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27 February 2019

Nicola Arnesen
Senior Resource Advisor
Greater Wellington Regional Council
PO Box 41
MASTERTON 5840

Dear Nicola,

FEATHERSTON WWTP RESOURCE CONSENT REVIEW

(1) Pattle Delamore Partners Limited (PDP) has been engaged by Greater Wellington Regional Council to provide technical review of the Featherston WWTP Resource Consent Application (WAR 170229), considering the proposed land discharge (irrigation) of treated wastewater to land and the associated assessment of effects. Assessment of discharge to surface water is being reviewed by Olivier Ausseil.

(2) The views expressed in this letter report are those of the following PDP experts, with our relevant area of expertise provided:

- Daryl Irvine (Wastewater and Land Treatment)
- Aslan Perwick (Groundwater)
- Jack Feltham (Wastewater and Land Treatment)

(3) Our key involvement to date is summarised as follows:

- Review of the Featherston WWTP Resource Consent Application documents.
- Assisted in the preparation of Section 92 requests for further information (sent to Applicant 19 April 2017).
- Assisted in the preparation of further points of clarification relating to Section 92 responses (sent to Applicant 28 June and 26 September 2017).
- Consultation meetings with Applicant's consultants and experts (Katie Beecroft LEI and Chris Simpson GWS) around the requirements to address outstanding uncertainty and concerns from the proposed activity associated with potential groundwater mounding and pathogen effects (24 January 2018 and 25 September 2018). Note it was agreed between all experts at both the 24 January 2018 and the 25 September 2018 meeting that further groundwater investigations and modelling work was required.
- Expert witness conferencing with Applicant's experts Katie Beecroft (LEI) and Chris Simpson (GWS) and issue of Joint Witness Statement (20 December 2018).

(4) This letter report has been prepared in order to:

- Summarise the assessment of the resource consent application, including review of completed conferencing and Joint Witness Statement (JWS), Section 92 response and further clarifications;
- Summarise outstanding concerns when considering the information provided by the Applicant by 25 February 2019; and,
- Notwithstanding the outstanding concerns identified, to provide review of the Consent Conditions currently proposed by the Applicant.

1.0 Summary Concerns for Resource Consent Application

1.1 Unacceptable Uncertainty and Risk

(5) We consider the proposal for the Featherston WWTP to be sound in principal. Progressively moving from the current direct surface water discharge system, to a dual land/surface water discharge system, and finally to what is primarily a land discharge only system will see a reduction of mass flux of nutrients into the surface water. However, the current application contains a high degree of uncertainty, predominantly with the proposed land discharge scheme, that represents a risk to human health, the environment, and potentially affected parties which cannot be supported.

(6) Although we accept that some level of uncertainty in the assessment of treated wastewater storage and land irrigation schemes is unavoidable at the current consenting stage, we consider that a conservative approach is warranted. At present, the applicant's effects assessment is considered incomplete and the current level of uncertainty is considered high. Residual areas of concern are:

1. Understanding the risks and potential effects associated with groundwater, primarily:
    a. The amount of groundwater mounding that the proposed scheme may cause.
    b. The resulting impact of groundwater mounding on the proposed irrigation scheme capacity, storage requirements, and the need to divert discharge to surface water (rather than land).
    c. The potential transport of pathogens through groundwater.
    d. The identification and mitigation of potentially affected parties/receptors.
2. The impact of a prolonged wet period (e.g. 'wet-year' scenario) – and impact on the abovementioned (Item 1).
3. The impact of the potentially limited I&I reductions on the proposed scheme i.e. should the predicted I&I reduction of 35% not be achieved in practice– and impact on the abovementioned (Item 1).
4. The potential risk of pathogen migration to human health or other ecological receptors.

(7) Further discussion on areas of residual concern is provided in Section 3.0.

(8) The Applicant has proposed an Adaptive Management Approach after the Consent is granted (See Section 4.1) in lieu of undertaking further investigation/assessment prior. We do not support such an approach for this Consent application as, in our opinion; these significant uncertainties leave too much residual risk to stakeholders and receptors.

(9) In conclusion, we consider the current level of uncertainty and risk to be unacceptable. We do not consider that it is appropriate to address this level of uncertainty and risk through consent conditions or through adaptive management.

(10) Furthermore, it is recommended that an effects assessment containing greater certainty on predicted effects is produced by the applicant.

1.2 Infrastructure Risk

(11) Notwithstanding the incomplete investigations and the resulting unacceptable uncertainty and risk discussed in Section 1.1, we consider that there will still be residual uncertainty and risk with the proposed activity that will need to be considered and addressed by the Applicant.

(12) Land discharge schemes like the one proposed for the Featherston WWTP have large capital costs associated with the construction of treated wastewater storage lagoons, land discharge infrastructure and in this case the remediation of reticulation to reduce I&I. There are two potential risks which would have significant consequences, namely:

1) That the I&I reduction programme does not turn out to be as effective as assumed in the AEE and therefore the inflows to the WWTP and irrigation system are higher than allowed for.

2) That the land treatment scheme turns out to have much less capacity to accept effluent than assessed at present, especially during winter conditions.

(13) Either or both of these scenarios are quite possible and the result could be a requirement for a larger treated wastewater storage lagoon and a greater land disposal area with associated infrastructure in order to maintain the proposed discharge to land irrigation regime. This requirement, or other alternatives not yet considered, could represent a significant cost increase above what has currently been assessed for the SWDC.

(14) If this cost is above the ability of the SWDC to service, the likely alternative is the discharge of treated wastewater to land and surface water at rates above that identified in the AEE and potentially resulting in greater adverse effects on the environment and human health.

(15) We note that we do not consider establishing a monetary Bond or alternative monetary commitment to be sufficient to address the current level of uncertainty and risk given that key investigations remain incomplete as discussed in Section 1.0. However, this may be an option worth considering if investigations are completed and the level of uncertainty is reduced to an appropriate level that allows the realistic land irrigation capacity and treated wastewater storage capacity to be assessed and the associated cost considered and planned for.

2.0 Joint Conferencing and Joint Witness Statement (JWS)

(16) Joint conferencing between PDP experts and Applicant experts Katie Beecroft (LEI) and Chris Simpson (GWS) was carried out on 18 December 2018, with the JWS issued on 20 December 2018.

(17) Although some progress appeared to have been made towards reducing uncertainty with the proposed activity and assessed effects, generally the additional assessments provided were not completed to the level requested during and post the s92 process. No further information has been provided following joint conferencing. Both the provided and outstanding (yet to be provided) components of the Applicant's groundwater and pathogen effects assessments are outlined in Section 2.1.

(18) As a result, the completed JWS could not provide statements of agreed position on the majority of expert brief items due to insufficient information, and consequently the majority of our concerns raised after review of Section 92 responses in August 2018 (see Section 3.0) have not been addressed.

2.1 Information provided by the Applicant prior to Conferencing

(19) Prior to caucusing, the Applicant's consultant (GWS) provided the "Further Evaluation of Groundwater Effects Associated with the Land Application of Wastewater at Featherston" report dated 14 December 2018, provided as an attachment to the issued JWS.

(20) In brief, this report provided:

- Details of a site topographical survey.
- Outline and discussion on some additional field investigation work, primarily associated with gauging the composition and thickness of the unsaturated soil zone and depth to groundwater measurements from onsite locations and some boreholes on neighbouring properties (completed in November and December 2018).
- An updated interpretation of the unsaturated zone thickness and groundwater flow directions.
- A groundwater mounding prediction under an 'Average Year' loading scenario.
- A prediction of the 5-year groundwater travel envelope (for use in the pathogen risk assessment).

(21) The Applicant has yet to provide:

- 'Groundwater modelling technical report' (GWS) which is to be Appendix B of the GWS Dec 2018 report – to include all of the industry standard details on the applicant's geological / hydrogeological interpretation of the site, the technical details of the groundwater model set-up and parameterisation, and technical details on how the current predictions have been modelled. Consequently, all of the applicant's existing groundwater related predictions are yet to be verified by our review. *(Note: It was agreed by the experts at joint conferencing that this 'Appendix B' work is to be completed.)*
- Nov and Dec 2018 Field investigation report (LEI). This is information which will support the GWS Dec 2018 report. *(Note: It was agreed by experts at joint conferencing that this work is to be completed.)*
- Assessment of a 'Wet Year' scenario, a lower I&I reduction scenario, or a Stage 1b (prior to I&I reduction) scenario, and the associated impact of these scenarios on the proposed scheme (i.e. groundwater mounding and pathogen transport, the irrigation scheme, storage requirements, and the need to divert discharge to surface water). *(Note: It was agreed by experts at joint conferencing that this work is to be completed.)*
- Identification of all potential receptors (groundwater/surface water users) within the currently adopted 5-year envelope. We understand that a letter drop has been completed, and the Applicant is awaiting responses from residents. *(Note: It was agreed by experts at joint conferencing that this work is to be completed.)*
- Assessment of pathogen related risks to all receptors by ESR (or similar consultant) following letter drop response. *(Note: It was agreed by experts at joint conferencing that this work is to be completed.)*
- Subsurface hydrogeological investigations below saturated soils. *(Note: This work was not proposed by LEI/GWS to be completed at joint conferencing – instead it was proposed that GWS would provide us with the information which they have used to inform/develop their hydrogeological model and we would assess whether or not we consider that information to be satisfactory. However, we now understand that further subsurface hydrogeological investigations are being conducted.)*

(22) As summarised above, the items relating to groundwater and pathogen risk assessment works that are yet to be provided are significant in terms of potential effects and potentially affected parties. As a result, we cannot verify the Applicant's assessment of effects.

3.0 Review of Applicant's Section 92 Responses and Discussion of Outstanding Concerns

(23) We have reviewed the following Section 92 related responses from the Applicant:

1. **Section 92 Letter Report:** The Mott MacDonald letter report titled "Featherston Wastewater Treatment Plan Resource Consent Applications – Response to Request for Further Information (s92)" dated 2 June 2017, including all attachments such as GWS Ltd letter report "Assessment of Groundwater Mounding Effects Relating to Proposed Land Discharge Area for the South Featherston WWTP" dated 1 June 2017 (GWS 2017a).

2. **Section 92 Further Clarification Table:** The Mott MacDonald table report titled "Featherston WWTP Resource Consent Applications – Further Points of Clarification" table dated 24 July 2017, including all attachments.

3. **Section 92 Further Clarification Letter:** The Mott MacDonald letter report titled "Featherston WWTP Resource Consent Applications - Further Points of Clarification Response to Request for Further Information (s92)" dated 20 October 2017, including all attachments such as GWS Ltd letter report "Response to Request for Further Points of Clarification Related to Proposed Land Discharge Area for the South Featherston WWTP" dated 18 October (GWS 2017b).

(24) We have considered the Section 92 responses and provide our assessment and outstanding concerns below. As discussed in Section 2.0 the additional assessments provided as part of joint expert conferencing (see JWS, 20 December 2019) are incomplete, and have not been verified or assessed, and therefore, have not addressed any of the concerns identified in the following sections.

3.1 Groundwater (Mott MacDonald Section 92 Letter Report - Section 1)

(25) Based on review of the applicant's assessment of groundwater effects (GWS, 2017a and GWS, 2017b), as well as a meeting with the applicant's technical advisors on 24 January 2018, we have summarised the following matters of concern:

1. We consider there to be overall insufficient site-specific data to support the applicant's effects assessment with respect to groundwater. The primary potential groundwater effects from a land application scheme are associated with: a) managing potential on-site and off-site increases to the groundwater level (commonly termed 'mounding'), and b) managing risks associated with contaminant migration / water quality (on-site and off-site).

2. In relation to the applicant's assessment of groundwater effects, a number of key assumptions and their associated uncertainties, were adopted. Whilst some assumption and residual uncertainty is almost always present when completing a groundwater assessment of this type, it is considered essential to obtain sufficiently detailed information to reduce uncertainty to an acceptable level. The following outlines some of the key information required for this type of groundwater assessment, which in our opinion is not currently of sufficient detail:

    a. Understanding of the geological units beneath the site and relevant surrounding areas – in the Featherstone setting, a particular emphasis on confirming the effective thickness of the gravel unit, coupled with confirming the presence or absence of clayey/silty/peat layers/lenses, and their depth, thickness and continuity.

b. Understanding of the key hydrogeological properties – with permeability of the relevant geological units of the most importance, and where most of the evaluation effort should be aimed. Storage is also a useful factor to assess.

c. Understanding of the groundwater level and flow regime – a number of key elements; groundwater level, groundwater flow direction, recharge, groundwater discharge.

d. Detailed understanding of climate forces – namely the annual and inter-annual variations in climate and how these can influence the soil drainage, groundwater level, flow regime, and water quality. An assessment of the different range of irrigation applications is also required due to varying wastewater flows which are also affected by climate forces due to I&I influences.

e. An appropriately detailed representation of land surface topography.

f. Assessment of a range of expected irrigation depths.

3. Recommendations are presented within the applicant's technical groundwater assessment documents, GWS (2017a) and GWS (2017b), which outline recommendations to undertake further site characterisation works. At the 24 January 2018 meeting, this topic was discussed and both parties agreed that obtaining additional site characterisation information would be more beneficial than completing 'sensitivity analysis' on the existing assumptions. We support the initiative of gaining additional information on site characterisation.

4. In relation to contaminant discharge and potential water quality effects, we have previously raised some specific requests for further information and assessment, these are:

   a. An assessment of a realistic scenario with respect to maximum pathogen magnitude and migration from the proposed discharge. This should include (but not be limited to) development of a suitable 'envelop of effects' with regard to potential pathogen migration and associated mitigation/management measures.

   b. Obtaining a high degree of certainty regarding the presence, location, vulnerability, and overall risk to relevant human and environmental receptors. This should include (but not be limited to) the potential presence of water supply boreholes on neighbouring properties that are not recorded in the GWRC borehole database; but are still being utilised for Permitted Activity take purposes.

5. Overall, we consider the current application to contain too much assumption and uncertainty, and consequently our opinion is that a confident position on the potential groundwater effects from the proposed discharge cannot be reached. This has been outlined previously to the applicant in the GRWC Section 92 requests (19 April 2017 and 28 June 2017), but the requests for additional information and assessment have not yet been fulfilled. Additionally, the requirements for additional information and assessment was discussed with the Applicant's technical advisors on 24 January 2018. However, no further verifiable information or assessment of site characterisation has been forthcoming.

6. Notwithstanding the limitations of the site specific and assumed information for the groundwater assessment, the currently assessed effects of the existing groundwater assessment is of concern to us. The Applicant's consultant has provided a prediction on the area impacted by groundwater mounding (GWS 2017b). The impact is currently defined as creation of 'near saturated' surface conditions. The areas predicted to be affected are displayed graphically in Figure 1 of GWS, 2017b. Whilst the applicant has not provided a meterage estimate of the area, Figure 1 indicates that the area is large (i.e. on the hectare scale) and occurs on a number of different land parcels

including neighbouring privately owned land parcels. No duration estimate of the predicted effect has been provided. Given the currently presented prediction, and without further explanation/assessment of the actual impacts and or proposed mitigation to these affected land parcels, we do not consider this magnitude of off-site groundwater level mounding to be acceptable for a municipal land discharge system. We would expect the predicted effects on neighbouring privately owned land parcels to be a concern to the potentially affected landowners.

7. Furthermore, the groundwater mounding currently assessed also indicates that the proposed applied volume is potentially above the capacity of the receiving land area. We have not seen any evidence that any predicted effects of onsite groundwater mounding has been incorporated into the land irrigation regime or storage volume requirement assessments by the Applicant. If the capacity of the land treatment area is less than assessed, then the potential storage volumes required for Stage 2B (100% discharge to land) and/or the volume of wastewater proposed (and assessed) for discharged to surface water may increase. We consider that the outputs of the current groundwater mounding assessment, or alternative groundwater mounding assessment based on further site information, should be incorporated into the land irrigation regime and storage requirement modelling, to reduce the cost and/or environmental risk of the scheme, as discussed in Section 1.0.

(26) It is noted that while preliminary results and further discussion of groundwater modelling and assessed effects of groundwater mounding and pathogens migration was conducted at the joint conferencing, no technical basis for these groundwater modelling results have been provided and no consideration of wet year or other "worse case" scenarios has been provided. As outlined in the JWS (20 December 2018) we therefore cannot verify the updated modelling results provided by the Applicant and the concerns outlined above are still to be addressed.

3.2 Overseer Modelling (Mott MacDonald Section 92 Letter Report - Section 2)

(27) We have undertaken a high level review of the Overseer® nutrient modelling summary and inputs provided, and are satisfied with this nutrient assessment. We consider that the inputs utilised and the estimated leaching for the baseline dairy farm system, and the proposed grazed pasture or cut and carry system, to be reasonable.

(28) However, we note that the above assessment assumes that the irrigation scheme is able to be operated as set out in the AEE. However, as discussed in this report there is a lack of certainty around I&I reductions, groundwater mounding, and potential for saturated conditions across a large portion of the site, which does not align with the AEE. We will need to review and consider any updated Overseer® modelling as a result of any updated investigation outcomes such as groundwater modelling and irrigation scheme changes.

(29) Notwithstanding the need to assess any changes in Overseer® modelling, one of our key concerns is ensuring that the Consent Conditions for land discharge reflect and limit the proposed activity to the land discharge that has been assessed in the AEE and modelled within Overseer® (or any subsequent updates). The Consent Conditions controlling nutrient loading for the proposed activity has been discussed in Section 4.9 of this letter report.

3.3 Soil Information (Mott MacDonald Section 92 Letter Report - Section 3)

(30) The Applicant provided additional soil assessment information and discussion as part of the Section 92 response. This provided site investigation and assessed conductivity information for shallow soils at the proposed irrigation activity area, however, the soil information provided has not described the deeper soil conditions relevant to the groundwater mounding assessment, and general hydrogeological conditions, as discussed in Section 3.1.

3.4 Inflow and Infiltration (Mott MacDonald Section 92 Letter Report - Section 4)

(31) We consider the Applicant's proposed approach of reviewing the effectiveness of the proposed I&I reduction as the staged land discharge system is implemented to be reasonable. The extent of I&I has been assessed by the Applicant based on measured catchment flow studies in part of the Featherstone reticulation. Based on this they have extrapolated this to cover the entire reticulation and estimated that 35% reduction can be achieved based on undertaking physical works. However, we considers that there is a level of uncertainty about achieving such a significant reduction as I&I reduction is typically very difficult to achieve, particularly in a cost effective manner. Given that the I&I reduction will affect other aspects of the proposed activity including the land discharge regime, required storage volumes and river discharge volumes, reviewing the implications of I&I reduction on flow when actual data for the Featherston reticulation becomes available is considered sensible and imperative. However, we note that the AEE states that this work will not begin until several years after the Consent is granted and so this leaves a level of uncertainty that the land irrigation system may not have sufficient capacity if the Consent were granted for the 35 year term as requested by the Applicant.

(32) The Applicant has stated that they have assessed the proposed land discharge area of 116 ha to be sufficient to receive the current annual flows without the assessed I&I reduction (Section 92 Letter Report Section 4.2.5), but that this would require significant storage volumes (~422,000 m^3). We consider the discharge of current flows without I&I reductions to 116 ha to be achievable in terms of hydraulic loading limits under the proposed irrigation scheme, given sufficient storage. However, we note that a detailed peer review has not been completed on the land irrigation regime or storage volume requirements for the proposed land discharge, or the alternative of increased storage and increased irrigation area as discussed above in the event that I&I reductions are found to be less than calculated (It is further noted that significantly more information would be required from the Applicant to perform this peer review). Furthermore, the impacts of groundwater mounding or greater reliance on surface water discharge, for a scenario where I&I flow reductions are found to be less than calculated, has not been assessed by the Applicant as outlined in the JWS (20 December 2018). No Overseer® nutrient modelling for a scenario where I&I flow reductions are found to be less than calculated has been provided by the Applicant, or reviewed by us.

(33) Notwithstanding the need to address the uncertainty associated I&I reduction to allow consideration of the Consent Application, it is our opinion that Consent Conditions will need to sufficiently cover the Applicants proposed review of I&I reduction, and the subsequent effects on the modelled land discharge regime, storage volumes and river discharges at future milestone dates.

4.0 Review of Proposed Conditions

(34) As discussed in Section 1.0, it is our opinion that the proposed activity presents unacceptable uncertainty and risk given that key investigations remain incomplete, and we do not consider that this uncertainty and risk can be addressed through appropriate conditions or adaptive management. Notwithstanding this, we have provided our review of the Consent Conditions currently proposed by the Applicant, with recommendations on changes to Conditions that we consider should be made **in addition** to addressing the outstanding incomplete assessments, uncertainty and risk outlined in Section 1.0.

4.1 Management Plans – Schedule 1, Cl. 3, 5 and 7.

(35) As discussed in Section 1.0, the Applicant has proposed an adaptive management approach for the proposed activity. These approach presents itself in the current Consent Conditions, which leave much of the specific controls of the proposed activity to be covered under the Management Plans to be produced after the granting of the consents, as outlined in Schedule 1, Cl. 3, 5, and 7. While we agree this could be

appropriate for monitoring programmes and specific management procedures, our opinion is that elements that control the proposed discharge should be covered by specific separate Consent Conditions.

(36) As one example, soil moisture conditions are likely to be the key controlling factor for the proposed land discharge activity. The proposal outlined in the AEE specifically discusses this method of control but no Consent Condition has been provided to limit soil moisture conditions under which irrigation can occur. We consider that this is a critical element to be controlled as it affects the whole basis of the AEE assessment. More specifically this element affects the modelled land discharge regime, the required land discharge area and storage volume requirements and subsequently the volume of discharges to surface water. Our opinion is that critical elements such as these should not be deferred to Management Plans, but should be incorporated into the Consent Conditions.

(37) We have raised some specific controls which we consider should be included in the Consent Conditions in the following relevant sections.

4.2 Reporting Condition – Schedule 1, Cl. 22

(38) We consider that the annual reporting Condition (Schedule 1, Cl. 22) needs to be expanded to not only assess the effect of data trends on aquatic life or in causing other adverse effects, but also to consider whether data trends indicate increased flows and loads into the WWTP, and whether these trends indicate increased populations or other sources of inflow, and/or a lower than expected I&I reduction as a result of reticulation remediation work proposed. The mitigation of any increasing trends can then be assessed prior to any non-compliances or operational issues at the WWTP occurring.

4.3 Staged Review of Proposed Activity – Schedule 1 – Cl. 38-41

(39) The proposed Consent Conditions, Schedule 1, Cl. 38 and 40, require review of the "efficiency and effectiveness" of Stage 1 within 3 years of commencement of Stage 1, and for Stage 2B within 3 years of commencement of Stage 2B respectively. Schedule 1, Cl. 39 and 41 outline the scope for these reviews respectively. However, these Consent Conditions do not currently require or outline any specific review around the items covered in the following sections.

4.3.1 I&I Reduction - Schedule 1 – Cl. 38-41

(40) The Consent Conditions do not currently require or outline reviewing the effectiveness of the I&I reduction achieved, or subsequent assessment of the effects of this on the proposed activity, such as effects on the proposed land discharge regime, required storage volumes and river discharge volumes. We consider that the assessment of I&I reduction must be incorporated into the Consent Conditions including defining the scope of these reviews because the success of the I&I reduction will have an impact on the proposed irrigation scheme.

(41) The physical works of the I&I reduction programme are scheduled to begin at the granting of the Consent and be completed within 5 years of this (as per updated staging proposed outlined in the "Memorandum of Counsel for the Applicant" dated 23 October 2018). It would seem reasonable to include a Consent Condition or update existing Consent Conditions to stipulate this timeframe, given that it may have a large bearing on the success of the overall Consent.

(42) Review of I&I reduction was discussed as part of the review process in the Applicant's Section 92 Letter Report. Item 4.2.3 of the Section 92 Letter Report outlines that in the event that I&I flows are not reduced, and risks of constructing the required deferred storage are unacceptable, then a suitable long term alternative will be confirmed as part of the review process. The Section 92 Letter Report outlines the following potential alternatives:

- Combined land and water discharge with contingency discharge flows directed to the Tauherenikau River.
- Land discharge with excess flows directed to rapid infiltration.
- Land discharge with new reticulation of the sewer network.
- Combined land and water discharge with high level treatment for Donald Creek discharge.
- Any other suitable alternative identified at the time.

(43) Obviously any of the above alternatives would require a variation to the Consents, or new Consents, including a detailed assessment of effects of the proposed changes. In addition, some of these options will have significant CAPEX requirements.

(44) An effective way to provide some surety particularly if a long consent term is to be considered would be for the Applicant to establish a monetary Bond (for example of $5M or some other calculated amount) through a Bank or Bonding Company, or some alternative monetary commitment. This would ensure that sufficient funds were available to build the necessary infrastructure and/or purchase extra land for irrigation if it is found to be needed. We note that we do not consider establishing a monetary Bond to be sufficient to address the current level uncertainty and risk given that key investigations remain incomplete as discussed in Section 1.0, but that this may be appropriate where uncertainty and risk has been reduced to an appropriate level.

4.3.2 Groundwater Mounding - Schedule 1 – Cl. 38-41

(45) There is no specific reference to assessing groundwater effects such as groundwater mounding based on groundwater monitoring information, or an assessment of the effects of any groundwater mounding on:

- The land treatment irrigation regime and its operation.
- The storage volumes required.
- The volumes of treated wastewater discharged to surface water.
- The effect on offsite neighbouring properties.
- Any management practices to mitigate potential adverse effects, such as buffer zones from areas susceptible to groundwater mounding.

(46) We consider that Consent Conditions Cl. 38 – 41 defining the scope of the staged review should include assessment of groundwater mounding effects as described above. These additions to the Consent Conditions would be in line with the recommendations outlined within Section 3 of the GWS Limited letter report titled “Assessment of Groundwater Mounding Effects Related to Proposed Land Discharge Area for the South Featherston WWTP” dated 1 June 2017, submitted as appendix A1 to the Applicant’s Section 92 Letter Report. These recommendations were also summarised in the Section 92 Further Clarification Table.

4.3.3 Storage Requirements - Schedule 1 – Cl. 38-41

(47) There is no specific reference to assessing the storage requirements for Stage 2B based on I&I (covered above) and land treatment efficiency achieved in earlier stages. It is our opinion that this should be incorporated into the Consent Conditions.

4.3.4 Review of Storage Requirements at Stage 2A - Schedule 1 – Cl. 38-41

(48) The proposed Consent Conditions outline review steps only at Stage 1 and Stage 2B of the staggered implementation of the land discharge project. The Applicant’s Section 92 Letter Report, Item 4.2.3 outlines assessing risks of Stage 2B storage at Stage 1, based on I&I reduction achieved.

(49) Although we agree with this proposed assessment at Stage 1 and believe it should be included in Consent Conditions as discussed, it is our opinion that the review of storage requirements at the completion of Stage 2A is necessary and should therefore be covered specifically by the Consent Conditions.

(50) This is consistent with the Applicant's proposal as per the AEE Section 4.0, Item iv., which outlines that "The implementation of Stage 2A will also enable full monitoring to occur to confirm the required volume of deferred storage prior to design of the final land treatment Stage 2B".

(51) As the storage requirements are a key parameter that is important to calculate correctly for any land disposal scheme, we recommend that the storage volume modelling be peer reviewed at the detailed design stage, and that the Consent Conditions are amended to require this peer review, as per Section 4.11 below of this letter report.

4.4 Discharge to River - Schedule 2 Cl. 1

4.4.1 Annual Discharge - Schedule 2 Cl. 1

(52) It is considered that the current proposed Condition (Schedule 2 Cl. 1) does not adequately restrict the discharge of treated wastewater to surface water in order to promote the preferential discharge of treated wastewater to land. The AEE outlines in Section 4.0 that Stage 1 land treatment should target to eliminate or minimise discharge to surface water during low flow periods, and that Stage 2A should eliminate all discharges to surface water during summer months.

(53) The Schedule 2 Cl. 1 Condition for Stage 1 and Stage 2A discharge only restricts the daily flow volumes permitted to be discharged to surface water, and does not limit the total allowable surface water discharge on an annual basis.

(54) Only at Stage 2B is discharge to surface water restricted by the proposed Consent Conditions, with Schedule 2 Cl. 2 requiring no discharge during summer months and discharge only when the surface water flows meet certain set limits, as discussed in Section 4.4.3 below. However, Stage 2B will not proceed until 13 years after the commencement of the consent, and it is our opinion that allowing unrestricted surface water discharge until this time to be inconsistent with the proposed activity described in the AEE.

(55) It is our opinion that Consent Conditions are required to restrict the volume of discharge to surface water, potentially by imposing either monthly or annual flow limits to river, or imposing annual contaminant or nutrient load limits for river discharge. These Consent Conditions should limit the discharge to river in line with the AEE Table 13 and Table 14, which respectively outline the percentage of annual flows to river for the various stages of the project, and the total annual discharge volumes (land and river discharge) from the Featherston WWTP for the various stages of the project.

4.4.2 Daily Flow Discharges Stage 1-2A - Schedule 2 Cl. 1

(56) Consent Conditions controlling daily effluent wastewater discharge flow limits to surface water for Stage 1 and 2A (Schedule 2 Cl. 1) include an average flow limit and a 90th percentile flow limit, rather than a maximum flow limit which is the existing discharge Consent Condition limit.

(57) The average flow limit appears to be in line with the winter mean average flow outlined in Table 2 of the AEE. This is considered reasonable as surface water discharge will predominantly occur in wetter winter months.

(58) However, we could not locate where the historic 90th percentile winter flow data has been provided in the AEE or supporting documentation. It is our opinion that the 90th percentile winter flow information should be provided as this is the basis for one of the proposed surface discharge consent limits.

4.4.3 Daily Discharges Stage 2B - Schedule 2 Cl. 2

(59) As discussed above in Section 4.4.1 of this letter report, Schedule 2 Cl. 2 will restrict discharge to surface water based on flows within the receiving surface water body. The condition restricts discharge to surface water "as far as reasonably practicable" when flows are below 2x median river flows. In our opinion the wording "as far as reasonably practicable" is not suitable, and we consider that the situations under which discharges to river can occur at flows below 2x median flows should be clearly defined as part of this condition.

(60) It is our opinion that the '2x median flow' limit should be clearly defined so that the Condition is self-contained, and does not require reference to external documents.

4.5 Effluent Water Quality Limits - Schedule 2, Cl.3

(61) The Applicant has outlined in the AEE Section 4.4.3 that they propose effluent quality limits that reflect the current plant performance. However, the proposed water quality limits (Schedule 2, Cl.3) do not all match existing WWTP effluent data provided in the AEE. The identified discrepancies are outlined in Table 1.

(62) It is our opinion that the proposed method of monitoring the 90th percentile compliance limits, i.e. not exceeding limits in more than 3 out 12 consecutive monthly samples, is consistent with the NZ Municipal Wastewater Monitoring Guidelines (September 2002) Table 13.2.

Table 1: Comparison of AEE reported WWTP Effluent Quality and Proposed Consent Limits

Parameter	Unit	AEE Table 3 (90th Percentile)	Conditions[1] Schedule 2 Cl. 3 (Not exceed limits below in more than 3 out of 12 consecutive monthly samples)
Biochemical Oxygen Demand (BOD_5)	g/m^3	30.1	35
Total Suspended Solids (TSS)	g/m^3	95.4	100
Ammoniacal Nitrogen (NH_4-N)	**g/m^3**	**8.7**	**12.0**
Total Nitrogen (TN	g/m^3	13	15
Dissolved Reactive Phosphorus (DRP)	g/m^3	3.3	4.0
Total Phosphorus	**g/m^3**	**4.21**	**N/A**

Notes:

1. *The proposed consent limit of 3 out 12 consecutive monthly samples is consistent with the NZ Municipal Wastewater Monitoring Guidelines (September 2002) Table 13.2 for a 90th percentile performance standard.*

(63) However, our concern is that not all the limits represent the current discharge quality. Specifically, the proposed Ammoniacal Nitrogen (NH_4-N) limit is approximately 50% higher than the existing effluent water quality. No discharge limit has been proposed for Total Phosphorus (TP), and it is our opinion that a limit for this parameter should be included in the Condition.

(64) We see no reason why effluent concentrations in the discharge should be permitted to increase as is proposed. It is our opinion that the Consent Conditions should be amended to match the existing effluent quality for the parameters noted. Should populations and therefore wastewater loads increase, the consent holder will need to make relevant amendments to the treatment system to maintain existing treatment quality.

(65) There is a limited dataset available for E coli. concentrations in the effluent discharge following UV treatment, as the Featherston WWTP UV unit was only installed in 2011. We consider the E Coli. limit of 100 cfu/100 mL in 5 out 10 consecutive monthly samples and 1000 cfu/100 mL in 2 out 10 consecutive monthly to be appropriate for the WWTP system, however, any outcomes of incomplete investigations into pathogen risk may impact this.

(66) It is also our opinion that maximum effluent concentration limits, a common restriction on treated wastewater effluent, are required for the Featherston WWTP, so that the discharge of unrestricted elevated contaminant loads or pathogens to the environment are not permitted. The Applicant should propose maximum effluent concentration conditions based on existing treated effluent wastewater quality outlined in the AEE.

4.5.1 Adjusted Effluent Water Quality Limits – Scheule 2, Cl. 4

(67) Schedule 2, Cl.4 outlines adjusted effluent quality concentration limits for the Featherston WWTP, for when I&I rehabilitation works and flow reductions have occurred. The reasoning behind this is that as inflows into the WWTP decrease, the dilution of wastewater will decrease. This will result in an increase in contaminant concentrations in the effluent treated wastewater. However, the Applicant is proposing concentration limits for discharge post I&I reduction, which were intended to maintain **contaminant mass load** discharges to the receiving environment in line with the loads resulting from the existing flows and the existing contaminant concentrations.

(68) However, when checking these numbers we discovered an apparent error in TSS concentration when adjusted for I&I reduction. While the other contaminants are adjusted according to the expected future flow of 65% of existing flows (due to an expected 35% reduction in flows due to I&I reduction) TSS appears to be adjusted by a factor of 60% of current flows. Therefore, the assessed future TSS concentration limit due to changes in flow is too high (un-conservative). This discrepancy will need to be addressed by the Applicant.

(69) The Applicant will also need to re-assess the adjusted concentrations based on any changes to Schedule 2, Cl.3 based on our assessment in Section 4.5.

(70) It is our opinion that there should be a Consent Condition included requiring independent assessment and reporting on reduced flow due to I&I and assessing the new resulting effluent concentration, and the effects of this discharge on the receiving aquatic environment, both in terms of acute and long term effects. The consent limit values for effluent quality going forward following I&I reduction should be established as part of this report, and would result in a variation to the Consent Condition. We recommend this course of action as the effluent quality concentrations could be higher than assessed in Schedule 2 Cl. 4 if I&I reduction is more effective than anticipated, or lower if I&I is less effective than anticipated. This creates uncertainty and potential risk for both the potential Consent Holder and the receiving environment.

4.5.2 Emerging Contaminants

(71) There are currently no conditions requiring assessment of emerging contaminants for the wastewater treatment plant effluent discharge. Given the duration of the consent applied for, it is our opinion that an assessment of emerging contaminants to be appropriate during the course of the consent period.

We consider that a condition should be included stipulating the timing and level of monitoring and assessment of emerging contaminants to be undertaken.

4.6 Pond Seepage – Schedule 2

(72) The Applicant proposes an assessment of pond leakage within 12 months of consents commencement in the AEE Section 6.4.3, however, this has not been included in the proposed Consent Conditions. It is our opinion that a Condition needs to be included in Schedule 2 to outline the scope of this assessment, including the establishment of the existing baseline leakage rate and the commitments by SWDC to mitigate the effects of the assessed leakage.

(73) As the Applicant has not assessed any effects of increased pond leakage it is our opinion that another Consent Condition is required restricting increased pond level or other alterations within the existing WWTP that could lead to increased pond leakage. Alternatively the new Condition could stipulate the existing leakage rate, established as outlined above, as an average annual leakage limit which would not be exceeded going forward.

4.7 Air Discharge Control Condition Schedule 3/4

(74) No specific buffer distances from potential air discharge receptors or elevated wind velocity "irrigation cut off" criteria are covered under the proposed conditions, instead these are identified as items to be covered under management plans that have yet to be produced (see Section 4.1). In the AEE Section 4.1.3 it is noted that buffer distances adopted will be dependent on wind strength and on irrigation nozzle type selected. Potentially the selection of appropriate separation distances and wind velocity cut off have been deferred to the management plan development so that nozzle selection can be confirmed/altered at a later stage (i.e. detailed design of the irrigation system). While we agree that the management through the adoption of appropriate separation distances and wind velocity cut off criteria is an appropriate and achievable mitigation of and the control, it is considered that more prescriptive conditions are required given that odour will be a concern for a number of neighbouring properties.

(75) We consider that conditions should outline the specific basis under which future buffer distances and wind cut-off controls are required at this stage i.e. the development of a relationship between the assessed irrigation cast distance for specific irrigation design/droplet generation and the identified wind velocity cut-off, such that the irrigation cast distance will not exceed the buffer distance from potential identified receptors at the proposed wind velocity cut-off.

(76) We also consider that consent conditions should specify that minimum buffer distances identified in management plans shall at minimum meet the proposed buffer distances outlined in the AEE.

4.8 Irrigation Regime Monitoring Conditions – Schedule 4

(77) It is our opinion that existing Consent Conditions around controls of the proposed irrigation scheme are not extensive enough. The irrigation regime should be limited by a number of factors including, but not limited to, the following:

- Instantaneous irrigation rates (mm/hr).
- Soil moisture limits.
- Rainfall limits, conditions.
- Wind conditions (see Section 4.7).
- Stand down periods.
- Groundwater depth from soil surface - limitations for irrigation.
- Crop/harvest schedule, or stock rotation.

(78) These aspects of the irrigation regime, which are detailed in the LEI Land Discharge AEE, need to be included in the Consent Conditions under Schedule 4 and need to be in-line with the hydraulic and nutrient modelling described in the AEE.

4.9 Nutrient Loading – Schedule 4, Cl 3 & Cl4

4.9.1 Nutrient Loading Limits - Schedule 4 Cl 3

(79) The current nitrogen loading limit of 300 kgN/ha/yr proposed in Schedule 4 Cl.3d relates to the potential cut and carry land use option that has been assessed and discussed in the Section 92 Letter Report and Further Clarification Table, and modelled in Overseer. However, the proposed activity allows for land use as either a cut and carry operation or as a grazed pasture system. The Applicant identified in the Section 92 Further Clarification Table that where a grazed pasture land use is adopted, a loading rate of 300 kgN/ha/yr would not be applied.

(80) The proposed Consent Conditions should be amended with specific nitrogen loading rates for each of the different potential land uses, i.e. grazed pasture and cut and carry. The specific nitrogen loading rates for each land use type should align with the loading rates assessed in the representative Overseer® nutrient modelling for the proposed activity. The current Overseer® nutrient modelling for the proposed activity as outlined in the attachment to the Section 92 Further Clarification Table - Attachment 1 – Nitrogen Balance, outlines nitrogen loading of below 150 kg N/ha/yr for a grazed farm land use, which is significantly less than the currently proposed 300 kg N/ha/yr loading consent limit.

(81) We consider that phosphorus load limits should also be included in these Consent Conditions, as the phosphorus application to land is not controlled by any other Consent Conditions, i.e. there is no phosphorus concentration limit proposed for the discharge to land activity. The phosphorus loading limit proposed should align with the phosphorus loading rates assessed in representative Overseer® nutrient modelling for the proposed activity.

(82) It is noted the Overseer® nutrient modelling will need to be updated to reflect any changes to the proposed land irrigation scheme as a result of further groundwater modelling and limited I&I reduction scenarios as discussed in Section 3.0, and that we would need to review this Overseer® nutrient modelling before we can validate it's use for the assessment of nutrient leaching effects or the basis of nutrient loading conditions. However, we consider that the key principal outlined here, that the nutrient loading rates utilised to assess effects should form the basis of nutrient loading limits, should be adopted by the Applicant.

4.9.2 Variation to Nutrient Loading Limits - Schedule 4 Condition 4

(83) It is considered that Condition Schedule 4, Cl. 4 should not be accepted. The Condition outlines that if nitrogen loading rates (i.e. 300 kgN/ha/yr for cut and carry pasture crop) are exceeded, the additional mass of nitrogen applied above the consented limit shall be removed in harvested material. However, the assessment of nitrogen loss to water from a cut and carry system receiving 300 kgN/ha/yr will already account for the removal of nitrogen through harvested crop removal. Therefore, the current consent wording allows for elevated nitrogen loading with no clear mitigation of nitrogen losses.

(84) It is our opinion that the Applicant should meet the set nutrient loading limits outlined in Schedule 4, Cl 3d.

(85) If the Applicant wishes to allow for flexibility in future they should propose a Condition prescribing an Overseer Nutrient Report process whereby an Overseer report outlining nutrient application above the consented limits can be submitted to Regional Council for approval, provided it shows that the proposed nutrient loading changes will result in the same or less nutrient leaching than the consented activity.

4.10 Restricting Artificial Drainage – Schedule 4

(86) We consider that a Consent Condition should be included in Schedule 4 to restrict upgrades or changes of configuration of the existing drainage, or installation of new drainage, for the land treatment irrigation areas which could otherwise result in increased drainage to surface water to occur. Increased drainage to the surface water could promote the transfer of nutrients from groundwater and soil moisture to surface water above what has been assessed in the AEE.

(87) In our opinion this Consent Condition is necessary as farm operators may wish to install or increase artificial drainage, given the potential for groundwater mounding in parts of the land treatment area, to lower groundwater levels and improve soil conditions for stock.

4.11 Storage Conditions – Schedule 4

(88) We consider that a Consent Condition should be included requiring the Applicant to have the irrigation regime and storage volume modelling for Stage 2B peer reviewed at the time of detailed design for Stage 2B of the proposed system.

(89) We consider that this Condition should outline that the storage volume requirements shall be sufficient to allow compliance with all annual and daily surface water discharge volume and land irrigation regime control Consent Conditions, with specific reference to those conditions.

4.12 Groundwater Conditions– Schedule 4

(90) Due to the matters outlined in Section 2.0 and 3.0, we are not in a position to provide specific review and verification on the appropriateness of any applicant proposed groundwater monitoring or other related conditions.

4.13 Buffer Zone Conditions – Schedule 4

(91) We consider that irrigation area buffer requirements should be covered under a specific Consent Condition. The buffer requirements should at minimum cover the buffer separation distances outlined in Section 6.4 of the LEI Land Discharge AEE.

(92) In addition, the Condition should also outline appropriate buffer distances from existing onsite drains and expected surface ponding or groundwater mounding outbreak areas.

4.14 Minor Changes to Consent Conditions

(93) We also recommend the following minor amendments to the Consent Conditions:

- Schedule 1, Cl.7, extend scope of management plant to cover failure of key components of the wastewater treatment plant and irrigation system.
- Schedule 1, Cl. 19, regarding flow measuring devices. The Condition should be amended to require calibration every five years (current wording) *or in accordance with the manufacturers specification, whichever is more frequent*.
- Schedule 1, Cl. 29, should be amended to exclude lactating cattle from grazing the embankments of the Featherston WWTP.

5.0 Limitations

(94) This report has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided South Wairarapa District Council and its consultants including Mott MacDonald, GWS Limited and Lowe Environmental Impact Limited. PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the report. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

(95) This report has been prepared by PDP on the specific instructions of Greater Wellington Regional Council for the limited purposes described in the report. PDP accepts no liability if the report 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.

Yours faithfully

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