



memorandum

TO Sven Exeter and Paul Barrett FROM Oliver Hunt, Mark Bellingham & Hilary Lough

Hawke's Bay Regional Council DATE 26 August 2022

RE Pōrangahau and Te Paerahi Wastewater Discharge Technical Review of August 2022 Further Information

1.0 Introduction

Central Hawke's Bay District Council (CHBDC) operates the wastewater treatment plants (WWTP) for the Pōrangahau and Te Paerahi communities. The Pōrangahau WWTP currently provides treatment and then discharges wastewater directly to the Pōrangahau River. The Te Paerahi WWTP provides treatment and then discharges wastewater to adjacent sand dunes via soakage. The resource consents for these discharges expired on 31 May 2021.

Currently, the Pōrangahau WWTP has a pond treatment system with treated wastewater being discharged via a wetland drain to the Pōrangahau River. The Te Paerahi WWTP has a pond treatment system with treated wastewater being discharged to sand dunes. A new combined long term WWTP and discharge system is being built, and then the existing facilities will be phased out (long term solution).

CHBDC is applying for consents from the Hawke's Bay Regional Council (HBRC) to continue operating their existing discharges from the Pōrangahau and Te Paerahi WWTPs while they transition to a new year-round irrigation system and consent to operate the new irrigation system. Specifically, this includes:

- ∴ *Discharge of contaminants into air:* Discharge of aerosols and odour to air associated with the receipt, treatment, storage and discharge of wastewater from the Pōrangahau and Te Paerahi Wastewater Treatment Plants.
- ∴ *Discharge of contaminants onto or into land:* Discharge of treated wastewater from the Te Paerahi WWTP to the existing land disposal area and discharge of treated wastewater from the Pōrangahau and Te Paerahi WWTPs at the proposed irrigation site.
- ∴ *Discharge of contaminants into water:* Discharge of treated wastewater from the Pōrangahau WWTP into the Pōrangahau River.

Pattle Delamore Partners Ltd (PDP) has been engaged by HBRC to provide a technical review of the following aspects of the application, specifically for the new proposed land application system:

- ∴ Details of the proposed land application system
- ∴ Effects on soils
- ∴ Effects on groundwater
- ∴ Effects on air quality (odour and spray drift)

- ∴ Effects on wetlands
- ∴ Risk of natural hazards

The information in the AEE and supporting documentation has been relied upon for this review.

On 30 September 2021, PDP provided a technical review of the initial application. This review sought further information on a number of relevant aspects. Further information was provided by the applicant in a s92 response letter dated 8 November 2021. Additional information was provided in January and February 2022 including a Cultural Impact Assessment (CIA) and related documents, a Quantitative Microbial Risk Assessment (QMRA) and accompanying response by CHBDC confirming that UV will be installed, within 18 months of consent being granted, and an updated water quality assessment.

On 4 March 2022, PDP provided a technical review of the further information provided in relation to the matters raised in PDP's initial review and recommended some additional clarification following a site visit undertaken by Oliver Hunt (environmental engineer at PDP) together with CHBDC, Lowe Environmental Impact (LEI), Mott MacDonald and Coast and Catchment staff on 21 January 2022. This review sought further information on a few aspects. Further information was provided by the applicant in a s92 response letter dated 25 March 2022. PDP reviewed this additional information in a memorandum dated 17 June 2022 and requested further clarification on the vegetation plot assessments for potential wetland site 8.

Subsequently, a prehearing meeting was held on 27 June 2022. Following this meeting, the applicant has provided an updated set of conditions with some commentary. PDP has prepared this memorandum to review and comment on the proposed consent conditions and outline the outstanding issues associated with the proposed discharges, within the scope of our technical review.

2.0 Outstanding Issues

2.1 Hydraulic Application Rates

The applicant has not responded to the issue raised in PDP's initial review memorandum dated 30 September 2021 regarding the application rates to LMU3. The soils in LMU3 are a recent soil with very limited water holding capacity. The reported profile available water (PAW) in the first 60 cm of LMU3 is 7 mm. Application of 20 mm in one event to LMU3 is expected to therefore exceed the field capacity of the top soil and result in significant drainage, and subsequent nutrient loss to the raw sand below. We recommend that the maximum application depth to LMU3 is reduced for the deficit regime given >50% of the application depth under a 'deficit regime' is expected to be lost to leaching.

2.2 Nutrient Balances

The overall nutrient mass balance is still an outstanding issue. The most up to date information provided by the applicant and summarised in the PDP memorandum dated 4 March 2022 shows that there will be an increase in nutrient contribution to the Pōrangahau River for nitrogen and phosphorus at all stages. The consent conditions proposed by the applicant also provide opportunity for greater loss of nutrients than has been assessed in the OverseerFM scenarios, which this mass balance is based on (refer to the comment on Condition 52 below for more information). The applicant has noted that some further attenuation is likely to occur in groundwater. We would recommend this be quantified if necessary to support the overall calculations of nutrient load to the river.

Ultimately, the nutrient losses from the discharge property will vary based on the farming practices. However, there are a range of steps the applicant could take to improve the expected nutrient losses from the discharge. These could include:

- ∴ Irrigating over a larger minimum area
- ∴ Utilising a cut and carry system instead of grazing the irrigated areas has the potential to significantly reduce the nitrogen leaching, particularly within LMU3, as nitrogen is not returned to the soils via animal urine patches.
- ∴ Minimising the use of synthetic fertilisers which may be required for fodder crops.
- ∴ Treating the wastewater to a higher level will reduce the nutrient levels within the irrigated effluent and therefore reduce the nutrients lost during non-deficit irrigation and when field capacity is exceeded.
- ∴ Maximising the volume of the storage pond at Stage 3 will reduce the frequency and depth of irrigation applied under non-deficit irrigation. It may also allow a larger fraction to be applied to LMU1, which has significantly lower nitrate leaching vulnerability compared to LMU3.

We consider that revised modelling is required to support the proposed consent conditions, as these enable a higher level of leaching than the modelling that has been used to support the AEE shows. We recommend that the above points are considered further with respect to ensuring nutrient leaching does not exceed acceptable levels to the river.

2.3 Wetland Delineation

The applicant has included a consent condition to prevent irrigation within 100 m of any wetland which meets the NES-F definition of a natural wetland. PDP and HBRC are awaiting the final wetland assessment from the applicant for review. Once this is received and reviewed it is expected that this element can be finalised. However, for clarity we recommend that a figure is included in the consent defining any known natural wetlands at the discharge site at the time of granting the consent.

3.0 Review of Draft Conditions

A review of the applicant's proposed consent conditions (v4) dated 1 Aug 2022 is provided in Table 1 below.

Table 1: Consent Condition v4 (1 Aug 2022) PDP Technical Review Comments		
No.	Condition	Comment
5	<p>The discharge of treated wastewater to the land at the Discharge Property via irrigation shall meet the following criteria:</p> <ul style="list-style-type: none"> a) Stage 0: 0 ha of irrigation; b) Stage 1: Not less than 4 ha of irrigation; c) Stage 2: Not less than 10 ha of irrigation; and d) Stage 3: Not less than 40 ha of irrigation. 	<p>It is not specified anywhere in the consent conditions that the irrigation shall be limited only to LMU 1 and LMU 3 as was confirmed by the applicant in the s92 response letter dated 25 March 2022. It was understood that irrigation to any other area would require a variation to the consent.</p> <p>We suggest inclusion of a plan showing LMUs and stipulation in Condition 5 (or other suitable condition) that irrigation at the Discharge property is limited to LMU1 and LMU3 as shown on Plan X.</p> <p>The proposed area of irrigation of LMU1 and LMU3 at the different stages should also be made clear.</p> <p>While we agree that more area is generally better, there is no upper limit for the area and therefore the wastewater volumes that can be discharged to the site. We recommend that limits on wastewater volumes should be included.</p>
6	<p>The Consent Holder shall provide the following volume of active storage:</p> <ul style="list-style-type: none"> a) Stages 1 and 2: Use of the existing treatment ponds to provide not less than a combined 1,000 m³; and b) Stage 3: Construction of a new pond with a volume not less than 10,000 m³. <p><i>Advice note: Stage 1 and 2 provides for the use of the existing ponds for storage until a new pond is built as required by Stage 3.</i></p>	<p>As outlined in the PDP memorandum dated 17 June 2022, we strongly recommend that the volume of the final storage pond is maximised to:</p> <ul style="list-style-type: none"> ∴ Reduce the frequency of irrigation to saturated soils which may result in runoff or large leaching volumes ∴ Increase the resilience of the system to climate change and extreme weather events. <p>It would be helpful if supporting calculations for the pond size were provided.</p>

Table 1: Consent Condition v4 (1 Aug 2022) PDP Technical Review Comments

No.	Condition	Comment
15	<p>In respect of monitoring required by the Consents, the following apply:</p> <ul style="list-style-type: none"> (a) All monitoring and sampling techniques employed in respect of the conditions of the Resource Consents must be carried out by suitably experienced and qualified persons; (b) All analytical testing other than on-site measurements, undertaken in connection with these Resource Consents must be performed by a laboratory that is IANZ accredited for the analytical tests or any other method approved in advance in writing by the Council Manager; (c) All water sample analyses must be undertaken in accordance with the methods detailed in the "Standard Methods For The Examination Of Water And Waste Water, 2017" 23rd edition by A.W.W.A., A.P.H.A. and W.E.F., or any other method approved in advance in writing by the Council Manager; and <p>If any monitoring sites are identified as unsuitable, alternative monitoring sites must be identified and developed within a reasonable time after consultation with the Council Manager.</p>	<p>We recommend alternative monitoring sites should require approval by HBRC (in addition to consultation).</p>
22	<p>No later than six months after the commencement of this Consent, the consent holder shall submit to Council's Regulatory Manager for certification, a Monitoring Plan (MP), completed by a suitably qualified and experienced person. The MP shall be designed to monitor any effects of the wastewater discharges, including to the Pōrangahau River, Te Paerahi sand dunes and Discharge Property. The MP shall include, but not be limited to:</p> <ul style="list-style-type: none"> (a) Methodology of the monitoring to be undertaken; (b) Locations for the individual monitoring types; 	<p>Clarification is required to what process will be followed to ensure the monitoring required by the consent is completed in the interim months.</p> <p>This condition should also link to conditions 61, 62 and 63 where monitoring sites, frequency and parameters are already proposed for the discharge property (to be included as a minimum).</p>

Table 1: Consent Condition v4 (1 Aug 2022) PDP Technical Review Comments

No.	Condition	Comment
	<p>(c) Responsibilities of those undertaking the monitoring;</p> <p>(d) Frequency of the monitoring;</p> <p>(e) ?;</p> <p>(f) ?; and</p> <p>(g) All necessary monitoring as requested by these consents.</p> <p>The MP shall be considered certified unless the Council's Regulatory Manager, within 20 working days of receiving the MP, refuses to certify it, and outlines its reasons in writing for not certifying the MP. If the MP is not certified, an amended MP must be submitted. Once certified by the Council, the MP shall be implemented within three months.</p>	
<p>27 (a)</p>	<p>The Consent Holder must maintain a record of all irrigation activities authorised by this resource consent that occur within the land treatment area. This record must include but not be limited to:</p> <ul style="list-style-type: none"> (a) The date, time, location and volume of each irrigation (both of wastewater and water); (b) The date, time, location, mass (kg) and rate (kg/N/ha or kg/P/ha) of any nitrogenous and phosphorus material applied; (c) The total cumulative nitrogen applied from all sources to each irrigation run over the period 1 July each year to 30 June the following year; (d) The hydraulic loading (application depth in mm) for each application of wastewater to each irrigation run; (e) The volume (m³) of wastewater applied to each irrigation event; 	<p>The total cumulative phosphorus applied should be recorded in addition to the total cumulative nitrogen.</p>

Table 1: Consent Condition v4 (1 Aug 2022) PDP Technical Review Comments

No.	Condition	Comment
	<p>(f) The area of pasture or crop that were irrigated in each block, and for crops, the type of crop irrigated; and</p> <p>(g) The date and time of pipeline flushes when they occur.</p> <p>Records shall be reported included in the Annual Monitoring Report as required by Condition 57.</p> <p><i>[Note: Included for consistency with Takapau and to utilise technology to replace manual recording (in places).]</i></p>	
27(b)	<p>The mass and rate of total nitrogen applied to each irrigation event, as specified in Condition X of this consent, shall be calculated as follows:</p> <ul style="list-style-type: none"> a) The average monthly total nitrogen concentration (g/m^3) shall be calculated by averaging the last wastewater sample from the previous month and the wastewater sample in the month to be calculated. These samples shall be taken in accordance with Condition X of this consent; b) The average monthly total nitrogen concentration for each month shall then be multiplied by the volume (m^3) of wastewater applied to each irrigation area in order to calculate the mass of total nitrogen applied (kg) per application to each irrigation area; c) The mass of total nitrogen applied (kg) per application shall then be divided by the area (ha) to calculate the rate (kg N/ha) of nitrogen loading per irrigation run/area; and d) The area (ha) irrigated during each application of wastewater shall be calculated. 	<p>The mass and rate of phosphorus should also be calculated.</p>

Table 1: Consent Condition v4 (1 Aug 2022) PDP Technical Review Comments

No.	Condition	Comment
	<p><i>[Note: Included for consistency with Takapau and to utilise technology to allow automatic calculation of totals.]</i></p>	
<p>29a</p>	<p>Within five years of the commencement date of this consent, and there after every 5 years, the Consent Holder must prepare a ‘System Review Report’ including but not limited to summaries of:</p> <ul style="list-style-type: none"> (a) the volume applied to land and discharged to the wet soils system; (b) when the wet soils system was used; (c) changes that have been made to the wastewater treatment plant and details of changes proposed; (d) opportunities to improve the treatment plant performance, and discharge standards, to reflect the requirements for the land application system, noting that this may see the effluent standards relaxed to allow higher wastewater loads and less synthetic fertiliser; (e) all monitoring undertaken as required by this consent, including Mauri monitoring, and may include additional monitoring undertaken by the Consent Holder; (f) Undertake assessment of application rate regime and potential adjustments to loading rates of nitrogen and phosphorus; and, (g) storage utilisation and opportunities to better utilise it to avoid the use of the wet soils. <p>Further, management of the system can be updated, with proposed changes to be made as necessary to the Operation and Management Plan after an annual review by the Consent Holder.</p>	<p>Five years is considered short for a review of the full system with the intention of modifying parameters given that Stage 2 must be in operation within 6 years and Stage 3 within 9 years. Suggest a wording change to five years after the commencement of Stage 3.</p> <p>Also suggest an advice note that any proposed increase in the discharge limits would need to be treated as a variation to the consent or as a new application dependent on the assessment of HBRC at the time of submission. This should also be added to Condition 34.</p>

Table 1: Consent Condition v4 (1 Aug 2022) PDP Technical Review Comments

No.	Condition	Comment
	<p><i>[Note: Included for consistency with Takapau. Helps to support the seeking and implementation of ongoing improvements.]</i></p>	
48	<p>The Consent Holder must ensure that the treated wastewater meets the following standards prior to discharge to the irrigation and non-deficit (wet soils) irrigation system following the construction of the new combined WWTP at the land discharge site to the end of the consent term:</p> <ul style="list-style-type: none"> (a) The concentration of Carbonaceous five-day Biochemical Oxygen Demand (BOD₅) must not exceed 50 g/m³ in more than 8 out of 12 consecutive monthly samples, or 100 g/m³ in more than 2 out of 12 consecutive monthly samples; (b) The concentration of Total Suspended Solids (TSS) must not exceed 60 g/m³ for more than 8 out of 12 consecutive monthly samples, or 140 g/m³ in more than 2 out of 12 consecutive monthly samples; (c) In accordance with Conditions 3 and 5, the concentration of Total (TN) must not exceed the following: <ul style="list-style-type: none"> a. Stage 1: 40 g/m³ for more than 8 out of 12 consecutive monthly samples, or 50 g/m³ in more than 2 out of 12 consecutive monthly samples. b. Stage 2 onwards: 35 g/m³ for more than 8 out of 12 consecutive monthly samples, or 40 g/m³ in more than 2 out of 12 consecutive monthly samples. (d) The concentration of Dissolved Reactive Phosphorus (DRP) must not exceed 6 g/m³ for more than 8 out of 12 consecutive monthly samples, or 10 g/m³ in more than 2 out of 12 consecutive monthly samples; and (e) The concentration of <i>Escherichia coli</i> (<i>E. coli</i>) must not exceed 1,000 cfu /100 mL for more than 8 out of 12 consecutive monthly samples, 	<p>We recommend that the limits are measured as 50th percentile (average) and 90th percentile for clarity and consistency with the limits set out for the Te Paerahi and Pōrangahau WWTP discharges.</p> <p>The applicant clarified in Section 5 of the s92 response letter dated 8 November 2021 that the limits for BOD, TSS, DRP and ammoniacal nitrogen in the discharge following UV treatment would be:</p> <ul style="list-style-type: none"> a) The concentration of Carbonaceous five-day Biochemical Oxygen Demand (BOD₅) must not exceed 25 g/m³ in more than 8 out of 12 consecutive monthly samples, or 40 g/m³ in more than 2 out of 12 consecutive monthly samples; b) The concentration of Total Suspended Solids (TSS) must not exceed 30 g/m³ for more than 8 out of 12 consecutive monthly samples, or 50 g/m³ in more than 2 out of 12 consecutive monthly samples; c) The concentration of Ammoniacal Nitrogen (NH₄-N) must not exceed 20 g/m³ for more than 8 out of 12 consecutive monthly samples, or 40 g/m³ in more than 2 out of 12 consecutive monthly samples; d) The concentration of Dissolved Reactive Phosphorus (DRP) must not exceed 5 g/m³ for more than 8 out of 12 consecutive monthly samples, or 9 g/m³ in more than 2 out of 12 consecutive monthly samples;

Table 1: Consent Condition v4 (1 Aug 2022) PDP Technical Review Comments

No.	Condition	Comment
	<p>or 10,000 cfu/100 mL in more than 2 out of 12 consecutive monthly samples.</p> <p>(f) The pH range shall be within the range of 6.5 – 9.</p> <p><i>Advice Note: Compliance will be demonstrated based on the samples required by Condition 17 [monitoring section]. The exceedance frequency allowed for the Treated Wastewater quality values identified above are based on monthly sampling over an annual 12-month monitoring period of 1 July to 30 June each year in accordance with the New Zealand Municipal Wastewater Monitoring Guidelines (NZWERF, Sept 2002) Table 13.2. If the frequency of sampling is more than monthly, the allowed numbers of annual exceedances will need to be amended to remain in line with the New Zealand Municipal Wastewater Monitoring Guidelines (NZWERF, Sept 2002) Table 13.2.</i></p> <p><i>[Note: The flowing provides clarification for the suggested markups:</i></p> <ol style="list-style-type: none"> 1) <i>Insert place holders which at the time of preparing the application were not known due to the treatment plant time having not been confirmed.</i> 2) <i>Specific limits:</i> <ol style="list-style-type: none"> a. BOD and TSS - <i>are not considered critical in terms of the assessment of effects for a land discharge, and therefore their concentration is not critical in conditions to mitigate effects. They are however, useful in conditions (and in this instance, this is the sole purpose) to demonstrate that the treatment plant is being operated to maintain a minimum level of treatment plant performance.</i> 	<p>The values proposed by the applicant for TSS and BOD have increased from those above and are higher than would be expected from a well performing WWTP as proposed. High BOD can result in blocked soil pores due to build-up of biofilm and high TSS levels can result in poor disinfection due to reduced UV transmissivity and blocking of sprinkler heads. We recommend further justification is provided for the need for these higher limits for the treatment system proposed.</p> <p>We agree that total nitrogen is a more suitable parameter for determining the nitrogen mass loadings. However, we recommend that ammoniacal nitrogen and nitrate should be included in Condition 48 as indicators of treatment plant performance for the nitrification and denitrification biological processes.</p> <p>We do not agree with the suggestion that N and P concentration limits could be removed from the consent conditions. Based on the applicant's modelling, the leaching from the discharge property is dominated by the leaching from LMU3/IMU3. The soils in LUM3 are a raw soil with a sandy texture which have very high nitrogen leaching vulnerability, rapid permeability and a very low profile available water (PAW) of 7 mm across the first 60 cm. See Figure 1 below this table for an example of the LMU3 soil profile. There is very little capacity for irrigated wastewater to be retained within the LMU3 soils which is likely to result in limited plant nitrogen uptake, immobilisation or denitrification. Because the PAW of LMU3 is so low it is expected that a significant percentage of irrigation events will result in leaching (the applicant has proposed up to 20 mm per event). Due to the soils at the discharge site, the concentration of nitrogen in the irrigated</p>

Table 1: Consent Condition v4 (1 Aug 2022) PDP Technical Review Comments

No.	Condition	Comment
	<p>b. Ammoniacal Nitrogen - was initially included, but should have been Total Nitrogen, as assessed in the Consent application and Assessment of Effects.</p> <p>3) Design v Max - The concentration values used in the system design, consent application and assessment of effects were averages (LEI, 2021:P.D.10 - pg 23). Whereas, consent conditions are not to exceed values. Because the treatment is undertaken biologically, it is inappropriate to set design values as consent maximums, and therefore there needs to be some ability for variations around the design values, hence the suggested numbers are greater than that in the Assessment of Environmental Effects. The variation between design and consent values should be reflective of the risk; and in this case the potential for the concentration to be higher and result in effects greater than predicted in the assessment of effects.</p> <p>4) Scope - There is also a consent scope issue, in so far that changes in what is now proposed (if in fact there are changes) need to be consistent with what was applied for and notified. With respect to nitrogen and phosphorus regarding scope, the critical issue for effects on the receiving environment is not concentration, but total mass loading to the irrigation area. This has been assessed as kilograms nitrogen and phosphorus per hectare per year (Condition 52). This value (being a maximum) has not changed and remains a point of compliance (condition has not changed). Changes are therefore considered to be within scope.</p> <p>5) Effect driver – expanding on the issue raised above, the effects assessment in this case primarily relate to the mass of N and P leached. The methodology uses a mass and volume approach where the treatment plant mass is assumed to be applied as soluble fertiliser and the effluent volume as irrigation water. Should the effluent concentration change in order to apply the same mass the irrigation</p>	<p>wastewater has a significant impact on the mass of nitrogen leached. It is therefore desirable to reduce the concentration of nutrients in the treated wastewater to minimise this leaching loss.</p> <p>As above, the applicant previously proposed that “The concentration of Ammoniacal Nitrogen (NH4-N) must not exceed 20 g/m³ for more than 8 out of 12 consecutive monthly samples, or 40 g/m³ in more than 2 out of 12 consecutive monthly samples”. They have clarified that this was intended to be Total Nitrogen but have not justified the increased limits beyond noting that “setting a tight/low effluent concentration for nitrogen and phosphorus means that a high level of nitrogen and phosphorus removal is needed at the treatment plant. However, this concentration is neither used or regulates effects. The effects associated with nitrogen and phosphorus discharged to land is controlled by the mass loading, in this case condition 52.” We note that the Beca Combined WWTP Concept Design was based on a median TN concentration of 20 mg/L. The WWTP should be designed to meet the consent limits rather than setting the consent limits based on the hypothetical performance of a WWTP which has not yet been designed. As above, given this is a year round discharge and the LMU3 soils have a low PAW, we consider that concentration limits are important to include in addition to a mass annual loading.</p> <p>The applicant clarified in Section 38 of the s92 response letter dated 8 November 2021 that the limits for <i>E. Coli</i> in the discharge following UV treatment would be:</p> <ul style="list-style-type: none"> ∴ Median 500 MPN/100 ml ∴ 95th Percentile 5,000 MPN/100 mL

Table 1: Consent Condition v4 (1 Aug 2022) PDP Technical Review Comments

No.	Condition	Comment
	<p><i>volume would have to decrease. A lesser irrigation volume results in less leaching for the same mass applied. This means that a higher concentration effluent, applied to the same mass loading, will have a lesser leaching rate – resulting in a potential decrease in effects. Such a change is within the scope of the application as:</i></p> <ul style="list-style-type: none"> <i>a. It is unlikely that additional parties would have submitted on the specifics of this information;</i> <i>b. There were no concentrations nominated in the suggested conditions.</i> <p>6) Removal of concentration – based on the scope discussion above, CHBDC would like to remove N and P limits as effects from N and P are covered by Condition 52.</p> <p>7) Staging – should N and P concentration limits stay, staging of (c) is to allow bringing online the preferred treatment plant – in a way that allows for modulation as the system grows (i.e. Stage 2 coming on line). This means that not all infrastructure is built in Stage 1, but comes on line in Stage 2. This serves to defer over \$500,000 in capital cost, assisting with project cashflow. Note that as discussed in [scope] and [removal of concentration] above, the effects are regulated by the mass loading and not the concentration.]</p>	<p>They have not stated why the higher limits are now proposed.</p> <p>We do not understand the rationale behind the statement from the Applicant that the concentration limits will affect the staging of the discharges. Based on the current effluent quality of the Pōrangahau and Te Paerahi WWTPs provided in Section 4.5 of the Land AEE P:D.10, the existing effluent would meet the 20 mg/L TN average concentration.</p> <p>It is important that the modelling and assessment of effects is based on what the consent enables at all stages.</p>
49	<p>New irrigation areas are to be developed in accordance with Condition 5 with irrigation applied meeting the following criteria:</p> <ul style="list-style-type: none"> (a) Regular irrigation: <ul style="list-style-type: none"> i. typical irrigation application regimes as defined by Conditions 50 and 51. (b) Wet soil irrigation: <ul style="list-style-type: none"> ii. Uses the same irrigation infrastructure as regular irrigation; iii. Used when soil conditions are too wet for regular irrigation; 	<p>Refer comment on Condition 5 – irrigation shall be to LMU1 and LMU3 only. We recommend the conditions make it clear how irrigation and use of LMU1 versus LMU3 will occur to maximise nutrient uptake (in more detail than currently in Condition 50).</p>

Table 1: Consent Condition v4 (1 Aug 2022) PDP Technical Review Comments

No.	Condition	Comment
	<p>iv. Used when storage capacity starts to become limited as described in Condition 50; and</p> <p>To be applied to areas identified on Plan 1 (Attachment 1, Plan 1 attached and forming part of these conditions).</p>	
51	<p>The Consent Holder must ensure the application rate of treated wastewater onto land or into land does not exceed:</p> <p>(a) Regular irrigation:</p> <ul style="list-style-type: none"> i. 2 mm above field capacity; ii. 10 mm/h; and iii. 20 mm in any one application. <p>(b) Wet soil irrigation:</p> <ul style="list-style-type: none"> iv. 10 mm/h; and v. 20 mm in any one application. 	<p>It is not clear from these how will field capacity be determined. This is an important factor given the very low profile available water (PAW) of LMU3; 7 mm in the first 60 cm. PDP has previously suggested soil moisture monitoring should be undertaken to inform irrigation application and avoid unintentional non-deficit irrigation.</p> <p>Application of 20 mm in one event to LMU3 is expected to exceed the field capacity of the top soil and result in significant drainage, and therefore nutrient loss to the raw sand below. We recommend that the maximum application depth to LMU3 is reduced for the deficit regime given >50% of the application under a 'deficit regime' is expected to be lost to leaching.</p> <p>The condition should also include a requirement to prevent overland flow and ponding along the lines of <i>"irrigation of wastewater to the discharge property must not result in any ponding or overland flow."</i></p>
52	<p>The consent holder shall ensure that the nutrient loading resulting from the discharge of wastewater onto and into land does not exceed the following criteria on an annual average. Where the discharge of wastewater does not exceed the cap identified below, the consent holder may apply a fertiliser material to meet the nutrient requirement of the specific crop. Where an additional fertiliser material is applied to land, record must be kept in accordance with Condition XXX.</p> <p>(a) Max N Load 250 kg N/ha/year; and</p>	<p>In the application, an OverseerFM scenario has been analysed to provide the leached nutrient masses to feed into the overall system nutrient balance. As outlined above in Section 2.2 of this memo, the proposed scenario does not provide a reduction in nutrients to the Pōrangahau catchment. However, the assessed Stage 3 scenario appears to consider much lower applications of N and P to what is sought here. These proposed limits and the proposed concentrations</p>

Table 1: Consent Condition v4 (1 Aug 2022) PDP Technical Review Comments

No.	Condition	Comment
	<p>(b) Max P Load 80 kg P/ha/year.</p> <p><i>[Note: Included for consistency with Takapau.]</i></p>	<p>should be assessed as they may result in a significant increase in nutrient loss than currently modelled.</p> <p>While it is true that fodder crops can have higher nutrient requirements, we do not believe that 250 kg N/ha/y is likely to be required. The applicant should provide information to justify this limit.</p> <p>We also note that even with high demand for nutrients from fodder crops, application of additional fertiliser is highly likely to increase nutrient losses. This is of particular concern for LUM3 which has very high nitrogen leaching vulnerability. The applicant should demonstrate that application of nitrogen at 250 kg/ha/y will not significantly increase nutrient losses relative to the application rates assessed in the application.</p> <p>It may be appropriate to impose a whole of farm average limit for fertiliser application with specific maximums for each LMU.</p> <p>We also note that the minimum Olsen P level measured on site is 18 mg/L with values up to 46 mg/L also recorded. Olsen P is proportional to DRP with losses from soils with higher Olsen P levels resulting in higher DRP concentrations in runoff and leachate. The optimum Olsen P concentration for sheep and beef farms is 20-30 mg/L with even high production farms on soils with high phosphorous retention (anion storage capacity) not recommended to exceed 40 mg/L. Given there is not a clear need for significant increases Olsen P at the discharge property, we question why such a high limit for phosphorous application has been requested. This is likely well above any additional fodder crop requirements given the suitable/high Olsen P levels</p>

Table 1: Consent Condition v4 (1 Aug 2022) PDP Technical Review Comments

No.	Condition	Comment
		<p>already recorded at the site. We would recommend the applicant provide justification for the high limit or else the limit be reduced.</p> <p>We also recommend a consent condition where, if the Olsen P exceeds 30 mg/L, wastewater may be applied but the consent holder/land owner must not apply any additional phosphorus from fertiliser. We also recommend a condition that prioritises wastewater irrigation of soils with lower Olsen P, where Olsen P already exceeds 30 mg/L.</p>
54	<p>The Consent Holder must ensure that treated wastewater is not discharged to land closer than:</p> <ul style="list-style-type: none"> (a) 20 m from any watercourse, whether flowing continuously or intermittently, including any open drain; (b) 5 m from any property boundary where there are no buildings; (c) 50 m from any bores used for water supplies; or (d) 150 m from any dwelling house, milking shed or other building on any property bordering the land treatment area when that building is directly downwind. (e) 50 m from rare habitats, threatened habitats or at risk habitats (as identified by HBRC at any time during the term of the resource consent) (f) 50 m separation distance from any sites of cultural significance known to exist at the time of approval for this resource consent, or any sites of cultural significance found to exist at any time following the grant of this resource consent. <p><i>[Note: Included for consistency with Takapau and other applications. Ngati Kere Hapu Authority to advise alternative wording.]</i></p>	<p>As per our 4 March 2022 review, in the absence of further information on the suitability of 5 m, we would recommend a minimum of 20 m from any property boundary where there are no buildings.</p>

Table 1: Consent Condition v4 (1 Aug 2022) PDP Technical Review Comments

No.	Condition	Comment
62	<p>The Consent Holder must measure and record the static water level of all bores identified in Condition 60 prior to purging and sampling. Samples collected from the bores and shall be analysed for the following parameters:</p> <ul style="list-style-type: none"> (a) Temperature (field measurement); (b) pH (field measurement); (c) Electrical Conductivity (EC); (d) Chloride (Cl); (e) Nitrate-Nitrogen (NO₃); (f) Ammoniacal-Nitrogen (NH₄N); (g) Nitrite-Nitrogen (NO₂); (h) Dissolved Reactive Phosphorus (DRP); (i) Escherichia coli (E. coli); and (j) Sodium (Na). 	<p>Total nitrogen and total phosphorus should be added to these parameters. We recommend further consideration be given to the adequacy of the groundwater monitoring sites, including the need for additional sites upgradient and near the edge of the river to capture the likely effects of the discharge.</p> <p>The annual monitoring report (Condition 29) is required to report on any declines in groundwater quality, but the condition set does not appear to require any improvements/changes if a decline is observed. We recommend proposed concentration limits or changes in water quality be defined, with specific actions required. This should be based on ensuring effects on the Pōrangahau River from groundwater discharge are acceptable.</p>
XX	Management of Helminths	<p>There is no condition around the management of helminths in the wastewater treatment/discharge system. The applicant has indicated that the irrigated areas will be grazed by sheep and beef. Unless sufficient removal of helminths is provided in the treatment phase, there is a risk of establishing livestock diseases in cattle such as <i>Cysticercus bovis</i>.</p> <p>As per our 4 March 2022 memo, we recommend that the consent conditions include a requirement for removal of helminths, either a minimum 30 days retention in a wastewater treatment pond prior to</p>

Table 1: Consent Condition v4 (1 Aug 2022) PDP Technical Review Comments

No.	Condition	Comment
		<p>irrigation or a suitably designed filtration system. Alternatively, a 6-month standdown period prior to grazing by cattle for pasture irrigated by wastewater may be appropriate.</p> <p>Refer to Victoria EPA Guidelines for Use of Reclaimed Water and NZ MoH Guidelines for Irrigation with Sewage Effluent.</p>
XX	Monitoring of heavy metals in soils	<p>As per our 30 September 2021 memo, we recommend that a baseline sample and long term monitoring (yearly or at a minimum 5 yearly) of heavy metals at the discharge property is undertaken to monitor for any potential build up. This is a typical requirement for municipal wastewater irrigation schemes. The heavy metals monitored should include As, Cd, Cu, Cr, Ni, Pb, Zn, Hg.</p>
XX	Reporting/investigating of consent limit breaches	<p>Samples are to be taken from the WWTPs under consent condition 17 and limits are set out in the sub-sections for each individual treatment system. Reporting of breaches occurs under condition 28. However, the conditions could be strengthened with more requirements around undertaking investigations into the cause of the breaches and implementing solutions to prevent future breaches.</p> <p>We suggest that the consent holder is required to investigate and report within 30 days of the breach being identified on the cause and outline the solutions the consent holder has implemented or will implement to prevent further breaches.</p>



Figure 1: LMU3 Soil Profile captured during discharge property site visit.

4.0 Limitations

This memorandum has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided by Hawke's Bay Regional Council and others (not directly contracted by PDP for the work), including Lowe Environmental Impact, WSP, Beca and Tonkin and Taylor. PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the memorandum. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

This memorandum has been prepared by PDP on the specific instructions of Hawke's Bay Regional Council for the limited purposes described in the memorandum. PDP accepts no liability if the memorandum is used for a different purpose or if it is used or relied on by any other person. Any such use or reliance will be solely at their own risk.

©2022 Pattle Delamore Partners Limited

Prepared by



Oliver Hunt
Environmental Engineer

Prepared by



Mark Bellingham
Technical Director - Ecology

Reviewed and Approved by



Hilary Lough
Technical Director – Water Resources