

BEFORE THE ENVIRONMENT COURT

AT AUCKLAND

I TE KŌTI TAIAO O AOTEAROA

KI TĀMAKI MAKAURAU

IN THE of appeals under Clause 14 of
MATTER Schedule 1 of the Resource
Management Act 1991

BETWEEN **BOONHAM**
(ENV-2021-AKL-000061)

MANGAWHAI MATTERS
INCORPORATED & OTHERS
(ENV-2021-AKL-000062)

AND **Appellants**

KAIPARA DISTRICT COUNCIL

Respondent

STATEMENT OF EVIDENCE OF ROBERT ALAN VAN DE MUNCKHOF
ON BEHALF OF MANGAWHAI CENTRAL LIMITED
(STORMWATER MANAGEMENT)

17 December 2021

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1. INTRODUCTION

1.1 My full name is Robert Alan Van de Munckhof.

1.2 I am a Principal and Senior Environmental Engineer at Tonkin & Taylor ("T+T"). I hold the qualifications of Bachelor of Engineering in Chemical and Materials from Auckland University. I have over 20 years' experience in environmental management and have been employed as a specialist in environmental management at T+T since 2005.

1.1 I have undertaken stormwater and water quality assessments for a wide range of industries and sites including:

(a) Expert technical evidence on behalf of University of Auckland and O-I Glass in relation to the stormwater framework in the Auckland Unitary Plan, including preparation of evidence, expert conferencing and mediation.

(b) Technical lead and reviewer for a water quality improvement options study for stormwater discharging into a natural coastal wetland on behalf of Auckland Council. This included reviewing the potential contaminant loads from a mixed urban catchment and evaluation of potential water quality improvements.

(c) Stormwater assessment for the proposed Auckland Regional Landfill including presentation of technical evidence relating to the proposed stormwater management measures.

Involvement with PC78

1.3 I have been engaged by Mangawhai Central Limited ("MCL") to review the stormwater management proposals for the Mangawhai Central development at Molesworth Drive, Mangawhai (the "Site") and provide evidence in relation to Private Plan Change 78 ("PC78").

1.4 I am familiar with the Site, having undertaken a site visit on 22 November 2021.

- 1.5 I have reviewed and am familiar with the proposed PC78 provisions; and other documents relating to stormwater aspects of the PC78 development, including the Stormwater Management Plan prepared by McKenzie & Co Consultants Ltd, and the Stormwater Modelling undertaken by Stantec. Although I was not involved in the Council-level hearing, I have reviewed the evidence presented at that hearing by Alan Leahy on stormwater, Dr Shane Kelly on marine effects, Richard Montgomerie on freshwater effects, and James Dufty on engineering. I have also reviewed draft Environment Court evidence of Dr Kelly, Mr Dufty, Mr Montgomerie, and Dr Neale.

Code of conduct

- 1.6 I confirm that I have read the Code of Conduct for Expert Witnesses in the Environment Court Practice Note (2014) and I agree to comply with it. In that regard, I confirm that this evidence is within my expertise, except where I state that I am relying on the evidence of another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

Scope of evidence

- 1.7 In my evidence, I address:
- (a) how the best practicable option for stormwater management has evolved over time;
 - (b) the nature of the proposed PC78 development and the potential for contaminants and effects associated with stormwater from the Site;
 - (c) the sensitivity of the PC78 receiving environment in terms of these contaminants and discharges;
 - (d) the proposed stormwater management controls and provisions in PC78 and the Stormwater Management Plan, including whether they are consistent with current best practice to manage potential effects associated with stormwater discharges; and
 - (e) matters raised in the appeals and s274 notices relating to stormwater.

2. EXECUTIVE SUMMARY

2.1 When evaluating whether proposed stormwater controls are appropriate, consideration of the activities and potential contributions to effects, the sensitivity of the receiving environment, and the appropriateness of the proposed controls to manage the potential effects, is required.

2.2 In relation to the PC78, I note the following:

- (a) The main source of potential contaminants is associated with the roadways and parking areas where traffic movements are highest, although overall traffic movements are expected to be low;
- (b) The PC78 development will result in increases in impervious areas and subsequent increases in peak flows during storm events;
- (c) The most sensitive freshwater environments to discharges of stormwater at the Site are the three freshwater wetlands; and
- (d) The Mangawhai Harbour is sensitive to contaminants due to potential for on-going accumulation from the overall discharges from the catchment.

2.3 The proposed PC78 provisions, structure plan and Stormwater Management Plan (SMP) minimise effects on the wetlands and harbour through a range of methods, including the following:

- (a) Minimising discharges of contaminants from stormwater into the wetlands by ensuring the areas with the highest contaminant generating potential (namely the commercial and service areas and the main access road) do not discharge into the wetlands; but discharge either downstream or through alternative discharge locations;
- (b) The creation of a new central swale which will provide the main stormwater conveyance pathway for the majority of the Site discharges;
- (c) A comprehensive package of best practice stormwater management measures, including the use of water

sensitive design for the PC78 development which seeks to maintain peak flows and provide stormwater treatment to minimise the discharge of any contaminants to the on-site wetlands and the harbour.

- 2.4 Overall, I consider that PC78 has appropriately identified the sensitivity of the receiving environment and the proposed provisions framework is reflective of this. In particular, the overall layout and planning of the PC78 development seeks to minimise effects through the layout of the Site, the application of water sensitive design (including the use of rainwater tanks and infiltration approaches to reduce peak flows and increase soakage) and the application of stormwater treatment through a variety of measures including the use of vegetated swales and rain gardens for roadways and parking areas.
- 2.5 I consider the proposed approach to stormwater management at the Site is consistent with current best practice, including the Auckland Council GD01 and GD04 guidance documents.
- 2.6 The proposal is also consistent with the approaches used at other recent developments which have applied a water sensitive design to stormwater management such as Hobsonville Point in North West Auckland, the Long Bay on the North of Auckland, and Drury South to the South of Auckland.
- 2.7 Overall, I consider that the proposed approach to stormwater management outlined in PC78 and the SMP is appropriate. It considers the overall environmental context and seeks to minimise the potential effects associated with stormwater discharges through application of a water sensitive design which considers the overall catchment and integrated effects.
- 2.8 I have also reviewed the evidence of Richard Montgomerie, Dr Martin Neale and Dr Shane Kelly in terms of effects of stormwater on the on-site wetlands and waterways and on the Mangawhai Estuary.
- 2.9 They conclude that the proposed approach to stormwater is appropriate and that any effects from the proposed stormwater discharges associated with the plan change on the onsite wetlands and streams or the Mangawhai Harbour can be appropriately managed.

2.10 I support the conclusions reached.

3. APPROACH TO STORMWATER MANAGEMENT

3.1 The approach to stormwater management is constantly evolving, with the current approach significantly different to that from 20 to 30 years ago.

3.2 Stormwater was initially considered an engineering problem focusing on the easiest way to convey and discharge stormwater away from a development area. This led to a heavy engineering focus, with streams being piped or lined with concrete, and significant loss of natural habitat. This resulted in contaminants in stormwater as well as sediment associated with the development of land being quickly conveyed to the closest marine environment, being either the closest estuarine environment or harbour.

3.3 This has resulted in significant contamination of harbours and estuarine environments following land development. Effects include loss of habitat due to smothering of weed and shellfish beds, and contamination of those remaining habitats.

3.4 Awareness of these issues increased in the 1980s and then, with the introduction of the RMA in the 1990s, there was a change in focus from stormwater being something to be disposed of, to something to be managed.

3.5 In terms of stormwater management, Auckland has been a leader within New Zealand. Within Auckland, this was initially driven through the development of the Auckland Regional Council Technical Publication 10, Stormwater Management¹. While this document introduced the need to consider stormwater detention and treatment, this still approached stormwater as an engineering problem to be managed at the “end of pipe” through heavy infrastructure. There was limited consideration of the receiving environment in selecting or choosing the appropriate management solution.

¹ Auckland Regional Council Technical Publication 10: Stormwater Treatment Devices, Design Guideline Manual, October 1992.

- 3.6 Towards the end the 1990s, a further shift occurred with an increased focus on Low Impact Design. This included the release of Technical Publication 124 (TP124) “Low Impact Design Manual for the Auckland Region” in 2000². While this introduced the concept of an integrated design approach, it was still perceived as simply replacing “grey” infrastructure with “green” infrastructure and did not reflect the receiving environment within the approach to land development.
- 3.7 TP124 was replaced in March 2015 with a guideline on water sensitive design for stormwater³. This represented a significant shift in stormwater management with a change in focus from Low Impact Design and “green” treatment to “Water Sensitive Design” with a greater emphasis on freshwater management.
- 3.8 This shift to “water sensitive design” requires the following:
- (a) address stormwater effects as close to the source as possible – a change from end of pipe approaches; and
 - (b) mimic natural systems and processes for stormwater management.
- 3.9 Ultimately it represents a change from stormwater and the natural environment being considered at the end, to the natural environment being considered first.
- 3.10 This is also supported by the National Policy Statement for Freshwater Management 2020 which includes Policy 3 as follows:⁴
- Freshwater is managed in an integrated way that considers the effects of the use and development of land on a whole-of-catchment basis, including the effects on receiving environments.*
- 3.11 In my opinion, within this context, consideration of the nature of activities and use of land needs to be considered in relation to receiving environments - including rivers, wetlands and harbours -

² Auckland Regional Council, Technical Publication 124 (TP124) Low Impact Design Manual for the Auckland Region, 2000.

³ Auckland Council Guideline Document 2015/004 (GD04), ‘Water Sensitive Design for Stormwater’, 2015.

⁴ Refer also to the National Policy Statement for Freshwater Management 2020 Subpart 1, 3.5 Integrated Management.

alongside cumulative effects from other activities within the whole catchment.

3.12 Therefore, in my opinion, determining whether a proposal is appropriate from a stormwater management perspective requires:

- (a) consideration of the proposed activities to understand the potential contribution of contaminants both in relation to the individual site and the overall catchment;
- (b) the nature and sensitivity of the receiving environment; and
- (c) the appropriateness of the proposed controls to manage potential effects.

4. PC78: NATURE OF THE DISCHARGE

4.1 PC78 seeks to rezone the Site for a combination of retail and commercial activities as well as residential activities. While the Site is currently zoned for residential land use, PC78 will allow for more intensive residential development than the operative zoning.

4.2 In terms of the potential for contaminants from the activities, the main sources are associated with trafficable areas including roadways, driveways and parking areas. Based on the proposed PC78 Structure Plan, the highest contaminant sources are associated with the main roadways and carparking areas, where vehicle movements will be the greatest.

4.3 Stormwater discharges from trafficable areas can include a range of contaminants such as oil and grease, suspended solids, and brake and tyre residues which contain a variety of environmentally toxic components including heavy metals and organic compounds.

4.4 While there are a wide range of potential contaminants, I agree with Dr Kelly that the key contaminants relating to urban stormwater runoff are copper and zinc. This is due to the higher loads of these contaminants, the sensitivity of receiving environments to these contaminants, and studies showing that contaminant concentrations of sediments and shellfish within both freshwater and estuarine environments are increasing.

- 4.5 The potential contaminants from other areas, including permeable areas such as grass and landscaping, is negligible. Provided that non-contaminant generating roofing materials, such as colour steel or roof tiles, are used (as is proposed by PC78),⁵ the potential for contaminants from roof areas is also negligible, although the increase in impervious areas can result in increases in flows within the catchment.
- 4.6 The remaining areas including residential driveways and non-trafficable areas will have low levels of contaminant generation but may contribute to changes in the hydrological flows through an increase in impervious surfaces which can result in increased peak flows during rain events and reduced infiltration.
- 4.7 The potential discharge of contaminants without treatment from the Site is dependent on a number of factors including the extent of trafficable impervious areas and the likely vehicle movements from the different areas. This means that an increase in the density of a development does not necessarily directly correlate with an increase in the loads of contaminants discharged.
- 4.8 While the roadways and parking areas are the areas which will generate the greatest contaminant loads, based on the evidence of Mr Hills, the overall vehicle movements are not expected to be significant when considered against other urban developments.
- 4.9 I also note that the current Chapter 16 plan provisions provide 7.5 hectares of commercial/ retail zoned land (Business 1 Sub-Zone) which will include the higher contaminant generating parking activities. This is compared to PC78 which reduces the area zoned for commercial/ retail area to 5.34 hectares which would be expected to result in a subsequent reduction in contaminant loads.⁶
- 4.10 In terms of changes to hydrology, stormwater modelling was undertaken by Stantec.⁷ The modelling was undertaken to

⁵ As outlined below, PC78 16.10.8.1 (see) and 16.10.8.2 (see) provide a matter of discretion and assessment criterion relating to the use of stabilised roofing material.

⁶ I acknowledge that under PC78 Service 7 Sub-Zone is proposed to increase from 7.5ha to 8.2ha. However, PC78 still proposes an overall decrease in areas zoned for business/service activity and therefore I consider that a reduction in contaminant loads from these areas is expected.

⁷ Mangawhai Central Stormwater Modelling, prepared for Mangawhai Ltd, October 2018, Stantec.

understand effects of climate change, changes in hydrology associated with the landuse changes, and flooding risk within the proposed development.

- 4.11 The modelling has been undertaken following current best practice approaches and is appropriate for understanding the potential changes to hydrology at the site which I discuss later in my evidence.
- 4.12 On-site flooding risk is addressed in the evidence of Mr Dufty. It can be managed through the Site and building design.

5. SENSITIVITY OF RECEIVING ENVIRONMENT

- 5.1 The evidence of Richard Montgomerie, Dr Martin Neale and Dr Shane Kelly describes in detail both the freshwater environments and the coastal environment, including the Mangawhai Harbour. I therefore do not address these in detail, but summarise key points in relation to sensitivity to stormwater runoff below.

Freshwater environments

- 5.2 Dr Neale's evidence describes the freshwater ecological values of wetlands and watercourses on the PC78 Site, except for Wetland 3 which is addressed in the evidence of Mr Montgomerie.⁸ Dr Neale and Mr Montgomerie also address the potential freshwater ecological effects associated with PC78 on the wetlands and watercourses within the Site.
- 5.3 I have considered the potential for development enabled by PC78 to affect wetlands 1, 2A, 2B and 3 on the PC78 Site, both with respect to potential contaminants and potential hydrological impacts. Based on Mr Montgomerie's evidence, Wetland 3 (which predominantly comprises manuka gumland) would be sensitive to both potential stormwater contaminants (with any contaminants discharged into the wetland likely to accumulate within the sediment and increase over time) and potential changes in water level.
- 5.4 Based on my Site visit, there was limited evidence of any defined channels through the Wetland 3 area which supports the potential for accumulation of contaminants within the wetland, with limited

⁸ Refer the Map attachment in Dr Neale's evidence.

potential for flushing of contaminants through the wetland to the coastal margin.

5.5 However, given that PC78 proposes residential areas upstream of Wetland 3 (and Wetlands 1, 2A and 2B), any contaminant loads entering the wetland are expected to be negligible. In addition, in terms of changes in hydrological flows, Mr Alan Leahy presented evidence at the Council-level hearing on the potential impact on Wetland 3 from changes in hydrological flows.

5.6 Mr Leahy concluded that there is little risk of Wetland 3 drying out because of the PC78 development⁹ based on both multiple site walk-overs of the Wetland and stormwater modelling undertaken by Stantec.¹⁰ I have reviewed the evidence prepared by Mr Leahy and based on both the review of his evidence and observations during my site walkover on 22 November 2021 I agree with the key conclusions in paragraph 81 of Mr Leahy's evidence, which are as follows:

- (a) flows into the wetland from the south (the proposed development site) are intercepted by the existing open drain and do not act as a recharge source for the wetland;*
- (b) the wetland outflows travel to the east and northeast to the estuary;*
- (c) the wetland levels are well above the natural tidal range in the estuary and will not be influenced by tide levels;*
- (d) overland flows into the wetland that are not intercepted by the existing open drain occur following quite moderate rainfall events;*
- (e) flows through the wetland (and therefore levels within it) are influenced both by varying natural land levels within it, the existing open drain cut through it and also by the construction of the path through and around it;*
- (f) I could draw no conclusion about whether the wetland was recharged by groundwater or springs within it.*

⁹ Paragraph 100 of evidence by Alan Leahy dated 6 November 2020.

¹⁰ As outlined in paragraph 71 of Mr Leahy's Council-level evidence, Mr Leahy's conclusion was based on: Site visits undertaken on 7 August 2020 and 16 October 2020; A review of the Geotechnical reports from Wiley Consultants Limited; Review of the Mangawhai Central Ecology Private Plan Change Ecology Affects Assessment by Freshwater Solutions, November 2019; and Stormwater runoff calculations prepared by Stantec.

- 5.7 In particular, during my site walk-over:
- (a) I observed similar findings to Mr Leahy regarding limited evidence of significant discharges from the wetland to the harbour with no clear channels;
 - (b) I observed that the wetland is raised above the adjacent high tide level and therefore is unlikely to be tidally impacted;
 - (c) I observed there was limited evidence of any significant flows into the top of the wetland.
- 5.8 I have also reviewed the stormwater calculations undertaken by Stantec and agree with the conclusions that the stormwater calculations indicate that the runoff volume into the wetland will increase in all post-development events. Therefore, I agree with the conclusions reached in paragraph 100 of Mr Leahy's Council-level evidence, being that there is little risk of Wetland 3 drying out because of the PC78 development.
- 5.9 While I agree with Mr Leahy's conclusions that the proposed development is unlikely to result in the wetland drying out, increased flows may potentially have effects on the wetland such as causing channelisation through the wetland, increased water levels, and reduced dry periods. This will be mitigated through the use of rainwater harvesting as well as potential groundwater recharge through the use of swales and raingardens.
- 5.10 In light of the above, PC78 has incorporated several provisions (which I outline below) to ensure that hydrological impacts on Wetland 3, as well as Wetlands 1, 2A and 2B, are appropriately managed.¹¹ PC78 also includes a comprehensive package of provisions addressing potential stormwater contamination effects.

Marine environment

- 5.11 As mentioned above, the Mangawhai Harbour and sensitivity to stormwater discharges is detailed in the evidence of Dr Shane Kelly.

¹¹ See for example matter of discretion 16.10.8.1 ee): "*Stormwater management plan for the hydrology of Wetlands 1, 2 and 3*" and assessment criteria 18.10.8.2 ee): "*For the catchment of Wetlands 1, 2 and 3, a stormwater management plan shall address the best practicable option to maintain surface flow hydrology.*"

Dr Kelly's evidence outlines the effects on marine environments from stormwater discharges, being related to the discharge of litter, sediment and diffuse chemical contaminants.

- 5.12 Dr Kelly outlines that the overall marine ecological values of the Mangawhai Harbour are high, even though multiple human activities have modified and continue to affect the natural ecological values of the harbour. He considers that a high standard of environmental management is warranted for urban development in the surrounding catchment, and that water sensitive approaches to development and stormwater management have been incorporated into PC78. With respect to diffuse stormwater contaminants arising from PC78, Dr Kelly's opinion is that such effects are likely to be localised and minor (or possibly negligible).

Summary

- 5.13 Overall, the on-site wetlands are likely to be sensitive to both stormwater contaminants and changes in the flow regime. The Mangawhai Harbour will also be sensitive to contaminants from stormwater runoff due to cumulative effects with the runoff from existing roads and urban stormwater runoff. PC78 incorporates a range of provisions addressing stormwater management measures/requirements (as outlined in my evidence below, and in the evidence of Mr Dufty and Dr Kelly) to ensure that effects of stormwater, including in the freshwater and marine environments, are appropriately managed.

6. PROPOSED PC78 DEVELOPMENT AND STORMWATER MANAGEMENT CONTROLS

- 6.1 As outlined above, in terms of the potential effects and the sensitivity of the receiving environment, key potential effects of PC78 include:

- (a) The discharge of contaminants from trafficable areas to the wetlands and Mangawhai Harbour; and
- (b) Changes in flows impacting wetlands on-site.

- 6.2 Current best practice stormwater management approaches for water quality involve management of stormwater as close to the source as possible through:

- (a) Source control measures to reduce the loads at source; and
- (b) Treatment at source, including measures to mimic the natural hydrological regime through the use of practices that increase infiltration.

Chapter 16 and PC78 Stormwater Provisions

- 6.3 I have reviewed both the operative Chapter 16 Provisions in relation to stormwater and the provisions in PC78.
- 6.4 I have considered the PC78 provisions against both the current best practice approaches for stormwater management and the environmental sensitivity of the Site.
- 6.5 Overall, I consider that the stormwater provisions in the *operative* Chapter 16 are limited. In my opinion, the PC78 provisions significantly strengthen the requirement to recognise and protect the ecological environment with respect to stormwater management.
- 6.6 In particular, Policy 16.3.1.1 (10) and (11) are as follows:
- 10) *By ensuring that stormwater is managed and treated to maintain and enhance the health and ecological values of the wetlands, streams and the coastal marine area environment.*
 - 11) *All land use, and development and subdivision must be designed and implemented to be consistent with the relevant Regional Stormwater Discharge Consent approved by the network utility operator, including the application of water sensitive design.*
- 6.7 I support the proposed policy which seeks to **maintain** and **enhance** the health and ecological values of the wetlands, streams and the coastal marine area environment.¹² I note that the evidence of Mr

¹² I note that Objective F.1.2 of the Proposed Northland Regional Plans is to:

Manage the use of land and discharges of contaminants to land and water so that:

1) *existing water quality is at least maintained and improved where it has been degraded below the river, lake or coastal water quality standards set out in H.3 Water quality standards and guidelines, and*

...

3) *that the significant values of outstanding freshwater bodies and natural wetlands are protected, and*

....

Montgomery, Dr Neale and Mr Tollemache identify PC78's proposed improvements to the existing environment, including works to restore and enhance the wetlands and waterways.

- 6.8 With respect to Policy 11 above, which references the relevant regional stormwater discharge consent, the focus of the current discharge consent held by KDC is on effects on sediment quality within the estuarine environment with sediment quality limits set for a range of contaminants including copper, zinc, lead, chromium, nickel and cadmium. PC78's best practice approaches seek to avoid or minimise the discharge of these contaminants and therefore are likely to be effective in ensuring discharges from the Site do not result in exceedances of these limits.
- 6.9 I also wish to highlight PC78 Rule 16.7.5(b) which relates specifically to Gum Diggers Track. This requires restoration of the hydrology of the wetland by replacing sections of track with boardwalks and placing subsurface drainage so that water can flow freely. I support this requirement, with the track currently providing an artificial barrier between sections of the wetland.
- 6.10 In terms of stormwater discharges, as these cannot be avoided, the focus is on mimicking the natural environment through water sensitive design. This can provide stormwater treatment, maintenance of groundwater levels through soakage and flow management to mitigate changes in impervious areas.
- 6.11 In terms of the Chapter 16 provisions sought by PC78, water sensitive design – and best practice stormwater management generally – is achieved through a number of provisions, including:
- (a) Policies 16.3.1.1 (10) and (11) addressed above;
 - (b) Policy 16.3.11.1 (1A):

1A) By ensuring that stormwater is managed and treated to maintain and enhance the health and ecological values of the wetlands, streams and the coastal marine area.
 - (c) Policy 16.3.8.1 (9):

While the Proposed Northland Regional Plan is not fully operative, I understand the provisions relating to stormwater are not subject to appeals and therefore are treated as operative and replace the previous provisions.

- 9) *By ensuring a landscaped design approach for new roads; including utilising water sensitive design techniques to achieve stormwater management outcomes.*
- (d) Policy 16.3.8.1 (12):
- 12 By ensuring that stormwater is managed and treated from larger areas of parking.*
- (e) The requirement to provide rainwater harvesting across both reticulated and non-reticulated areas within PC78;¹³
- (f) The requirement to consider low impact design, stormwater treatment and disposal;¹⁴ and assessment criteria 16.7.4.1 e) iv): *“Whether the proposal utilises low impact stormwater design solutions.”*
- (g) Reference to the following best practice Auckland Council stormwater documents (GD01, GD04, GD05, and GD07):¹⁵
- (i) *Guideline Document 2017/01 Stormwater Management Devices in the Auckland Region. December 2017 (Amendment 2).*
- (ii) *Guideline Document 2015/04 Water Sensitive Design for Stormwater. March 2015.*
- (iii) *Guideline Document 2016/05: Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region. June 2016 (incorporating Amendment 2).*
- (iv) *Guideline Document 2021/07 Stormwater Soakage and Groundwater Recharge in the Auckland Region. Version 1, 2021.*
- (h) The requirement to consider stormwater quality treatment and litter management for any activity with more than 30 carparks;¹⁶

¹³ See for example 16.8.3 b)-d) requiring water harvesting on non-reticulated and reticulated lots.

¹⁴ 16.10.8.1 e).

¹⁵ Refer the version of PC78 attached to Mr Tollemache's evidence (16.1.6).

¹⁶ 16.9.3.2 c) and 16.9.3.2.1 c).

- (i) Assessment criteria 16.7.4.1 c) v. relating to litter management for parking;
- (j) The requirement to consider the use of low impact and/or water sensitive stormwater management devices and designs, and outfalls that mitigate concentration flows;¹⁷
- (k) The requirement to consider stormwater quality treatment to protect the environment from contaminants generated from the activity;¹⁸
- (l) Provisions addressing stabilised roofing materials;¹⁹
- (m) The proposed use of swales, rain gardens, grass berms and sand filters to capture and filter stormwater from roads, as outlined in the evidence of Mr Dufty;
- (n) Provisions managing the design of the proposed Central Watercourse;²⁰
- (o) Provisions addressing the hydrology of onsite wetlands;²¹
- (p) Maximum impervious surface requirements which restrict the impervious areas and therefore reduce the increase in peak flows;²²
- (q) Yard controls with respect to the coastal marine area, streams, wetlands, and Sub-Zone 8 (natural environment) which require buildings to be set back 30m from the coastal marine area and 10m from streams, wetlands and Sub-Zone 8 (these controls provide an additional level of protection for these areas from a stormwater management perspective); and
- (r) Rule 16.10.10.4.3 for stormwater disposal.

¹⁷ 16.10.8.2 j).

¹⁸ 16.10.8.2 jj).

¹⁹ PC78 16.10.8.1 eee) and 16.10.8.2 eee) (see footnote 5 above).

²⁰ Discretion 16.10.8.1 k) and assessment criteria 16.10.8.2 l).

²¹ 16.10.8.1 ee): *"Stormwater management plan for the hydrology of Wetlands 1, 2 and 3"* and assessment criteria 18.10.8.2 ee): *"For the catchment of Wetlands 1, 2 and 3, a stormwater management plan shall address the best practicable option to maintain surface flow hydrology."*

²² 16.8.2.9.

- 6.12 In terms of water quality, the PC78 provisions require stormwater treatment for both roads and carparks where there are more than 30 carparks. These are the highest contaminant generating activities on-site and providing stormwater treatment for these is appropriate and I consider is consistent with current best practice.
- 6.13 In terms of changes in hydrological flows, minimising the quantity of impervious surfaces and the use of rainwater harvesting through provision of rainwater tanks will have the biggest impact as this reduces changes in peak flows from the Site. As identified in the list of provisions above, PC78 provisions limit maximum impervious surfaces and require rainwater harvesting. These measures are consistent with current best practice.
- 6.14 With respect to water retention through soakage to mimic natural stormwater processes, PC78 also references GD01 (as identified in the list of provisions above), which includes retention requirements.²³ While water retention through soakage is not excluded in the PC78 provisions and the proposed water quality treatment methods utilised by water sensitive design (including raingardens and swales), the approach to the design is slightly different when designing for both retention (soakage) and treatment compared to designing for just treatment.
- 6.15 In summary, I support the PC78 provisions, and provided they are implemented effectively, I consider they are appropriate to ensure any stormwater discharges are minimised and appropriately managed. They are also consistent with current best practice such as that outlined by Auckland Council Guidance Documents GD01 and GD04.
- 6.16 I note that the PC78 provisions are a shift from the original approach outlined by the operative Chapter 16 which includes a number of online stormwater ponds and wetlands where the existing natural wetlands are located.
- 6.17 In my opinion, the provisions within PC78 are consistent with current best practice approaches and are more appropriate to minimise potential effects associated with stormwater runoff from the proposed development.

²³ For example, GD01 provides for retention of the first 5mm of runoff from rain events.

Stormwater management plan

- 6.18 A Stormwater Management Plan (SMP) was prepared by McKenzie & Co Consultants Ltd.²⁴ The SMP sets out the management practices and mechanisms proposed to avoid or otherwise manage adverse effects associated with the discharge of stormwater.
- 6.19 The SMP seeks to manage stormwater firstly at the source to reduce runoff and contaminants via rainwater harvesting and infiltration devices, and then by ensuring any residual effects are managed through treatment before being discharged from the Site.
- 6.20 The SMP appropriately sets out the overall environmental context for the site including outlining the ecological setting including the wetland systems and the estuarine environment and potential for flooding.
- 6.21 The SMP provides a framework for stormwater management based on:
- (a) On-site retention and re-use of stormwater;
 - (b) Stormwater treatment;
 - (c) Where possible, opportunities for groundwater recharge and enhancement of base flows to streams.
- 6.22 The SMP sets out requirements for stormwater management depending on the proposed land use. In my opinion, the SMP is consistent with both the provisions in PC78, and current best practice for stormwater management.

7. RESPONSE TO MATTERS RAISED IN THE APPEALS/S274 NOTICES

- 7.1 Mangawhai Matters, NZ Fairy Tern Charitable Trust and Mr Peter Rothwell have raised general concerns about stormwater and sediment discharges from Mangawhai Central to the estuary and uncertainty about the likely effects of sediment runoff on marine communities.

²⁴ I have reviewed the version dated October 2019.

- 7.2 As outlined above, Dr Bramley addresses effects on birds in his evidence. However, based on my understanding of the concerns expressed in the NZ Fairy Tern Charitable Trust s274 notice, my evidence will be relevant to their concerns.
- 7.3 As outlined earlier in my evidence, I acknowledge that the ecological values of Mangawhai Harbour are high, and as such, high levels of stormwater and sediment management are warranted to ensure those values are sustained.
- 7.4 As highlighted in my evidence, I consider that the proposed PC78 provisions for stormwater management are appropriate and reflect both the sensitivity of the environment and the nature of the proposed activities. The proposed measures are consistent with current best practice and ensure any potential effects associated with the discharge stormwater and contaminants (including sediment) are minimised.
- 7.5 I note that the evidence of Dr Kelly has concluded that the effects on the Mangawhai Harbour associated with stormwater discharged, in particular with respect to copper and zinc, are likely to be localised and minor (possibly negligible), which I support.
- 7.6 I understand that the proposed measures for erosion and sediment control are consistent with best practice and are in accordance with existing Regional Consent requirements.

Robert Van de Munckhof

17 December 2021