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Opus International Consultants Ltd

P +64 6 350 2500

Palmerston North Office
L4, The Square Centre, 478 Main Street
PO Box 1472, PN Central, Palmerston North 4440
New Zealand

Fiona Morton
Senior Consultant Planner
Horizons Regional Council
Private Bag 11025
Manawatu Mail Centre
Palmerston North 4440

Ref: 5-P0531.05

Eketahuna Further Information Request Response - APP-200501178.01.

Dear Fiona

Below is a response to your further information request dated 13 November 2016.

1. End of Pipe concentrations/standards.
Please provide estimated end of pipe concentrations/standards for the measured parameters of the discharge.

Response

Eketahuna is known to have had a significant inflow and infiltration problem. This is currently being addressed by Council, as noted in the original application the 2014 Earthquake exacerbated this problem. Following on from the earthquake and subsequent insurance claim, work has now largely been completed to the network However, at this time, we have no information on actual flows into the treatment plant or how these are trending as work progresses.

Neither is any influent characterisation data available to the team. Thus, the actual biochemical loading on the pond system can only be estimated.

Based on data from Metcalf and Eddy[1], and the census population of 441 persons, we have calculated approximate loading onto the treatment plant.

[1] Wastewater Engineering: Treatment and Reuse, Metcalf &Eddy Inc. Engineering reference textbook, contains details of typical residential loadings used to derive approximate loadings.

We also have historical final effluent concentrations.

Constituent	Total Loading in kg/day	Mean Effluent Conc. Mg/l
BOD	41	2.68
COD	104	
TSS	40	26.02
NH3-N	4	4.42
TKN	7	8.38
TP	1	1.23

The calculated loadings provide for a 15% factor of safety over the published loadings for unknown factors such as septage dumping and trade waste.

The BOD concentration in the table is the soluble cBOD5.

Some back calculations have been done from a pond performance model and from this it is assumed that infiltration probably results in average flow being 2 to 3 times what we would normally expect for a community this size.

A number of changes are anticipated at Eketahuna which will influence effluent quality to a greater or lesser extent such as:

a) That inflows will reduce. This will have the 'numerical' effect of increasing influent and effluent concentrations.

b) The hydraulic retention time will increase due to the reduced flow. This will decrease some of the effluent concentrations.

c) A lamella clarifier is proposed. In theory, this should reduce the effluent concentrations of TSS and TP and TN be removing organic N&P in the TSS.

d) A UV disinfection system is being introduced. This will only improve the *E.coli* result.

Based on model results and Pahiatua results.

The following is based on an analysis of the results received to date from the Pahiatua site testing, as well as the model (referred to above).

TSS

Based on results at Pahiatua no measurable improvement is seen in the TSS results either on an individual sample run basis or on a whole of data set basis. It is not clear if the lamella has been turned off (records have not been kept) or the filter ineffective. Though some early issues were identified with blockages occurring (bird feathers etc) resulting in a screen being constructed at the inlet point to the clarifier. It is understood that now that these issues are resolved the lamella clarifier at Pahiatua should be able to have more of the effluent passed through this treatment process. Mean result to date is 34mg/l and on that basis, we could not categorically state that the proposed lamella clarifier will produce any

significant improvement at Eketahuna, even though, in theory, it should substantially reduce the TSS. Therefore, we would also not expect improvements in TP, based on results seen to date.

E.coli

While UV systems with differing capacities and output rating could be applied to the site, we would typically expect approximately a 1 log10 inactivation of indicator bacteria on pond effluent without very good TSS removal and clarification. This would reduce the mean effluent *E.coli* level at Eketahuna to approximately 200 MPN/100ml. At Pahiatua, the mean effluent *E.coli*, post UV is 789 MPN/100ml (although if 1 outlier at 10,000 is removed, this becomes 429) and the median, for the entire data set is 120. Therefore, a mean result in the range 200 to 400 is to be expected at Eketahuna. Unfortunately, at Pahiatua, none of the requested sample point 6 (SP6) samples have been tested for *E.coli,* so we can't see the actual effluent *E.coli* entering the UV system and hence can't judge its actual effect.

Ammonia

None of the improvements proposed at Eketahuna will improve the ammonia situation as the ammonia is entirely dissolved. And, because any nitrate created now is denitrified anyway, the whole discharge SIN levels are therefore unlikely to change.

$cBOD_5$

The soluble $cBOD_5$ levels are already low and are very unlikely to change as a result of the addition of a clarifier.

DRP

Turning to DRP. The current mean effluent concentration is 1.3 mg/l. This is similar to the Pahiatua plant. At Pahiatua, the installed improvements appear to have had no effect of removing DRP from the effluent stream. The earlier (2015) results are better than the current performance. If the chemical dosing is correctly set up and tuned, results should improve just as they should have improved the TSS result. In theory, it should be possible to reduce the DRP to 0.5mg/l using a coagulated and flocculated lamella clarifier. At Gore, the Actiflo clarifier, albeit using sand ballast, achieves a mean DRP level of 0.1mg/l

Likely effluent standards

Therefore, based on the available information, the likely **mean** performance of the plant with proposed improvements is:

scBOD5 <3mg/l

TSS < 30mg/l (should be able to achieve <15mg/l if correctly sized and tuned)

Ammonia < 5mg/l

TP < 1.3mg/l (should be able to do < 0.5mg/l if correctly sized and tuned)

E.coli < 500 MPN/100ml

Further monitoring

TDC advisors are recommending that sampling continue at the Pahiatua site, and that the frequency of monitoring is increased for a period of time. Accordingly, further data may be available for interpretation at the hearings however this will still only be from a relatively short period of time.

2. Discharge Location

TDC have suggested they intend to move the discharge point, and monitoring points, further downstream to negate the effect of the Ngatahaka stream and so to help clarify the effect the discharge is having on the Makakahi River. In relation to this:

a. Could you please outline exactly where the discharge, upstream monitoring point, and downstream monitoring point are likely to be? Please identify these points on a location map.

b. Has the applicant considered the different levels of shading provided by the proposed upstream/downstream sites and the impact this may have on monitoring results?

c. Would the applicant be comfortable using these new monitoring points in respect of measuring compliance against the parameters in any consent conditions?

Response

TDC are currently investigating two possible locations for the discharge, both downstream of the confluence of the Ngatahaka Stream with the Makakahi River.

The first option is to create a series of small bunded areas/wetlands in the shallow gully located immediately to the Northeast of the oxidation ponds. The map attached gives the indicative location.

The second option is to create a larger wetland area on a lower river terrace below the golf course. This option will require the pumping of the treated wastewater to the constructed wetland area. TDC are currently in discussions with the owners of the golf course.

In both options, the discharge point is located sufficiently downstream of the confluence of the Ngatahaka and the Makakahi to ensure reasonable mixing of the two water bodies upstream of the discharge point. This is important to ensure that inputs (in particular of SIN and sediments) from the Ngatahaka Stream are equally accounted for in the upstream and downstream monitoring sites.

Appropriate monitoring sites located upstream and downstream of the discharge point will have to be determined once the option has been selected. The sites will be selected to ensure they are, as much as practicable given the site's constraints, safely accessible and of comparable physical characteristics (e.g. depth, velocity, substrate size, shading).

TDC are comfortable with a condition requiring that the monitoring sites are identified in consultation with the Regional Council once the discharge location has been identified. Such conditions are not unusual, for example a condition requiring the identification of a suitable in-river monitoring site was placed on the resource consent for the Taihape WWTP, granted in 2014.

All reasonable efforts should be made to identify comparable upstream and downstream monitoring sites, however, given the site's limitations it is possible that some discrepancies between the two sites' characteristics will not be able to be avoided. If that was the case, the implications of the discrepancies will have to be assessed and acknowledged.

3. The application does not propose any upgrade to the WWTP to significantly reduce SIN in the discharge. This is despite an increase in SIN downstream of the discharge and a decrease in the QMCI downstream of the discharge. Is the applicant comfortable that moving the discharge point (and thus removing the confounding factor of the Ngatahaka Stream input) will mean no additional SIN specific upgrade is required; or that a SIN decrease will be required but some part of the currently proposed upgrades is likely to result in a decrease in SIN sufficient that there will no longer be a decrease in QMCI downstream of the discharge?

Response

Monitoring data does show that there is an increase in SIN concentration and a decrease in QMCI between the upstream and the downstream site. However;

(1) there is no established direct causal link between an increase in SIN and a reduction in QMCI. SIN may promote excessive periphyton growth, which may in turn have adverse effects on macroinvertebrate communities (of which QMCI is an indicator). The relationship between SIN and MCI is thus indirect, and in this situation quite uncertain given that excessive levels of periphyton do not appear to generally be present at the downstream site. Other factors, such as deposited sediments, or substrate characteristics may also have a negative influence on QMCI.

(2) Further analysis of the monitoring data indicates that the Ngatahaka Stream is a significant contributor, in fact possibly the main contributor, to the increase in SIN measured between the upstream and downstream sites.

TDC considers it would be very premature to commit additional sums of public money (Rough order of costs range from $200K for partitions and aeration at the front end, with no guarantee of any better result to in excess of $1million, $2-3K per person, for a more formalised side stream treatment) to implement nitrogen removal at the Eketahuna WWTP, given there is no clear evidence (1) that SIN is the source of the problem and (2) that the discharge from the Eketahuna WWTP is the main source of the SIN. TDC's suggested approach is to assess the situation on the basis of monitoring information once the discharge has been shifted to the new location. The resource consent conditions and term should allow for sufficient time for this monitoring and assessment to occur, as was discussed at the pre-hearing . This form of adaptive management approach is considered appropriate, and has become a more common place way of addressing these types of situations

4. Policy 5-11

Please advise how you intend to meet this policy, including potential timeframes.

Following on from the pre-hearing, where it was discussed that TDC would continue to work with iwi to address Policy 5-11, the draft conditions that were circulated suggested a two year timeframe within which this should occur. TDC consider that this is an appropriate length of time to finalise an appropriate solution. As noted above, TDC are in the process of looking at alternative discharge options with the aim of addressing this Policy. The first step is around appropriate discussions with landowners and iwi.

It is worth noting, that should the wetland option currently being discussed with the Golf Course be considered feasible, both from an engineering and design and affordability point of view, then additional consents would be required (as a minimum for earthworks). While initial discussions have been positive, sufficient work has not yet been able to be undertaken to clearly state that this option can be secured. TDC will continue to work in good faith with the owners of the Golf Course. Once more certainty is secured around this option, a consultation strategy will be developed.

Regards

Tabitha Manderson
Senior Resource Management Planner

Encl: Map of indicative discharge location options