Aukaha

Cultural Values Statement:

The Lake Onslow option for the New Zealand Battery project Phase 1B

Mō tātou, ā, mō kā uri a muri ake nei.

For us, and for our children after us.

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This report has been prepared by Aukaha (1997) Ltd., for the Ministry of Business, Innovation, and Employment on behalf of Te Rūnanga o Ōtākou, Kāti Huirapa Rūnaka ki Puketeraki, and Hokonui Rūnanga.

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Version (final): 29 August 2022.

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Report 2 of 2 (provisional)

For Ministry of Business, Innovation, and Employment

Contents

1. He kupu arataki: Introduction

The NZB[1] project has been established under MBIE management to provide comprehensive advice on the technical, environmental, and commercial feasibility of pumped hydro storage and other potential projects as a solution for sustainable dry-year energy production.

The NZB project aims to support efforts to achieve Carbon Zero 2050, which will require a move from fossil fuels to renewable sources for power generation. More than four-fifths (81%) of energy production in Aotearoa comes from renewable generation methods, primarily hydropower; however, hydro generation is impacted by low levels of lake storage and inflows at certain times of year.[2] Consequently, we still rely on coal- and gas-fired power stations to provide on-demand energy generation for Aotearoa.

The challenge is to find an alternative source that can store energy sufficient to provide back-fill for an entire year of less than average rainfall. The increasing move towards solar and wind-powered energy production means "we could face a more complex 'dry, calm, and cloudy problem' in the future."[3] It is predicted that climate change will contribute to these conditions.[4]

MBIE are considering a range of other possible solutions. Following engineering assessment, hydrogen, flexible geothermal generation, and bioenergy were identified as having the most potential. None of these three options can solve the dry year problem alone due to energy storage issues, but they could be part of a multi-solution approach. Feasibility analysis of these options will continue throughout the year.[5]

Geotechnical investigations began at several sites near Lake Onslow in April 2022 and Cabinet confirmed in July that a pumped hydro scheme at Lake Onslow appears technically feasible with more analysis needed. Further work over the coming months, including geotechnical investigations in the Teviot Valley, will analyse potential engineering, cost, timing and consenting. More work is required to incorporate environmental, cultural, social, and geotechnical findings, and refine potential design options.[6]

Pumped hydro energy storage is becoming an increasingly popular option overseas, as countries try to meet carbon emission targets amid the consequences of climate change. Fossil fuels have been the mainstay of global energy production for the last century, but this has come at a terrible cost for the environment, people, and economies across the world.[7]

Climate change is caused by the accumulation of GHGs in the atmosphere. Human activities that produce GHG emissions, such as transportation, industry, and agriculture, all contribute to our carbon footprint. Significant GHGs include carbon dioxide and methane, which make up 88% of GHG emissions in Aotearoa. These gases absorb heat from Earth's surface, warming the atmosphere and increasing global temperatures which has huge knock-on effects for every ecosystem across the globe.[8]

'Zero Carbon' is New Zealand's commitment to reducing net GHG emissions to net zero by 2050. This will be achieved by ensuring that any human-produced carbon dioxide is removed from the atmosphere, and instituting policies to combat climate change.[9] Reducing global carbon emissions is the only way to avoid

[1] A list of abbrevitations in provided in Appendix 2.
[2] MBIE, 2021a.
[3] MBIE, 2021a, p. 23.
[4] By 2090, it is predicted that climate change will contribute to Aotearoa experiencing a range of impacts that will contribute to the incidence of dry-year conditions, including higher average temperatures (increase of +0.7 to +3.0^{o}), more extreme hot days (increases of 40-300%), more dry days per year (~5% increase), and increased incidence and intensity of drought. The interior of Te Wai Pounamu at higher elevations is identified in relation to increased incidences of dry days per year, and droughts. MfE, 2018.
[5] Te Rōpū Matatau, 2022a.
[6] MBIE, 2022.
[7] IHA, 2020.
[8] Statistics New Zealand, 2020b.
[9] MfE, 2021.

the catastrophic consequences of further global warming.[10] It is expected that Māori will be disproportionately affected by the impacts of climate change in Aotearoa.[11]

The following cultural values statement identifies the mana whenua values associated with the Mata-au, Lake Onslow, and Te Awa Makarara, including the significance of wai māori,[12] and connections and associations to these waterbodies, and the wider cultural landscape. The Kāi Tahu history of loss since the advent of colonisation is also explored, including an examination of the ways this has influenced the contemporary mana whenua relationship with these waterbodies.

Whakaahua 1: Lake Onslow from the southwest[13]

[10] WEF, 2020.
[11] Awatere, King, Reid, Williams, Masters-Awatere, Harris, Tassell-Matamua, Jones, Eastwood, Pirker, and Jackson, 2021.
[12] A glossary of Māori terms is provided in Appendix 1.
[13] Image credit: Privacy of natural persons


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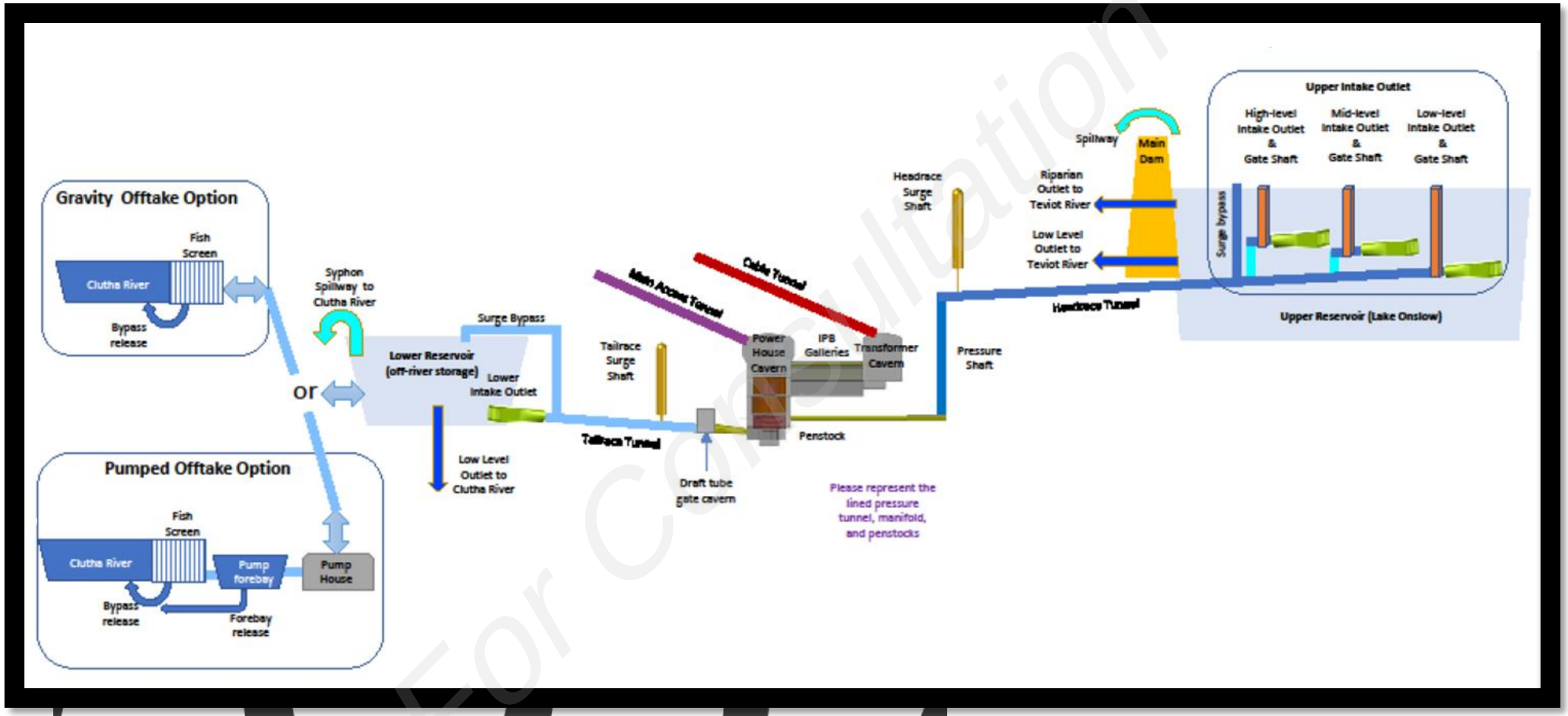
Whakaahua 3: Lake Onslow pumped hydro storage project: Representative scheme layout[15]



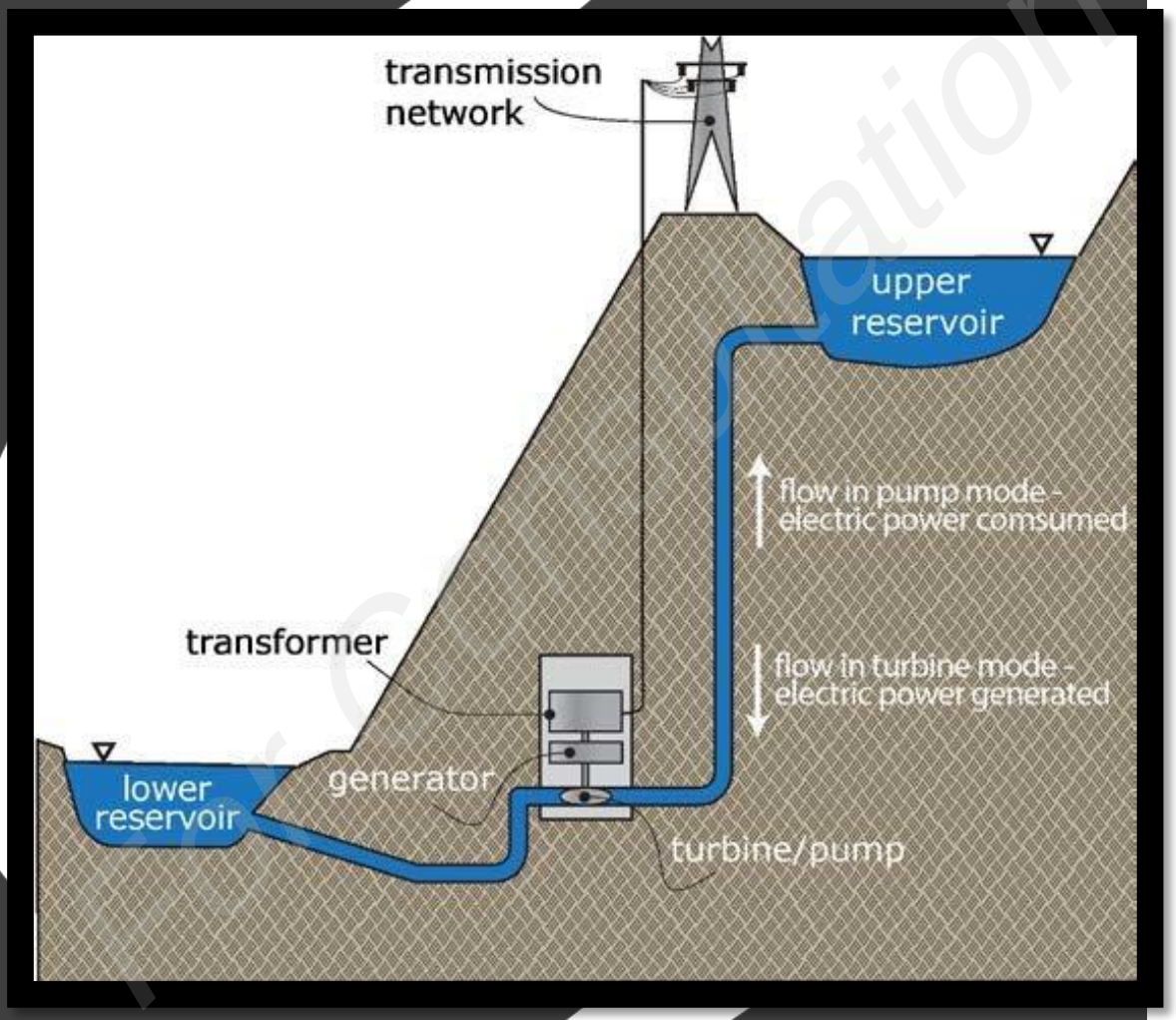
[15] Image credit: Te Rōpū Matatau, 2022, p. 47.

2. Ko te kāhui mauka: Description of proposed activities

Pumped hydro storage provides a ready supply of stored power production that can respond quickly to meet power consumption demands. The model consists of two reservoirs, one at a higher elevation than the other. When the power supply is not required, volumes of water are pumped into the upper reservoir and stored for later use. Power from the scheme would be generated during a dry year, or whenever needed based on energy demand or market requirements. When generating, water from the upper reservoir is dropped down through power station turbines to the lower reservoir, with the resulting energy converted into power and fed into the national grid.

Construction of a pumped hydro-storage facility would turn Lake Onslow into a stored energy source, much like a battery, and provide a sustainable solution for the dry-year problem.

Whakaahua 4: Main elements of a pumped hydro scheme[16]



2.1 Summary of proposed activities

The proposed pumped hydro scheme at Lake Onslow would consist of the following elements (see also Whakaahua 2):

- An upper reservoir (Lake Onslow) to store the water that is used to generate electricity
- A dam (on Te Awa Makarara) to provide greater storage capacity within the lake

[16] Image credit: Viadero, Rehbein, & Singh, 2017.

- Intakes/outlets within Lake Onslow to transfer water between Lake Onslow and a lower water source
- A source of water at a lower elevation (the Mata-au)
- Intakes/outlets to transfer water from the source to Lake Onslow, EITHER within a lower reservoir adjacent to the Mata-au, OR directly into the Mata-au upstream of the Roxburgh dam
- An underground tunnel to transfer water between the lower offtake and Lake Onslow, and
- An underground powerhouse to:
    - generate electricity as water passes from Lake Onslow down into the lower reservoir; and
    - pump water up to Lake Onslow.[17]

For Lake Onslow to be an effective solution to the dry year problem the scheme needs to fulfil two functions effectively.

1. Continuous energy generation at the optimum rate when it is needed. The optimum energy output rate (installed capacity) is still to be determined, but is expected to be between 750MW and 1250MW, and
2. Continuous pumping to fill the upper reservoir with the rate of this being dependent on water availability, hydraulic constraints, and time constraints in low energy periods.

It is possible that the scheme may be used outside of dry year storage for regular power generation and flexible use in the future will be considered in the ongoing design analysis. The potential implications of this from an environmental perspective is the impact of the discharge on the Mata-au. Another concern would be the impact on the size of the powerhouse, as this would in turn influence the volume of spoil produced.

The following summary will provide an overview of the key component parts of the project, being:

2.2 The upper reservoir
2.3 The dam structure
2.4 Lower off-take options, and
2.5 Other elements.

Brief summaries are also provided for the following:

2.6 Construction, and
2.7 Operation.

2.2 The upper reservoir

It is proposed that an upper reservoir is established at Lake Onslow by constructing a new dam across Te Awa Makarara, increasing the capacity and size of the lake considerably. Water would be pumped into the lake via the reversible turbines located in an underground powerhouse, travelling through an underground tunnel to discharge into Lake Onslow. The maximum size of the upper reservoir is yet to be determined, but is expected to be between 3TWh (60m higher than current full reservoir elevation) and 5TWh (80m higher than the current full reservoir elevation).

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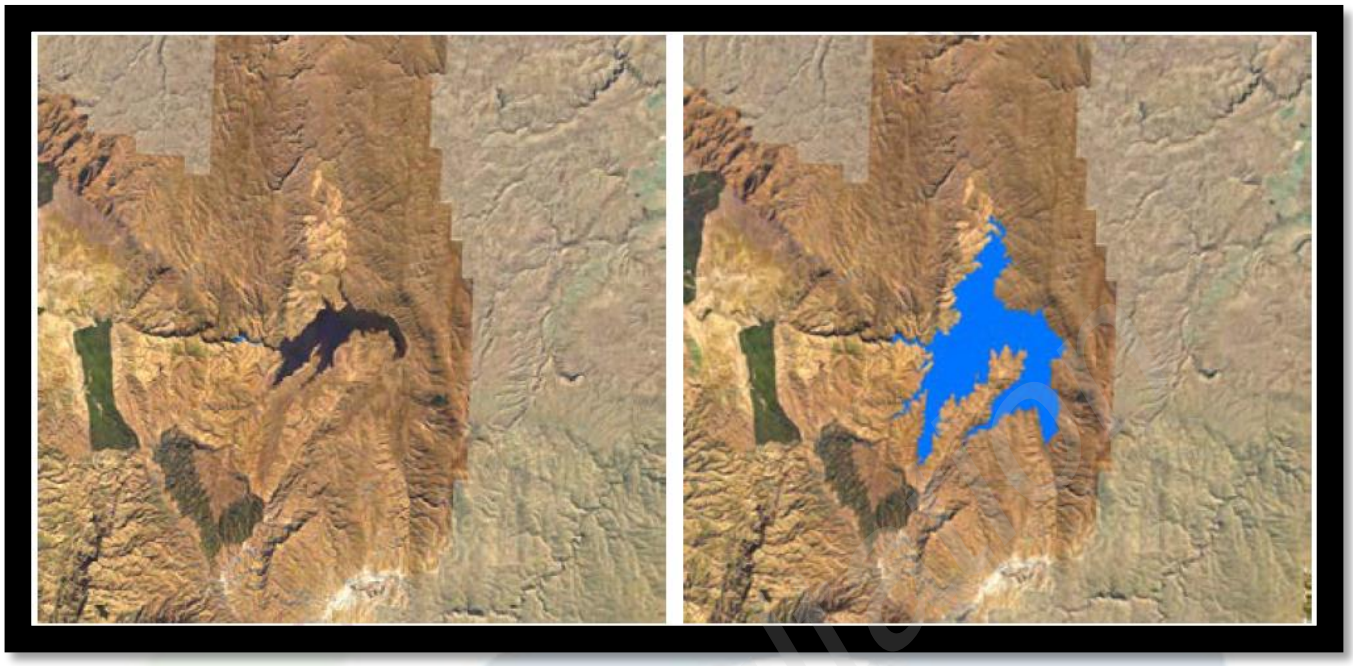
[17] Te Rōpū Matatau, 2022.
[18] Flushing refers to the period when the Roxburgh reservoir is lowered to remobilise sediments stored behind the Roxburgh Dam.

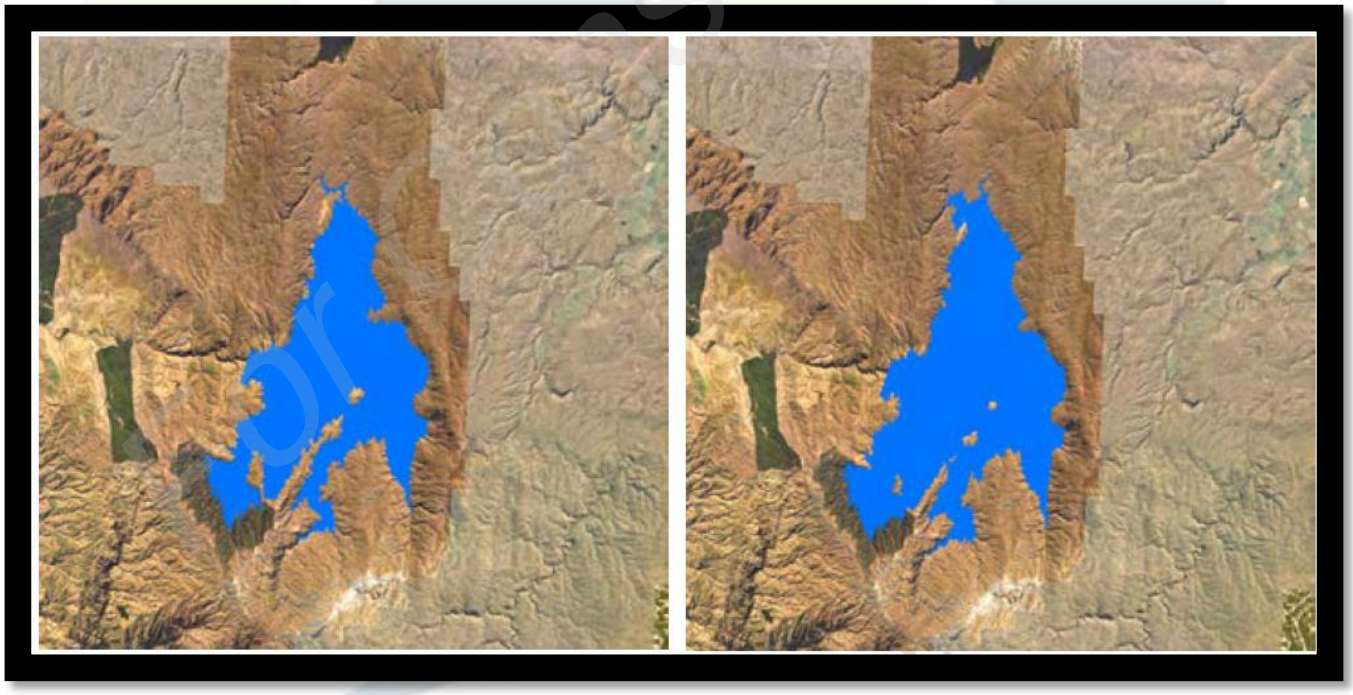
Whakaahua 5: Lake Onslow current full reservoir elevation (684.9mRL)[19]

Whakaahua 6: Lake Onslow proposed minimum operating level (695mRL)[20]



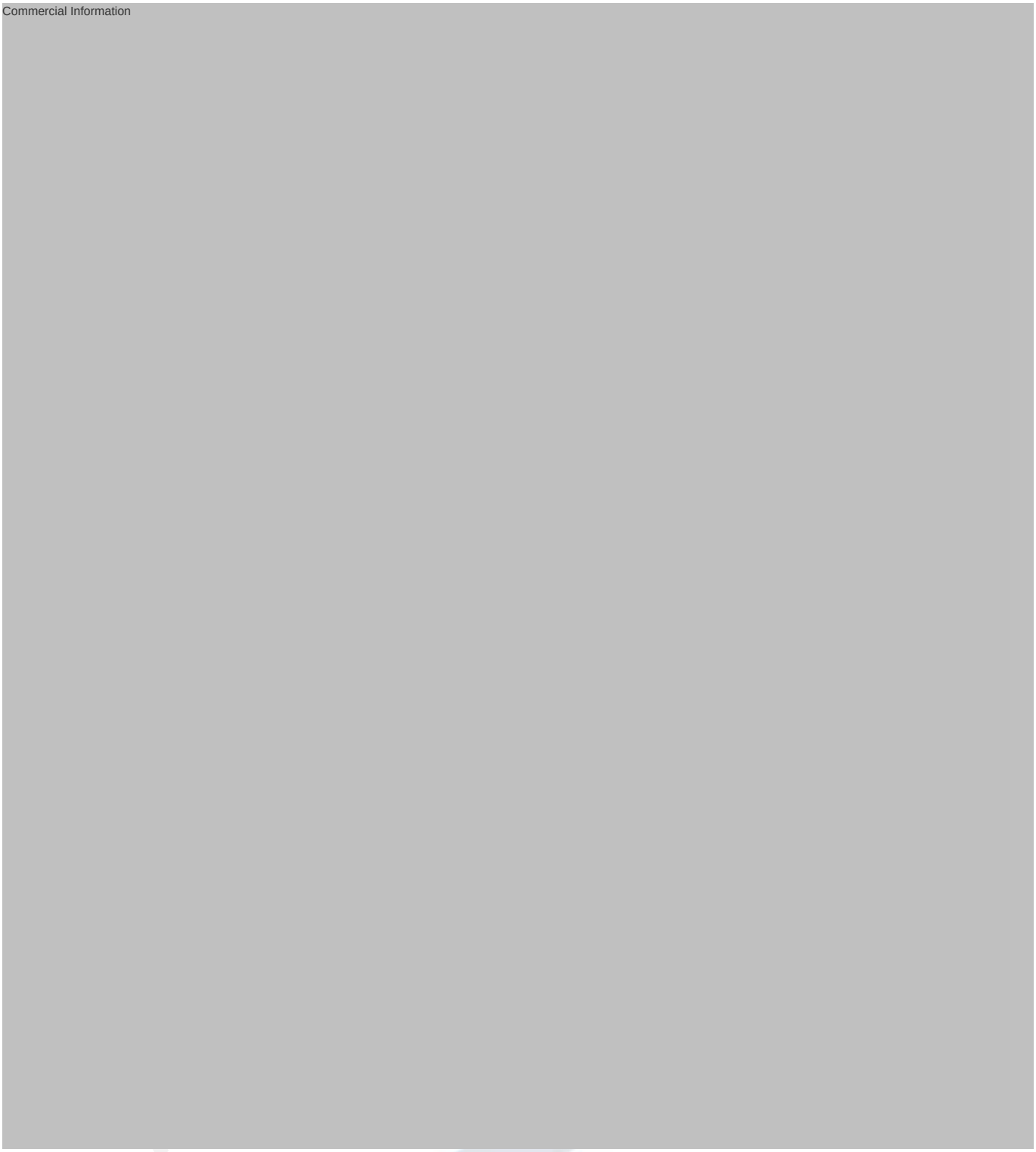
Whakaahua 7: Lake Onslow proposed full supply level – 3TWh (745mRL)[21]

Whakaahua 8: Lake Onslow proposed full supply level – 5TWh (765mRL)[22]



Once the upper reservoir has been filled, water would be stored until needed, with occasional top-up pumping to replenish water lost through evaporation and seepage, or to provide for baseline flows to Te

[19] Te Rōpū Matatau, 2022, p. 11.
[20] Te Rōpū Matatau, 2022, p. 11.
[21] Te Rōpū Matatau, 2022, p. 12.
[22] Te Rōpū Matatau, 2022, p. 12.



[23] Te Rōpū Matatau, 2022, p. 9.
[24] Te Rōpū Matatau, 2022, p. 13.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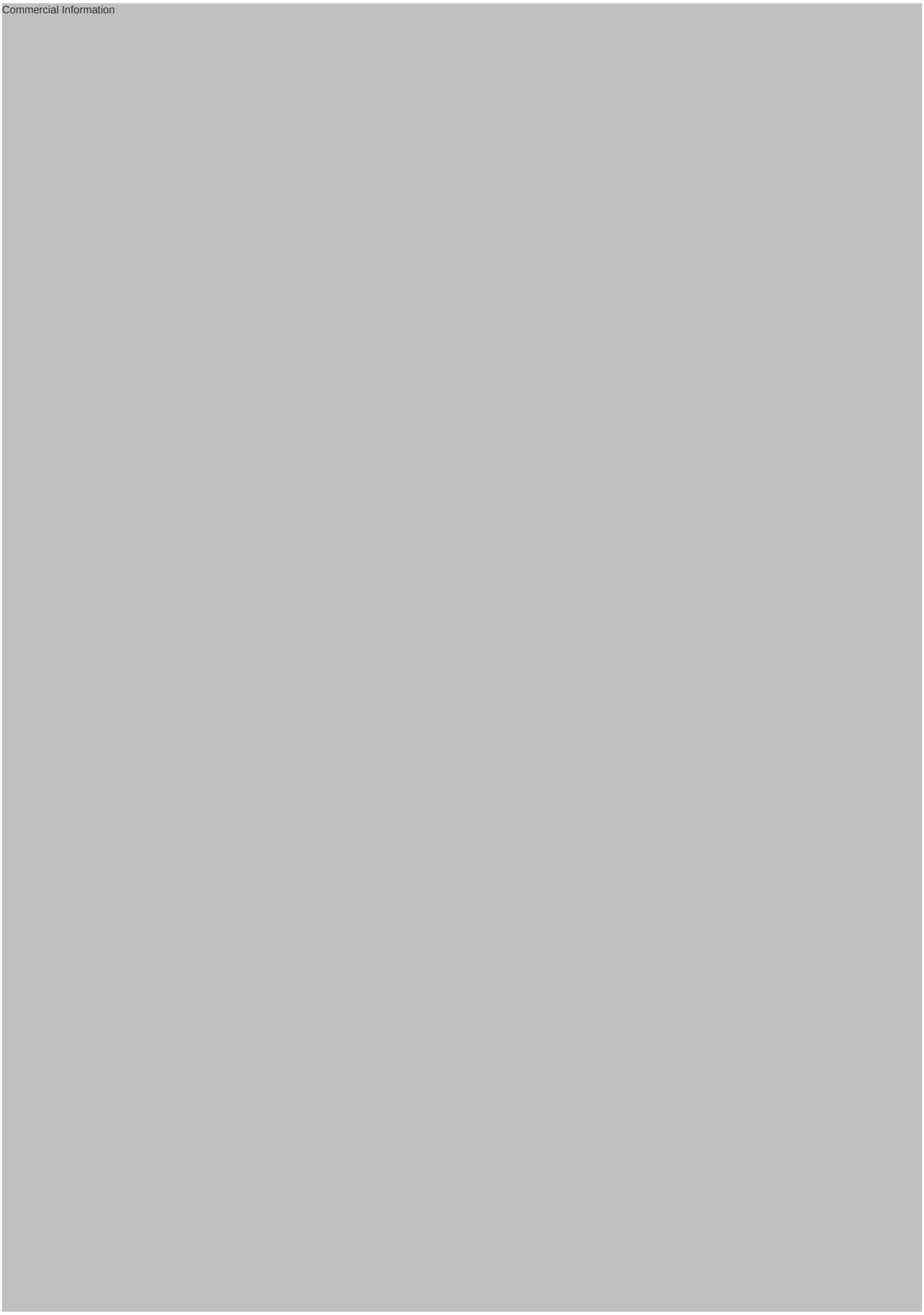
[26] Te Rōpū Matatau, 2022b.
[27] Te Rōpū Matatau, 2022, p. 16.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[31] Te Rōpū Matatau, 2022a.

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[32] Te Rōpū Matatau, 2022, p. 18.

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[33] Te Rōpū Matatau, 2022, p. 19.

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[redacted]

[34] Te Rōpū Matatau, 2022, p. 20.

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[redacted]

[35] Te Rōpū Matatau, 2022.

2.6 Construction and Infrastructure

Construction will occur in stages over a number of years as shown in the construction sequence below (see Whakaahua 14) and summarised below.

2.6.1 Dam construction

Typical dam construction steps:

1. River diversion
2. Excavation and preparation of the foundation
3. Concrete fill placement
4. Completion of concrete and outlet works

- High volume concrete production, involving quarrying, processing, and stockpiling of concrete aggregates and sand
- Quarry and concrete batching plants would be established in the zone which would later be inundated with the filling of the enlarged lake, and
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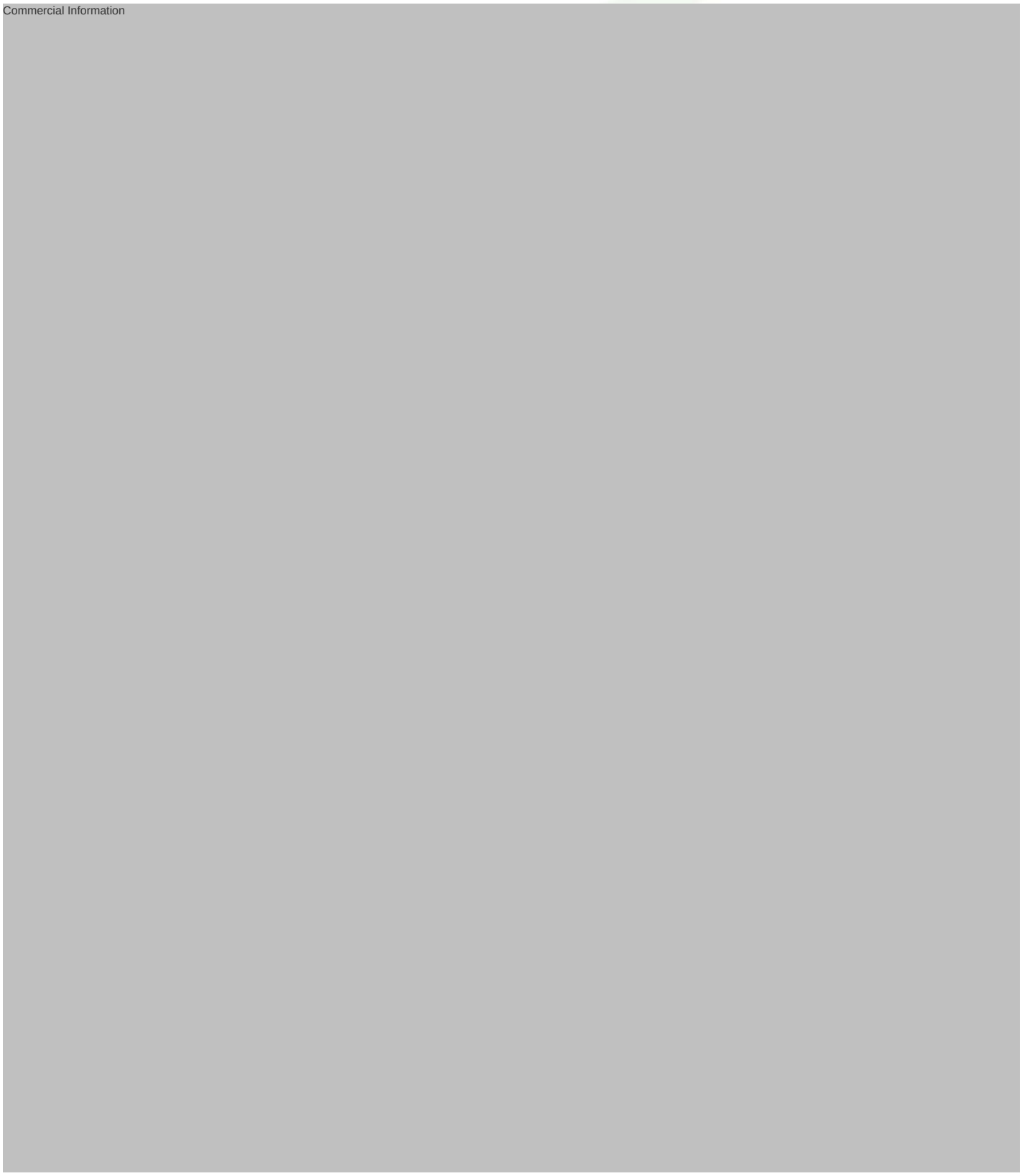

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[36] Te Rōpū Matatau, 2022, p. 32 (amended by Aukaha, 2022).

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2.6.6 Construction workforce

It is expected that a peak of 1,000 workers will be required to service the construction of the proposed screen, with a total of 2,500 positions over the course of the project.

A workcamp of 5ha will be needed to house up to 700 people at a time, but details of how the Roxburgh community could accommodate this increase in population have not yet been determined. Based on a maximum workforce of 1,000 workers there would be a need for approximately 170,000 litres of water per day. It has been assumed that this supply would need to be taken from Lake Onslow, adjacent local streams, and Te Awa Makarara.

Recent engagement between Mana Taiao and CODC staff regarding three waters infrastructure and spatial planning has indicated that the three waters infrastructure in the Teviot Valley is already at capacity.

In October 2021, CODC were issued with three abatement notices by ORC for non-compliance of wastewater treatment, including for the treatment plant at Roxburgh. The plant was non-compliant for an increase in nitrogen levels in treated discharge. Current upgrades are being undertaken under the Council's 2021-2031 Long Term Plan, which aim to improve biological health of treatment ponds, and the quality of the discharge.[37]

Biosolids from Central Otago's wastewater treatment plants are currently trucked to Victoria Flats Landfill near Queenstown, but new options for treatment and removal of biosolids are being explored.[38]

2.6.7 Construction materials

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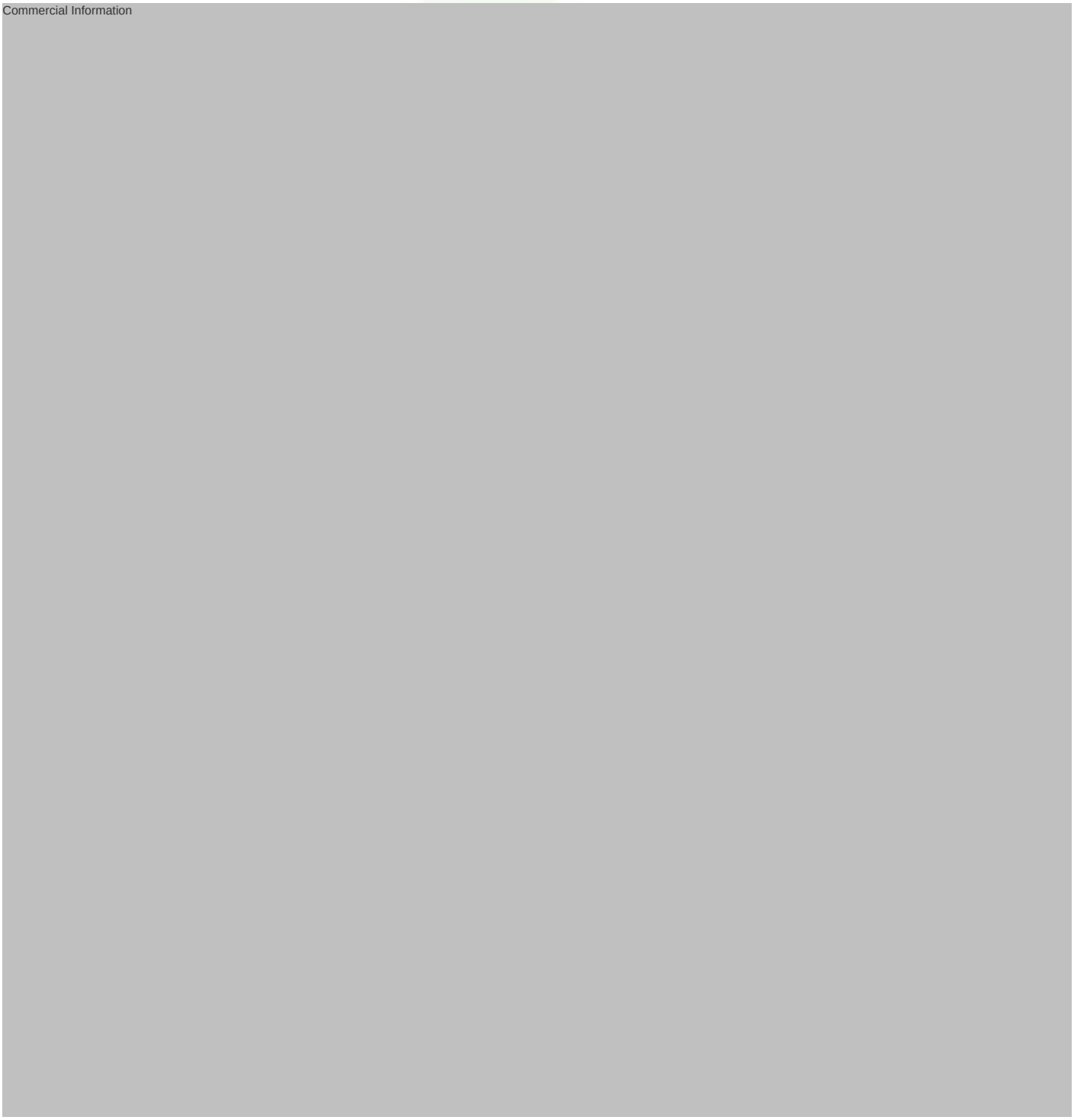
2.6.8 Supporting infrastructure

A range of infrastructure projects of different types would be required to support construction, and are likely to include:

- New and upgraded access roads and bridges
- Tunnel boring of machine launch pads
- Power supply
- Workshop facilities
- Pre-construction facilities, and
- Concrete batching plant(s) (likely to be located near the dam, within the inundation footprint).



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[39] Te Rōpū Matatau, 2022a.

[40] Image credit: Privacy of natural persons

3. Toitū te mana, toitū te whenua: Kā Papatipu Rūnaka

There are three papatipu rūnaka located in Otago that hold shared authority and mana whenua status in the area surrounding Lake Onslow, including the Mata-au. These are:

- Te Rūnanga o Ōtākou
- Kāti Huirapa ki Puketeraki
- Hokonui Rūnaka

In this report, the three papatipu rūnaka are alternatively referred to as Kā Rūnaka, or as mana whenua.

Te Rūnanga o Ōtākou

The coastal of takiwā of Te Rūnanga o Ōtākou centres on Ōtākou on Otago Peninsula, and extends from Purehurehu to Te Mata-au. The inland reaches of the takiwā include shared interests in the lands and mountains to the western coast with kā rūnaka to the north and south.

Kāti Huirapa ki Puketeraki

The takiwā of Kāti Huirapa ki Puketeraki centres on Karitāne and extends from the Waihemo to Purehurehu. The takiwā extends inland to the Main Divide, sharing interests in the lakes and mountains to Whakatipu-waitai.

Hokonui Rūnanga

The takiwā of Hokonui Rūnanga centres on the Hokonui region, and includes shared interests in the lakes and mountains between Whakatipu-waitai and Tawhititarere with other Murihiku rūnaka, and those located from the Waihemo south.

Kā Rūnaka are represented by Aukaha (1997) Ltd., a regional environmental entity established and owned by the papatipu rūnaka with shared authority in the Otago region. Aukaha works on behalf of Kāi Tahu, to support rūnaka aspirations in the natural, rural, and built environments.

The RMA 1991 places obligations on local and central government to engage with mana whenua as a Treaty partner.[41] Aukaha staff provide best-practice planning advice to rūnaka to support their mahi in this area.

[41] RMA 1991.

4. He tikaka rakahau: Project methodology

In mid-2022, Aukaha (1997) Ltd. ('Aukaha') was contracted by MBIE to prepare an assessment of the cultural values associated with Lake Onslow and the surrounding area. The focus of the report is the three intake options for the design of a pumped hydro storage option at Lake Onslow, as part of the Phase 1 feasibilty study of the NZ Battery Project. This report supplements the previous cultural values statement provided by Aukaha in December 2021, focused on the proposed inundation zone at Lake Onslow.

The key elements of the project methodology are set out below.

4.1 Review of literature

A desktop review of the project area was undertaken, focusing on detailed documentary research, to inform the drafting of a cultural values statement related to the proposed activities. Reference material has been derived from the following key sources:

a. The Kāi Tahu ki Otago NRMP[42]
b. Ngāi Tahu cultural maps[43]
c. District wāhi tūpuna mapping
d. Recorded archaeological sites via ArchSite,[44] and
e. Available ecological and environmental monitoring data and reports.

Other relevant policies, plans, government and industry literature and reports, and academic research publications were identified as further source material during the review of literature.

4.2 Cultural values assessment

A cultural values assessment identifies key mana whenua values in the area affected by the proposed activity, particularly focused on the affected waterways, and the area related to proposed tunnelling and construction.

The cultural values statement provided below was drafted by Aukaha staff members, and presented to mana whenua representatives for review, comment, and amendment. All material released by Aukaha has been assessed and approved by mana whenua, to ensure that the final statement accurately reflects the position of Kā Rūnaka.

[42] KTKO, 2005.
[43] TRONT, 2022.
[44] NZAA, 2022.

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[45] Image credit: Privacy of natural persons

5. Kā puna-karikari-a-Rākaihautū: The significance of freshwater

Wai is a central element in Kāi Tahu creation traditions and is placed at the core of the whakapapa of the world. In this kōrero, darkness gives rise to the light, and through an abyss of nothingness, moisture materialises as the first iteration of wai.

The following account of Kāi Tahu whakapapa and creation stories is sourced from the words of Rāwiri Te Mamaru, a rakatira of Moeraki in the mid-1800s following the death of the famed Kāi Tahu leader, Matiaha Tiramōrehu. The whakapapa continues down to Rakinui and his wives, Pokoharua-i-te-Pō and Papatūānuku.

Nā Te Pō, ko Te Ao	*From eternity came the Universe*
Nā Te Ao, ko Te Ao Marama	*From the Universe, the bright clear light*
Nā Te Ao Marama, ko Te Ao Tūroa	*From the bright clear light, the enduring light*
Nā Te Ao Tūroa, ko Te Kore Te Whiwhia	*From the enduring light, the void unattainable*
Nā Te Kore Te Whiwhia, ko Te Kore Te Rawea	*From the void unattainable, the void intangible*
Nā Te Kore Te Rawea, Ko Te Kore Te Tamaua	*From the void intangible, the void unstable*
Nā Te Kore Te Tamaua, ko Te Kore Matua	*From the void unstable, the void endowed with paternity*
Nā Te Kore Matua, Ko Te Mākū	*From the void of paternity came moisture*
Nā te Mākū, ka noho i a Mahoranui ātea	*From the moisture came limitless thought.*
Ka puta ki waho ko Raki	*Then came the visible heavens*
Nā Raki, ka noho i a Poko haru a te Pō	*The visible heavens combined with the great abyss to produce the numberless sorceries and the ultimate calamity!*
Ko Aoraki me Rakamaomao, tana a Tāwhirimātea	*Thence to Aoraki and the winds and weather*
Ka tū te Rakiwhānoa	*To the creator of land*
Ui rā ki Te Maha-a-nui ā Māui	*And the canoe of Māui.*
Ko te Ao Tākata!	*And finally, to people!*
Tihei mauri ora! [46]	*I cough, the breath of life.*

The children of Rakinui and his wives created elements of te taiao, including mountains, rivers, forests, and seas, and all living things. These atua are the spiritual source of wai and whenua, connected to mana whenua through whakapapa. Wai is a central unifying feature in this whakapapa, as it is in our landscape, connecting the coast to the hinterland, and as a source of life.

As an early ancestor in the whakapapa of the Kāi Tahu world, wai māori has enhanced mana, placing great obligation on mana whenua to protect it. The duty of kaitiakitaka is not merely about guarding or caretaking, but involves acting as an agent for environmental protection and decision-making, on behalf of tūpuna and mokopuna. As expressed in the whakataukī, Mō tātou, ā, mō kā uri a muri ake nei, the focus of kaitiakitaka is to ensure environmental sustainability for future generations.

[46] Higgins, 2020.

Mauri is a concept central to the action of kaitiakitaka. It is the mauri that binds the spiritual and physical aspects of our world together, generating and upholding all life. All elements possess a life force, from living things, to inanimate objects, natural and made. Mauri flows from our living world and down through whakapapa, linking all aspects of our world. The mauri of water represents the essence that binds all things, acting as a life-giving force, and connecting the environment, from the mountains to the sea. Thus, mauri is a critical element in the relationship of Kā Rūnaka with all waterways, including the Mata-au, Te Awa Makarara, and Lake Onslow.

Beyond the important links of wai to atua, tūpuna, and te taiao, water was, and is, used extensively by mana whenua for spiritual and common uses. Wai is used to remove tapu, and in ceremonies. Waterways like the Mata-au were important pathways, whether traversed by waka or mōkihi, or followed on foot, and they are often still recognised as ara tawhito. The kōrero above is a recitation of the map that was followed from the Upper Lakes to Dunstan, following the ara tawhito as passed down from the ancestors. Wai māori is fundamentally important for human health and well-being, as a safe source of hydration and healthy kai.

Beyond meeting the needs of people, the life-supporting properties of wai māori support a wealth of native biodiversity. The ecosystems provided by wai, in lakes, rivers, wetlands, estuaries, and at the coast, offer lifegiving habitats for indigenous species, which are also considered whanauka. Consequently, the relationship between mana whenua and wai is significant and enduring, stretching from the past and into the future, as a central component of Kāi Tahu identity.

To Kāi Tahu, wai is a taoka under their mana and rakatirataka. Whanaukataka is at the heart of this relationship, rather than an economic model of ownership. Thus, when the health of a waterway is degraded, the impacts are far-reaching, for the waterway, for the ecosystems, habitats, and species it supports, and for the people.

When the mauri of wai is degraded, there are multiple impacts. Physical effects may be noticeable in the environment, through changes in the āhua of the water, such as appearance, smell, colour, or taste. Changes in chemical composition or flow of water may also be present. These physical changes are likely to affect animal and plant species that live in surrounding ecosystems. Impacts might include the decline of species, usually natives, and over-population of other species, often those that are introduced. In turn, this alters the connection of mana whenua with a waterway, as mahika kai uses may become unsustainable if the mauri continues to degrade. From here, a loss of knowledge can occur, as the opportunities to share the stories, practices, and histories associated with a waterway diminish due to the lack of connection.

Kā Rūnaka have seen this pattern take place over and over throughout the history of European settlement in Te Waipounamu, with many behaviours and actions that undermine and degrade the mana and the mauri of our waterways still in evidence today. For Lake Onslow, this history is tied to the modification of the waterway over the settlement period from a wetland and wāhi mahika kai, to the artificial reservoir as it is today. For the Mata-au and Te Awa Makarara, their kōrero is implicitly linked to the ongoing modification and abstraction of these ancestral waterways, through the impacts of mining, damming, consenting processes, and contemporary land usage practices.

6. He taura whiri kotahi: Mana whenua associations

Mana whenua associations with the waterways directly affected by the proposed activities are clearly identifiable in the layers of kōrero, naming, and history. Kāi Tahu associations with Lake Onslow were previously outlined in the initial cultural values statement for Phase 1A of the NZ Battery Project Lake Onslow option feasibility study, which was delivered to MBIE in December 2021.[47] The following section aims to build on the values and associations outlined in the previous statement. This will be achieved by considering the mana whenua associations and values associated with the wider area, encompassing the Mata-au, Te Awa Makarara, and the landscapes surrounding the proposed construction and tunnelling activities.

The cultural significance of wai māori and natural waterways as taoka and wāhi tapu identified in the whakapapa of water is overlaid with the reliance on water as a source of sustenance, connection, and wellbeing. Waterways were significant sources of food and resources, but also a means of travel, either by waka or mōkihi. The ease of fashioning a quick raft from raupō and kōrari made mōkihi a popular mode of travel. Water was needed for hydration, hygiene, and ablutions. It was recognised as one of the fundamental building blocks of a healthy society; the health of the people was dependent on the health and vitality of wai māori and the waterways that connected the landscape from the mountains to the sea.

Just as it is today, the Mata-au was recognised as a river of great significance by Kāi Tahu whānui in the past, and as such, it is recognised as a statutory acknowledgement area under the Ngāi Tahu Claims Settlement Act 1998, encompassing the Mata-au and Kā Moana Haehae.

> *"The Mata-au takes its name from a Ngāi Tahu whakapapa that traces the genealogy of water. On that basis, the Mata-au is seen as a descendant of the creation traditions. For Ngāi Tahu, traditions such as this represent the links between the cosmological world of the gods and present generations, these histories reinforce tribal identity and solidarity, and continuity between generations, and document the events which shaped the environment of Te Wai Pounamu and Ngāi Tahu as an iwi."*[48]
>
> *"The whole of the Mata-au… was part of a mahinga kai trail that led inland… [It was] a highway into the interior… [and] a significant indigenous fishery… The waterway was very important in the transportation of pounamu from inland areas down to settlements on the coast, from where it was traded north and south… [It] was an integral part of a network of trails which were used to ensure the safest journey… Knowledge of these trails continues to be held by whānau and is regarded as a taonga… The traditional mobile lifestyle of the people led to their dependence on the resources of the waterway."*[49]

The Mata-au is recorded as a significant ara tawhito, and consequently, supported the practice of seasonal heke, whereby groups of whānau from the coast would undertake regular and timed journeys inland to access food and resources. These practices went far beyond mere survival practices, with heke providing opportunities to share the stories, skills, and knowledge linked to inland sites and activities, facilitating the intergenerational transfer of mātauraka, whakapapa, and tikaka. Heke were multi- and trans-disciplinary events, with broad layers of influence encompassing mahika kai practices, politics and diplomacy, skills acquisition and skill mastery, knowledge sharing and transfer, and trade and industry. By looking at the landscape through these layers of connection, we can start to identify the values of mana whenua for these places and the practices, histories, and tīpuna associated with them. Placenames and histories associated with recorded wāhi tūpuna strongly reference mahika kai practices in the affected area, including migratory fish like kanakana, īnaka, and tuna, and more commonly available species such as weka, kāuru, and pōhata.

[47] Timms-Dean, Wesley-Evans, & Golding, 2021.
[48] Schedule 40, Ngāi Tahu Claims Settlement Act 1998.
[49] Schedule 22, Ngāi Tahu Claims Settlement Act 1998.

Tūtohi 5: Wāhi tūpuna in the wider area[50]

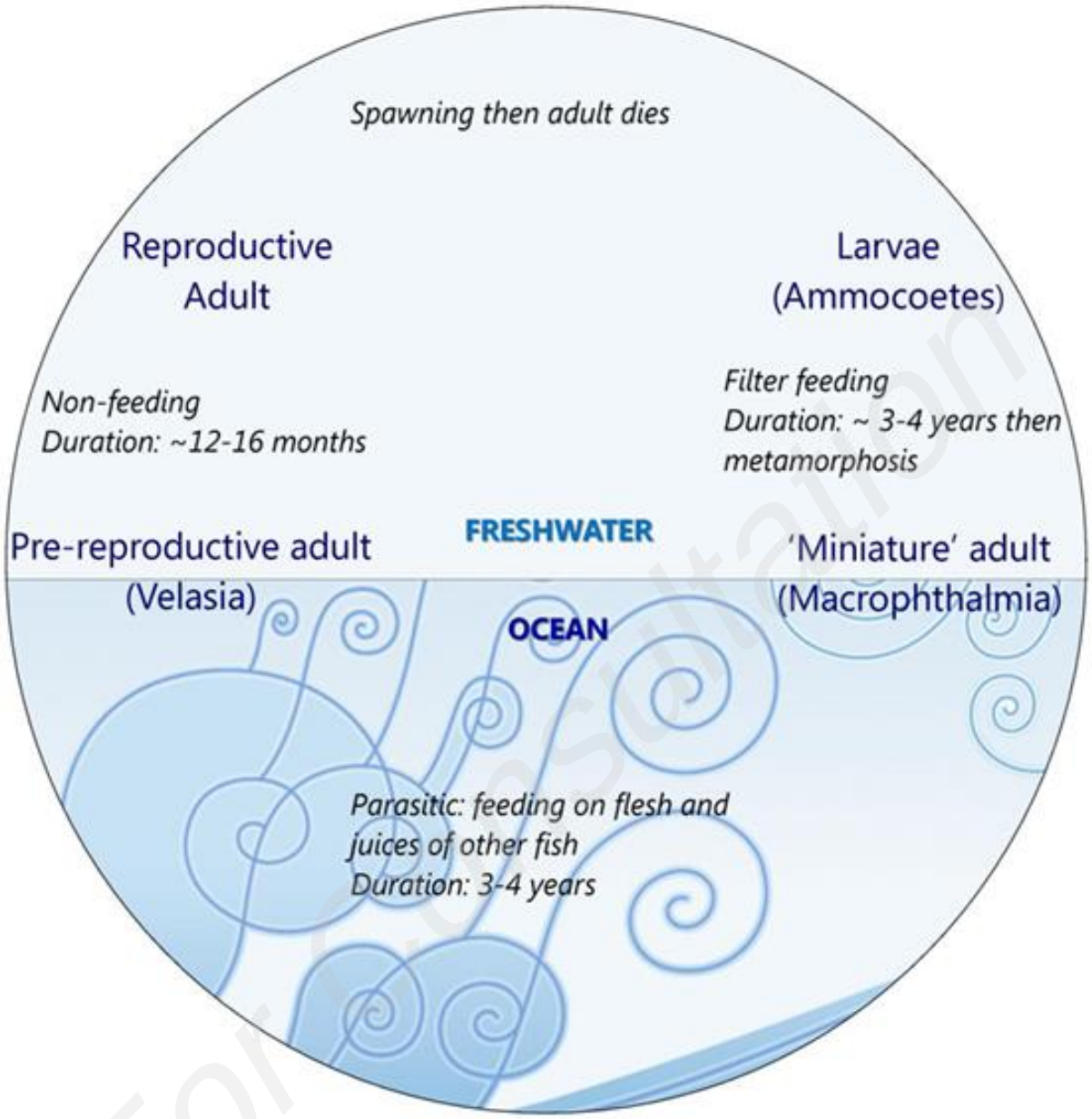
Ikoa Māori	Ikoa Pākehā	Description
Te Awa Makarara	Teviot River	Recorded Māori name.
Mata-au	Clutha River	Recorded Māori name.
	Oven Hill	Named for the Māori ovens found there.
Omaiuru		A wāhi mahika kai located near Ettrick, where tuna and pōhata were gathered.
O Puriri		A wāhi mahika kai near the Mata-au where kanakana, īnaka, and pōhata were gathered.
Te Tihi o Kaitarau		An inland kāika mahika kai located east of the Mata-au where weka, and kāuru were gathered.
Ōkura	Beaumont River	Recorded Māori name, with the word 'kura' referencing red rocks or cliffs along the river.
Makiu (possibly Makio)		A tributary of the Poumāhaka River.

Heke were organised around a seasonal calendar of activity, guided by celestial and lunar calendars, and heavily influenced by the seasonal availability of mahika kai species. Heke were timed to take advantage of migratory patterns of species like kanakana, tuna, and īnaka. At the same time, more commonly available resources like kāuru, weka, and pōhata were gathered opportunistically, as they were also plentifully available in the surrounding area.

Kanakana are amongst the last descendants of an ancient genetic line of jawless and boneless vertebrates that have lived on Earth for at least 360 million years. They are similar in shape to an eel, but instead of a mouth, kanakana have a large round toothed sucker. Of the 41 known species of lamprey worldwide, kanakana is the only species found in Aotearoa, *Geotria australis*. Known as piharau in the North Island, kanakana hatch in freshwater streams where they spend three or four years before migrating to sea. The next time they return to freshwater it is to their birth river, where they breed and then die.[51] Harvesting is undertaken during the upstream migration of the adult kanakana, which occurs in August to November in southern parts of Te Wai Pounamu.[52] Kanakana were considered inedible after they have moved further inland, and so only the fresh-run fish were taken. They were then preserved for the winter by drying, or as a resource for bartering.[53]

[50] TRONT, 2022.
[51] NIWA, n.d.c.
[52] Kitson & Te Ao Marama Inc., 2012.
[53] NIWA, n.d. c.

Whakaahua 17: Life cycle of *Geotria australis*[54]



Tuna is another migratory species that were extensively sourced by tīpuna from the upper lakes and along the length of many waterways in these inland areas, and were caught either in eel pots (hīnaki), or with nets or spears. Heke were timed to coincide with tuna migrations when the adult tuna travel downstream to start their journey to their breeding ground in Te Moana-nui-a-Kiwa in late summer and early autumn.

Not only were tuna plentiful and easily caught, they were also readily preserved by drying over racks or smoking, and provided an excellent source of nutrition.[55]

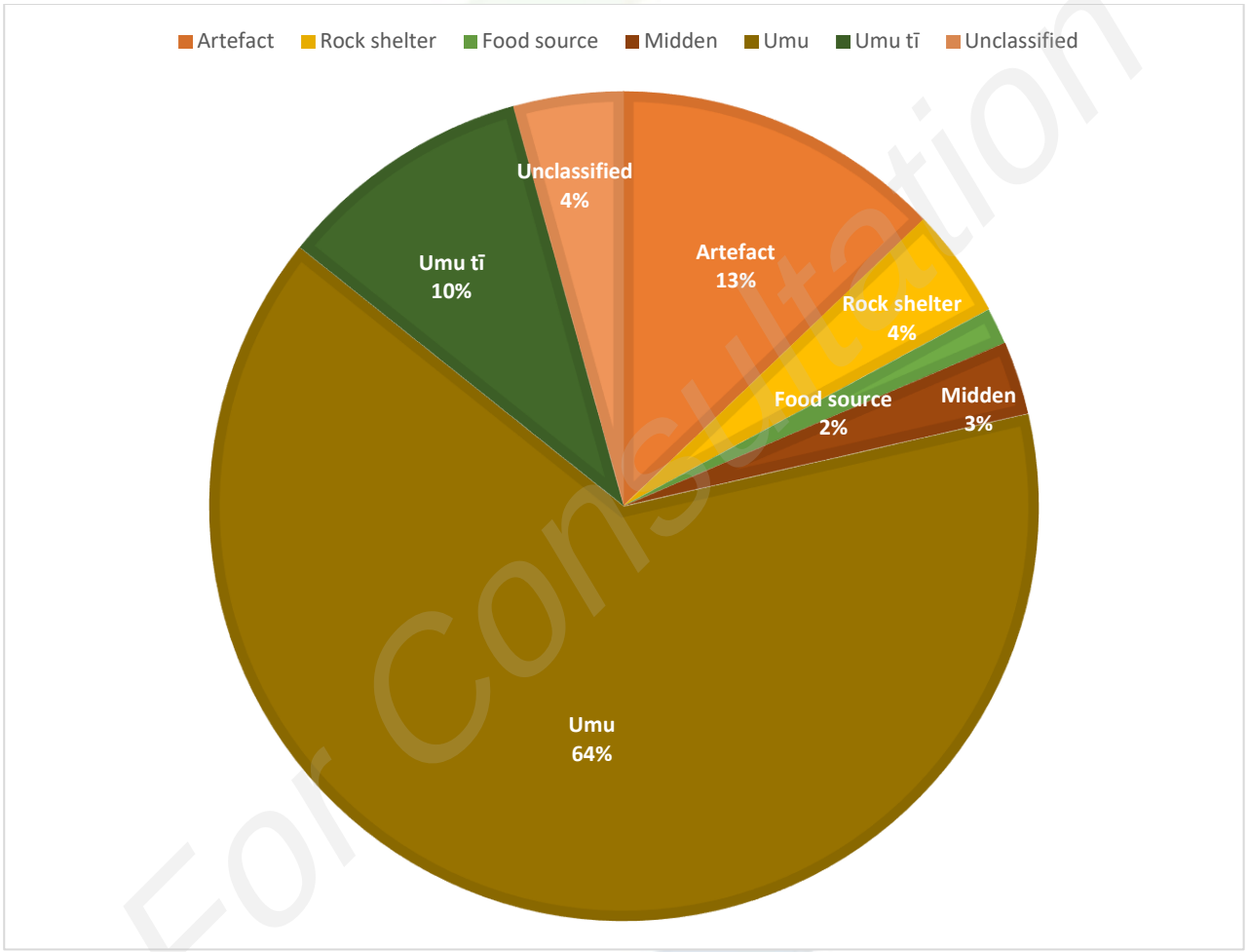
Īnaka are another prized migratory mahika kai species, with harvesting undertaken to align with both their upstream and downstream migration. Once caught, the fish could easily be dried in the sun, preserving

[54] Kitson & Te Ao Marama Inc., 2012, p. 7.
[55] NIWA, n.d. b; TRONT, 1997.

them for consumption up to some months later. The upstream migration of īnaka takes places in late winter and early spring when the juveniles make their way upriver, with adult fish migrating back out to sea in the autumn after spawning is complete.[56]

Just as modern humans will pop into a shop while they are 'in the neighbourhood,' this was also the practice for mana whenua in the past, who would use the opportunity of being in the location for specific seasonal produce, to access other resources that were generally plentiful. This phenomenon is identifiable across the archaeological record between Lake Onslow and the Mata-au, with a significant number of umu identified, equating to 74% of the Māori archaeology found in the area (see Mahere 1 below). A notable number of umu tī were identified, equating to 10% of Māori archaeology in the area, indicating that the harvesting and processing of tī kōuka to produce kāuru was a significant activity.[57]

Mahere 1: Māori archaeology in the area by type[58]



Another mahika kai species in plentiful supply throughout the region was weka. These large flightless native rails were a significant mahika kai resource for Kāi Tahu in the past. Not only were weka plentifully available, but their meat was also easily preserved, by smoking and storing in their own fat in pōhā bags. The fatty flesh was a source of oil for preserving food, and for use as a lubricant. One account claims that a fat weka could produce nearly a pint of oil (300ml) when boiled.[59]

[56] Walrond, 2007.
[57] NZAA, 2022.
[58] See Appendix 3 for a full list of known Māori archaeologocal sites in the wider area.
[59] Harper, 1949.

Kōura and kākahi are recorded as having been harvested by tīpuna in the wetland that was located where Lake Onslow now lies, and which overflowed to feed Te Awa Makarara. The name Makarara combines the word 'maka' meaning stream, with a word which could be 'rarā,' meaning to rattle, or make a continuous sound,[60] evoking the image of a vibrant and animated stream environment. However, there is little evidence to be found of the cultural use related to this waterbody.

Mahika kai practices extended beyond the gathering of animals and plants for food to include resource gathering for technological applications. Plant species, geological resources, and animal by-products, like feathers and bones, were all valuable resources for tīpuna.

Mahika kai practices were not just about gathering food; these practices were also drivers for the intergenerational transmission of knowledge, in the form of mātauraka, maumaharataka, tikaka, and kawa. Seasonal migrations along ara tawhito like the Mata-au provided opportunities to pass on important histories, memories, practices, and knowledge as taoka tuku iho, treasures passed down from the ancestors. Seasonal heke did not only enable physical sustainability through the accessing of food and resources, but also facilitated cultural transfer to take place, sustaining the culture and the practices of the people through time.

For hundreds of years, mana whenua were able to practice, hone, and develop their skills, practices, and knowledge of the natural environment, enabling them to flourish. But life never stays the same for long, and the arrival of people from Europe brought about changes that are still manifested in the lives of mana whenua today, under the long shadow of the Kāi Tahu history of loss.

Whakaahua 18: The Mata-au looking north towards Roxburgh Bridge[61]

[60] Moorfield, 2003-2022, rarā.
[61] Robertson, 2005.

7. E rite ana ki te karo o te moa: The Kāi Tahu history of loss

Te Tiriti o Waitangi was signed by representatives of Kāi Tahu whānui in late May and early June of 1840.[62] Subsequently, in 1844 and 1864, Kāi Tahu agreed a series of land sales with the Crown. Rather than acting in good faith, the Crown reneged on key elements of the agreements, resulting in widespread land alienation and economic deprivation for mana whenua.[63]

The 1848 Kemp's Deed was the largest of the Crown land purchases, comprising 13,551,400 acres for which £2,000 was paid. Although the deeds promised a tenth of the land would be retained as reserves for Kāi Tahu, less than 6,500 acres were allocated within the footprint of the deed.[64]

The loss of connection to whenua that took place as a result of the Deeds, coupled with the visible deterioration and degradation of lakes, rivers, and waterways since that time, is a source of great mamae for mana whenua. This is particularly true given the obligations of mana whenua to fulfil their roles as kaitiaki whenua in their takiwā, mō tātou, ā, mō kā uri a muri ake nei.

Barriers to following kā ara tawhito made visiting wāhi tūpuna and wāhi mahika kai as was done in the past more and more difficult. Over time, the ancestral lands were surveyed, sold, and settled. Wetlands like Dismal Swamp and Te Paruparu-a-Te-Kaunia were dammed, and other waterways were modified and drained. Changes in the landscape led to changes for the people, contributing to the displacement of whānau, loss of knowledge and identity, and the suffering of economic hardship.

When gold was struck in Otago in 1862, thousands flocked to Te Waipounamu to find their fortunes. A number of Kāi Tahu people saw the benefits to be had from joining the gold rush, as well as engaging in other paid work like shearing and labouring. In 1862, Māori gold miners were recording catching weka and whekau.[65] Nevertheless, the influx of people, and the wealth that the gold rush produced, pushed a further wedge between Kā Rūnaka and the hinterland.

Gold mining had a myriad of impacts for mana whenua, with every aspect of the relationship and connection with the landscape coming under attack. Physical barriers to accessing Central Otago and the Upper Lakes became increasingly apparent. When a group of mana whenua from the coast undertook a heke inland in an attempt to retain access to their traditional land and resources, they were unable to progress past Ōmārama. They stayed there until 1879, when they were forcibly ejected. From that point onwards, the primary economic activity available to mana whenua in the Upper Lakes region was as labourers.[66]

The development of key infrastructure like roads, towns, and services, caused physical changes to landscape, some impacting significant landmarks and wāhi tūpuna. Events like the mining of Pukemakamaka, the channelling of the Ōwheo, and the draining of the inland saline lakes of the lower Taiari, all sites now mapped as significant wāhi tūpuna, but without regard for their values, is indicative of the manner in which the settlement of Aotearoa occurred.

The impact of goldmining on mana whenua associations is evident in the archaeological record surrounding the Mata-au, Lake Onslow, and Te Awa Makarara, which shows a significant number of sites linked to mining and settlement, notably water races, sluices, tailings, and huts. The landscape was extensively modified at Roxburgh during this period, following the discovery of gold in Te Awa Makarara in 1862.[67]

The damming of Dismal Swamp adversely affected mana whenua values associated with the place, and for Te Awa Makarara. At Dismal Swamp, ancestral sites and wāhi mahika kai were obliterated by the

[62] Waitangi Tribunal, 1991, s4.2.
[63] Ibid.
[64] TRONT, 1997.
[65] Beattie, 1945.
[66] Kleinlangevelsloo & Clucas, 2017.
[67] Hamilton, 2009.

inundation. The landscape changed irrevocably, drowned under the trout-laden waters of the reservoir above. With the loss of these values, the impetus for mana whenua to retain their connections was degraded, and with significant challenges being faced closer to home at the coast, mana whenua grew further and further removed from their places, and the knowledge with which they were associated. Over time, this led to a significant loss of cultural knowledge, as stories, knowledge, history, and learning that had previously been shared during heke, were no longer being shared, no longer being remembered.

The trout themselves had further impacts, pushing highly endangered species like the Teviot flathead, a non-migratory galaxiid species, to the brink of extinction. Teviot flatheads are now restricted to a habitat of less than a hectare in remote tributaries whose hydromorphology allows them to remain untouched by the predation of trout. Recognised as having a nationally critical level of endangerment, the highest conservation rating available, the survival of this taoka species is finely balanced, with severe risks should the population be exposed to predation.[68]

The introduction of rabbits to Te Waipounamu for meat and hunting in the 1830s saw the explosion of their population. From the 1870s, rabbit plagues became a concern, leading to major impacts for farming. Weka and kāhu were their only natural predators, but they were unable to keep up with the spread of rabbit numbers.[69]

Farmers used a variety of methods of control rabbits, with poisons and toxins being employed from the 1880s. Native species like weka became significant victims of poisoning, and rabbit populations continued to soar. In the same decade, stoats, and other mustelids were released as a further rabbit control measure, but immediately began to prey on native species.[70] The impact of these introduced species on native species has been profound, and continues to hamper their survival today due to habitat loss and predation.

As land use in the area turned from mining to agricultural activities, water rights associated with mining rights started to be used to access water for irrigation. Over time, the water rights associated with mining privileges were not required to meet the contemporary resource management standards. In the Teviot Valley, these mining privileges became the driver for power generation on Te Awa Makarara, with Pioneer Energy currently holding consents for damming and discharging water for power generation, supplemented by consents held by the Teviot Irrigation Company.

When the RMA was enacted in 1991, these water rights were recast as ‘deemed permits,’ with a time length set for their resolution at 30 years. When the end of this timeframe came in 2021, the result was PC7 to the ORPS, which heavily encourages consent-holders to accept a short-term consent duration so as to coincide with the timeframes of the regional long-term plan.

Agriculture and pastoralisation imposed significant barriers for mana whenua in accessing the inland areas of Otago including the Teviot Valley. Access to the sites associated with mahika kai was inhibited, both through physical barriers created by landowners, and as a result of the environmental impacts on the resources themselves. The result of this separation has been far-reaching for mana whenua.

Further impacts for migratory species and the health of these waterways can be attributed to damming. Damming has effectively disrupted the migratory paths of taoka species that evolved in the waterways of Otago. The impact of this and other pressures are clear in the decline in the populations, for example, of tuna, which have been reduced by up to 90%.[71] The loss of access to the bountiful harvests of tuna from the Upper Lakes that whānau and hapū once enjoyed was significant and pronounced after the dams were built.[72]

[68] DOC, 2021.
[69] Peden, 2008.
[70] Ibid; Brockie, 2007.
[71] Clucas, 2019.
[72] Jellyman & Harding, 2012.

The construction of the Roxburgh Dam took place between 1949 and 1956 at a cost of over £24M. The project was plagued with issues and delays, while at the same time the population of Aotearoa was experiencing power shortages and even rationing. An ecological survey undertaken by the Otago Acclimatisation Society in 1962 identified a number of impacts, including changes in river morphometry, increased sedimentation, and decreased native biodiversity in relation to both animal and plant species.[73]

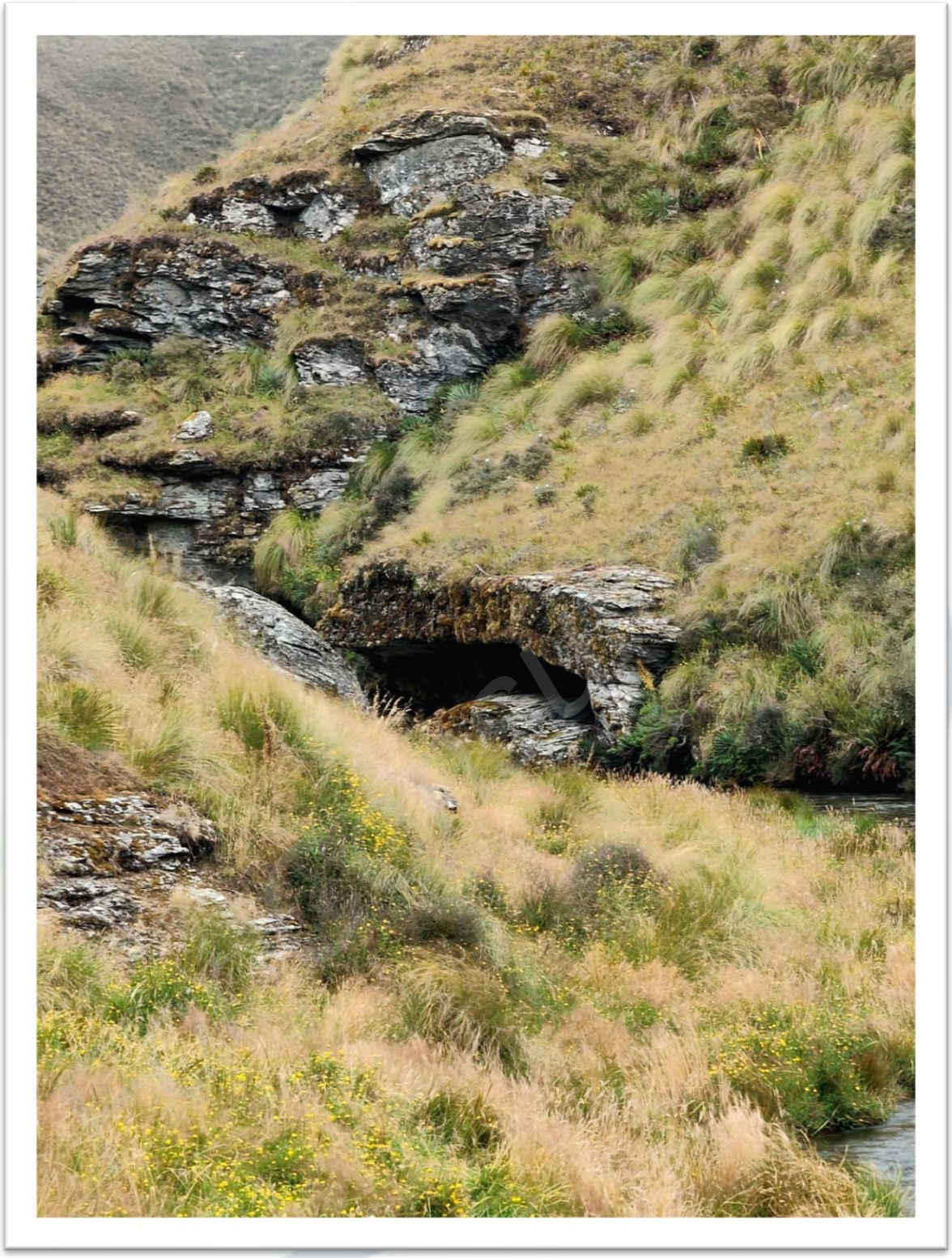
As well as the Roxburgh Dam, there are two dams on the Teviot, at Lake Onslow, and at Horseshoe Bend located 7km downstream from the upper dam. Native plant species, like mānia, pātītī, and tī kōuka, which previously grew in abundance throughout the area, are being increasingly replaced with exotic grasses and pastureland, which has been linked to the increases in phosphorous and nitrogen levels in the lake.[74] The modification of the land and environment continues. For mana whenua, this is a history that replays over and over, with echoes of the losses of the past reverberating through to the future.

The significance of mahika kai as a cornerstone of Kāi Tahu kawa and tikaka cannot be overstated. It was through these practices that knowledge and skills were handed down, and through the seasonal practice of heke that the relationship with whenua and wai māori was sustained. This continued reaffirmation of ahikāroa across the seasons was required to affirm rakatirataka and mana, but also provided opportunities for reconnection with the deeds, stories, and learning of tūpuna.

Thus, the deprivation suffered by Kāi Tahu over this time encompassed not only the material loss of land as an asset base and seasonal hunting grounds, but the loss of a spiritual connection to te taiao, of their ability to exercise rakatirataka, a fundamental building block of Kāi Tahu life and identity, and the transmission of mātauraka.[75] The legacy of this period continues today, through the continuing commitment and duty to advocate for, and protect, te taiao, mō tātou, ā, mō kā uri a muri ake nei.

[73] Winter, 1964.
[74] LAWA, 2021a.
[75] Waitangi Tribunal, 1991.

Whakaahua 19: Te Awa Makarara looking downstream from the Lake Onslow bridge[76]



[76] Timms-Dean, 2021.

8. Mauri tū, mauri ora: Mana whenua values in the Lake Onslow area

8.1 Wāhi Tūpuna and Ara Tawhito

Lake Onslow, Te Awa Makarara, and the Mata-au are all mapped as wāhi tūpuna (see Whakaahua 20 below), referencing the significance of these sites to Kā Rūnaka as mana whenua in the Otago takiwā. The Mata-au is further identified as a significant ara tawhito, linking many wāhi tūpuna along its route. The river has also been identified as a statutory acknowledgement area under the provisions of the Ngāi Tahu Claims Settlement Act 1998.

Commercial Information

Lake Onslow is listed in Schedule 1D of the ORPW as having cultural values as a wāhi taoka, and a wāhi mahika kai. Te Awa Makarara is also recognised as a wāhi mahika kai. The history of loss has seen mana whenua lose many aspects of the mahi and mātauraka that were shared in the past.

Intrinsic to the status of wāhi tūpuna is a history of connection, and a relationship that was experienced and shared across generations. In the case of many of these sites, including Lake Onslow, that connection has been alienated or degraded through the history of loss. Thus, at the core of mana whenua values for the wāhi tūpuna and ara tawhito in this area is to rekindle that connection, and to reignite the fires of ahikāroa. These links are strongly bedded in the core Māori values of whakapapa, mana, and tapu.

The health of wai māori is reflected and enforced by the health of the wider environment, the associated biodiversity, and by the health and wellbeing of people. Under their rakatirataka and mana, Kā Rūnaka are duty-bound to act as kaitiaki in the environment, and to ensure that te taiao is maintain and protected, mō tātou, ā, mō kā uri a muri ake nei.

[77] TRONT, 2016.

8.2 Wai māori values

Wai māori is a taoka of extreme significance for mana whenua. The waters that feed major rivers like the Mata-au contribute to the whakapapa of the awa as it travels from the mountains to the sea. Different waterbodies were seen for their intrinsic values by tūpuna, each having its own mana and mauri, and providing a source of well-being. The ecological services provided by waterways were well recognised by tūpuna, and were valued as a taoka. Waterways were significant sources of food and resource for mana whenua in the past, which became a driver for cultural practices related to learning, knowledge, and intergenerational succession. The restoration of mahika kai and taoka values associated with waterways and wai māori is a significant priority for Kā Rūnaka, as a vehicle for cultural development.

Under the NPS:FM 2020, the fundamental concept underpinning freshwater management in Aotearoa in Te Mana o te Wai, which "recognises that protecting the health of freshwater protects the health and well-being of the wider environment."[78]

Tūtohi 6: Mana whenua values for the Mata-au FMU relevant to the proposed activity[79]

1. The management of the FMU recognises that: (a) the Mata-au is a single connected system ki uta ki tai, and (b) the source of the wai is pure, coming directly from Tāwhirimātea to the top of the mauka and into the awa.
2. The ongoing relationship of Kāi Tahu with wāhi tūpuna is sustained.
3. Waterbodies support thriving mahika kai, and Kāi Tahu whānui have access to mahika kai.
4. Indigenous species migrate easily and as naturally as possible along and within the river system.
5. The ecosystem connections between freshwater, wetlands, and the coastal environment are preserved, and wherever possible, restored.
6. Flows in waterbodies sustain and, wherever possible, restore the natural form and function of main stems and tributaries to support Kāi Tahu values and practices.
7. Sustainable abstraction occurs from lakes, river mainstems, or groundwater in preference to tributaries.
8. Practices reduce discharges of nutrients and other contaminants to waterbodies so that they are safe for human contact, and mahika kai species are safe for consumption.
9. There is no further modification of the shape and behaviour of the waterbodies and opportunities to restore the natural form and function of waterbodies are promoted wherever possible.
10. The desire for the outcomes to be achieved by 2045 for the Roxburgh and Lower Clutha rohe.

In the hierarchy of obligations identified under Te Mana o te Wai, the first priority for freshwater management is to ensure that the health and wellbeing of waterways is protected, and that where the mauri of the waterbody is degraded, it will be restored.[80] According to the PORPS 2021, in order to uphold Te Mana o te Wai, the management of land and water in Otago must recognise and reflect that water is the foundation and source of all life – nā te wai ko te hauora o kā mea katoa. The key role of mana whenua in

[78] NPSFM 2020, s1.3 (1).
[79] Aukaha (1997) Ltd., 2021.
[80] NPSFM 2020, s1.3 (5).

defining Te Mana o te Wai is recognised, including in the identification of freshwater values.[81] Significant work has been undertaken by mana whenua to identify wai māori values for the Mata-au catchment under the provisions of Te Mana o te Wai, and are summarised in Tūtohi 6 above.

Given the level of modification and abstraction in the environment surrounding Lake Onslow and Te Awa Makarara, there is no doubt that the mana and mauri of these waterways have been degraded. Any indigenous biodiversity in the catchment has been heavily influenced by introduced species, with some species no longer being present. In order to meet the requirements of the NPSFM 2020, it is vital that the proposed activities are undertaken in such a way as to uphold and promote the mana of these waterways.

The presence of three scheduled wetlands in the vicinity of the lake provides a focus for these activities, as does the conservation status of the indigenous species identified in the area. The loss of wetlands in the Otago takiwā is a significant concern for mana whenua, as it is becoming for our wider community. It is estimated that around 90% of our wetland habitats have already been lost, and many more are under threat. The NPSFM 2020 provides specific guidance about the protection of wetland environments, stating "There is no further loss of extent of natural inland wetlands, their values are protected, and their restoration is promoted."[82]

8.3 Ecological values

Strongly associated with the protection of mana whenua values for freshwater is the protection of ecological values. Retention and restoration of indigenous freshwater ecosystems is a crucial element of upholding Te Mana o te Wai. The Mata-au provides an important habitat for many native species, including fish, bird, and plant species.

The Mata-au is the largest catchment by area and river flow volume in Te Wai Pounamu, and across the country. The total catchment area is approximately 21,000km^2 with a mean annual flow of 575 m^3/s.[83] At 338km in length, the Mata-au is the second longest river in Aotearoa after the Waikato. From below Roxburgh dam to the sea there is approximately 140km of river that is unimpeded by manmade structures that would disrupt fish passage.

There are numerous tributaries connected to the Mata-au mainstem, providing suitable habitat for a range of aquatic species. From Roxburgh to Balclutha, the awa is relatively deep and swift, resulting in conditions that do not provide suitable habitat for fish species other than tuna[84] and introduced salmonids. Smaller Mata-au tributaries provide habitats that are not as deep or swift, and subsequently more suitable for a broader range of native fish species.

The Mata-au serves as the highway to several larger tributaries within Otago, including Te Awa Makarara, Tima Burn, Tall Burn, Ōkura, Tuapeka, Poumāhaka, Waitāhuna, and Te Waiwhero are some of the more prominent tributaries of Mata-Au between Roxburgh and the sea.

Tūtohi 7 highlights ecosystem values for the Mata-Au between Alexandra and the sea recorded in Schedule 1A of the Regional Plan: Water for Otago. The values identify that the size of the awa, variety of bed composition substrata and habitat characteristics make it one of the most ecologically highly valued awa in Otago. There are currently no areas defined as having a high degree of naturalness under the provisions of the current ORPW.

Freshwater fish species records from the past four decades have noted a number of native freshwater fish species which are of value to Kāi Tahu either as mahika kai or taonga species. Table 5-1 in Kuczynski *et al*

[81] PORPS 2021, LF-VM-O2.
[82] NPSFM 2020, s2.2(6).
[83] LAWA, n.d.
[84] NIWA, 2022.

2022[85] compiles fish records from reports published in 1984, 1988, 2000 and review of the NIWA Freshwater Fish Database. Review of those information sources provided records for the Mata-Au mainstem and tributaries below Roxburgh.[86] Kanakana, tuna, īnaka and black flounder are all recognised mahika kai species that have been recorded in some area of the Mata-au below Roxburgh. Other native species records were common smelt, kōaro, giant kōkopu, roundhead galaxias, torrentfish, common bully, redfin bully and upland bully. Common smelt, giant kōkopu, and torrentfish are all recognised in Schedule 98 Part A of the Ngāi Tahu Settlement Act as taonga fish species. Compared to other waterways in New Zealand this diversity of fish records is considered limited. The fish diversity observed has been influenced by the incursion of dams on the Mata-Au.

8.3.1 Plant and Algae Biosecurity risk

There are three well-known species of non-native pest algae or plant species that are present in the Mata-Au system. The species are *Lagarosiphon major* (Lagarosiphon), *Lindavia intermedia* (Lindavia) and *Didymosphenia geminanta* (Didymo). Lagarosiphon is an invasive weedy aquatic plant species that can cause a number of adverse impacts. It can displace and shade out aquatic native plants. When it aggregates into thick clusters, lagarosiphon can disturb water flows, cause localised deoxygenation, can have negative effects on aesthetic values and can disturb freshwater recreational activities[87]. Under the Biosecurity Act 1993, *Lagarosiphon major* is designated as an Unwanted Organism.

Both Lindavia and didymo are types of brown algae (diatom). Lindavia is sometimes referred to as lake snow, which forms when Lindavia proliferates into visible brown blobs. In a similar way, didymo or 'rock snot' form dense algal mats on the beds of rivers. Both invasive algae species are capable of causing undesirable effects on recreational and amenity value. Additionally, emerging research is beginning to show that didymo can impact native fish species both directly through alteration of habitat, and indirectly by bringing about changes to macroinvertebrate communities and consequently food sources for fish[88]. Lindavia is defined as an 'Organism of Interest', capable of causing adverse effects, under the Otago Regional Pest Management Plan. Didymo is designated as an Unwanted Organism under the Biosecurity Act 1993.

The pumping of water from the Mata-Au to Lake Onslow increases the possibility of transporting these unwanted pest species into the Te Awa Makarara / Teviot River catchment. The spread of these unwanted organisms threatens to negatively impact the mauri of these waterways. The wellbeing of aquatic organisms, both fish and macroinvertebrates, could also come under threat if these pest species are able to establish in new areas. As tangata tiaki/kaitiaki for the waterways in their rohe Kā Rūnaka have a duty of care to protect these places from biosecurity threats.

[85] Cited by Stoffels, 2022.
[86] Stoffels, 2022.
[87] ORC, 2022.
[88] University of Canterbury, 2016.

Tūtohi 7: Ecosystem values for the Mata-au (Alexandra to the sea)[89]

Stretch of the Mata-au	Ecosystem Values															Outstanding natural features or landscapes	Significant indigenous vegetation and significant habitat for indigenous fauna
	Psize	Psand	Pgravel	Prock	Hjuve	Eel	Trout	Salmon	Birddiv	Hspwan	Sigveg	Rarefish	Fishdiv	Gbird	PPass		
Alexandra to Island Block (Millers Flat)	√	√	√	√	√	√	√	√	√	S[90]	√[91]						*Significant habitat* for lamprey (uncommon in Otago)
Island Block to Balclutha	√	√	√		√	√	√	√	√	T/S	√	√	√	√[92]	√	Beaumont Rongahere Gorge	*Significant habitat:* Remnant indigenous ecosystem at Birch Island. *Significant vegetation*: Rare association of aquatic plants above confluence with Tuapeka
Balclutha to the sea	√	√	√		√	√	√	√		S		√	√	√	√		

KEY:

Psize	Large water bodies supporting high numbers of particular species, or habitat variety, which can provide for diverse life cycle requirements of particular species, or a range of species.	Ppass	Access within the main stem of a catchment through to the sea or a lake unimpeded by artificial means.
Psand	Sand bed composition	Pgravel	Gravelly bed composition
Prock	Rock bed composition	Salmon	Significant presence of salmon.
Trout	Significant presence of trout.	Eel	Significant presence of eel.
Hspawn	Significant fish spawning area; T = trout, S = salmon.	Hjuve	Presence of significant areas for development of juvenile fish.
Rarefish	Presence of indigenous fish species threatened with extinction.	Birdrare	Presence of indigenous waterfowl threatened with extinction.
Gbird	Regionally significant presence of gamebirds.	Birddiv	Presence of significant range of indigenous waterfowl.
Sigveg	Presence of significant indigenous aquatic vegetation.		

[89] Schedule 1A, ORPW.
[90] Below Roxburgh Dam.
[91] Below Roxburgh Dam.
[92] Balclutha to Tuapeka River mouth.

Whakaahua 21: *Lagarosiphon major* in Lake Taupo[93]

Within the impetus for Carbon Zero 2050 is not just our own survival as a species, but the survival of the indigenous species that currently surround us, and that inhabit the area around Lake Onslow. In doing so, we will be able to work together to uphold the core values of mana and mauri in relation to te taiao.

8.4 Archaeological values

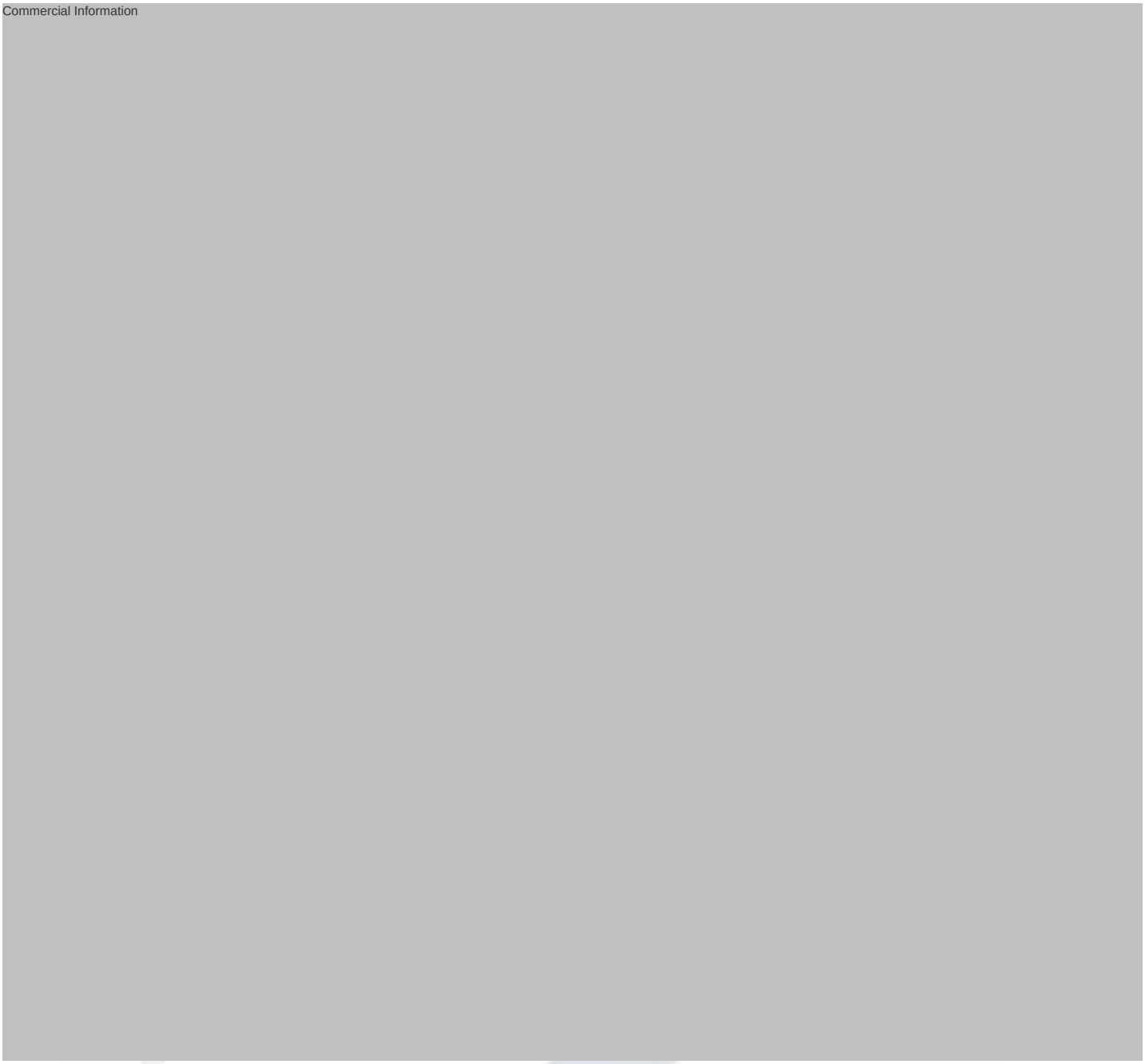
Māori archaeological evidence in the proposed Lake Onslow inundation zone will be completely lost if not recovered prior to the proposed inundation. Given the abundance of known Māori archaeological sites in the immediate area, it is likely that more evidence is yet to be found. Moreover, the areas where earthworks related to construction and tunnelling will take place are in areas where, not only is there significant archaeological evidence known to be present, but also areas that have not been adequately surveyed and will no doubt yield further such evidence.

Significant tracts of land appear to have been meticulously assessed, particularly to the south of Te Awa Makarara, and west of Lake Onslow. Commercial Information traverse areas covered in mapped archaeological sites. North of the Makarara, very few sites have been identified, except for one, a silcrete blade found in 1978, about 18km west of the Lake Onslow Dam, further 'empty' tracts of land visible on all side of the lake itself (see Whakaahua 22 below). This potentially means that the tunnel alignment for the Lake Roxburgh option may have not been previously surveyed for archaeological values.

Mana whenua are acutely aware that these are only the sites that have been found, while there are likely to be more sites yet to be discovered. Archaeological evidence provides further information about tūpuna and their daily lives, building the knowledge of mana whenua for the tasks and feats undertaken by their ancestors. The lessons of the original flooding of Dismal Swamp can still be seen in the archaeological

[93] NIWA, n.d. a.

record for this site, recorded in 1978, ninety years after the building of the first dam. At this stage, of course, there is no site left visible to examine.[94]



Kā Rūnaka strongly advocate that every measure available be taken to assess the inundation zone and surrounding affected areas, to identify archaeological evidence and sites, so this can continue to build our knowledge of the lives of tūpuna in the past. Given the remote location, and the likelihood that further archaeology will be present, Kā Rūnaka contend that an archaeologist be present for earthworks in all areas that are identified as high value by the archaeological and heritage assessment.[96] The preservation of the

[94] Croad, 1978.
[95] TRONT, 2021.
[96] Davies, Cropper, & Hurford, 2021.

histories of tūpuna through archaeological evidence strongly support the core mana whenua values of whakapapa, mana, and tapu.

8.5 Equity values

Throughout the history of loss, a significant feature of the social and political landscape was the lack of equity in outcomes. For Māori, the history of inequity has been overwhelming, particularly in that these inequalities are still clearly identifiable today, through the health, welfare, education, and criminal justice statistics for Māori that we often see reported in the news. Opportunities for progress and success are usually handed down through families and communities, meaning that people who are not part of these communities often miss out.

Given the potential wide-ranging benefits available should the project proceed, it is vital that these are distributed equitably across the whole community, not just in employment, but through active engagement in all levels of the activity, including governance.

Since the early days of European settlement, many whanauka have taken advantage of employment opportunities in the hinterland of Te Waipounamu. Today, Kā Rūnaka want to see those opportunities elevated, providing a platform for the development and growth of their people through the acquisition of valued skills and experiences, and through to the action of mana and rakatirataka within their takiwā as mana whenua.

Whakaahua 23: The Mata-au at Roxburgh, from the Roxburgh Bridge, 1968[97]

[97] Image credit: Capper, 1968.

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Appendix 1: Glossary of Māori terms

ahikāroa	title to land through longstanding occupation; literally 'the long-burning fires'
āhua	nature, appearance
ara tawhito	ancestral trails
atua	deity, early ancestor
awa	river
heke	migration, movement
īnaka	whitebait
kai	food
kāika	settlement(s)
kāika mahika kai	food gathering settlement(s)
kākahi	freshwater mussel
kaitiaki whenua	caretakers of the land
kaitiakitaka	the exercise of guardianship by the mana whenua of an area in accordance with tikaka Māori in relation to natural and physical resources, and including the ethic of stewardship
kanakana	lamprey
kāuru	edible parts of the cabbage tree
kawa	accepted protocols
kō	digging stick
korikori	hairy alpine buttercup, mountain buttercup
kōura	freshwater crayfish
kukupako	black teal
mahi	work, activities
mahika kai	practices, knowledge, and activities related to food gathering
mamae	pain, distress
mana	status, prestige, honour
mana whenua	customary authority exercised by an iwi or hapū in an identified area, and the people mandated to exercise it on their behalf
mānia	Carex tussock
Mata-au	Clutha River
mātauraka	knowledge, wisdom, understanding
maumaharataka	the accumulated memories of whānau
mauri	life force, life essence
mōkihi	reed raft

mokopuna	grandchildren, descendants
nohoaka	temporary campsites
Ōkura	Beaumont River
Ōwheo	Leith River
panapana	New Zealand bitter cress
papatipu rūnaka	entities mandated to uphold mana in their takiwā
pārera	grey duck
pāteke	brown teal
pātītī	red tussock
pekapeka	New Zealand bat
pōhata	turnip
Pukemakamaka	Saddle Hill
Purehurehu	Hayward Point
pūtakitaki	paradise duck
rakatirataka	chiefly authority
rūnaka	council, board
takiwā	territory
taoka	treasure
taoka tuku iho	treasures handed down (by the ancestors)
tapu	spiritual restrictions
tautiakitaka	the act of protecting
Te Awa Makarara, Makarara	Teviot River
Te Papanui	Lammermoor Range
Te Paruparu-a-Te-Kaunia	Great Moss Swamp
te taiao	the natural environment
tikaka	correct procedure, correct method
tī kōuka	cabbage tree
totokipio	New Zealand dabchick
tuna	eel
tūpuna	ancestors
tūtohi	table (of data)
tūturiwhatu	banded dotterel
umu	oven
umu tī	oven used to preserve kāuru
wāhi mahika kai	food gathering sites

wāhi tūpuna	ancestral landscapes of significance to iwi
wai	water
Waihemo	Shag River
wai māori	freshwater
waka	canoe
weka	woodhen
whakaahua	image
whakapapa	genealogy
whakataukī	proverb
Whakatipu-waitai	Lake McKerrow
whakawhanaukataka	the process of building relationships
whānau	extended family
whanauka	relative, relatives
whanaukataka	a sense of family connection
whekau	laughing owl, now extinct
whenua	land
whio	blue duck

Appendix 2: List of Abbreviations

AHEC	Australian Hydro-Electric Corporation
DRP	dissolved reactive phosphorous
FMU	Freshwater Management Unit
GHG	greenhouse gases
IHA	International Hydropower Association
LAWA	Land Air Water Aotearoa
MBIE	Ministry of Business, Innovation, and Employment
MfE	Ministry for the Environment
NZAA	New Zealand Archaeological Association
NZB	New Zealand Battery
NZHP	New Zealand Heritage Properties Ltd.
NNN	nitrite-nitrate nitrogen
NPS:FM 2020	National Policy Statement for Freshwater Management 2020
ORPW	Otago Regional Plan for Water
PORPS 2021	Proposed Otago Regional Policy Statement 2021
RMA 1991	Resource Management Act 1991
TRONT	Te Rūnanga o Ngāi Tahu

Appendix 3: Māori archaeological sites in the surrounding area[98]

Descriptor	ArchSite records	Mana whenua associations
Artefact	G43/2	Oven stones, waste flakes
	G43/39	Moa bones, stone flakes, possible gizzard stones
	G43/49	Cache of at least six artefacts (unspecified)
	G43/50	Silcrete 'cleaver'
	G43/80	Greenstone artefact, possibly an adze
	G44/3	Earthworks, charcoal, oven stones, stone flakes
	G44/4	Adze
	G44/11	Stone flakes
	G44/47	Stone flakes
Cave / Rock shelter	G43/31	Large rock shelter, midden waste
	G43/193	Rock shelter
	G43/194	Rock shelter
Food source	G43/47	Reported source of kōura and kākahi, moa bone fragments
Midden	G43/51	Flaking floor, cooking area, moa remains (feet, neck, crania)
	G44/10	Adze fragments, flaked material, oven stones, moa bone
Umu	G43/5	Burnt schist, charcoal
	G43/6	Stone flakes, blades, moa bone, earthworks
	G43/8	Orthoquartzite blades (not recovered), earthworks
	G43/9	Burnt schist, bone (possibly moa)
	G43/44	Earthworks
	G43/45	Earthworks (six ovens)
	G43/79	Earthworks
	G43/102	Earthworks
	G43/108	Earthwork
	G43/109	Earthworks, potential occupation material
	G43/110	Earthworks
	G43/111	Earthworks
	G43/112	Earthworks (Oven Hill)
	G43/113	Earthworks, charcoal, burnt schist
	G43/114	Earthworks

[98] TRONT,

	G43/115	Earthworks, porcellanite, bones, kākahi shells
	G43/116	Earthworks
	G43/117	Earthworks
	G43/118	Earthworks
	G43/119	Earthworks
	G43/120	Earthworks, moa bone, stone flakes
	G43/121	Earthworks
	G43/122	Earthworks
	G43/125	Earthworks
	G43/126	Earthworks
	G43/128	Earthworks
	G43/129	Earthworks
	G43/130	Earthworks
	G43/131	Earthworks
	G43/132	Earthworks, charcoal, burnt stone, stone flakes
	G43/133	Earthworks
	G43/134	Earthworks
	G44/12	Earthworks
	G44/14	Earthworks
	G44/17	Earthworks, charcoal, moa bones, adze
	G44/29	Earthworks
	G44/30	Earthworks
	G44/31	Earthworks
	G44/32	Earthworks
	G44/33	Earthworks
	G44/34	Earthworks
	G44/35	Earthworks
	G44/36	Earthworks
	G44/37	Earthworks
	G44/38	Earthworks
Umu tī	G43/3	Porcellanite flakes
	G43/38	Earthworks
	G43/46	Burnt stone, black ashy soil
	G43/192	Earthworks
	G44/9	Earthworks

	G44/13	Earthworks
	G44/127	Earthworks
Unclassified / Unspecified	G43/4	Earthworks, stone flakes
	G43/105	Earthworks, stone flakes and tool remnants, moa bones
	G44/8	Wala huia