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PART G

HBRC Pre-Application Review and Response Tables

HBRC Peer Reviewer	Memo / Document Details	Ravensdown Technical Response Author(s)	Memo / Document Details
Mott McDonald Simon Liddell & Nick Dempsey	Memo 5 Nov 2021	**Aurecon** David Delegarza, Anna Lindgren **Land Vision HB** Ian Millner **Streamlined Environmental** Ngaire Phillips **Bay Geological Services** Alexandra Johansen	Response Table 29 Nov 2021
Coast and Catchment Shane Kelly	Memo 10 Nov 2021	**Streamlined Environmental** Ngaire Phillips	Response Table 22 Nov 2021 Further detail in above Response Table 29 Nov 2021
Coast and Catchment Shane Kelly	Memo 18 Nov 2021	No Response required	
Christensen Consulting Kyle Christensen	Email 5 Nov 2021	No Response required	
PDP Andrew Curtis	Memo 12 Nov 2021	**Tonkin + Taylor** Richard Chilton	Memo 26 Nov 2021
Bioresearches	Email (Tania Diack) 12 Nov 2021	No Response required	

MOTT MACDONALD

Ravensdown
Review of Draft AEEs

Project:	Ravensdown Awatoto Consent Application		
Our reference:	343853BA18	**Your reference:**	Ravensdown
Prepared by:	Simon Liddell & Nick Dempsey	**Date:**	5 November 2021
Approved by:	Sven Exeter	**Checked by:**	Sven Exeter
Subject:	Ravensdown – Preliminary Review of Draft Water and Land Technical Documents – Pre-application Stage - **DRAFT**		

1 Introduction

Ravensdown Limited Napier Works ("Ravensdown") hold resource consents to discharge stormwater and process water discharges from their site in Awatoto, Napier. Currently, stormwater and process water that is not reused on site is collected in a discharge pond and pumped into the Ravensdown and Awatoto Drain, with the ultimate receiving environment being the Tūtaekurī River and Waitangi Estuary.

Ravensdown initiated an assessment of alternative options for the treatment and discharge of the stormwater and process water from the site to review both the method of treatment and the receiving environment utilising a multi criteria decision analysis process (MCDA).

In doing this a Technical Focus Group (TFG) made up of representatives from key stakeholder groups provided their feedback on each option with the following objective for the MCDA process:

> *To establish the most sustainable long-term solution for the treatment and discharge of stormwater and process water from the Ravensdown Napier Works to enable the continued operation of the site.*

As a result of this process a discharge strategy has been developed. This assessment forms part of the execution of that strategy and specifically relates to the effects of the discharge of treated stormwater and process water to land.

The proposed stormwater and process water management system will reduce contaminant loads being discharge to the estuary from the Site via the commissioning of new on-site treatment technology and the diversion (after treatment) of as much stormwater as technically feasible to land via spray irrigation.

The Discharge Strategy is Ravensdown's cornerstone document underpinning a complete review of stormwater and process water management on the Site looking forward to the replacement of the company's permit to discharge stormwater and process water from the Site which expires on 31 May 2022. In order to continue to operate under this consent, under section 124 of the Resource Management Act 1991 ("RMA"), an application to renew this discharge permit must be lodged with the Hawke's Bay Regional Council on or before 30 November 2021 (six months prior to the expiry date) or within 3 months' time of expiry with HBRC permission.

Before lodging the resource consent applications, Ravensdown have requested that a pre-application review of the draft land and water technical documents is undertaken:

> *"Ravensdown request that that the councils technical team undertake a pre application review of the final draft versions of the assessments and provide feedback prior to the application being lodged in November. This process will allow the technical team to update the assessments where necessary and avoid technical questions and further information requirements following lodgement."*

Mott MacDonald New Zealand Limited (Mott MacDonald) has been engaged by Hawke's Bay Regional Council (HBRC) to provide an initial review of the following:

a. A10: Ravensdown Stormwater and Process Water Discharge - Land Discharge Effects And Management – Draft. October 2021.
b. R6: Project description. Ravensdown Napier stormwater and process water management. Draft. 8 September 2021.
c. R8: Ravensdown Napier Works Resource Consent Renewal Project Water Discharge Strategy 2021. Draft. September 2021

From our review of the request from Ravensdown, we consider that the scope of the initial review is to provide:

a. High-level commentary on the reasonableness of the assessment given the scale of the activity and effects.
b. Identify any key gaps in the assessment from a technical perspective with regard to Schedule IV of the Resource Management Act (RMA) and relevant industry guidelines.

2 A10: Land Discharge Effects and Management

Potential Effects Covered

The discharge to land has not been clearly stated as having a potential contaminated land compliance requirement and in turn, the approach and relevant guidelines have not been cited.

Effect to deep groundwater is referred to however this is only one potential receptor and as the report provides no conceptual site model which is required for the assessment of projects that have the potential to contaminate, characterisation of all the potential source/pathway/receptor linkages is missing. Furthermore, the term "deep groundwater" is not informative the name of the aquifer unit and its key hydrogeological characteristic should be given i.e., confined aquifer.

Results of Assessment

1 An assessment for soils for the suitability of irrigation and potential contaminant loading

These are two different soil assessment types and should be given separate bullets, one assesses agricultural feasibility of the soil types, the other the soil types fate and transport characteristics and in turn comparison against relevant contaminated land guidelines. The assessment for agricultural feasibility is sound and the baseline parameters have been collected to assess this.

The statement regarding the "proposed contaminant loadings being adequate for the foreseeable future" have not been justified quantitatively, key gaps include: predicted contamination concentrations in soil and the unconfined aquifer, depth to water table, estimates of the hydraulic conductivity of the unconfined aquifer, fraction of organic carbon in soils and comparison of the predicted concentrations to applicable guideline values.

2 Baseline Monitoring to Account for Current Soil Loadings

A concluding statement on the ecological assessment of risk to feedstock is made under this baseline monitoring section, it is not appropriate to provide an assessment statement under a baseline monitoring section. The ecological assessment statement is also incorrect, the risk pathway of direct ingestion to animals has not been removed by cut and carry. Animals off-site will be fed from this bailage and more importantly, there is the pathway to humans and a risk to human health through ingestion of animal products from animals that feed from the sites crops.

3 Investigations in sub regional geology (as it relates to groundwater)

This section would be more suitably called “hydrogeological investigation” and the focus should be the characterisation of the unconfined aquifer (water table) and potential pathways to the confined aquifer (focused on down hydraulic gradient wells). The summary characterisation of the hydrogeology provided here is inadequate and confused. The statement that there is no evidence of groundwater discharging within the vicinity of the project area or the Waitangi Estuary is misinformed. The unconfined aquifer will discharge to the estuary. Clear distinction between which aquifer is being referred to and their interaction with the estuary the foreshore and across the confining layer is required.

4 Analysis of projected load of contaminants reviewed against baseline soil loadings and properties

As noted above predicted contaminant soil loadings should be compared to appropriate contaminated land guidelines (as provided in R8 Water Discharge Project Description Table 1). The statement that there is unlikely to be any “significant” accumulation of the other five elements (heavy metals) when compared to soil fluorene is incorrect. The significance of risk should be made in relation to relevant guidelines only. Comparison to another chemical compound is meaningless as the significance of risk is derived from the toxicology of each compound which vary by several orders of magnitude between compounds.

Suggested Approach

The suggested approach (for Adaptive Management) both in the ‘Executive Summary’ and with further details in the report under the section ‘Monitoring’ does not allow for sufficient monitoring wells to be installed in the unconfined aquifer to generate a water table contour map. A minimum of three wells are required within the same aquifer unit in triangular formation to obtain a groundwater contour map (the report recommends four wells in total are installed in a linear formation at two depths targeting different hydraulic conditions/heads).

A groundwater contour map is required to understand groundwater flow direction and gradient from which a groundwater velocity can be estimated using assumptions of hydraulic conductivity based on geological logs of the test pits.

Information in the report describes wells in the unconfined aquifer in the near vicinity of the site as being highly influenced by tide and for the ground water to be slightly brackish. As the site has low topography and is close to the shore, the unconfined aquifer (water table) beneath the site is likely to have a low gradient and water levels will respond to tidal cycles. The proposed irrigation is likely to create a localised groundwater mound and the behaviour of this mound especially at the site boundaries will be informative of potential for off-site contaminated groundwater migration. Because tidal variation is likely to be the dominant driver in changing groundwater levels obtaining a data set that enables differentiation of tidal influence from the influence of the mound will require continuous water level monitoring using commonly utilised pressure transducers. Baseline monitoring should then characterise groundwater levels of the unconfined aquifer over a temporal period that covers a full lunar tidal cycle.

Ongoing groundwater level monitoring will require a similar network of transducers to be used to characterise any potential groundwater mound however given the presence of low permeability sediments shown in bore logs near the site and the flat topographic gradient, groundwater velocities are likely to be low and the monthly monitoring frequency proposed is considered excessive. Monitoring frequency should then be based on groundwater flow velocities which may be low is such a flat area and low permeability subsurface

conditions. Six monthly for the first year and annually subsequently is more commonly used in these conditions.

Introduction

1.1 Soils

Surface drains are described in the report but the function of the surface drains being installed on the perimeter of the paddock is a gap. Has the land previously been irrigated? Also required is an estimate of depths of the drains relative to ground surface. The drains together with the ephemeral channel are potential preferred pathways for irrigation water migrating off site in the event of surface runoff event or elevated groundwater levels.

Groundwater monitoring (discussed in depth under 'Suggested Approach' above), appears under this 'Soils' subheading. Hydrogeology requires its own section for characterisation. Monitoring requirements for groundwater should be reported in Section 3 'Monitoring'. In relation to the groundwater monitoring requirements these should include frequency, physical and chemical parameters to be monitored. It is recommended that the groundwater parameters should mirror soil parameters and include the industry standard physical parameters of electrical conductivity, temperature, and pH.

1.1.2 Current levels of heavy metals and non-metals

We suggest that the statement about assessing future risk of contaminants is removed, this is a baseline section.

Requires a short methodology summary of the electromagnetic survey, date, company. This can be included in the Appendix.

2 Proposed Solution

A more descriptive title be better suit for this section, e.g. Proposed spray irrigation system.

2.1 Infrastructure

For context it would be especially useful to provide average irrigation rates used in the region and compare those to the rates proposed at the site.

2.2 Estimated nutrient and other element applications to the forage block in the treated irrigation water

Information on the impact to cropping productivity of the elevated fluoride concentrations described is required.

3 Monitoring and Reporting

3.5 Shallow groundwater

The correctly term in a technical report on hydrogeological characterisation would be 'unconfined aquifer'. The unconfined aquifer is also referred to colloquially as the water table. Refer review comments about under "Suggest Approach" for recommended revision of locations.

3.6 Deep groundwater

<u>Terminology</u>

The term deep groundwater used in this section describes shallow subsurface features which are referred to as clay/sand (6-10m) are considered part of the unconfined system potentially showing some sign of semi-confinement. In the Executive Summary deep groundwater is used to describe the risk to the confined aquifer that is utilised for potable water. The unit characterisation referred to here as clay/sand (6-10m) and in Section 1.1 silt/sand Terminology should be used consistently and technical terminology is required in a report characterising hydrogeology. It is also recommended the suffix 'bgl' for below ground level is added to statements of depth in discussions on hydrogeology for clarity.

Hydrogeology

Wells are typically not installed in clay/sand, this an aquitard with low permeability. Assuming the unit is silt/sand which is a low permeability unit and while more permeable than clay, this is not a good unit to target as monitoring wells are unlikely to recharge in sufficient time when purged prior to sampling collection. A reasonable assumption based on the depth and the heterogeneity of the Holocene beach sediments and alluvium is that they are in the unconfined aquifer. As the identified contaminants of concern migrate by being soluble, there presence in groundwater would be most likely to be detected near the surface of the water table. Given the low concentrations being applied the likelihood of contaminants migrating by diffusion to this depth would only be justified if a significant contaminant plume were predicted. Based on the above rationale installation of these two wells is not recommended. A recommendation of the monitoring well network to be installed as be provided in the Suggest Approach section above.

3.8 Fluoride Research

Remove this section. If fluoride levels were to become of research interest that would in relation to toxicology meaning the site would be in breach of consent as guidelines are available for fluoride.

A10 Report Gaps

A Conceptual Site Model either in schematic diagram form or written. Recommendation would be to include both.

Applicable contaminated land guidelines and consent conditions noting that these may be in the planning report.

Separate section on assessment of effects, currently the assessment of environmental impacts provided in various section throughout the report with some rationale being introduced in the summary.

Climate Change

Impact of sea level rise is a potential effect for this project as it has been noted in the report that the unconfined aquifer beneath the site is brackish and water levels fluctuate with the tide. Future elevations in sea level may therefore reduce the capacity of system to store discharge water. Some quantification of sea level risk predictions including climate change scenarios time frames and elevations would inform long term decision making regarding the site. This should include the suitability of cut and carry allowing for the business-as-usual climate change scenario for Representative Concentration Pathway (RCP) 8.5 where groundwater levels would become significantly higher and groundwater quality more saline. This recommendation is consistent with current NZ guidance on climate change risk assessment[1], a qualitative evaluation would be suitable because of the high degree of uncertainty in climate change risk assessment scenarios.

Health Risk Assessment

[1] Refer to the Ministry for the environment National Climate Change Risk Assessment and also the latest Hawke's Bay assessment undertaken by NIWA: https://www.hbrc.govt.nz/assets/Document-Library/Reports/Climate-change-projections-and-impacts-for-Tairawhiti-and-Hawkes-Bay.pdf

The review of the contaminate component of this report has undertaken by applying the industry convention of first developing a conceptual site model to first captures the potential source/pathway receptor/ linkages before moving to the next level of detail. If no linkage between the three elements of a conceptual site model is present, it can be qualitatively stated that there is no significant risk. In this land discharge report, the source of contamination has been assumed as being at the point spray contacts land which is a reasonable assumption. However, applying a project wide conceptual site model it can been seen that the use of spray irrigation to land creates a potential airborne pathway where water may migrate to impact non site land-based receptors, namely people in the vicinity of the site inhaling wind born spray drift.

The Health Effects Assessment (Environmental Medicine Limited) was read by us to check if this pathway was included and it was not in the list of Site Hazards (Section 3.1) primarily because the site for the purpose of that report does not extend to the area where spray is discharged to land.

3 R6 Project description: stormwater and process water management

Section 1 – Introduction

Table 1: A qualifier for contaminants is described in the second column, but I would expect that this would vary depending on the receiving environment and source of the Guideline / Standard Value. Not reviewed in detail at this stage. Consider including a qualifier for each receiving environment and information source.

Table 2: Why is there no available information on TSS, when there is data provided for this parameter in Table 1?

We would expect to see a detailed assessment of the data that has been gathered on the existing discharge since 2007; including collection method, tests conducted, statistical analysis and graphical representation, assessment and treatment of outliers.

Section 3 – Existing stormwater and process water system

- An indication of the property boundary would assist for this diagram.
- If the roads are included in the boundary, where do these drain to? Which catchment? Is there any risk of contamination on the roads?
- Why is the area south of Catchment 3 and 4 not treated as a catchment? Is there any contamination (or risk of) in this area?
- Where does the process water from acid plant operations and cooling tower blowdowns enter the stormwater system, and is this conveyed to the pond or into the adjacent swales?
- The above points highlight a need to better clarify all of the stormwater systems on the site.

"The stormwater and process water that is not reused on site, ultimately…"

Where is it that the reuse of water on site is described, and how this impacts the treatment process and discharge? Is this included in the MUSIC or effluent assessment models?

Section 4 – Proposed stormwater management system

Where is the adaptive management strategy – will this be part of the full document set? Would also expect that this includes stakeholder engagement and allowance for climate change adaptation, and carbon emissions.

Where is the evaluation of options that lead to the Best Practicable Option outlined?

Section 4.1.1 Bioretention basin

Overtopping of the bioretention basis (at >25mm of rain) flows to the Main Drain and Discharge Pond. What does modelling say about this frequency and the level of contamination?

Plants will be selected to uptake nutrients and cope with the high concentrations of heavy metals (in particular fluoride). Have they identified what plants are able to do this? What is the cropping requirement? And what is the uptake of nutrients? I.e. what will the resulting discharge concentration be?

It is noted that the basin will be lined with a geosynthetic clay liner (GCL) or similar impervious liner which will prevent the interception of ground water or the discharge of contaminated water to ground. Why is a PE liner not suitable, as is more commonly the case in modern pond treatment plants? Is there a risk of root damage to a clay liner?

Section 4.1.2 Clarifier System

What is proposed for the solids stream coming off the bottom of the Clarifier? Noting that these will be fluoride and metal rich.

Note that fluoride expected to be reduced to ~3mg/L through coagulation and clarification. Similar noted for other heavy metals. Is the in agreement with the environmental impacts assessed?

Holding pond proposed between bioretention and clarifier – size of this and the clarifier throughput poses a risk for overtopping and bypassing treatment. How is the scale of this risk assessed?

> *"The holding pond has been sized based on operating at a constant flowrate of 10 L/s, which reduces the bulk storage requirement necessary to achieve the desired 75mm capture volume. As the specific clarifier operational parameters are subject to ongoing design, the exact design flow rate may vary and the proposed volume in the holding pond will be determined based on the final device selected."*

We expect to see an assessment of expected frequency and impact of overflows and therefore treatment bypasses.

Section 4.1.4 Discharge Pond discharge improvements

We note the mention of stakeholder and Mana Whenua engagement. We expect to see documentation supporting the outcome of this engagement in the full lodgement.

Section 4.2.1 Settling Pond

We expect to see an assessment of expected frequency and impact of overflows and therefore treatment bypasses over this setting pond. Will the pond normally operate empty, so that the full storage capacity is available during rain events? If not, the flooded volume of the pond should be excluded.

Section 6 Proposed stormwater and process water system performance

Table 9. No units except for Annual Mass. The existing discharge values do not appear to match the existing discharge values noted in Tables 1 and 2.

> *"It is noted that this analysis is based on broad assumptions around the source of contaminants and the overall removal efficacy of the proposed devices and are not based on modelling. The actual performance of the system may vary significantly depending on a range of factors."*

Given the uncertainty noted here, and the potential requirement for high cost contingencies noted in Section 7, we will expect to see the workings and assumptions that produced the expected treatment performance in Table 9.

Table 10. It is noted that some areas and contaminants will require source control measures to reduce contaminants by up to 99%. Is this realistic?

Section 7 Potential future adaptive management pathways (Stage 3)

Given the uncertain treatment performance of the proposed system (Section 6), and high reliance on source control in some areas, the potential future adaptive pathways may need to have well defined triggers and conditions in the consent. Consider the level of detail that can be provided to support this.

4 R8: Water Discharge Strategy

Section 3 Baseline Environmental Assessment

It would be useful to include an indication of the discharge location and indicative monitoring locations in this section.

Section 4.2 Alternative Options Assessment

We hope to see the assessment of alternative options included in the application to demonstrate selection of the BPO.

Section 5.6 Process Water Management

We note that the process water from both the acid plant and cooling towers will be rerouted through the proposed treatment systems. Given that the cooling tower water is likely to be dosed with biocides, has the effect of these chemicals on the proposed biological treatment system been considered?

5.7 Process Water and Stormwater Treatment

Table 1: Does not appear to include construction of land discharge systems.

Figures 5 and 6, note that solids from the clarifier “will be reinjected to the process water or dewatered and solids integrated with product. Has the suitability of coagulant laden solids in the product been assessed? Will dewatering of this solid be part of the monitoring and adaptive management and included in the Stage 3 for potential construction if required?

Section 6 Determination of Discharge Water Quality Targets

It is noted in this section that only discharge on a falling tide will be appropriate as if provides the additional dilution required (4.9 times). But document R6 indicates that discharges will need to occur from time to time at any tide. Does this mean that the National Policy Statement and/or TANK will not be met on these occasions?

Table 2.

- It is not clear from the Rationale column which regional or national policy each parameter meets.
- Do all of these relate only to discharge to the river, or is discharge to land also considered here?
- Also, it is noted that the proposed quality conditions are 95th percentiles over a 12 month period. Given that some of the receiving environment quality conditions are medians or averages, how have these be correlated?

5 Other Comments

Where is the Best Practicable Option selection process described? We assume this is covered in other consent application suite documents.

Has whole of life carbon / greenhouse gas emissions been considered in the options assessment and solution decision-making process? This is important for climate change mitigation obligations.

6 Conclusions and Recommendations

6.1 Conclusions

6.1.1 A10 Land Discharge Effects and Management

The land discharge report does not provide a robust technical consideration of the contaminated land and groundwater issues related to discharge of stormwater to land at the site. Key deficiencies include:

- Absence of guidelines for which risk have been assessed against
- Absence of a conceptual site model identify the source pathway receptor linkages
- Absence of a sub-section on hydrogeological characterisation of the site
- Absence of a section on environmental effects
- Weakness in the use of hydrogeological terminology
- Inconsistent use of terms
- Weakness in cross referencing to other reports
- Groundwater monitoring recommendations that would not sufficiently characterise the project area to determine compliance
- Inappropriate recommendation of a national level fluoride contamination research using site data.

The land discharge report provides adequate consideration of the agricultural viability of spray irrigation and cut and carry with points of clarification required on:

  - Information on the impact to cropping productivity of the elevated fluoride concentrations described is required.
  - Methodology of electromagnetic survey, date, company. This can be included in the Appendix.
  - Climate change risk with sea level rise elevating groundwater levels and water quality with potential impact to cut and carry viability.
  - Related gaps identified relevant to other reports.
  - A gap has been identified in that the human health hazard from bailage sprayed with treated stormwater from site being used for animal feed loosely described in this report has not been included in the human health risk assessment.
  - A further human health hazard has identified in this report namely the risk to human health receptors adjacent to the site from spray drift.

6.1.2 R6 and R8 Reports

A number of discrepancies and queries have been raised in the sections above for these two reports.

6.2 Recommendations

6.2.1 R6 and R8 Reports

A number of discrepancies and queries have been raised in the sections above for these two reports.

6.2.2 A10 Land Discharge Effects and Management

It is recommended that the:

1. Review comments in relation to the effects of contamination from discharge are undertaken by an author with 5-10 years' experience (minimum) in contaminated land assessment.
2. Primary author remains responsible for revision of the overall report structure and incorporates review comments in relation to cropping efficacy and the electromagnetic survey.

6.2.3 Other

Human health risk assessment should cover the land (A10) and water (R6 & R8) discharge components.

To:	Mott MacDonald FAO: Simon Liddell, Nick Dempsey and Sven Exeter	**From:**	Aurecon and LandVision
Copy:	Andrew Torrens, Helen McCarthy, Anita Anderson, Stephen Daysh	**Reference:**	509619-16 HBRC Review Comments
Date:	29-Nov-21	**Pages:**	8
Subject:	**Ravensdown-Preliminary review of draft water and land technical documents-pre application stage** The table below has been prepared as a response to the review comments received from Mott MacDonald on the 5 November 2021 for the Ravensdown-Preliminary review of draft water and land technical documents-pre application stage-DRAFT. The responses have been prepared by Aurecon and LandVision.		

Item number	Query/comment	Agreed action/comment	Action status
A10: Land Discharge Effects and Management			
Potential Effects Covered	The discharge to land has not been clearly stated as having a potential contaminated land compliance requirement and in turn, the approach and relevant guidelines have not been cited	Analysis relating to current and future loads against standards added	Closed
	Effect to deep groundwater is referred to however this is only one potential receptor and as the report provides no conceptual site model which is required for the assessment of projects that have the potential to contaminate, characterisation of all the potential source/pathway/receptor linkages is missing. Furthermore, the term “deep groundwater” is not informative the name of the aquifer unit and its key hydrogeological characteristic should be given i.e., confined aquifer.	Further description of site added to describe surrounding drainage network.	Closed
Results of Assessment			
1 An assessment for soils suitability of irrigation and potential contaminant loading	These are two different soil assessment types and should be given separate bullets, one assesses agricultural feasibility of the soil types, the other the soil types fate and transport characteristics and in turn comparison against relevant contaminated land guidelines.	A comparison has been made against relevant guidelines based on the soils ability to adhere contaminants. Further explanation of the site and the absence of connections to surrounding landscape has also been provided.	Closed
	The statement regarding the “proposed contaminant loadings being adequate for the foreseeable future” have not been justified quantitatively, key gaps include: predicted contamination concentrations in soil and the unconfined aquifer, depth to water table, estimates of the hydraulic conductivity of the unconfined aquifer, fraction of organic	As above - a further analysis of expected loadings after a 35 year consent period has been provided. The soil loadings will stay within known standards.	Closed
2: Baseline monitoring to account for current soil loadings	A concluding statement on the ecological assessment of risk to feedstock is made under this baseline monitoring section, it is not appropriate to provide an assessment statement under a baseline monitoring section.	Statement has been moved to appropriate section.	Closed
	The ecological assessment statement is also incorrect, the risk pathway of direct ingestion to animals has not been removed by cut and carry. Animals off-site will be fed from this bailage and more importantly, there is the pathway to humans and a risk to human health through ingestion of animal products from animals that feed from the sites crops.	The has been further explained within the report. Direct ingestion refers to direct ingestion of soil, not having animals on the block clearly illuminates this risk. Any potential risk to animals off site is managed via testing against ANZEC guidelines	Closed
3 Investigation in sub regional geology	This section would be more suitably called “hydrogeological investigation” and the focus should be the characterisation of the unconfined aquifer (water table) and potential pathways to the confined aquifer (focused on down hydraulic gradient wells).	Further explanation of the existence and significance of HBRCs drainage network provided. Monitoring of adjacent wells included in conditions	Closed

Item number	Query/comment	Agreed action/comment	Action status
	The summary characterisation of the hydrogeology provided here is inadequate and confused. The statement that there is no evidence of groundwater discharging within the vicinity of the project area or the Waitangi Estuary is misinformed. The unconfined aquifer will discharge to the estuary. Clear distinction between which aquifer is being referred to and their interaction with the estuary the foreshore and across the confining layer is required	Removed terminology deep groundwater and replaced with confined aquifer except where it is quoted from independent analysis. Reference was for confined layer - which in this location is considered confined.	Closed
4 Analysis of projected load of contaminants reviewed against baseline soil loadings and properties	As noted above predicted contaminant soil loadings should be compared to appropriate contaminated land guidelines (as provided in R8 Water Discharge Project Description Table 1). The statement that there is unlikely to be any "significant" accumulation of the other five elements (heavy metals) when compared to soil fluorene is incorrect. The significance of risk should be made in relation to relevant guidelines only. Comparison to another chemical compound is meaningless as the significance of risk is derived from the toxicology of each compound which vary by several orders of magnitude between compounds.	As above - further analysis provided in section 3.2	Closed
Suggested Approach	The suggested approach (for Adaptive Management) both in the 'Executive Summary' and with further details in the report under the section 'Monitoring' does not allow for sufficient monitoring wells to be installed in the unconfined aquifer to generate a water table contour map. A minimum of three wells are required within the same aquifer unit in triangular formation to obtain a groundwater contour map (the report recommends four wells in total are installed in a linear formation at two depths targeting different hydraulic conditions/heads)	Assumed need for this removed after meeting with reviewers explaining the significance of the drainage network that surrounds 3/4 of site and connects to a HBRC pumping station. This network effectively modifies and controls the water table.	Closed
	A groundwater contour map is required to understand groundwater flow direction and gradient from which a groundwater velocity can be estimated using assumptions of hydraulic conductivity based on geological logs of the test pits.	Refer to response above.	Closed
	Because tidal variation is likely to be the dominant driver in changing groundwater levels obtaining a data set that enables differentiation of tidal influence from the influence of the mound will require continuous water level monitoring using commonly utilised pressure transducers. Baseline monitoring should then characterise groundwater levels of the unconfined aquifer over a temporal period that covers a full lunar tidal cycle.	As above - ground water levels in the area are actively managed by HBRC drainage network and pumping station. This network is needed to overcome the drainage impediment created by a flood control scheme on there Tutaekuri river.	Closed
	Ongoing groundwater level monitoring will require a similar network of transducers to be used to characterise any potential groundwater mound however given the presence of low permeability sediments shown in bore logs near the site and the flat topographic gradient, groundwater velocities are likely to be low and the monthly monitoring	As above - have suggested two monitoring bores for shallow groundwater initially at monthly sampling in order to gain baseline data. Agree this could be reduced to 6 monthly or annual after 2 years	Closed
Introduction 1.1 Soils	Surface drains are described in the report but the function of the surface drains being installed on the perimeter of the paddock is a gap. Has the land previously been irrigated?	Further explanation (including images) and significance of drains provided. The site currently intermittently irrigated	Closed
	Also required is an estimate of depths of the drains relative to ground surface.	1.6m - approx described in report	Closed
	Hydrogeology requires its own section for characterisation.	Provided in appendices	Closed
	Monitoring requirements for groundwater should be reported in Section 3 'Monitoring'. In relation to the groundwater monitoring requirements these should include frequency, physical and chemical parameters to be monitored. It is recommended that the groundwater parameters should mirror soil parameters and include the industry standard	This has been updated.	Closed
1.2.2 Current levels of heavy metals and non-metals	We suggest that the statement about assessing future risk of contaminants is removed, this is a baseline section.	Moved to section 3.2	Closed
	Requires a short methodology summary of the electromagnetic survey, date, company. This can be included in the Appendix.	Added description of operator and machinery	Closed
2 Proposed Solution	A more descriptive title be better suit for this section, e.g. Proposed spray irrigation system.	This has been updated.	Closed
2.1 Infrastructure	For context it would be especially useful to provide average irrigation rates used in the region and compare those to the rates proposed at the site.	Further analysis of regional irrigation rates and localised soil moisture deficit added with comparison on local average soil moisture deficit	Closed
2.2 Estimated nutrient …	Information on the impact to cropping productivity of the elevated fluoride concentrations described is required.	No impact expected from this activity	Closed

Item number	Query/comment	Agreed action/comment	Action status
3 Monitoring and Reporting			
3.5 Shallow Groundwater	The correctly term in a technical report on hydrogeological characterisation would be 'unconfined aquifer'. The unconfined aquifer is also referred to colloquially as the water table. Refer review comments about under "Suggest Approach" for recommended revision of locations.	Terminology changed so that deep groundwater refers to confined aquifer and shallow groundwater refers to near surface	Closed
3.6 Deep Groundwater	The unit characterisation referred to here as clay/sand (6-10m) and in Section 1.1 silt/sand Terminology should be used consistently and technical terminology is required in a report characterising hydrogeology. It is also recommended the suffix 'bgl' for below ground level is added to statements of depth in discussions on hydrogeology for clarity.	We have cross checked the comments made against the report but are unable to correlate this, we are happy to address this if further details are provided. Suffix bgl has been defined in section 2.	Closed
Hydrogeology	Based on the above rationale installation of these two wells is not recommended. A recommendation of the monitoring well network to be installed as be provided in the Suggest Approach section above.	This has been changed to reflect conversation with reviewers and further consideration with team. Recommended two bores - one a boundary condition monitor on northern boundary and one near south eastern boundary to provide on site trend data	Closed
3.8 Fluoride Research	Remove this section. If fluoride levels were to become of research interest that would in relation to toxicology meaning the site would be in breach of consent as guidelines are available for fluoride	This has been removed.	Closed
A10 Report Gaps	A Conceptual Site Model either in schematic diagram form or written. Recommendation would be to include both.	Further diagrams, images, and written explanation provided	Closed
	Applicable contaminated land guidelines and consent conditions noting that these may be in the planning report.	This has been added.	Closed
	Separate section on assessment of effects, currently the assessment of environmental impacts provided in various section throughout the report with some rationale being introduced in the summary.	Changed focus and name of section 4 to include effects	Closed
Climate Change	Some quantification of sea level risk predictions including climate change scenarios time frames and elevations would inform long term decision making regarding the site. This should include the suitability of cut and carry allowing for the business-as-usual climate change scenario for Representative Concentration Pathway (RCP) 8.5 where groundwater levels would become significantly higher and groundwater quality more saline.	The discharge site is protected from the potential effect of climate change on sea levels by drainage network and pumping station.	Closed
Health Risk Assessment	Applying a project wide conceptual site model it can been seen that the use of spray irrigation to land creates a potential airborne pathway where water may migrate to impact non site land-based receptors, namely people in the vicinity of the site inhaling wind born spray drift.	Commentary provided regarding airborne risk - considered very minor as the site is well buffered and no people on site. irrigator design and operation will have significant capacity to further reduce any risk. Further evaluated in Environmental health report.	Closed
	The Health Effects Assessment (Environmental Medicine Limited) was read by us to check if this pathway was included and it was not in the list of Site Hazards (Section 3.1) primarily because the site for the purpose of that report does not extend to the area where spray is discharged to land.	Addressed in health effects assessment	Closed
R6 Project description: stormwater and process water management			
Section 1 Introduction	Table 1: A qualifier for contaminants is described in the second column, but I would expect that this would vary depending on the receiving environment and source of the Guideline / Standard Value. Not reviewed in detail at this stage. Consider including a qualifier for each receiving environment and information source.	Commentary added under Table 1 to clarify our approach. See also comment below regarding why only one set of water quality parameters has been used for both land and water discharges.	Closed
	Table 2: Why is there no available information on TSS, when there is data provided for this parameter in Table 1?	TSS numbers updated in new version	Closed

Item number	Query/comment	Agreed action/comment	Action status
	We would expect to see a detailed assessment of the data that has been gathered on the existing discharge since 2007; including collection method, tests conducted, statistical analysis and graphical representation, assessment and treatment of outliers.	A detailed assessment of discharge data (including temporal trend analysis) has been provided in Chapter 4 the baseline report (Phillips et al., 2021a). A summary of the key findings of this analysis is presented in Chapter 4.2 of the Ecological Effects report (Phillips et al. 2021b) (Phillips, N., De Luca, S., Stewart, M., Leitch, K., McDermott, K., Eivers, R. (2021a) Ravensdown Napier Baseline Technical Investigations. RVD1901, Streamlined Environmental, Hamilton, 157 pp; Phillips, N., De Luca, S., Stewart, M. (2021) Ravensdown Napier discharge consent - Assessment of Estuarine Ecological Effects. Report RVD2101, Streamlined Environmental, Hamilton, 62 pp.)	Closed
Section 3 **Existing stormwater and process water system**	An indication of the property boundary would assist for this diagram.	Drawing updated to show property boundary	Closed
	If the roads are included in the boundary, where do these drain to? Which catchment? Is there any risk of contamination on the roads?	Drawing updated to include surrounding roads in catchments. Text added to discuss interception of roadway flows and flow directions.	Closed
	Why is the area south of Catchment 3 and 4 not treated as a catchment? Is there any contamination (or risk of) in this area?	Text added to report to indicate that there are no ongoing industrial activists in this area and the drainage swales do not directly connect to the settling pond.	Closed
	Where does the process water from acid plant operations and cooling tower blowdowns enter the stormwater system, and is this conveyed to the pond or into the adjacent swales?	Only an abbreviated description of the existing stormwater systems provided in this document. The High Level Options Report includes a detailed description of the existing stormwater system on the site, including a detailed schematic of the stormwater and process flows. A reference has been made to this document in the text.	Closed
	The above points highlight a need to better clarify all of the stormwater systems on the site.	Only an abbreviated description of the existing stormwater systems provided in this document. The High Level Options Report includes a detailed description of the existing stormwater system on the site, including a detailed schematic of the stormwater and process flows. A reference has been made to this document in the text.	Closed
	Where is it that the reuse of water on site is described, and how this impacts the treatment process and discharge? Is this included in the MUSIC or effluent assessment models?	The overall reuse of stormwater is a consumptive use. The specific locations and flows are outlined in detail in section 3 of the high level options report. Stormwater reuse was not directly included in the Music model as the reuse is irregular, based on industrial needs. Overall the consumptive reuse will reduce inflow volumes, so the water balance in the MUSIC model is conservative.	Closed
Section 4 **Proposed stormwater management system**	Where is the adaptive management strategy – will this be part of the full document set? Would also expect that this includes stakeholder engagement and allowance for climate change adaptation, and carbon emissions.	The adaptive management plan will form part of the final consent documents. The framework will be applicable to anything that results in the water quality targets not being met (including climate change). The Adaptive Management Plan is stormwater management focussed and does not cover carbon emissions. We note that consideration of climate change and carbon emissions is currently excluded from the RMA.	Closed
	Where is the evaluation of options that lead to the Best Practicable Option outlined?	This is detailed in the High level options report.	Closed
Section 4.1.1 **Bioretention basin**	Overtopping of the bioretention basis (at >25mm of rain) flows to the Main Drain and Discharge Pond. What does modelling say about this frequency and the level of contamination?	Cross reference included in Section 4 to Section 5 where Table 9 summarises the mean volumed which is bypassed. Section 5 discusses that this uncontrolled discharge will be only during large SW events where the receiving environment will be subject to significant dilution and flushing flows.	Closed
	Plants will be selected to uptake nutrients and cope with the high concentrations of heavy metals (in particular fluoride). Have they identified what plants are able to do this? What is the cropping requirement? And what is the uptake of nutrients? I.e. what will the resulting discharge concentration be?	The project team has been working from a list of fluoride tolerant species. These plantings have been successfully established at the Christchurch site, which has similar levels of fluoride. However, the uptake of nutrients by these plants is not known, but the overall process is subject to adaptive management.	Closed

Item number	Query/comment	Agreed action/comment	Action status
	It is noted that the basin will be lined with a geosynthetic clay liner (GCL) or similar impervious liner which will prevent the interception of ground water or the discharge of contaminated water to ground. Why is a PE liner not suitable, as is more commonly the case in modern pond treatment plants? Is there a risk of root damage to a clay liner?	No decision has been made on the liner, the text has been updated to not exclusively refer to a GCL. We have used GCLs extensively on similar projects. When used in buried applications, we consider them to be more robust as they are self-healing when punctured. When potentially subject to penetration from roots, a root barrier may be used.	Closed
Section 4.1.2 Clarifier System	What is proposed for the solids stream coming off the bottom of the Clarifier? Noting that these will be fluoride and metal rich.	The text has been updated to provide a description of the envisioned solids management.	Closed
	Note that fluoride expected to be reduced to ~3mg/L through coagulation and clarification. Similar noted for other heavy metals. Is the in agreement with the environmental impacts assessed?	The expected removal efficacies provide the foundation that the environmental impacts are based upon. Ngaire - any additional comment?	Closed
	Holding pond proposed between bioretention and clarifier – size of this and the clarifier throughput poses a risk for overtopping and bypassing treatment. How is the scale of this risk assessed? We expect to see an assessment of expected frequency and impact of overflows and therefore treatment bypasses.	Cross reference included in Section 4 to Section 5 where Table 9 summaries the mean volumes which are bypassed. Section 5 discusses that this uncontrolled discharge will be only during large SW events where the receiving environment will be subject to significant dilution and flushing flows.	Closed
Section 4.1.4 Discharge Pond discharge improvements	We note the mention of stakeholder and Mana Whenua engagement. We expect to see documentation supporting the outcome of this engagement in the full lodgement.	Ravensdown to provide details as part of application	Open
Section 4.2.1 Settling Pond	We expect to see an assessment of expected frequency and impact of overflows and therefore treatment bypasses over this setting pond. Will the pond normally operate empty, so that the full storage capacity is available during rain events? If not, the flooded volume of the pond should be excluded.	A cross reference included from section 4 to Section 5 where Table 9 summarises the mean volumes which are bypassed. Section 5 has been updated to include a discussion that untreated discharges will be only during large rainfall events where the receiving environment will be subject to significant dilution and flushing flows. The text has been updated to clarify that the settling pond will operate as normally empty and allow for full volumetric attenuation. Music includes this operation	Closed
Section 6 Proposed stormwater and process water system	Table 9. No units except for Annual Mass. The existing discharge values do not appear to match the existing discharge values noted in Tables 1 and 2.	The table has been updated to show units for all columns.	Closed
	Given the uncertainty noted here, and the potential requirement for high cost contingencies noted in Section 7, we will expect to see the workings and assumptions that produced the expected treatment performance in Table 9.	A table has been added summarising the assumptions used in the treatment performance.	
	Table 10 [now Table 11]. It is noted that some areas and contaminants will require source control measures to reduce contaminants by up to 99%. Is this realistic?	Where high levels of source control are needed, The text in table 11 provides reasoning behind why this is considered appropriate. There are good reasons to believe that all contaminants can be managed through source control or adaptive management moving forward. A comment has been added around the management of nitrate-based contaminants.	Closed
Section 7 Potential future adaptive management pathways (Stage 3)	Given the uncertain treatment performance of the proposed system (Section 6), and high reliance on source control in some areas, the potential future adaptive pathways may need to have well defined triggers and conditions in the consent. Consider the level of detail that can be provided to support this.	Agreed - trigger levels are set out in the proposed conditions of consent which will form part of the application, and the adaptive management approach is detailed in the adaptive management plan, which will also form part of the application	Closed

R8: Water Discharge Strategy

Item number	Query/comment	Agreed action/comment	Action status
Section 3 **Baseline Environmental Assessment**	It would be useful to include an indication of the discharge location and indicative monitoring locations in this section.	Locations identifed in Figure 5 of the Estuarine Ecology Assessment (A5).	Closed
Section 4.2 **Alternative Options Assessment**	We hope to see the assessment of alternative options included in the application to demonstrate selection of the BPO.	High level options report	Closed
Section 5.6 **Process Water Management**	We note that the process water from both the acid plant and cooling towers will be rerouted through the proposed treatment systems. Given that the cooling tower water is likely to be dosed with biocides, has the effect of these chemicals on the proposed biological treatment system been considered?	An assessment of the risks associated with process chemicals was undertaken, this is presented in full in the Baseline Technical Investigations Report (Chapter 6) and in summary in the Ecological Effects report (Chapter 4.4).	Closed
Section 5.7 **Process Water and Stormwater Treatment**	Table 1: Does not appear to include construction of land discharge systems.	Table 1 is intended to summarise treatment devices, i.e. those that are intended to materially reduce the mass of contaminants from the effluent. We have not included the land discharge system as we have not assessed it as a treatment device but a discharge apparatus that functions independently of the treatment.	Closed
	Figures 5 and 6, note that solids from the clarifier "will be reinjected to the process water or dewatered and solids integrated with product. Has the suitability of coagulant laden solids in the product been assessed? Will dewatering of this solid be part of the monitoring and adaptive management and included in the Stage 3 for potential construction if required?	The proposed clarifier is described in detail in section 4.1.2 of the project description. This outlines a potential methodology of dewatering and management of the solids. As the solids are intended to be consumptively used in manufacture, they are not directly subject to the adaptive management, however the quality of the treated water is a fundamental part of the final strategy.	Closed
Section 6 **Determination of Discharge Water Quality Targets**	It is noted in this section that only discharge on a falling tide will be appropriate as if provides the additional dilution required (4.9 times). But document R6 indicates that discharges will need to occur from time to time at any tide. Does this mean that the National Policy Statement and/or TANK will not be met on these occasions?	An assessment of effects of predicted concentrations following the different treatment stages under high and low tide dilution scenarios is provided in the Ecological Effects report (Phillips et al. 2021b). Table 17 presents the assessment of effects of predicted concentrations relative to NPSFM and TANK. Under low tide conditions some guidelines would not be met, which is why discharge around the ebbing tide has been recommended. Discharging on low tide will only occur if excess water on site needed to be discharged (e.g. following a significant rainfall event where the stormwater system was overwhelmed and there was considerable dilution)	Closed
	Table 2 • It is not clear from the Rationale column which regional or national policy each parameter meets.	This level of detail has been provided in other locations in the consent application documents (for example the proposed conditions of consent)	Closed
	• Do all of these relate only to discharge to the river, or is discharge to land also considered here?	Only surface water quality standards have been used. This is because we understand there is likely a strong hydraulic connection between shallow groundwater and surface water in this area, meaning that surface water is the receptor that trigger levels are aimed at protecting. Further, we understand the risk of contaminants reaching an aquifer used for water supply purposes is very low due to the confining layer / aquitard beneath the site, so adding triggers for the protection of drinking water was not considered necessary.	Closed
	• Also, it is noted that the proposed quality conditions are 95th percentiles over a 12 month period. Given that some of the receiving environment quality conditions are medians or averages, how have these be correlated?	The water quality guidance values are for monitoring in the receiving environment, however we are applying them to the discharge itself. For simplicity of monitoring we have used the values themselves, rather than varying the statistical approach in the results assessment. In our view adding this layer of complexity to the results assessment increased the potential that there would be an error in the assessment and reporting. We note that the stormwater sampling approach is a flow proportional composite sample approach, and further averaging was not considered valuable.	Closed
5 Other comments			
	Where is the Best Practicable Option selection process described? We assume this is covered in other consent application suite documents.	Covered off in High Level Options Report	Closed
	Has whole of life carbon / greenhouse gas emissions been considered in the options assessment and solution decision-making process? This is important for climate change mitigation obligations.	See detail in Section 2.6 of AEE.	Closed
Conclusions and recommendations			
	The land discharge report does not provide a robust technical consideration of the contaminated land and groundwater issues related to discharge of stormwater to land at the site. Key deficiencies include:		

Item number	Query/comment	Agreed action/comment	Action status
	• Absence of guidelines for which risk have been assessed against	As described above. The current and predicted future state of soil contaminant loadings has been compared against MFE standards for all contaminants except fluoride (fluoride not in the standards). A suggested limit for fluoride is provided as a upper limit for toxicity to cattle. As no livestock will be present on site this limit is considered a suitable standard .	Closed
	• Absence of a conceptual site model identify the source pathway receptor linkages	Further description (written, schematic and images) of the site has been provided emphasising the scale and significance of drainage networks and pumping stations. this network effectively is the only pathway from the site.	Closed
	• Absence of a sub-section on hydrogeological characterisation of the site	This was provided as an appendix	Closed
	• Absence of a section on environmental effects	Have provided further focus in section 5 to expressly consider potential effects of the activity as outlined in the introduction	Closed
	• Weakness in the use of hydrogeological terminology	Changed terminology to reflect difference between confined aquifer and shallow groundwater.	Closed
	• Inconsistent use of terms	As above	Closed
	• Weakness in cross referencing to other reports	Not a significant need to cross reference other reports in this analysis. Cross reference to the Environmental Medicine report included to account for issues relating to human health.	Closed
	• Groundwater monitoring recommendations that would not sufficiently characterise the project area to determine compliance	The installation of groundwater monitoring bores is recommended along the bounds of the proposed irrigation area in order to track any potential contamination of unconfined aquifers. It is recommended that three bores (up to 6 m depth) be drilled in a triangular formation across the site to map groundwater contours in the unconfined aquifer and establish the groundwater flow direction in conjunction with information gained from the BioRich monitor bores. Once the hydraulic gradient is confirmed, two of the three bores will be completed as monitor wells, located hydraulically up and down-gradient of the discharge area. A series of water quality sampling and SWL recording should be undertaken prior to commencement of the irrigation of stormwater and process water in order to collect a robust set of baseline water quality data and establish groundwater levels in the unconfined aquifer. Ongoing groundwater sampling should be completed on a six-monthly basis. Water level data can be recorded by downhole pressure transducers which will reveal long-term trends and document tidal flux which can be used to aid scheduling of irrigation application and mitigate groundwater mounding at the site and neighbouring blocks.	Closed
	• Inappropriate recommendation of a national level fluoride contamination research using site data.	Removed	Closed
	The land discharge report provides adequate consideration of the agricultural viability of spray irrigation and cut and carry with points of clarification required on:		
	• Information on the impact to cropping productivity of the elevated fluoride concentrations described is required.	Plants do not actively take up fluoride and therefore exhibit no effects. This is evidenced by the crop health and performance currently on site. All proposed limits and management recommendations are designed to prevent geophagy by livestock. Limits relating to ANSEC guidelines are recommended to account for fluoride on the surface of forage as opposed to within the forage. Surface applied fluoride is a result of aerosol accumulation. Conversely the application of irrigation water will reduce this effect by washing the deposited fluoride off forage.	Closed
	• Methodology of electromagnetic survey, date, company. This can be included in the Appendix.	Have included the operator and machine used.	Closed
	• Climate change risk with sea level rise elevating groundwater levels and water quality with potential impact to cut and carry viability.	As described above. The site is surrounded (on three sides) by drains connected to HBRC pumping station. This effectively maintains shallow groundwater levels at a constant level	Closed
	• Related gaps identified relevant to other reports.	One other report has been referred to in report A10 Land Discharge Effects and Management, this is the A4 Human Health Effects Environmental Medicine report. The authors of reports A10 and R6 Project Description stormwater and process water management, have collaborated to ensure consistency between reports. Report A10 has also had direct input from relevant experts as opposed to being cross referenced.	Closed
	• A gap has been identified in that the human health hazard from bailage sprayed with treated stormwater from site being used for animal feed loosely described in this report has not been included in the human health risk assessment.	The human health assessment has now reviewed the discharge report and concluded this potential effect is not a risk to human health.	Closed

Item number	Query/comment	Agreed action/comment	Action status
	• A further human health hazard has identified in this report namely the risk to human health receptors adjacent to the site from spray drift.	The environmental medicine report(2021) does not consider spray drift during windy conditions a public health risk.	Closed
Recommendations			
	Review comments in relation to the effects of contamination from discharge are undertaken by an author with 5-10 years' experience (minimum) in contaminated land assessment.	Refer to environmental health report	Closed
	Primary author remains responsible for revision of the overall report structure and incorporates review comments in relation to cropping efficacy and the electromagnetic survey.	Adjustments made where appropriate	Closed
	Human health risk assessment should cover the land (A10) and water (R6 & R8) discharge components.	This is covered in A4 Human Health Effects Environmental Medicine.	Closed

MEMO	
ATTENTION	Tania Diack
FROM:	Shane Kelly
CC	
DATE:	10 November 2021
REGARDING	Ravensdown water strategy

COAST & CATCHMENT
ENVIRONMENTAL CONSULTANTS

BACKGROUND AND SCOPE

Ravensdown have requested feedback from Hawkes Bay Regional Council technical advisors, on their draft water management strategy for managing discharges of stormwater and treated process water from their Napier manufacturing plant.

This memo considers two elements of the strategy:

- the proposed discharge standards; and,
- the proposed approach to adaptive management.

Key elements of the strategy of relevance to this review are:

- Recognition that regulatory water quality standards have become more stringent since the current discharge permit was obtained, and a commitment to apply the most conservative standards in cases where available standards overlap.
- The management of environmental effects through a staged adaptive management programme, informed by a comprehensive sampling and monitoring programme. Up to three stages are proposed, with the need for the final stage to be informed by sampling and monitoring of the previous stages. If viable, a primary discharge to land, with secondary discharge to the estuary is proposed from Stage One.
- Dye studies indicate that minimal mixing of the discharge occurs within the mixing zone, with surface water dilutions of 2 to 2.8 times during low tide, and 3.2 to 4.9 times at high tide.

PROPOSED DISCHARGE STANDARDS

The strategy notes that regulatory water quality standards have become more stringent since the current discharge permit was obtained, and uses water quality objectives from more recent regional and national planning documents as a guide. It goes on to indicate that the most conservative standards are used in cases where documents provide overlapping standards.

“Likely water quality targets” for key contaminants are provided in Table 2 of the Draft Water Discharge Strategy, based on the most conservative regulatory standards with 4.9 times dilution applied. I note that:

- “Targets” and “standards” are used interchangeably in the document so I am unsure about how Ravensdown intends to apply them.
- The targets/standards are generally consistent with those specified in the TANK Plan Change, s42A Addendum report, and/or the surface water quality standards of the

Hawke's Bay Regional Coastal Environment Plan (RECP), and ANZG (2018). However, the freshwater guideline was used for aluminum (presumably because a marine guideline is not provided in ANZG (2018)), whereas marine guidelines were used for all other metals. This seems a reasonable, but I note that care will need to be taken in the interpretation and application of aluminum results.

- The TANK Plan sets water quality targets that HBRC seeks to achieve by 2040 (i.e. in around 18-19 years), while the consent term being sought is 35 years. The application of TANK Plan targets therefore seems appropriate.
- Ravensdown are seeking to have the targets/standards applied as 95%ile values over any 12-month period, which in some cases differs from the measurement methods specified in the source documents (e.g. for soluble reactive phosphorus) and/or will allow for a standard lower than that allowed in the existing consent (e.g. suspended solids).
- The dilution rate of 4.9 applied to the targets/standards is based on a dye study, with measurements taken from a surface water sample at the edge of the mixing zone, collected during a single, late March spring tide, 1 hour 49 min after the discharge started, and around 50 min after the high-tide peak (Phillips et al. 2021). In my experience, the measured dilution through the mixing zone is very low for a discharge of this type, and at times, rates could be lower, as variability has not been determined.
- The Strategy and proposed standards do not seem to cover, or address, the management and potential effects of toxic process chemicals (see Phillips et al. 2021).
- The proposed dilution rate is less than the rates that 2020 WET testing results indicate are required to achieve no toxicity, which showed dilutions of 13 fold and 25 fold were necessary (Phillips et al. 2021).
- Little information is provided on the proposed discharge regime, apart from indicating that only discharging on the falling tide is feasible.

Overall, the proposed reference sources for setting discharge standards appear appropriate, but do not cover all contaminants of concern. In my opinion the strategy also needs to do a better job of laying out how toxicity beyond the mixing zone is going to be prevented, given the results of WET testing, limited dilution within the mixing zone, and potentially variable dilution rates.

PROPOSED APPROACH TO ADAPTIVE MANAGEMENT

The proposed, staged approach appears sensible, but it lacks the detail required to provide confidence on:

- What initiatives will definitely be implemented.
- How their performance will be assessed.
- The criteria to be used when making decisions about moving from one stage to the next.
- What happens if key options, such as land disposal, are not viable.
- How the plan will be reviewed and updated over the term of consent.

The lack of detail on land disposal is particularly problematic, as it affects what happens in the marine receiving environment. I also note that Figure 5 suggests land disposal is planned for Stage 1, but Table 1 does not mention it. The 5 November, memo of Mott MacDonald also raises questions that could affect its viability.

I therefore recommend that more detail and certainty is provided on the above matters prior to the water management strategy being finalised.

REFERENCES

ANZG (2018) Australian and New Zealand guidelines for fresh and marine water quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia. Available at: www.waterquality.gov.au/anz-guidelines [Accessed: 2020]

Phillips, N., De Luca, S., Stewart, M., Leitch, K., McDermott, K., Eivers, R. (2021) Ravensdown Napier baseline technical investigations. RVD1901, Streamlined Environmental, Hamilton. 157 pp.

Ngaire Phillips, Streamlined Environmental, 22 Nov 2021

Response to Coast and Catchment Memo, 10 Nov 2021

Comment/question	Response
Use of freshwater aluminium guideline as no marine guideline; caution with interpretation	Noted
The strategy and proposed standards do not seem to cover, or address, the management and potential effects of toxic process chemicals.	We undertook an assessment of the risks associated with process chemicals, which is presented in full in our Baseline report (Chapter 6) and in summary in our Ecological Effects report (Chapter 4.4).
Dilution rate for meeting targets (4.9) less that rates that 2020 WET testing results indicate are required to achieve no toxicity (13 fold and 25 fold)	Within the mixing zone, dilutions at the surface range between 1.7 and 17.8 fold (median = 3.5, average = 6.8 fold) when discharged prior to low tide and between 2.1 and 14.9 fold (median = 5.3, average = 6.6 fold) when discharged prior to high tide. Dilutions of upto 113 fold were recorded at 500mm below the surface under high tide conditions, but there was generally little evidence of vertical mixing. While these dilutions are generally lower than the 100 fold dilution required to meet the toxicity compliance limit, this does not mean toxic effects have occurred. For example, the 2020 WET testing results indicated that dilutions of only 13 fold and 25 fold were necessary to achieve no toxicity. These dilutions are comparable with those recorded from the dye study.
Overall, the proposed reference sources for setting discharge standards ...do not cover all contaminants of concern.	The risk assessment undertaken indicates no more than minor impacts from process chemicals. Process chemicals are generally bespoke and designed for a particular industrial process. As such, unlike more traditional contaminants (i.e., nutrients, metals etc), most process chemicals are not able to be measured in environmental matrices (such as water, sediment, biota). Hence potential effects are assessed using risk assessments. It is not possible to set standards for process chemicals, as they do not exist.
In my opinion the strategy also needs to be a better job of laying out how toxicity beyond the mixing zone is going to be prevented, given the results of the WET testing, limited dilution within the mixing zone, and potentially variable dilution rates.	See comment above re dilution rates In addition, there is no evidence for significant effects on ecological communities beyond the mixing zone.

MEMO	
ATTENTION	Tania Diack, Hawkes Bay Regional Council
FROM:	Shane Kelly
CC	
DATE:	18 November 2021
REGARDING	Review of assessment of estuarine ecological effects report prepared for Ravensdown Napier

COAST & CATCHMENT
ENVIRONMENTAL CONSULTANTS

BACKGROUND AND SCOPE

Ravensdown have requested feedback the assessment of estuarine ecological effects prepared to support a resource consent application for the discharge of stormwater and treated process water from their Napier manufacturing plant:

Phillips, N., De Luca, S., Stewart, M. (2021) Ravensdown Napier discharge consent - assessment of estuarine ecological effects. Client report for Ravensdown Napier, RVD2101, Streamlined Environmental, Hamilton. 62 pp.

The report:

- describes the site drainage and pond system, and general characteristics of the receiving environment;
- summarises:
  - available data on receiving water quality and trends;
  - the results of dilution studies carried out in the mixing zone below the discharge point;
  - findings from an assessment of risks associated with process chemicals; and,
  - findings from ecological monitoring of discharge effects.
- assesses potential ecological effects from the existing discharge using methods developed in accordance with EIANZ guidelines;
- assesses ecological effects with proposed improved treatment, and considers whether improved treatment would achieve compliance with various standards;
- provides recommendations on monitoring.

Overall, the report is well written, appears technically robust, and covers key issues of concern in appropriate detail. In my opinion, it should provide a good foundation for developing plans to manage stormwater and treated process water from the site. On that matter, I note that in my earlier memo, dated 10 November 2021, listed several issues that, I believed, needed to be addressed in the draft Ravensdown water strategy. The information provided in the ecological assessment should be able to inform responses on those issues.

From: Tania Diack
To: Anita Anderson
Subject: FW: Ravensdown Consenting - Technical Report Review
Date: Monday, 8 November 2021 7:24:28 AM
Attachments: image001.png
ATT00001.png
ATT00005.png

Good morning Anita,

See below from Kyle, which obviously doesn't require any further changes/information.

Thanks
Tania

Tania Diack
Team Leader Consents
06 835 9200 | 027 318 9762
Hawke's Bay Regional Council | Te Kaunihera ā-rohe o Te Matau a Māui
159 Dalton Street, Napier 4110 | hbrc.govt.nz
Enhancing Our Environment Together | Te Whakapakari Tahi I Tō Tātau Taiao

From: Kyle Christensen <kyle@christensenconsulting.co.nz>
Sent: Friday, 5 November 2021 6:24 pm
To: Tania Diack <tania.diack@hbrc.govt.nz>
Subject: Re: Ravensdown Consenting - Technical Report Review

Hi Tania,

I have reviewed the report and noted that the focus is on improving the water quality of the stormwater discharge. The devices being used for treating the stormwater will also attenuate and reduce peak stormwater outflows. There is no proposed increase in impervious area proposed as part of the works and as there will be a reduction in peak outflows I don't see any issues with regard to increased flooding on or off the site.

Best regards

Kyle Christensen
Rivers & Stormwater Engineer

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12 November 2021

Tania Diack
Team Leader Consents
Hawkes Bay Regional Council
159 Dalton Street
NAPIER 4110

Dear Tania

REVIEW OF DRAFT AIR QUALITY ASSESSMENT FOR RAVENSDOWN

1.0 Introduction

Ravensdown Limited (Ravensdown) is in in the process of applying to the Hawke's Bay Regional Council (HBRC) for new consents for its Awatoto manufacturing site. Ravensdown has provided copies of draft documents to HBRC for an initial review prior to lodging the application.

Pattle Delamore Partners Limited (PDP) has been engaged by HBRC to undertake a review of the draft air quality assessment and this letter sets out our comments on that document.

2.0 Document Reviewed

PDP has reviewed the following documents:

- Reconsenting of Ravensdown Napier Works Air Quality Assessment Final Draft, Tonkin & Taylor Limited (T+T), October 2021 (Assessment); and
- Ravensdown Napier Works Resource Consent Renewal Project, Air Discharge Strategy 2021, Ravensdown, September 2021.

PDP notes that there appeared to be section numbering issues with the version of the Assessment provided by Mitchell Daysh, and therefore PDP subsequently obtained a version of the Assessment directly from Richard Chilton of T+T, which had these issues resolved.

PDP considers that the Assessment is a comprehensive report, and deals well with the various matters that have been assessed. The Assessment appendices were not provided, therefore PDP cannot comment on the accuracy of any conclusions reached that were based on appended material. At this stage, from the material that has been reviewed, PDP has no reason to consider that T+T's conclusions are not valid.

3.0 Review Comments

Based on PDP's review of the material that was provided, PDP considers that additional information is required, either to provide clarification or better justification for assumptions that have been made. There are also a couple of areas where PDP considers that additional assessment is required. Note when making reference to specific sections of the Assessment, PDP has used the numbering in the version of the report provided by Richard Chilton.

In Section 3.1.2 of the Assessment, there is a discussion on stack emissions. PDP considers that this discussion should include the emissions associated with start-up, and in particular the combustion emissions associated with the diesel fired unit used to heat the plant up. The discussion should also include emissions of sulphur compounds from the start up of the acidulation plant, particularly given that there have been exceedances of the National Environmental Standard for Air Quality (NES AQ) for sulphur dioxide that are associated with this process.

In Section 3.2.6 of the Assessment, there is a discussion on other discharges, which states that discharges of combustion related compounds such as nitrogen dioxide and carbon monoxide during start up are negligible in relation to other emissions. While this may be true, there are NES AQ for both of these compounds that must be met. Consequently, PDP considers that the assessment should provide information to demonstrate that all of the relevant NES AQ are met for emissions during the start-up process.

In Section 3.2.2.2 of the Assessment, there is a discussion on the emission of sulphur dioxide from the manufacturing plant. PDP agrees that the limit of 10 kg/hr seems appropriate as a starting point but is concerned, given the limited monitoring, about the appropriateness of using a lower emission rate to assess the annual average. PDP considers that additional information needs to be provided to justify this approach, or more conservative assumptions need to be made for the emission rate used for considering annual emissions.

PDP also considers that it is practical to model start-up emissions from the acid plant, with this having been done in the past for other fertiliser works. Given that PDP understands that HBRC is considering enforcement action in relation to exceedance of the NES AQ for sulphur dioxide this is key information that needs to be included.

In Section 3.2.2.3 of the Assessment, there is a discussion on the acid gases and emission rates selected. While PDP does not consider it unreasonable to have selected the 75%ile value to represent long term averages, the data presented in Figure 3.3 shows a definite increase in values in 2021 compared to the previous three years. It would be helpful to understand the reason for this and whether values are expected to stay at this level in the future. If continued higher emissions are likely, then it would be helpful to understand what impact this might have on the emission rates selected, and ultimately off-site effects.

Section 3.2.3 of the Assessment discusses particulate matter from the Bradley Mills and includes monitoring results in Figure 3.4. It is not possible to determine from the data provided which data points relate to the operation of a single mill and which relate to multiple mills operating. It would be helpful if the figure could be modified to provide this data and allow a better understanding of the representativeness of emission rates used in the assessment. This information would also be useful to understand the appropriateness of using the 75%ile value for long term emissions, to understand the typical operating hours of the mills, and the likelihood of one or more of the mills operating concurrently.

Section 3.2.3 of the Assessment should also discuss the emissions from the diesel fired heater.

Section 3.4.1 of the Assessment contains a useful discussion on the stack discharge parameters. Having reviewed the information in Figure 3.5, PDP considers it would be appropriate to include discussion or information on the potential change in off-site sulphur dioxide effects resulting from reduced velocities and temperature that appear to be associated with more typical operating rates. PDP also considers it would also be helpful to understand what the stack discharge conditions would be for the plant operating at the proposed discharge limit of 40 kg/hr.

Section 5.4.1 of the Assessment discusses the HBRC Awatoto PM_{10} and $PM_{2.5}$ monitoring, and indicates that the main contributors appear to be the north of the monitoring site and therefore not related to Ravensdown during light winds. PDP considers T+T's conclusion is reasonable, but that there also appears to be a clear PM_{10} signature during stronger winds that is most likely to be associated with Ravensdown.

In Section 5.4.3 of the Assessment, T+T provides its estimate of background PM_{10} and $PM_{2.5}$. PDP considers T+T's approach is reasonable but notes that the latest NZTA background concentration information which PDP understand T+T prepared, contains estimates of $PM_{2.5}$ for Awatoto of 15.3 $\mu g/m^3$ as a 24 hour average and 6.3 $\mu g/m^3$ as an annual average. This potentially means that the background value selected by T+T for 24 hour $PM_{2.5}$ is low.

Sections 6.2 and 6.3 of the Assessment presents the model results. PDP considers that the results as presented, all seem to be reasonable and indicate a low level of effects. Given PDP's comments above, including on emission rates and plant start-up conditions, the conclusions from modelling may need to be revisited in the final assessment. In particular, the SO_2, PM_{10} and $PM_{2.5}$ model results should be updated following inclusion of combustion emissions associated with acid plant start-up operations, and the short term sulphur dioxide concentrations during start up operations.

PDP would also expect to see new sections to address at a minimum the short-term nitrogen dioxide concentration associated with acid plant start-up.

Finally PDP is uncomfortable with the fact that T+T is prediction in Section 6.2.5.1 of the Assessment that concentrations of PM_{10} of the former Winstone Aggregate site will sit just below the NES AQ at a cumulative value of 49 $\mu g/m^3$. PDP considers that this could potentially prevent or curtail the establishment of a range of new industrial activities. It would therefore be helpful to have information on the potential implications of PM_{10} on this site in light of Regulation 17 of the NES AQ and the range of combustion devices which are either permitted under Rule 17 in the Regional Resource Management Plan or meets the requirements of Rule 18 as a controlled activity.

4.0 Closure

If you have any questions about the above, then please contact the undersigned.

5.0 Limitation

This report has been prepared by PDP on the specific instructions of Hawkes Bay 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

PATTLE DELAMORE PARTNERS LIMITED

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Memo

To:	**Andrew Torrens (Ravensdown), Helen McCarthy (Ravensdown) Stephen Daysh (Mitchell Daysh), Anita Anderson (Mitchell Daysh)**	**Job No:**	**1012315**
From:	**Richard Chilton**	**Date:**	**26 November 2021**
Subject:	**Responses to items in PDP technical review of pre-application draft of the Napier Works Air Quality Assessment**		

Pattle Delamore Partners Limited (PDP) has been engaged by Hawkes Bay Regional Council (HBRC) to undertake a review of the draft air quality assessment for the Ravensdown Napier Works that Tonkin & Taylor Limited (T+T) has prepared. The PDP review is provided in its letter to HBRC dated 12 November 2021.

This memorandum lists the matters raised in the PDP letter, provides responses to those matters and references where this has been addressed in the revised air quality assessment report.

Table 1: Responses to PDP technical review

Section	PDP review comment	T+T Response
S3.1.2	In Section 3.1.2 of the Assessment, there is a discussion on stack emissions. PDP considers that this discussion should include the emissions associated with start-up, and in particular the combustion emissions associated with the diesel fired unit used to heat the plant up. The discussion should also include emissions of sulphur compounds from the start-up of the acidulation plant, particularly given that there have been exceedances of the National Environmental Standard for Air Quality (NES AQ) for sulphur dioxide that are associated with this process.	Diesel fuel is used to fire three appliances during start-up of the Acid Plant in order to bring the plant up to the necessary temperatures to facilitate it being fired on molten sulphur. This includes: • Direct firing of the furnace with diesel, with the exhaust from the furnace being discharged to the 13 m by-pass stack • Indirect heating of the remainder of the Acid Plant • Firing of the auxiliary boiler to initially heat the sulphur melter. The combustion of diesel fuel will give rise to discharges of PM_{10}/$PM_{2.5}$, oxides of nitrogen (NO_X), carbon monoxide (CO) and sulphur dioxide (SO_2). SO_2 discharges from diesel combustion are typically negligible due to the very low sulphur content of New Zealand diesel (10 ppm). Notwithstanding this, SO_2 emissions from the firing of the furnace can be more significant due to the burning-off of any residual sulphur that has settled on the refractory lining of the furnace during the previous plant shutdown. S3.1.2 has been updated to reflect the above information.
S3.2.6	In Section 3.2.6 of the Assessment, there is a discussion on other discharges, which states that discharges of combustion related compounds such as nitrogen dioxide and carbon monoxide during start up are negligible in relation to other emissions. While this may be true, there are NES AQ for both of these compounds that must be met. Consequently, PDP considers that the assessment should provide information to demonstrate that all of the relevant NES AQ are met for emissions during the start-up process.	Section 3.2.6 has been updated, describing that the combustion of diesel during start-up is equivalent to a 7 megawatt (MW) diesel fired boiler, to provide context for the scale of these short term emissions. Emission rates for NO_X, CO, PM_{10}/$PM_{2.5}$ and SO_2 from the combined burning of diesel fuel have been calculated using USEPA AP42 emission factors for a small diesel fired boiler, with details of the calculations provided in Appendix B and summarised in Table 3.1. Notwithstanding the above, it is T+T's experience that emissions of NO_X, CO, PM_{10}/$PM_{2.5}$ and SO_2 from diesel fired external combustion appliances of this scale (i.e., 7 MW) do not typically give rise to off-site ground level concentrations that approach relevant assessment criteria. The risk of any such exceedance is further minimised given the very infrequent nature of cold start-up of the Acid Plant. Given this, no further assessment of the effect of emissions from diesel combustion for the cold start-up of the Acid Plant is provided.

		The expectation that assessment criteria will not be exceeded is further reflected in the findings of work undertaken to inform the activity status of diesel-fired boilers in several regional plans. These studies (NIWA 2013[1],Golder 2012[2]) used generalised dispersion modelling for a range of scenarios and show that ground level effects of emissions from a 7MW diesel-fired boiler with a stack in excess of 10 m are small in comparison with assessment criteria. Plan.
S3.2.2.2	In Section 3.2.2.2 of the Assessment, there is a discussion on the emission of sulphur dioxide from the manufacturing plant. PDP agrees that the limit of 10 kg/hr seems appropriate as a starting point but is concerned, given the limited monitoring, about the appropriateness of using a lower emission rate to assess the annual average. PDP considers that additional information needs to be provided to justify this approach, or more conservative assumptions need to be made for the emission rate used for considering annual emissions. PDP also considers that it is practical to model start-up emissions from the acid plant, with this having been done in the past for other fertiliser works. Given that PDP understands that HBRC is considering enforcement action in relation to exceedance of the NES AQ for sulphur dioxide this is key information that needs to be included.	At this time, there has only been a single round of testing for SO_2 emissions from the manufacturing plant, which determined a combined mass emission rate of approximately 1 kg/hr. This is well below the emission rates used for the air quality assessment and it is expected that the emission rates adopted for the assessment will be conservatively high. Notwithstanding this, it is recommended that Ravensdown undertakes additional rounds of stack emission sampling of the Manufacturing Plant Stacks to confirm this. Emissions of SO_2 associated with a cold start-up of the Acid plant can occur from the use of diesel for pre-heating the plant. However, SO_2 emissions from diesel combustion are typically negligible given the very low sulphur content of diesel mandated by national fuel standards (less than10 ppm or 0.001%). The main source of SO_2 during a cold start-up is instead from the preheating of the sulphur furnace where any residual sulphur present on the refractory lining of the furnace can be oxidised and discharged as SO_2. During pre-heating, the discharge from the sulphur furnace is diverted to an 18 m high 'Start-up' stack. SO_2 emissions associated with the Start-up stack have not been measured in the same way that they are for the main Acid Plant stack. This is mainly due to the start-up process being an infrequent activity (typically occurring once per year over a period of approximately 60 hours – 2.5 days). Therefore, while it is technically possible to model start-up emissions, we consider this is of limited value in understanding air quality effects given the intermittent nature of start-ups and the absence of reliable emissions data. We consider that evaluation of the ambient SO_2 monitoring data presented in Section 5.3 of the Air Quality Assessment provides a better means for assessing the impact of start-up emissions compared to dispersion modelling.

[1] NIWA 2013. Definition of Activity Classes for Industrial Boilers – Part 3: Applicability to other Regions – Prepared for Marlborough District Council. NIWA Project EFL12229

[2] Golder 2012. Review of combustion rules – Investigation of small combustion appliance thresholds for permitted activity status. Report prepared by Golder Associates (NZ) Limited for Auckland Council. Report number 1278104-068-Rev1.

		Regarding the comment that start-up emissions have been modelled for other fertiliser plant sites, we understand that PDP is referring to the Ballance Fertiliser site in Tauranga and Ravensdown's Dunedin works. We are not familiar with the work undertaken for the Ballance site. However, the study done for Ravensdown's Dunedin works was to examine the height of its start-up stack – it did not seek to quantify SO_2 emissions during start-up. With regard to PDP's comment about possible enforcement action being considered by HBRC, it is noted that SO_2 exceedences measured at the Winstone site are described in Section 5.3. This includes commentary regarding the causes and actions as a result. There has only been one measured exceedance of the SO2 standard related to an Acid Plant start-up. Following this event, a significant change was made to the start-up stack in 2018 to make it a permanent stack (rather than temporary) and increasing its height from 3 m to 13 m . The monitoring data from 2018 onwards demonstrates that there have been no exceedances related to Acid plant start-up stack emissions since that time.
S3.2.2.3	In Section 3.2.2.3 of the Assessment, there is a discussion on the acid gases and emission rates selected. While PDP does not consider it unreasonable to have selected the 75%ile value to represent long term averages, the data presented in Figure 3.3 shows a definite increase in values in 2021 compared to the previous three years. It would be helpful to understand the reason for this and whether values are expected to stay at this level in the future. If continued higher emissions are likely, then it would be helpful to understand what impact this might have on the emission rates selected, and ultimately off-site effects.	The reason for the increase in measured SO_3 concentrations in 2021 compared to previous years is not clear. Possible causes could include reduced absorption efficiency in the final tower, the mist elimination candles not working ideally or an increased gas velocity through the plant (due to a bigger blower having been installed) that reduces the efficiency of the candles. However, in relation to the dispersion modelling results for annual average SO_3 presented in Section 6.2.4, emission rates would need to be substantially greater than measured, or indeed the current discharge limit, for concentrations to approach the corresponding human health assessment criteria. Accordingly, the conclusions of the assessment in relation to annual average SO_3 concentrations are not considered sensitive to the assumptions that have been made regarding the long term emission rate. Clarification of these matters has been made to the text of Section 3.2.2.3 of the Report.
S3.2.3	Section 3.2.3 of the Assessment discusses particulate matter from the Bradley Mills and includes monitoring results in Figure 3.4. It is not possible to determine from the data provided which data points relate to the operation of a single mill and which relate to multiple mills operating. It would be helpful if the figure could be modified to provide this data and allow a better understanding of the representativeness of emission rates used in the assessment. This information would also be useful to understand the appropriateness of using the 75%ile value	The air quality assessment has conservatively assumes that all of the Bradley Mills operate continuously throughout the year. In practice, one or more mills will operate whenever the Manufacturing Plant is in operation. However, the number of mills operating concurrently depends on the rock blend being used and the product being manufactured. Most commonly three mills are operated at the same time, very occasionally four mills and on occasions just two mills. Section 3.2.3 has been updated to reflect this.

	for long term emissions, to understand the typical operating hours of the mills, and the likelihood of one or more of the mills operating concurrently.	
S3.2.3	Section 3.2.3 of the Assessment should also discuss the emissions from the diesel fired heater.	This matter is addressed in Section 3.2.6..
S3.4.1	Section 3.4.1 of the Assessment contains a useful discussion on the stack discharge parameters. Having reviewed the information in Figure 3.5, PDP considers it would be appropriate to include discussion or information on the potential change in off-site sulphur dioxide effects resulting from reduced velocities and temperature that appear to be associated with more typical operating rates. PDP also considers it would also be helpful to understand what the stack discharge conditions would be for the plant operating at the proposed discharge limit of 40 kg/hr.	Figure 3.5 of the air quality assessment shows a good relationship between discharge velocity, temperature and emission rate. Accordingly, any scenario that considers a reduced velocity or temperature needs to also account for the corresponding lower emission rate. Given the above, and based on Figure 3.5, we consider a reasonable 'alternative' scenario to evaluate in this context is as follows: Velocity of 3 m/s Temperature of 50 ^{o}C SO_2 emission rate of 20 kg/hr This alternative scenario has been included in Section 6.2.3 of the Report. The predicted SO_2 concentrations for this alternative scenario are substantially lower than the maximum emissions scenario. Accordingly, the modelling scenario representing the Acid Plant discharging at its maximum SO_2 emission rate of 60 kg/hr (with corresponding exhaust temperature and velocity conditions) provides the most conservative (i.e., highest) off-site predictions of SO_2.
S5.4.1	Section 5.4.1 of the Assessment discusses the HBRC Awatoto PM_{10} and $PM_{2.5}$ monitoring, and indicates that the main contributors appear to be the north of the monitoring site and therefore not related to Ravensdown during light winds. PDP considers T+T's conclusion is reasonable, but that there also appears to be a clear PM_{10} signature during stronger winds that is most likely to be associated with Ravensdown.	We acknowledge PDP's point that there is a signature in the polar plots for PM_{10} and $PM_{2.5}$ of a source in the upwind direction of the Ravensdown site. and have reflected this in Section 5.4.1. Notwithstanding this, discharges from the Ravensdown site do not appear to be the cause of high 24-hour average PM_{10} and $PM_{2.5}$ concentrations.
S5.4.3	In Section 5.4.3 of the Assessment, T+T provides its estimate of background PM_{10} and $PM_{2.5}$. PDP considers T+T's approach is reasonable but notes that the latest NZTA background concentration information which PDP understand T+T prepared, contains estimates of $PM_{2.5}$ for Awatoto of 15.3 µg/m^3 as a 24 hour average and 6.3 µg/m^3	PDP is referring to work (and data) that has been undertaken by T+T for Waka Kotahi. The report summarising the approach and findings has been finalised but has not yet been published by Waka Kotahi. Section 5.4.3 has been updated to use 24-hour and annual average $PM_{2.5}$ values from the work that was recently undertaken for Waka Kotahi, acknowledging that the updated data have been made available by Waka Kotahi to some air quality consultants to assist in

	as an annual average. This potentially means that the background value selected by T+T for 24 hour $PM_{2.5}$ is low.	the preparation or air quality assessments. It is also noted that the updated values are derived from measured concentrations at the HBRC monitoring site at Awatoto. Values for the 24-hour average and annual average PM_{10} concentration have been calculated using the same approach that was used to determine the value for $PM_{2.5}$ derived for Waka Kotahi. In adopting these values as representative of background air quality (i.e., air quality in the absence of impacts from the site) it is important to note that this will introduce an element of "double counting". This is because the monitoring data used as the basis for the Waka Kotahi background maps includes the effects of the site's emissions. However, given that the incremental impact of the site's emissions is relatively small, the updated background map values have been adopted to provide a conservative assessment. Section 6.2.5 has been updated to reflect the revised values.
S6.2 & S6.3	Sections 6.2 and 6.3 of the Assessment presents the model results. PDP considers that the results as presented, all seem to be reasonable and indicate a low level of effects. Given PDP's comments above, including on emission rates and plant start-up conditions, the conclusions from modelling may need to be revisited in the final assessment. In particular, the SO_2, PM_{10} and $PM_{2.5}$ model results should be updated following inclusion of combustion emissions associated with acid plant start-up operations, and the short term sulphur dioxide concentrations during start-up operations. PDP would also expect to see new sections to address at a minimum the short-term nitrogen dioxide concentration associated with acid plant start-up.	As discussed in response to the comments made in relation to Section 3.2.6, T+T does not expect that the very infrequent emissions from diesel combustion would give rise to off-site concentrations of NO_2 that would approach relevant assessment criteria (which includes the NES_{AQ} for NO_2). Accordingly, no further assessment is provided.
Non-section rated comment	Finally PDP is uncomfortable with the fact that T+T is prediction in Section 6.2.5.1 of the Assessment that concentrations of PM_{10} of the former Winstone Aggregate	T+T is not aware of any regulations or rules in the Regional Resource Management Plan (RRMP) that would act to curtail the establishment of activities seeking to discharge PM_{10} from the former Winstone site as a result of discharges from the Ravensdown site.

	site will sit just below the NES AQ at a cumulative value of 49 µg/m^3. PDP considers that this could potentially prevent or curtail the establishment of a range of new industrial activities. It would therefore be helpful to have information on the potential implications of PM_{10} on this site in light of Regulation 17 of the NES AQ and the range of combustion devices which are either permitted under Rule 17 in the Regional Resource Management Plan or meets the requirements of Rule 18 as a controlled activity.	Regulation 17 of the NES_{AQ} relates to granting of consent for new discharges of PM_{10} in 'polluted airsheds'. Awatoto is a polluted airshed and therefore Regulation 17 would prevent HBRC from granting consent for new PM_{10} discharges that result in 24-hour average PM_{10} concentrations at the boundary that are 2.5 µg/m³ or greater, unless the they are offset from elsewhere in the airshed. Accordingly, discharges from the Ravensdown site would not be a matter for consideration under Regulation 17 for a new activity seeking to discharge PM_{10}. Rule 17 of the RRMP provides for certain combustion activities to be 'permitted'. Where the conditions of Rule 17 are met, resource consent is not required. The conditions of Rule 17 do not make any reference to the impacts of other discharges at the site. Accordingly, Ravensdown's activities would not preclude the operation of permitted activities at the former Winstone site. Rule 18 provides for large scale combustion activities at a controlled activity, subject to a set of conditions. As with Rule 17, the conditions of Rule 18 do not relate to impacts on the site from other discharge sources. Accordingly, Ravensdown's activities would not preclude the operation of activities seeking consent under Rule 18. This matter is not addressed in the Air Quality Assessment as it is more appropriately considered in the statutory assessment in the Assessment of Environmental Effects report. In the context of a cumulative effects assessment for PM_{10} and $PM_{2.5}$, consideration would need to be given to the off-site cumulative effect of an activity discharging from the Winstone site on the surrounding land (including the Ravensdown site which experiences high concentrations as a result of its own discharges). However, in this context, any discharges from the Winstone would need to be very small in order to meet the requirements of Regulation 17 of the NES_{AQ}. Additionally, given the nature of the land uses surrounding the Winstone site (mainly industrial or rural), it is not expected that 24-hour exposure would be applicable.

30-Nov-21
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From: Tania Diack
To: Anita Anderson
Subject: Review of draft air quality assessment for Ravensdown
Date: Friday, 12 November 2021 3:32:45 PM
Attachments: ATT00001.png
ATT00005.png
A03553802L001_Assessment of Draft Report.pdf

Hi Anita,

Please see attached from Andrew Curtis.

He did also contact Bioresearches and they seem comfortable with the proposed reduction in the fluoride emission limit to 1 kg/hr from 1.5 kg/hr however due to their late inclusion to this review they couldn't provide anything further.

Thanks
Tania

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Enhancing Our Environment Together | Te Whakapakari Tahi I Tō Tātau Taiao