



Technical Memorandum

To: Hannah Goslin, Consents Processing

From: Dr John (Jack) McConchie

Company: Otago Regional Council

Landscape Dynamics Ltd

cc: Tim Baker, Practice Manager
SLR Consulting (NZ) Ltd

Date: 14 August 2026

RE: Expert review “Consent Application Number RM26.297 – long-term discharge from QLDC WWTP”

Queenstown Lakes District Council (QLDC) is applying for resource consents to authorise the disposal of treated wastewater from the Shotover Wastewater Treatment Plant (WWTP) to the Kawarau River for a period of 35-years; consistent with Enforcement Order (EO) ENV-2025-CHC-001. These consents will enable the eventual transition of the Shotover WWTP disposal infrastructure from the consented, but failed, DAD disposal system and the short-term Kimiākau/Shotover River emergency discharge, to a permanent, fit-for-purpose discharge. The activities for which consent is sought are:

- Section 15 RMA - The discharge of treated wastewater into water and onto or into land where it may enter water, and the discharge of odour into air;
- Section 13 RMA – Works to install and maintain an outfall structure and/or pipe in the bed of the river; and
- Section 14 RMA – The taking of groundwater for dewatering during construction.

Regarding the potential effects of granting the consents on fluvial geomorphic processes, the resource consents seek to authorise the construction of one of two possible outfall structures on the bed of the Kawarau River. These are:

- A rock outfall discharging treated effluent into higher-velocity flows. This would involve constructing a rock armoured structure with pipes to discharge treated effluent into deeper, faster-flowing water. This would avoid near-bank mixing and achieve more rapid dilution than an ‘at bank’ discharge.
- A submerged pipe/diffuser outfall. This would involve discharging treated effluent through a pipe configuration, with or without a diffuser, within the main channel of the Kawarau River. It is argued that this would promote more rapid mixing and achieve faster dilution.

Preliminary details have been provided only for the rock outfall option at this stage, with the Applicant deciding on their preferred option as the consenting process continues (**Figure 1**).

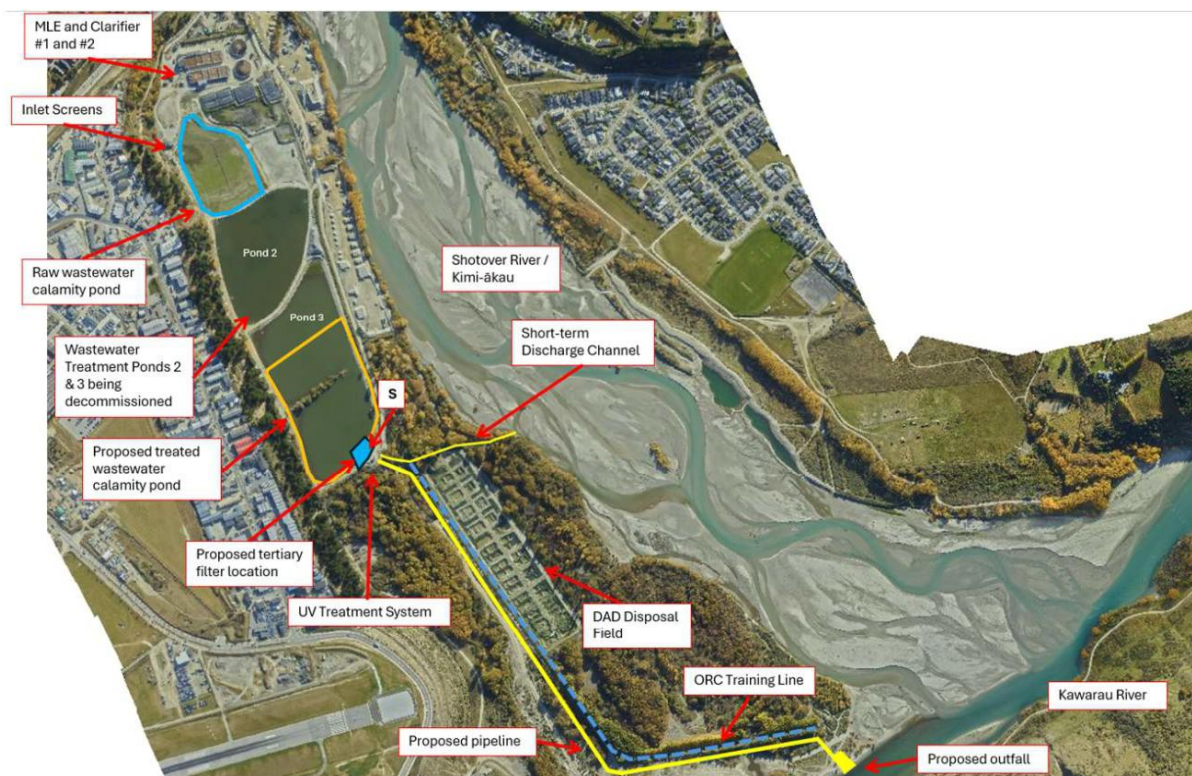


Figure 1: *Proposed pipeline and outfall location for the discharge of treated effluent.*

Scope of work

This memorandum provides an audit of the information provided by Applicant for resource consents to install and maintain an outfall structure and/or pipe in the bed of the Kawarau River. The specific focus is the effect of the proposed works on the fluvial geomorphic processes, including the potential for scour, erosion, and sedimentation. It also responds to questions asked by the Consent Processing Officer. This memorandum does not provide a new or full assessment of effects or make recommendations regarding changes to the system (apart from perhaps the location of the outfall).

Documents reviewed

To inform this audit of the resource consent application, the following documents were reviewed:

- QLDC Shotover WWTP – Long term discharge Assessment of Environmental Effects;
- Appendix A – Surface water and groundwater assessment; and
- Appendix O - Shotover Long-term Draft conditions for lodgement 29 May 2026, specifically Consent #2.

Key issues

In my opinion, the Assessment of Effects provided by the Applicant is very descriptive and general. This is particularly the case regarding the interaction of the proposed outfall with the dynamics and characteristics of the Kawarau River, and the fluvial geomorphic processes operating. Without



detailed information as to the nature, design, and construction of the potential outfall, it is difficult to assess its potential effects. Since detailed designs and construction methodologies are not currently available, this may explain the very general nature of the information provided. However, the lack of this detail makes it very difficult to provide a robust review and audit of the proposal.

While it may be pragmatic to allow flexibility regarding possible discharge options, any assessment of potential effects must, in my opinion, therefore be conservative i.e., reflect the 'worst case' scenario. This would establish an upper limit or 'umbrella of effects', within which the final outfall will have to be designed and constructed. Any effects would have to be no greater than assessed during the consent process.

Having reviewed the documents provided, in my opinion, there are several key issues that have not been addressed. These are summarised below.

Hydrology

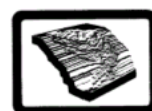
Several hydrological metrics are provided; however, it appears that these are largely to inform the discussion of effects on water quality. I assume the potential for dilution. The two sites referenced are the Shotover at Bowens Peak and the Kawarau at Chard Road. Neither of these hydrometric stations, however, are directly related to the proposed outfall and therefore the potential for dilution.

The relevant hydrological information is that for the Kawarau River at the point of discharge. Since there are no hydrological data for this location, and the outflow from Lake Wakatipu is not measured, flow must be inferred from the available data. Although providing a conservative measure i.e., higher than actual, an estimate of the flow at the point of discharge could be derived by subtracting the flow in the Shotover River at Bowens Peak from the flow in the Kawarau River at Chard Road. Since it is likely that the key metrics relate to periods of low flow, mean daily flows at the two sites could be used. This would avoid the need to account for the travel time between the Shotover River at Bowens Peak and the Kawarau River at Chard Road.

The only effect of the proposed outfall that is currently considered, and only at a very general level, is the reduction in channel cross-sectional area adjacent to the outfall and the potential effect of this on the existing flood hazard. The conclusion is that any effects will be 'less than minor' because of the relatively small percentage change in this one channel cross-section. This, however, in my opinion, grossly simplifies both the situation and the potential effects of the outfall. Any effect on the flood hazard needs to be quantified once a potential design for the outfall has been confirmed.

The potential effects of the two options are likely to be very different. The rock outfall has the potential to act as a groyne, which will then interact with the flow and sediment transport regimes. The submerged pipeline is likely to have less effects on the flow and sediment transport regimes, however, this is impossible to assess without more details on its likely design and construction.

Any structure on the bank, and particularly a structure that extends into the Kawarau River as proposed, will change the existing distributions and patterns of flow, velocity, bed shear stress, and



potentially erosion and sediment transport processes. No discussion is provided of these potential effects.

No discussion is provided of the existing character and dynamics of the Kawarau River, or fluvial processes, in the vicinity of the outfall. The interaction of the proposed outfall with the flow hydraulics of the Kawarau River, and the existing flow and sediment transport regimes, is critical when assessing the potential effects of the outfall.

Given the volume of treated effluent that it is proposed to discharge relative to the flow in the Kawarau River, the effects of the discharge on hydrology are likely to be negligible i.e., unable to be measured within the river. However, the analysis to support this conclusion needs to be based on the correct assumptions. In my opinion, this is not the case at present.

Outfall location

No discussion is provided to justify the location of the proposed outfall, which is immediately adjacent to the upstream edge of the Shotover River/Kimiākau Delta and the downstream end of the ORC Training Line. As discussed later, a rock discharge structure will act as a groyne, with the greatest potential for erosion effects immediately downstream i.e., on the Shotover River/Kimiākau Delta and potentially on the end of the Training Line. The location proposed currently is also on land managed by the Department of Conservation. This could be problematic.

Since no justification is provided for the location proposed currently for the outfall, it is unclear why the outfall could not be a simple extension of the straight pipeline (**Figure 2**).



Figure 2: Proposed pipeline and outfall (solid red line) and a possible shorter alternative (dotted red line).



Such an option would appear to have several advantages, including:

- A shorter length;
- Avoiding two relatively sharp bends in the existing pipeline;
- Remains largely within land owned by QLDC;
- Likely a more stable location with respect to fluvial processes; and
- No change to the assimilative capacity of the Kawarau River at the point of discharge.

Discharge options

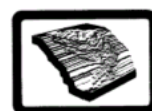
The application discusses two potential outfall options for the discharge of treated wastewater from the Shotover WWTP, a rock outfall and a pipeline under the bed of the Kawarau River. While limited information is provided on the rock outfall, just a conceptual design, no information is provided for a pipeline beneath the bed of the river. It is argued that a final decision regarding the outfall will be made 'during the consenting process'. Given the lack of information and detail, it is currently impossible to provide a robust review of the potential effects of either outfall configuration on fluvial geomorphology and fluvial processes.

In the absence of a detailed design for consideration, in my opinion, any assessment of effects must be conservative. That is, the assessment must provide an 'umbrella of effects', that would represent the upper limit of potential effects. If consented, the final design and construction of the outfall must ensure that any effects are less than those considered during the consenting process.

The discussion of the efficiency of the outfall options references 'higher dilution'. This, in my opinion, may be misleading. The amount of dilution is a function of the ratio of the volume of treated wastewater to the volume of water in the river. Since the volume of the river is constant under both outfall options, it is not possible to have higher dilution. I think that it is the speed of dilution or dispersion that is relevant metric. Consequently, the discussion should refer to 'faster' rather than 'higher' dilution.

Rock outfall

While two possible discharge options are listed, limited information is only provided for one of these i.e., the rock outfall. In my opinion, what is being proposed will act as a 'groyne' or 'stream barb'. The only effect that is currently considered is the reduction in channel cross-sectional area adjacent to the outfall. The conclusion is that any effects will be 'less than minor' because of the relatively small percentage change in this one channel cross-section. This, however, in my opinion, grossly simplifies both the situation and the potential effects of the outfall. Any effect on the flood hazard needs to be quantified once a potential design for the outfall has been confirmed. The potential effects of the outfall on the flood hazard will extend both upstream and downstream and not be limited to only at the outfall.



The rock outfall will change the existing distributions and patterns of flow, velocity, and bed shear stress. However, no discussion is provided of these potential effects. In general, what might be expected is deposition and accretion against the upstream edge of the outfall, with erosion and degradation immediately downstream.

While it is likely that the sediment load of the Kawarau River is very low where it discharges from Lake Wakatipu, the load will increase downstream and particularly in the vicinity of the Shotover River/Kimiākau Delta. The depositional zone of the delta extends upstream of the proposed outfall. As discussed above, the moving to the potential outfall slightly upstream would mitigate the potential interaction of the outfall with sediment transport and fluvial processes within the Kawarau River and particularly on the Shotover River/Kimiākau Delta.

There needs to be a full assessment of the potential effects of the proposed outfall on flow, velocity, and particularly the distribution of bed shear stress under a range of flow conditions. The analysis needs to include a discussion of how these changes will affect the existing fluvial processes including scour, erosion and sedimentation.

Submerged pipeline

No discussion of the potential effects of the submerged pipeline is provided in the AEE. The only discussion relates to the ability of such an outfall to achieve “higher” (sic) dispersion and therefore dilution.

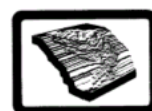
To assess the potential effects of the submerged pipe option, the applicant needs to provide both design schematics and construction details. Without this information, it is impossible to assess the potential effects of this discharge option. Since construction will be within the active bed of the Kawarau River, information is also required on the construction methodology, how construction will interact with and effect flow in the Kawarau River, and any erosion and sediment controls.

Scale of effects considered

As discussed above, in the absence of a detailed design for consideration, in my opinion, any assessment of effects must be conservative. That is, the assessment must provide an ‘umbrella of effects’, that would represent the upper limit of effects. If consented, the final design and construction of the outfall must ensure that any effects are less than those considered during consenting.

In my opinion, the current application provides limited information, and almost no discussion, of the potential effects of the potential outfall on fluvial processes, river dynamics, and the stability of the bed and banks of the Kawarau River and the Shotover River/Kimiākau Delta. Without a full description of both discharge options, and a robust analysis of their potential effects on existing fluvial processes and river dynamics, a detailed assessment of effects of the discharges is not possible.

In my opinion, it is not appropriate to defer a decision on the final outfall design and consideration under later during the consenting process. This is because the final design and construction will have direct implications for the scale and magnitude of effects, therefore possible conditions, and even if consent should be granted.



Assessment

Q:	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?
R:	In my opinion, the information provided by the Applicant relating to the potential effects of 'an' outfall on fluvial geomorphic processes is very simplistic, general, and descriptive. While two outfall options are provided, with the final selection being made during the consenting process, some limited details are provided for only one of these, the rock outfall. Even these details are very general and descriptive. The direct effect of the outfall on the channel cross-section is discussed, with a comment regarding the effect of this on the flood hazard. It is concluded that since the reduction in cross-section is relatively small, there will be a less than minor effect on the flood hazard. Since the rock outfall has the potential to act as a groyne, its effects on the flow and sediment transport regimes need to be investigated and quantified. This is critical because the proposed outfall is adjacent to the end of the ORC Training Line, where the existing environment is likely to be most sensitive to changes caused by the flow regime. More information is required as to the design and construction of the rock outfall and how it will interact with the flow and sediment transport regimes within the Kawarau River. These effects need to be quantified and not simply described. Also, what effects will the outfall have on velocity and bed shear stress and therefore the potential for erosion. How will these effects be avoided or mitigated? What monitoring is proposed to ensure that any effects of the outfall on fluvial geomorphic processes are no greater than assessed during the consenting process? While the submerged pipeline is likely to have less effect on the fluvial geomorphic processes, this cannot be assessed without details regarding the design and construction methodology.
Q:	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]
R:	More information is required as to the design and construction of the rock outfall and submerged pipeline. How will they interact with the flow and sediment transport regimes within the Kawarau River. These effects need to be quantified and not simply described. Also, what effects will the outfall have on velocity and bed shear stress and therefore the potential for erosion. How will these effects be avoided or mitigated? What monitoring is proposed to ensure that any effects of the outfall on fluvial geomorphic processes are no greater than assessed during the consenting process?



	While the submerged pipeline is likely to have less effect on the fluvial geomorphic processes, this cannot be assessed without details regarding the design and construction methodology.
Q:	If granted, are there any specific conditions that you recommend should be included in the consent, beyond those that have been proposed in Appendix O?
R:	Only two of the draft consent conditions relate to the potential interaction of the proposed outfall with fluvial geomorphic processes. For example, Condition 4 of Consent 2 states: <i>4) Construction works must be undertaken and the outfall structure and/or pipe designed and maintained in a way so that they do not decrease flood carrying capacity of the Kawarau River (in reference to the capacity prior to 2011), or exacerbate erosion, scour or instability of the bed or banks of the Kawarau River.</i> While I support this condition, the condition needs to provide a range of metrics and measures to define how the flood carrying capacity, erosion, scour, and instability are going to be quantified and how the effects of the outfall will be assessed. Currently, no information is provided of the magnitude and scale of potential effects on these characteristics of the Kawarau River. Also, no details are provided of the existing environment and therefore how any change may be assessed. The condition also needs to provide a range of responses if the effects listed eventuate. I am also not sure why the reference to 2011 is included. I would have thought that the existing/baseline environment is that operating under current conditions and not those 15-years ago. <i>8) a. At least 20 working days prior to the commencement of works to construct the outfall structure and/or pipe at the site, the Consent Holder must provide detailed design plans of the outfall structure and/or pipe to the Consent Authority to certify that the structure complies with the conditions of this resource consent and is in general accordance with the plans in Appendix A.</i> In my opinion, no robust quantification of the potential effects of the outfall on fluvial geomorphic processes has been undertaken. While the rock outfall option is described, no details are provided for the submerged pipe option. Without a robust assessment of actual and potential effects, in my opinion, it is not appropriate that the details of the design and construction of the outfall are provided only 20 working days prior to the start of construction. Such a condition might be appropriate if an umbrella of effects had been established, if this umbrella had shown that any effect will be 'less than minor', and if the final design had to fall under this umbrella. In my opinion, this is not the situation at present. Therefore, I would not support this consent condition. There need to be conditions that set the scale and magnitude of the effects that have been consented and how the effects of the proposed works will be assessed relative to those



	consented. This would include conditions requiring the monitoring of the character and stability of the bed and banks both upstream and downstream of the proposed outfall.
	Do you agree with the Applicant's assessment of effects on the discharge component of the application i.e. stating that the discharge is largely beneficial for aquatic communities/values.
R:	I would agree that the discharge of treated wastewater is likely to have a negligible effect on the flow and flow regime in the Kawarau River. However, while the volume of discharge may be negligible and any effects 'less than minor', this is not the case regarding the outfall structure. There is no assessment currently of the interaction of the outfall with the flow and sediment transport regimes, or fluvial processes. The effects of the outfall, both its design and construction, may be significant. More information and detail are required on these matters so that the potential effects of granting the consents sought can be fully assessed.
Q:	Have the cumulative effects of the discharge activity been appropriately assessed? Is there any additional information required from the applicant to adequately assess these effects.
R:	There is no discussion of potential cumulative effect of the discharge but from a fluvial geomorphic perspective, any cumulative effects are likely to be limited. In my opinion, the design and construction of the outfall, and its interaction with fluvial geomorphic processes operating within the Kawarau River, can be treated in isolation. Any potential effects of the outfall are likely to be focused on the vicinity of the outfall, and certainly upstream of the true left of the Shotover River/Kimiākau Delta.

If you require any clarification or explanation, please do not hesitate to contact me.


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