

From: [Kay I Lindis](#)
To: [Natasha Pritchard](#)
Subject: Final amenity audit report attached
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Attachments: [Lake Onslow Pioneer Energy amenity assessment final 27.9.21.docx](#)
[Lake Onslow Pioneer Energy amenity assessment final 27.9.21.pdf](#)

Kia ora Natasha

Good to talk this morning.

I attach my report (final version) that audits the Pioneer Energy Ltd consent variation application with respect to amenity values.

I have attached the report in two formats - Word and PDF.

Ngā mihi
Kay

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**Pioneer Energy Limited consent amendment for Lake Onslow:
Audit of the application with respect to amenity values**

Prepared for Otago Regional Council

By Dr Kay Booth

Final report: 27 September 2021

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1. INTRODUCTION

1.1 PURPOSE

Otago Regional Council (ORC) has requested an audit of the application from Pioneer Energy Limited (PEL) to vary their water permits for damming, taking and using water from Lake Onslow with respect to effects on amenity values.

1.2 SCOPE AND DEFINITIONS

Amenity value has been defined by ORC as recreation, angling amenity, collecting mahika kai, and aesthetics. I have defined 'aesthetics' to be the experiential perspective of landscape amenity or visual amenity value. This report does not otherwise assess landscape amenity which is a specialist area of expertise.

ORC requested that this audit address seven questions, as set out in section 2 of this report.

1.3 AUDIT MATERIALS

An initial audit (dated 18 August 2021) was conducted on the consent application (PEL 2018 and Dungey 2017) and additional information provided by the Applicant (Dungey 2018a, 2018b, 2021a, 2021b and LandPro Limited 2021a). Relevant materials supplied by ORC were also reviewed, including assessments of the consent application (Aquatic Environmental Sciences (AES) (2018) and Augspurger (2017)) and correspondence that provided views from the Teviot Angling Club and Fish & Game Otago.

ORC requested further information from the Applicant, following receipt of the initial audit report. Additional material (LandPro Limited 2021b and Dungey 2021c) was provided on 2 September and a revised audit report then prepared (dated 6 September 2021). Following its receipt, ORC again requested additional information from the Applicant which was provided on 9 September 2021 (LandPro Limited 2021c) and 14 September 2021 (Kai Tahu ki Otago c2005). This audit report takes all of this information into account.

Subsequent clarification was sought (between 15 September and 24 September) about expected changes in the scheme's operating regime and operating environment as a result of the proposed consent variation, particularly how Lake Onslow may be affected. Responses to these queries have been considered in preparing this report.

1.4 CONSENT AMENDMENT

PEL has sought an amendment to its existing consents to operate the Teviot River hydro-electric scheme, specifically to increase the drawdown rate for Lake Onslow from the currently consented 0.2 m/week to 0.4 m/week. The relevant condition states that the rate at which the lake shall be drawn down shall not exceed 0.2 (proposed to change to 0.4) metres over any period of seven days ("the proposed change"). No other changes are proposed to existing consent conditions including the rate of take, the minimum operating level of the lake or the existing residual flows.

The company initially proposed to increase the drawdown rate to 0.5 m/week but revised this down to 0.4 m/week in response to concerns raised by Fish & Game Otago. These concerns were about effects on ecological and amenity values.

The Applicant has proposed an adaptive management approach. Ecological effects of the change in drawdown rate would be monitored in order to verify that effects are as anticipated. If they are not, then the drawdown regime would revert back to 0.2 m/week.

1.5 RESULTING CHANGES TO THE SCHEME'S OPERATING REGIME

A suite of consent conditions influences the scheme's operating regime. The interplay of the proposed change with the other consent conditions (none of which change) may modify the existing pattern of water storage in Lake Onslow and flows in the Teviot River. Understanding these likely changes is a prerequisite for understanding how the proposed change will affect amenity values. For this reason, I now set out my understanding of the implications of the proposed change to the scheme's operating regime and operational environment.

Details about the proposed change

- The proposed change is to increase the drawdown rate of Lake Onslow from 0.2 m per 7-days to 0.4 m per 7-days (from 1.2 mm/hr to 2.4 mm/hr on average).
- This change is sought by the Applicant to provide more flexibility to react to relatively short periods of high electricity demand.
- The current restriction of lake level drawdown means that at lake levels lower than about 1m below the dam crest the Applicant is unable to take the consented maximum flow at a sustained rate and at lower levels is effectively restricted to much lower sustained rates of take.
- The proposed change will allow more water to be released from the dam as the lake level lowers. The current consent effectively restricts the volume of water that can be taken over a 7-day period in late summer.
- More specifically, the consented maximum discharge from Lake Onslow is 6 cumecs. The Applicant states that the consented drawdown rate of 0.2 m/week does not allow the maximum take of 6 cumecs to be exercised for a sustained period but, rather, that a take of approx 3.5 cumecs is sustainable.
- The proposed increase in drawdown rate enables a higher sustainable rate of take; in effect, that the average take over a 7-day period could be higher. This is because increasing the allowable change in lake level over a 7-day period enables a higher volume of water to be released over that period.
- The Applicant states that the outflow within a 7-day period will vary significantly. There will be periods of higher outflow and periods of lower outflow.
- The Applicant is unlikely to ever fully utilise the 6 cumecs maximum discharge rate. This is because of other parameters of the operational regime.
- First, that downstream generation infrastructure in the Teviot River has a maximum take of 6 cumecs and there is significant natural inflow (approx. 1/3 of the total Teviot River catchment) between the Onslow dam and the first generation unit at Horseshoe Bend. Therefore, it is unlikely that the full 6 cumecs discharge from Lake Onslow will be fully exercised as this would result in spill at Horseshoe Bend and wasted generation potential.
- Second, that if the higher outflow (6 cumecs) was to be exercised for part of a 7-day period, then a reduced flow may be required for the remainder of that period so as not to exceed the maximum weekly drawdown limit. How this plays out depends upon the volume available at a given depth, with available volume being a function of the lake area and the 7-day limit.
- For this reason, when discussing lake level reduction scenarios associated with outflows from Lake Onslow at various depths (see later), the Applicant refers to maximum average outflows over the 7-day period.

- In summary, the Applicant has stated that:
 - The proposed change enables a higher sustained rate of take (ie. a higher average take over the 7-day period) because a greater volume of water may be taken in a 7-day period.
 - While a drawdown of 0.4 m/week is being sought, it is unlikely that this drawdown rate would ever be fully executed. It is more likely that an increased drawdown rate of around 0.25 m/week (0.05 m above what is currently consented) would be utilised, in order to respond to electricity market demand.
 - Within a 7-day period, outflows will vary significantly.

Timing and frequency of use of the proposed change

- The Applicant anticipates utilising the larger drawdown rate in late summer/autumn (March to June). This period typically has low lake levels.
- The Applicant expects to use the greater drawdown rate approximately twice in a 5 year period, although no restrictions on the frequency of use are proposed within the consent.
- There is uncertainty on when the greater drawdown rate will be required because it is a function of market demand and low rainfall years.

Effects on the lake from the proposed change

Lake operating range:

- There is no change to the lake's operating range.
- The Applicant advises that the usual operative range is 2.5 m, with lows (ie. close to 5 m below the crest) experienced about once a decade.
- The lake's minimum operating level remains unchanged at 5 m below the crest of the dam.

Rate of drop of lake level:

- The rate of drop in lake level has been quantified by the Applicant through the use of scenarios which assume no inflow (nil rainfall) and the maximum consented outflow (6 cumecs), ie. they are conservative estimates. The scenario relating to the lake at 2 m below full states: the current 0.2 m/week drawdown limit will be reached in 2.87 days at a maximum rate of 69.6 mm/day. At the same flow rate, the time taken to lower the lake 0.4 m will be 5.75 days at a maximum rate of 69.6 mm/day. This equates to a maximum short-term drawdown rate of 2.87mm/hour.
- I note that the scenarios are based on the maximum allowable rate of take (6 cumecs) and the Applicant has explained that this rate of take cannot be exercised for a sustained period. Therefore, changes in lake level will be less than these scenarios under the proposed variation to the drawdown rate.
- As the level of the lake lowers, the speed (rate) of drop increases.
- I note that if the lake level was closer to its consented minimum (5 m below the dam crest), the speed of drop would be faster than the scenario above. This is relevant because the 'worst case scenario' for lake users plays out when the lake is at its lowest.
- As explained above, the scenarios provided are calculated as a maximum average outflow over the 7-day period. The Applicant has described that significant variability in outflows will occur within a 7-day period.
- I note that short-term (ie. minutes to hours) changes to lake levels may be masked within the averaging process across the 7-day period. Short-term variability in outflow from the dam may influence the level of the lake on a short-term basis. It is not clear how the proposed change may influence short-term variability in lake level, if at all.

Fluctuations in lake level:

- The Applicant states that the proposed increased drawdown rate does not directly equate to more fluctuations in lake level. It is simply that water could be used more quickly on occasion.
- The lake will still need to be recharged (via rainfall) and this will limit how often the faster drawdown can be applied.

Sustained low lake levels:

- The proposed change may mean that lake levels remain lower for longer than at present if rainfall does not eventuate to refill the lake. The Applicant states there is a low likelihood that this impact will occur.

Effects on the shoreline/mudflats from the proposed change

- Exposure of the lake bed as the lake level lowers is dependent on the contour of the terrain. Shallow areas will expose a greater area of lake bed surface, with water receding more quickly, compared with steeper areas.
- Approximately 80 percent of the Lake Onslow shoreline is very shallow so a small change in depth produces a relatively large change in shoreline.
- Much of the southern shore, and a smaller section of the northern shore, is gently sloping and therefore has significant amounts of lake bed exposed as the lake level drops.
- Because the minimum operating level of the lake does not change, the proposed change is not expected to expose any more lakeshore than at present.
- But the lower level lake shoreline may be dry in late summer for longer than at present; the Applicant states the likelihood of the lake being lower for longer is low. It is dependent on rainfall which refills the lake.
- The Applicant states that it is not expected that erosion or land instability (such as from increased wave action on exposed shoreline) would increase due to the proposed change.

Effects on the boat ramp from the proposed change

- The Applicant states that use of the boat ramp should not be affected by the proposed change as the ramp is formed from concrete and access is assumed possible in any drawdown scenario. That is because the ramp has historically provided angler access at all lake levels since the raising of the lake in 1984.

Effects on the Teviot River from the proposed change

- The proposed change will result in higher flows down the Teviot River during a period of the year that is typically dry. This is advantageous to aquatic biota and, in this way, to angling opportunity.

2. AUDIT FINDINGS

Overview of audit findings:

- The Application does not provide an adequate assessment of amenity values and the effects of the proposed change upon amenity values.
- The Applicant has not assessed human use and appreciation values directly. Instead the assessment of amenity values is based on information about sites and species associated with amenity value, such as trout and waikōura.

- Assessment of effects upon amenity values rests on the Applicant’s conclusion that the proposed change in drawdown rate will result in little change to the operating environment and, therefore, will have negligible effect on amenity values.
- The monitoring programme should be expanded to include amenity-related metrics.

Q1	Is the technical information provided in support of the application robust, including being clear about uncertainties and any assumptions? Yes, or no. If not, what are the flaws?
Recreation	<p>No.</p> <p>Dungey (2021c) gives a useful but incomplete description of recreational values and use. The report’s primary weakness is the reliance on the knowledge of a single individual which results in a lack of comprehensiveness.</p> <p>The effects assessment is predicated on the proposition that the proposed change will result in little modification to the existing operating environment and, therefore, effects upon lake users are not expected to be significant.</p>
Angling	<p>No with respect to recreation technical information, as noted immediately above.</p> <p>Yes with respect to relevant ecological technical information, in that I rely on the audit by AES (2018).</p>
Gathering mahika kai	<p>No. The Applicant has not determined whether mahika kai gathering occurs in the area. No technical information is provided about the presence, extent or importance of the activity of mahika kai gathering. The focus of the assessment is on biological assessment of resource availability (notably waikōura).</p> <p>I note that a Cultural Impact Assessment by Kai Tahu ki Otago Limited (c2005), in connection with earlier consents, discusses mahika kai species, noting that the most important mahika kai species in the catchment are waikōura and brown trout. This report also refrains from discussing the activity of mahika kai gathering.</p> <p>The Applicant relies on their assessment that changes in the operating environment are minor and therefore any use will not be affected.</p> <p>The Applicant is upfront that the assessment of cultural effects has been undertaken from a non-expert perspective and without input from iwi. This is likely to be the reason for this information gap.</p>
Visual amenity	<p>No. There is no technical information provided on visual amenity.</p> <p>The Applicant relies on their assessment that the proposed change will not alter the surrounding landscape or the aesthetics of the lake or the Teviot River; therefore, no experiential or visual effects associated with the proposed change are expected.</p>

Q2	Are there any other matters that appear relevant to you that have not been included? Or is additional information needed? Please specify what additional info you require and why [please explain]
Recreation	<p>Yes. A more comprehensive assessment of recreational values and likely effects upon them from the proposed change. In particular, to address the gaps in the interim assessment (Dungey 2021c):</p> <ul style="list-style-type: none"> • Utilise the most up-to-date data (ie. data from the 2007/08 National Angling Survey is used rather than the most recent survey from 2014/15 (Unwin 2016)). • Review available information sources (eg. guidebooks) to help assess activity significance. • Given the likely dearth of quantitative data, the usual approach would be to collect qualitative data from knowledgeable people (eg. Fish & Game Otago, Teviot Angling Club, lake hut owners). The existing assessment is based on one individual's knowledge. This is inadequate. • Alternatively, undertake a user survey. But given use levels appear to be low for activities other than fishing, quantitative data collection may not be practical. • Pay particular attention to effects upon access to/on the water (particularly by boat). • Assess the recreational values of the Teviot River. No mention is made of river-related effects beyond highlighting that additional flow into the Teviot in the autumn would be beneficial to the fishery (and therefore angling).
Angling	Yes. The technical recreation assessment is preliminary and incomplete. See immediately above.
Gathering mahika kai	<p>No. While the Applicant does not clarify whether the activity of gathering mahika kai currently takes place within the operating area, I conclude that it is unlikely to be a significant existing amenity value. The basis for my conclusion follows: if the activity of gathering mahika kai is undertaken to some extent, then I would have expected this to be identified by:</p> <ol style="list-style-type: none"> 1. The Cultural Impact Assessment (c2005) and the subsequent consent conditions and mitigation package – with the caveats that (a) this work was undertaken approx. 15 years ago and there may have been change in the interim period, and (b) that the report's focus was species/sites and not the activity of mahika kai gathering; or 2. Aukaha in discussions about the proposed change. <p>Furthermore, I assume that the proposed change is likely to affect any mahika kai gathering activity <u>in a similar way to recreational activity</u>. This point also applies to any future amenity value, ie. the future opportunity to gather mahika kai.</p>
Visual amenity	No. I consider effects upon visual amenity to be less material than effects upon recreation and (potentially) mahika kai gathering, especially access-related matters.

Q3	If granted, are there any specific additional conditions that you recommend should be included in the consent or recommended changes to the conditions to be varied and the proposed conditions including in the amendment document?
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It is difficult to make recommendations in the absence of an adequate amenity assessment; however, two areas appear to warrant examination:

1. Provide warnings to users about the risk of lake level drop. I note that signage “to warn the public of safety and navigation risks associated with the lake” is an existing requirement (consent no. 2001.475), which may be considered adequate.
2. Expand the monitoring regime to include key amenity values (I note that the Applicant and AES both identify this opportunity).

Q4	Have the aesthetic values associated with Lake Onslow and the Teviot River been appropriately identified and appropriately assessed?
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While there has been no technical assessment of visual amenity value, I do not believe this warrants further investigation; this aspect of amenity is likely to be less affected than other amenity values.

Q5	Have the recreational values and effects on them associated with Lake Onslow and the Teviot River been appropriately identified and appropriately assessed, including effects on public access?
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No.

Identification of recreation values:

- Angling on Lake Onslow is of regional significance and, as such, warrants attention. Anglers fish from the whole lake shoreline and all of the lake trolling. All of the lake is considered ‘high use’.
- Other recreational activities have limited assessment, albeit their significance appears to be lower.

Assessment of effects:

- From the (incomplete) material provided, I conclude that the most material potential effects upon recreation are related to water-based activities and associated with access, without which recreational activity cannot take place.
- I am particularly interested in the **April-June period** as this is when the proposed change is likely to be utilised and when lake levels are typically at their lowest. Therefore, this is the period of highest potential impact for recreationists, especially boaties.
- The Applicant addresses this point. Given that late summer/early autumn is when lake water temperatures tend to be warmest, anglers target the deeper zones of the lake as that is where trout tend to congregate. Therefore, most of the fishing at this time of the year would be away from the shallower areas of the lake, meaning that the areas with the potential for the greatest adverse effect tend to be low-use from a recreational perspective.

- I am particularly concerned about **boaties being stranded**. Given the nature of the terrain, boat stranding could be life threatening and I note it already occurs on the lake. It appears that most anglers use boats – either to fish from, or to access fishing sites.
- The point is made that Lake Onslow already has known shallow spots where care has to be taken at any lake level to avoid running aground on a mud flat. Local knowledge is required to safely navigate the lake at all lake levels at present.
- The Applicant states that the boat ramp (the only lake launching site) will remain usable at all lake levels under the proposed change.
- The Applicant states that there is no increase in the risk of boat stranding because the change in hourly maximum drawdown rate as a result of the proposed variation will be undetectable to lake users over a given day’s activity, irrespective of lake depth. This is based on average figures over a 7-day period for the hourly rate of drawdown: 1.2 mm/hr (for 0.2 m per 7-days) cf. 2.4 mm/hr (for 0.4 m per 7-days).
- The Applicant states that over 14 hours (a theoretical user-day), the lake level drawdown would be approx. 16.8 mm (at the current drawdown rate) and approx. 33.6 mm (under the proposed drawdown rate). This indicates that the increased drawdown over 14 hours as a result of the proposed consent change would be no more than approx. 16.8 mm.
- These figures are averages over a 7-day period. Most pertinent to boaties are short-term lake level changes: changes to the lake level while they are out on the lake.
- It remains unclear to me how the proposed change might alter lake levels (if at all) over the short term.
- Furthermore, the proposed change may result in the lake remaining at low levels for a longer duration than at present, albeit the Applicant states this likelihood is low.
- I conclude that:
 1. The time of year when the proposed change is likely to be applied is historically the period of lowest lake levels.
 2. Most anglers use boats; therefore, the effect of the proposed change upon lake levels is critical.
 3. Low lake levels currently offer navigation challenges to boaties; however, a regionally-significant angling opportunity operates within this constraint.
 4. The greatest issue is likely to be boat stranding, which already occurs on Lake Onslow.
 5. The potential for a higher risk of stranding as a result of the proposed change appears slight for mid-range lake levels (when the lake is 2 m below the crest of the dam) on the basis of the Applicant’s 7-day average figures of lake level drop. The equivalent figures for low lake levels have not been provided and therefore cannot be assessed. I stress that these figures are averages over a 7-day period.
 6. It is not clear how the proposed change may alter lake levels, if at all, in the short-term. Therefore, it is not clear how the proposed change might affect boaties at low lake levels.
 7. Potential effects of sustained low lake levels upon the recreational/mahika kai gathering experience have not been assessed.

Q6	Have the overall amenity effects of the activity been appropriately assessed? Do you concur with the assessment?
<p>In summary, I find that:</p> <ol style="list-style-type: none"> 1. The Applicant has not adequately assessed amenity values and potential effects from the proposed change upon those values. 2. The interim recreation assessment (Dungey 2021c) is helpful but incomplete. 	

3. The amenity values with greatest potential for impact from the proposed change appear to be:
 - a. Angling, because it is the main activity undertaken in the area, is of regional significance, and potential impacts will be most felt by water-based activities.
 - b. Angling access in particular, especially whether there is any increase in the risk of boat stranding. This potential health and safety issue is critical given the risk to life that may result.
4. I cannot assess the effect of the proposed change upon lake users given the lack of data about whether the proposed consent variation may result in short-term changes to the lake level.
5. I concur with the Applicant that land-based recreational activities are unlikely to be materially affected by the proposed change.
6. The assessment for mahika kai gathering is weak as it does not address the activity of mahika kai gathering. However, I conclude that: (1) existing gathering activity appears likely to be low (and may be non-existent), and (2) potential effects from the proposed change on any existing or future mahika kai gathering activity are likely to be similar to potential effects upon recreational activity.
7. There is no assessment for visual amenity value; however, I consider effects upon visual amenity to be less material than effects upon recreation and (potentially) mahika kai gathering.
8. Lake Onslow is the focus of the amenity assessment. It would be helpful to clarify amenity values of the Teviot River, even if that is simply to indicate there are few.

Q7

Is there a need to consider the effects on amenity from the potential creation of more mud flats and potential dust generation?

Covered in Q1 (recreation).

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