

MEMORANDUM

FILE: APP-1994001032.01, PRD 0802

DATE: 16 April 2015

TO: Jasmine Mitchell

FROM: Jon Bell

**SUBJECT: TECHNICAL ASSESSMENT - AUT-2015200192.00 - LAND USE CONSENT
- CONTROL STRUCTURE CONSTRUCTION**

In accordance with your request of 16 April 2015 I have carried out a technical assessment of this consent application from AFFCO. A suite of consents have been applied for in respect to the proposed upgrading of the Meat Processing Plant Discharge.

As part of this upgrade it is proposed to install a new High Rate Overland Flow System in the bank of the Oroua River, both to replace the current discharge into the Otoku Stream which is a tributary to the river, and to incorporate a component of land passage into the river discharge. Incorporated with this, it is proposed to install a new bed level control structure over a steep reach of the bed of the un-named tributary for the purpose of securing that reach against scour and improving the ecological connectivity with the Oroua River.

I have discussed the proposed design with the applicant's Consulting Engineer – John Philpott, and my assessment is that the proposal meets design standards and hence, I recommend technical approval of this application.

The following points refer:

Design Standard

Essentially the proposal is to construct a rock rip rap lining protecting the true left bank of the Oroua River.

The Horizons Regional Council design standard for protection works such as this is normally:

- Passage of the 5% AEP (20 year) plus global warming design velocity without erosion or failure of the protection works.

In this case the global warming component is not considered critical, as there is only a marginal increase in flow velocities.

Hydrology

The information provided, in Appendix K of the Application, shows that the rock rip rap discharge ramp has been designed to withstand a 1% AEP flood flow in the Oroua River.

This design flow, and associated velocity, was provided to the consulting engineer by HRC Operations and I can confirm that these are accurate.

***The 1% AEP design flow = 620 cumecs
The 1% AEP flow velocity = 3 ms⁻¹.***

Structure Design

The design provided in Appendix K of the application essentially specified a rock rip rap lining constructed to the following parameters.

- Rock Grading = 500 kg graded rock
- Batter Slope = 2:1
- Rock Layer Thickness = 1 m (minimum)
- Foundation Depth = at least 1 m below river bed level
- Rock to be tied in to the river bank by at least 2 m at the upstream and downstream end of the rock lining.
- 400 mm layer of filter rock

This design generally meets HRC design standards, however the rock layer thickness needs to be a minimum of $1.5 D_{50}$. That is it needs to be at least $1 \frac{1}{2}$ times as thick as the mean diameter of the rocks that make up the lining. For a graded 500 kg rock, this layer thickness would need to be at least 1.2m.

HRC Operations have designed a number of rock linings that have been successfully placed in this reach of the river. These rock linings have been constructed using graded 300 kg rock which requires a layer thickness of 1 m.

This has been discussed with John Philpott and a modified design using 300 kg rock instead of 500 kg has been agreed upon and accepted. This is confirmed in John Philpott's e-mail of 16 April 2015.

All other aspects of the proposed rock design are in keeping with those designed by HRC in this reach of the river.

Fish Ladder Stream Pipe

The application also proposes to construct a fish ladder stream pipe to reconnect the stream channel, from the effluent ponds, with the Oroua River. Currently this stream flows in a shallow concrete channel to the edge of a terrace where it has a free outfall onto concrete rubble before flowing to an area of overgrown vegetation to the Oroua River channel. The end of the concrete channel is approximately 2.5 m above the low flow level of the Oroua River.

It is proposed to install a 40 m long 600 mm diameter reinforced concrete culvert laid on a uniform grade with its upstream invert slightly lower than the invert of the upstream channel and its outlet slightly below the low flow water level in the river.

The culvert trench would be backfilled and the ground surface protected with a layer of rip rap to prevent damage during large floods in the river and from overflows from the upstream channel. The outlet would be protected by an extension from the upstream discharge structure.

I agree with John Philpott's assessment, that constructing this pipe in this way will avoid creating significant turbulence in the river, and hence pose an erosion risk, during flood events.

Stream Bed Refurbishment

John Philpott has recommended that the existing concrete stream channel be removed and the channel bed be reformed. He has recommended that the channel bed be lined with river run gravels and randomly placed larger rocks, to prevent scour of the channel.

I concur with these recommendations.

Flood Contingency Plan

The applicant should prepare a flood contingency plan which will incorporate procedures which will be carried out to ensure that adjacent property and infrastructure are not put at risk during a flood event while the construction phase of the work is in progress. This can be covered through the consent conditions.

Construction Methodology

There is no description of the construction methodology included in the application. As works will take place in the Oroua River while it is flowing we will need to see details on the proposed construction methodology. However, since the works are fairly standard this can be addressed through a condition of consent.

Recommended Conditions

I recommend that the following conditions are applied:

1. The Consent Holder shall prepare a flood contingency plan which will incorporate procedures which will be carried out to ensure that adjacent property and infrastructure are not put at risk during a flood event while the construction phase of the work is in progress. A copy of the plan shall be supplied to the Horizons Regional Council prior to the commencement of the works.
2. Prior to works proceeding all materials and equipment must have been sourced such that their availability will not cause a more than minor delay to construction - i.e. ensuring a speedy job during the critical phase;
3. The Consent Holder shall only commence construction of works in the bed of the Oroua River if the flow is low and there is an extended period of fine weather forecast by the New Zealand Meteorological Service (MetService) for the waterbody's catchment;
4. The rock lining shall be constructed so that it is structurally stable with minimal risk of collapse into the riverbed.
5. The Consent Holder shall ensure that the completed protection works shall be free of any significant projections out of the smooth line of the work and it shall tie in to the riverbank both upstream and downstream of the proposed work in a secure and hydraulically smooth fashion.
6. The works shall remain the responsibility of the Consent Holder and be maintained so that:
 - a. any erosion, scour or instability of the stream bed or banks that is attributable to the works carried out as part of this consent is remedied by the consent holder within 10 working days;
 - b. fish passage is not impeded on completion of works;
 - c. the works shall not adversely affect the ability of the Oroua River to convey flood flows or floating or flood borne debris and shall remain substantially free of debris; and
 - d. the structural integrity of the structures remains sound.
7. The standard condition requiring notification to the Area Engineer Central prior to works commencing. This is enunciated below:

“The consent holder shall contact the Manawatu-Wanganui Regional Council’s Area Engineer – Central two (2) working days prior to the commencement of works.

Advice note: *The Area Engineer – Central can be contacted on Freephone 0508 800 800”*

Jon Bell

From: John Philpott <johnphilpott@inspire.net.nz>
Sent: Thursday, 16 April 2015 3:57 p.m.
To: Jon Bell
Subject: Re: AFCO Feilding - Discharge Structure

As per phone discussion. 300 kg rock 1 m thickness. Ok

Sent from John Philpott's iPhone

On 16/04/2015, at 3:34 PM, Jon Bell <Jon.Bell@horizons.govt.nz> wrote:

Hi John,

I'm currently doing a technical assessment of the discharge structure that you designed for AFCO's consent application.

Essentially the rip rap structure is to be constructed from 500kg graded rock in a 1 m thick layer, on a 1:2 batter and founded 1 m below bed level.

My only issue with this is the thickness of the rock layer. For a rock lining such as this we would require a layer thickness of at least 1.5 D₅₀. This means that the 500kg rock rip rap would need to be increased in thickness to 1.2m from 1m.

However, HRC designs for rock linings in this reach of the Oroua River specify only a 300 kg graded rock. If your design were to specify this smaller rock, then the proposed 1 m layer thickness would satisfy the 1.5 D₅₀ design requirement.

Would either of these alternatives be ok with you?

Regards

Jon

JON BELL | Design Engineer

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