw on the outcomes of consultation from previous studies along with her experience of assessing how major developments may affect populations, groups, and settlements to provide robust assessment of the options against key social criteria.

Warkworth to Wellsford RONS

NZ Transport Agency | Auckland | 2017 – 2019
Social Impact Specialist

In the early stages of the project, Alex participated in multi-criteria analysis (MCA) workshops as a social impact specialist to assess project alternatives and enable confirmation of a preferred route. She then worked with the Lead Planner during the consenting phase to assess and articulate the social impacts and mitigation for the project in a concise chapter of the AEE.

AMETI Stage 1 & Stage 2

Auckland Transport | Auckland | 2010-2015
Senior Planner & Social Impact Specialist

The Auckland Manukau Eastern Transport Initiative (AMETI) is a group of projects that aims to give residents of Auckland's south-eastern suburbs improved transport choices, and better connect them to the rest of Auckland. Alex wore multiple hats on the AMETI project, including stakeholder and community engagement, social impact assessment and the preparation of the NORs, resource consents and supporting AEEs. From a social impact perspective, her work contributed to building up an understanding of the social and community impact of the AMETI project and her findings were used to inform project decision making relating to location, form and function, and the mitigation of effects.

Seapath

NZ Transport Agency | Auckland | 2015
Social Impact Specialist

This project involves a new combined pedestrian and cycle path adjacent to the SH1 Northern Motorway between the Auckland Harbour Bridge and Esmonde Road/Akoranga Drive. It aims to improve the current level of service (in terms of safety and efficiency) available to pedestrians and cyclists, hereby making these modes of transport more attractive and/or desirable and encouraging commuters to make a modal shift to free up capacity on SH1 and adjoining roads (reduced congestion). Alex prepared a preliminary social impact assessment for the options evaluation phase. Three alignment options were evaluated, and one was selected as the preferred alignment. The entry and exit points of the Seapath, in particular, were assessed as having the potential to affect adjacent communities – both positively and negatively. From this experience, Alex has a deeper appreciation of social impacts and perceptions of communities of proposed new interventions.

Auckland South Correctional Facility (Kohuora)

Department of Corrections | Auckland | 2010-2011
Social Impact Specialist

Alex assisted in preparing the social impact assessment for a proposed men's prison at Wiri (the Auckland South Correctional Facility). The assessment formed part of the supporting information for an Assessment of Environmental Effects and associated alteration to the designation for the Auckland Regional Women's Correctional Facility. The application was referred to an Environmental Protection Agency (EPA) Board of Inquiry (BOI) for decision. Alex played an integral role in the writing and review of evidence in chief, and rebuttal evidence, in relation to social impact. To inform the evidence, Alex undertook a comprehensive review and analysis of all specialist and community submissions to the BOI process; she collected and analysed demographic and statistical information; developed a survey to gather feedback from prisoners and prisoner families; and conducted interviews with Department staff and partner agencies.

In brief

The following work further demonstrates Alex's experience in social impact assessment. Alex has been the technical reviewer for social impact assessments undertaken for:

- Green Island Landfill
- RiverLink
- Bendigo Ophir Gold Project
- Lake Pūkaki Hydro storage and dam resilience works

In all cases Alex has worked closely with the lead author to understand the community profile, including reviewing demographic data and auditing social and recreation infrastructure; scope out potential impacts, drawing on case studies as relevant; verify these potential impacts through consultation and a review of relevant technical studies. She has then supported, challenged and tested the assessment of impacts and recommendations for mitigation, leading to robust conclusions.

Career history

2022 – present	GHD, Auckland, Business Group Leader – National Planning
2020 - 2022	GHD, Auckland, Technical Lead - Planning
2015 - 2021	GHD, Auckland, Senior Environmental Planner
2012 – 2015	Opus, Auckland, Senior Planner
2012	Sinclair Knight Merz, Auckland, Senior Planner
2007 - 2012	Opus, Auckland, Planner

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