



Report pursuant to s42A Resource Management Act 1991

In the matter of:	A Notice of Requirement to construct and operate a new intermodal rail and freight hub on land between Palmerston North and Bunnythorpe
And:	A hearing by Palmerston North City Council pursuant to s100A
Requiring Authority:	KiwiRail Holdings Ltd
Hearing date:	9 August 2021

S42A Technical Evidence: Stormwater and Flooding

By: David Christopher Arseneau and Allison Reiko Baugham

1 Executive Summary

1. Our assessment of the Notice of Requirement in the context of stormwater management considers a range of matters, including the key issues with the designation, the relevant planning framework, an overview of the existing environment, an assessment of KiwiRail's investigations and findings, the likely effects of the designation, and the various submissions received that relate to stormwater topics.
2. The key issues from a stormwater and flooding perspective include the following:
 - a. flooding of upstream and downstream areas: the designation appears to adequately mitigate the potential for upstream and downstream flooding risk, with the exception of the impact of filling a portion of the 0.5% AEP flooded area of the Mangaone Stream; further details are expected at the consenting stage;
 - b. stream erosion: the technical analysis completed by the requiring authority concludes that stream erosion will not be a significant issue due to the modified nature of the existing streams, which we do not agree with; a more detailed erosion assessment is recommended to be provided at the consenting stage;
 - c. water quality impairment: the designation and supporting technical analysis completed by the requiring authority appear to adequately mitigate potential water quality impairment effects, but further details are expected at the consenting stage to confirm;
 - d. fish passage through the site: the designation and supporting technical analysis completed by the requiring authority have provided accommodation for fish passage through the site, but we have some concerns on the feasibility and effectiveness of these measures; further details are expected at the consenting stage to confirm;
 - e. impacts to aquatic habitats resulting from stormwater quantity or quality effects: the designation and supporting technical analysis completed by the requiring authority appear to adequately mitigate the potential for aquatic habitat impacts related to stormwater; further details are expected at the consenting stage to confirm.

3. We are of the opinion that the Notice of Requirement is generally in alignment with the relevant planning framework, although we feel that insufficient information has been provided to conclusively assess the potential for downstream erosion, the potential impact of site fill within the 0.5% AEP flooded area of the Mangaone Stream, and the effectiveness of the proposed fish passage mitigation measures. However, the planning framework comprehensively addresses potential effects related to stormwater discharges, providing an effective means to regulate the development of the Freight Hub site to mitigate effects.
4. We generally agree with KiwiRail's characterisation of the existing environment at the designation site, as well as their data collection and assessment techniques, both in terms of the Multi Criteria Analysis in site selection and the subsequent stormwater flooding assessment methodology of the designation site.
5. The adequacy of KiwiRail's investigations and interpretation of the findings of those investigations, as evidenced through the original Notice of Requirement and subsequent section 92 response. In general, we have found the investigations and findings adequate and appropriate for the purpose of the Notice of Requirement, but note that uncertainty remains on several key issues including downstream erosion effects, feasibility and effectiveness of fish passage measures through the proposed long culverts, and impacts on the flooded area of the Mangaone Stream (issues which are considered unlikely to impact the designation area).
6. The likely key effects (positive and adverse) on the environment of confirming the Notice of Requirement, along with the appropriateness of proposed mitigation measures or monitoring. In general, we agree with the characterisation of key effects and appropriateness of proposed mitigation, with the understanding that comprehensive detailed design is required to achieve full confidence on the adequacy of proposed stormwater mitigation.
7. Submissions relating to stormwater and flooding. In general, we believe that the concerns raised in the submissions can be adequately addressed during detailed design and do not affect the Notice of Requirement. However, we have flagged that certain issues should be further investigated by PNCC independent of the Notice of Requirement.

8. We consider it critical to the successful outcome of the Notice of Requirement that the Stormwater Management Framework as outlined in Appendix B of Technical Report G – Stormwater Flooding Assessment be included in the Notice of Requirement conditions for future submission by KiwiRail at the earliest opportunity for review by the territorial authority and Horizons Regional Council.

Contents

1	EXECUTIVE SUMMARY	2
2	INTRODUCTION	7
2.1	Author #1 – David Arseneau	7
2.2	Author #2 – Reiko Baugham	7
2.3	Expert Witnesses – Code of Conduct	8
3	BACKGROUND AND SCOPE OF EVIDENCE	9
3.1	Background	9
3.2	Scope of evidence	10
3.3	Reports and material considered	10
3.4	Site visit	11
3.5	The Statutory and Planning Framework	11
3.5.1	District Plan: Industrial Zone	12
3.5.2	District Plan: Subdivision	14
3.5.3	District Plan: Rural Zone	15
3.5.4	District Plan: Natural Hazards	15
3.5.5	Horizons Regional Council One Plan	16
3.5.6	National Policy Statement for Freshwater Management 2020	18
3.5.7	Resource Management (National Environmental Standards for Freshwater) Regulations 2020	20
4	EXISTING ENVIRONMENT	20
5	DATA COLLECTION AND ASSESSMENT TECHNIQUES	21
5.1	Multi Criteria Analysis and Decision Conferencing	21
5.2	NoR Stormwater Flooding Assessment	22
6	EFFECTS OF THE NOR	22
6.1	Construction Phase Effects	22

6.2	Operational Phase Effects	23
6.3	Consideration of alternative sites, routes or methods	26
7	MITIGATION OF EFFECTS	27
7.1	Mitigation of Construction Phase Effects	27
7.2	Mitigation of Operational Phase Effects	28
7.3	Mitigation of Ecology and Landscape Effects	31
8	SUMMARY OF NOR EFFECTS AND MITIGATION ASSESSMENT AGAINST STATUTORY FRAMEWORK	32
8.1	Palmerston North City Council District Plan	32
8.2	Horizons Regional Council One Plan	33
8.3	National Policy Statement for Freshwater Management 2020	33
8.4	Resource Management (National Environmental Standards for Freshwater) Regulations 2020	35
9	REVIEW OF SUBMISSIONS	36
9.1	Stormwater and flooding effects	36
9.2	Environmental effects	38
9.3	Effects of hazardous substances	39
10	DRAFT REQUIREMENT CONDITIONS	39
11	CONCLUSIONS	41

2 Introduction

2.1 Author #1 – David Arseneau

9. My full name is David Christopher Arseneau. I hold a degree in Civil Engineering with a specialisation in Water Resources from the University of Waterloo (Canada), obtained in 2008, and a Master of Engineering in Public Policy degree from McMaster University (Canada), obtained in 2011. I am a licensed Professional Engineer (P.Eng.) in the Canadian province of Ontario (since 2011).
10. I am a Senior Water Engineer, with 13 years of experience in stormwater management, flood assessment and mitigation, erosion and sediment control, and the restoration of natural streams.
11. I have been a practicing water resources engineer since 2008 and have been working in New Zealand since August 2019. I have experience in the analysis, design and construction of a variety of water resources infrastructure in Canada, including stormwater management systems/facilities, drainage improvements, flood risk assessments and river engineering works. In New Zealand I have undertaken development of stormwater management plans for large residential developments in the Palmerston North area, such as the Aokautere and Kākātangiata growth areas (approximately 250 ha and 690 ha in size, respectively), and have worked with Palmerston North City Council on numerous smaller subdivision reviews and stormwater management plans throughout the City. I have also undertaken design of stormwater attenuation facilities for local Councils, fish passage assessments in urban streams, and coordination of stopbank upgrades for flood protection in Gisborne.
12. I have prepared this evidence on behalf of the territorial authority, Palmerston North City Council, in relation to the Notice of Requirement (“**NoR**”) for the KiwiRail Regional Freight Hub (“**the Freight Hub**”) lodged by KiwiRail Holdings Ltd (“**KiwiRail**”). My evidence accompanies the planning report being prepared by the determining authority under section 42A of the Resource Management Act 1991 (the “**Act**”).

2.2 Author #2 – Reiko Baugham

13. My full name is Allison Reiko Baugham. I hold a dual degree in Civil Engineering and Engineering & Public Policy from Carnegie Mellon University (USA)

received in 2008, and a Master of Engineering degree in Environmental Engineering & Water Resource Systems from Cornell University (USA) received in 2009.

14. I am a Chartered Professional Engineer (CPEng) of Civil Engineering, my practice area being investigation, design and construction management of water, wastewater and stormwater reticulation systems. I am also a licensed Professional Engineer (PE) in the state of New York, USA.
15. I am a senior water engineer with 12 years of experience in the planning and design of three waters infrastructure. In addition to infrastructure design my experience also includes hydraulic / hydrological modelling of stormwater for local government. I transferred to New Zealand in 2013 and have mainly be involved in projects for local councils in the Manawatu-Whanganui region.
16. I have served as a Consultant Engineer for Palmerston North City Council since 2017, assisting in a myriad of capital works projects relating to stormwater and planning across the city. As part of my role I have assisted in preparing the stormwater servicing assessments for multiple Plan Changes and providing expert evidence on behalf of the Council. I have also provided assistance to the Stormwater Activity Manager and Development Team since 2016 reviewing resource consents, subdivision plans and stormwater management plans. In addition to my work at Palmerston North City Council, I have also been involved in developing the Stormwater Master Plan for Whanganui District Council, various structure plans and servicing assessments for Whanganui and Manawatu District Councils, and have undertaken impact assessments for Whanganui and Horowhenua District Councils as they relate to growth and stormwater effects.
17. I have prepared this evidence on behalf of the territorial authority, Palmerston North City Council, in relation to the NoR for the Freight Hub lodged by KiwiRail. My evidence accompanies the planning report being prepared by the determining authority under section 42A of the Act.

2.3 Expert Witnesses – Code of Conduct

18. Both authors make the confirmation below.
19. I confirm that I have read the Code of Conduct for Expert Witnesses in the Environment Court Practice Note 2014 and that I agree to comply with it. I

confirm that I have considered all the material facts that I am aware of that might alter or detract from the opinions that I express, and that except where I state I am relying on information provided by another party, the content of this evidence is within my area of expertise.

3 Background and Scope of Evidence

3.1 Background

20. KiwiRail is seeking to designate approximately 177.7 hectares of land between Palmerston North Airport and Bunnythorpe for a new Regional Freight Hub.
21. The Freight Hub will consist of a centralised hub incorporating tracks, marshalling yards, maintenance and service facilities, a train control and operation centre, freight handling and storage facilities (including for logs and bulk liquids), provision of access, including road and intersection upgrades where required, and specific mitigation works including noise walls/bunds, stormwater management devices and landscaping. In addition, the North Island Main Trunk rail line will be relocated to sit within the new designation area and directly adjacent to the Regional Freight Hub. The activities that take place at KiwiRail's Tremaine Avenue freight yard (apart from the passenger terminal and the network communications centre) will be relocated to the new site to form part of the new Regional Freight Hub.
22. A detailed description of the NoR is set out in 6.3 of the Assessment of Environmental Effects (AEE) submitted by the requiring authority and a summary description in the s42A Planning Assessment.
23. With particular regard to stormwater and flooding aspects of the site, the Freight Hub will include three stormwater attenuation ponds, two of which will host treatment wetlands within their footprints. Streams that currently flow through the site from east to west will be managed primarily through diversion and piping, with one stream located along the north edge of the rail yards proposed to be restored and naturalised. The proposed Freight Hub site is located adjacent to the Mangaone Stream and partially within the stream's mapped 0.5% annual exceedance probability ("**AEP**") flooding extents as determined by Horizons Regional Council and published in the Palmerston North City District Plan.

3.2 Scope of evidence

24. We have been asked to assess the stormwater and flooding elements of the NoR. Our assessment considers the following matters:
- a. The key issues from a stormwater and flooding perspective.
 - b. The relevant planning framework.
 - c. An overview of the existing environment in terms of the scale and nature of hydrologic conditions in the catchment of the proposed Freight Hub site(s).
 - d. The adequacy of KiwiRail's investigations and interpretation of the findings of those investigations.
 - e. The likely key effects (positive and adverse) on the environment of confirming the NoR.
 - f. The appropriateness of proposed mitigation measures or monitoring.
 - g. Submissions relating to stormwater and flooding.
 - h. Any other matters.
25. Our evidence should be read in conjunction with expert evidence of the other experts who have submitted briefs of evidence alongside the s42A Planning Assessment.

3.3 Reports and material considered

26. As part of preparing this statement of evidence, we have read the following reports and documents:
- Designation drawings - Appendix B - Concept Plan, and Appendix C - Landscape Plan, Cross Sections;
 - Multi Criteria Analysis and Decision Conferencing Process:
 - Appendix F - MCA Summary Report
 - Appendix F4 - MCA Natural Environment Assessment
 - Appendix F8 - MCA Resilience Assessment

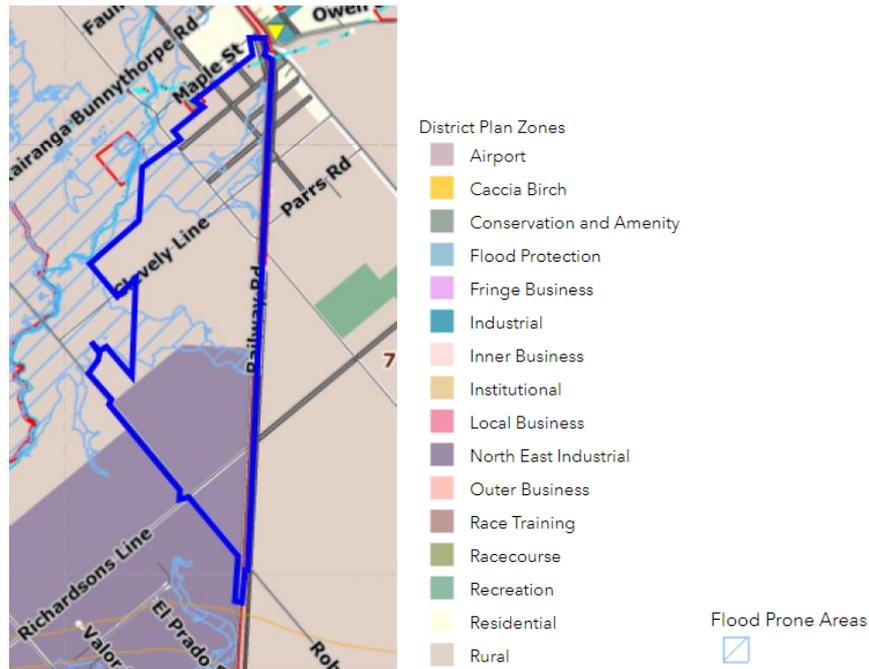
- Notice of Requirement and Assessment of Environmental Effects – KiwiRail Regional Freight Hub (October 2020);
- Technical Report A - Design Construction and Operation Report;
- Technical Report F - Assessment of Ecological Values and Effects;
- Technical Report G - Stormwater Flooding Assessment;
- Draft Notice of Requirement Conditions (as updated by the s92 response, February 2021 – Appendix B – Updated NoR Conditions);
- Section 92 response from KiwiRail (dated February 2021) – Attachments 2a and 2b Ecology (where relevant to stormwater), Attachment 6 – Stormwater, and Attachment 10 Landscape and Visual (where relevant to stormwater).

3.4 Site visit

27. We undertook a site visit on 02 November 2020 and are familiar with the surrounding environment. We have taken note of the existing water features, flow paths and overall topography as it may relate to the proposed Freight Hub and the NOR.

3.5 The Statutory and Planning Framework

28. The statutory framework relevant to the evaluation of the NoR is set out in the s42A Planning Assessment. For the purposes of preparing this evidence, we have had particular regard to the following planning documents, which are relevant to assessing the stormwater and flooding effects of the NoR.
29. The Freight Hub straddles two different zones in the Palmerston North City District Plan (“**District Plan**”) as shown in the figure below. These are: North East Industrial and Rural. The Freight Hub area also contains several areas of Flood Prone land.



Landuse Zones in the Region of the Freight Hub Site (Source: Stormwater Flooding Assessment, Figure 3, Stantec, October 2020)

3.5.1 District Plan: Industrial Zone

30. The District Plan Section 12A: North East Industrial Zone outlines several provisions related to stormwater management in the Freight Hub area, including but not limited to the following:

- Objective 3, Policy 3.4 “To manage adverse effects on the environment from inundation or the discharge of stormwater.”
- Objective 3, Policy 3.7 “To ensure the adverse effects of stormwater runoff in the North East Industrial Zone Extension Area are mitigated by utilising on-site primary stormwater management with collection and storage, and permeable surfaces, in addition to integrated secondary processing through common watercourse reserve areas.”
- Objective 3, Policy 3.8 “To require an integrated approach to the provision of stormwater management that recognises the capacity of existing systems and natural drainage patterns within the North East Industrial Zone Extension Area.”
- Objective 3, Policy 3.9 “To require the use of sustainable urban drainage systems and low impact design systems throughout the North East Industrial Zone Extension Area.”

- Objective 3, Policy 3.10 “To ensure stormwater management contributes to the visual amenity of the development.”
- R12A.6.2 provides performance standards for stormwater management including:
 - Any activity must provide on-site retention of the first 5 mm of a 24-hour rainfall event.
 - 10% of a site must be set aside for on-site stormwater retention purposes.
 - Any activity must ensure that runoff generated beyond the first 5 mm of a 24-hour rainfall event is directed to a Watercourse Reserve Area.
- R12A.6.2 provides assessment criteria for stormwater management including:
 - The extent to which proposed on-site stormwater retention and detention measures ensure hydraulic neutrality is achieved in the 1% AEP plus climate change storm, as per NZS 4404:2010, and that there is no increase in stormwater effects on surrounding areas.
 - Whether on-site Water Sensitive Design measures have been put in place to assist with achieving hydraulic neutrality.
 - The extent to which Water Sensitive Design measures contribute to the visual amenity of the development.

31. Although the above will most likely apply to the Freight Hub area, Section 12: Industrial Zone of the District Plan also outlines provisions related to protection of the environment in industrial zoned areas. This includes:

- Objective 3, Policy 3.1 “To manage the adverse environmental effects of Industrial Zone activities on those areas at the interface with the Industrial Zone.”

3.5.2 District Plan: Subdivision

32. District Plan Section 7: Subdivision outlines several provisions related to stormwater management generally related to subdivision or modification of land title boundaries, including but not limited to the following:

- Objective 1, Policy 1.3 “To ensure that all proposed new lots have been designed to allow development and use without any adverse effects on the environment which cannot be adequately avoided, remedied or mitigated.”
- Objective 1, Policy 1.4 “To avoid the intensive urban subdivision of land which is subject to significant physical limitations and/or natural hazards.”
- Objective 2, Policy 2.9 “To safeguard people, property and the environment from the adverse effects of surface water by ensuring that: [abridged list]
 - The layout and functioning of the stormwater drainage system:
 - adequately services its catchment;
 - incorporates Water Sensitive Design principles wherever appropriate;
 - caters for a 1% AEP rainfall event (100-year flood) using a system appropriate for the intended land use;
 - ensures that stormwater disposal from the subdivision would not increase the risk of inundation in urban areas.
 - In rural areas, stormwater runoff from new subdivisions and subsequent uses should be discharged to existing water courses in a manner which will not damage property or cause erosion of any riverbank or bed, or increase sedimentation of any river bed.
- Objective 5, Policies 5.8 to 5.11:
 - To have stormwater management measures in place in advance of industrial development within the North East Industrial Zone Extension Area.

- To demonstrate an integrated approach to the provision of stormwater management that recognises the capacity of existing systems and natural drainage patterns within the North East Industrial Zone Extension Area.
- To require the use of sustainable urban drainage systems and low impact design systems throughout the North East Industrial Zone Extension Area.
- To ensure stormwater management contributes to the visual amenity of the development within the North East Industrial Zone Extension Area.

3.5.3 District Plan: Rural Zone

33. District Plan Section 9: Rural Zone does not contain specific requirements for stormwater management, and notes that responsibility for activities in the beds of rivers and lakes or discharges of contaminants into the environment (land, air or water) sits with the Manawatu-Wanganui Regional Council (Horizons Regional Council). Although much of the designation area is currently zoned as rural landuse, the NoR will put the land to an industrial use. Accordingly, we have considered the proposal against the provisions of the industrial zone, which are appropriate for framing and considering the effects of the NoR.

3.5.4 District Plan: Natural Hazards

34. District Plan Section 22: Natural Hazards outlines several provisions to protect development in flood prone areas. Relevant policies include, but are not limited to, the following:

- Objective 2, Policy 2.1 “To exclude development on hazard-prone land where the effects of the hazard cannot be effectively avoided, remedied or mitigated.”
- Objective 2, Policy 2.2 “To establish appropriate controls to avoid, remedy or mitigate the effects of natural hazards.”
- Objective 2, Policy 2.3 “To control subdivision and development within the Flood Protection Zone and within Flood Prone Areas to avoid or

mitigate adverse effects of flooding hazards on people, property, infrastructure and the environment."

- R22.6.1 identifies permitted activities within Flood Prone Areas for non-habitable structures in relation to obstruction of overland flow paths.

3.5.5 Horizons Regional Council One Plan

35. Horizons Regional Council One Plan contains several critical provisions and requirements relevant to stormwater management and flooding, and the Freight Hub will ultimately require resource consent from Horizons Regional Council for the discharge of stormwater from the site (at minimum).

36. A summary of some of the relevant policies and site-specific criteria for the NoR is included below in order to frame a general assessment of the NoR against the One Plan requirements. This is not to be considered a formal planning assessment and was only carried out to inform our stormwater assessment.

- Policies related to stormwater discharges outlined in Chapter 5 Water, recognised through Significant Resource Management Issues 5-1 Water Quality and 5-3 Beds of Rivers and Lakes, such as:
 - The NoR is located within the Upper Manganone Stream Water Management Zone (zone Mana_11d in the One Plan), with site-specific/reach Surface Water Management Values in Flood Control and Drainage functions. This requires that "The integrity of existing flood and river bank erosion protection structures and existing drainage structures is not compromised and the risks associated with flooding and erosion are managed sustainably" (Policy 5-1, Table 5.2).
 - Policy 5-2 establishes water quality targets for surface water in each Water Management Zone, which will be relevant for the NoR stormwater discharges.
 - Policy 5-6 requires discharges and land use activities be managed in a manner which maintains existing groundwater quality, which will be relevant for the NoR in how contaminated runoff is managed on-site and how it may affect the nearby drinking water bores.

- Policy 5-9 requires that point-source discharges to surface water have regard for water quality management strategies and targets, which will be relevant for the NoR discharges from the proposed stormwater management ponds and wetlands.
- Policy 5-22 requires management of effects on adjacent rivers with respect to flood capacity, passage of debris, erosion and stability, habitat diversity and morphology, natural character, and fish passage both upstream and downstream.
- Policy 5-24 states management requirements for those reaches with an identified Surface Water Management Value of Flood Control and Drainage, as is the case for the NoR site, which generally requires the existing degree of flood hazard and erosion protection to be maintained or enhanced.
- Policies related to flooding hazards outlined in Chapter 9 Natural Hazards, recognise through Significant Resource Management Issue 9-1 Effects of Natural Hazard Events, such as:
 - The NoR is located very near the upstream limit of the Taonui Basin Spillways system, as identified in Schedule J, Figure J:2 of the One Plan; specifically, the NoR is adjacent to the Roberts Line spillway of the Mangaone Stream, and will need to have special regard for maintaining the flood conveyance and protection function of the system.
 - Portions of the NoR are located on land that is expected to be inundated in a 0.5% AEP storm event, as shown in available flood mapping data from Horizons Regional Council's online flood mapping service. As a result, Policy 9-2 of the One Plan, which governs development in areas prone to flooding, would require flood hazard avoidance or mitigation (if avoidance not possible) for both the proposed use and potentially impacted existing uses.
 - Policy 9-5 Climate Change requires that the territorial authority take a precautionary approach when assessing the effects of climate change on the scale and frequency of natural hazards,

including stormwater discharges, activities adjacent to rivers, and flood mitigation activities. These will apply to the NoR.

- Objectives related to the impacts of stormwater discharges to the environment outlined in Chapter 14 Discharges to Land and Water, such as:
 - Rule 14-18 details the requirements for a stormwater discharge to water to be considered a Permitted Activity, whereas Rule 14-19 classifies any discharges that do not comply with Rule 14-18 as a Restricted Discretionary activity. These rules and conditions will be relevant to the NoR in determining the need for resource consent for the stormwater discharges; however, there is insufficient information at this stage to make a definitive assessment of the NoR activity classification. The requiring authority will need to demonstrate compliance of the proposed activity with the conditions of Rule 14-18 in order to substantiate status as a permitted activity.
- Objectives related to impacts to rivers outlined in Chapter 17 Activities in Artificial Watercourses, Beds of Rivers and Lakes, and Damming, such as:
 - Section 17.3, Table 17.2 details general requirements for activities involving the beds of rivers such that the life-supporting capacity condition of the watercourse is maintained. In particular for the NoR, this will be relevant for the discharge of stormwater into the downstream environment, and for impacts to the existing watercourses that traverse the site.
 - Rule 17-15 identifies a range of activities on or under a river with a Surface Water Management Value of Flood Control and Drainage, or adjacent land.

3.5.6 National Policy Statement for Freshwater Management 2020

37. The National Policy Statement for Freshwater Management 2020 ("**NPS FM**") must be given effect by regional and territorial councils in any aspect of their jurisdiction which involves freshwater. From the perspective of the determining authority, this includes assessing the NoR against the objectives and policies of

the NPS FM to gauge if sufficient consideration for the NPS FM has been made in the assessment of effects and proposed mitigation.

38. The objective of the NPS FM is to ensure that natural and physical resources are managed in a way that prioritises:

- first, the health and well-being of water bodies and freshwater ecosystems;
- second, the health needs of people (such as drinking water);
- third, the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future.

39. The NPS FM includes 15 policies that support and enable the primary objective; those policies that are considered most relevant to the NoR in terms of stormwater management and that will be briefly reviewed in this report include the following:

- Policy 1: Freshwater is managed in a way that gives effect to Te Mana o te Wai.
- Policy 3: 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.
- Policy 4: Freshwater is managed as part of New Zealand's integrated response to climate change.
- Policy 5: Freshwater is managed through a National Objectives Framework to ensure that the health and well-being of degraded water bodies and freshwater ecosystems is improved, and the health and well-being of all other water bodies and freshwater ecosystems is maintained and (if communities choose) improved.
- Policy 7: The loss of river extent and values is avoided to the extent practicable.
- Policy 9: The habitats of indigenous freshwater species are protected.

- Policy 13: The condition of water bodies and freshwater ecosystems is systematically monitored over time, and action is taken where freshwater is degraded, and to reverse deteriorating trends.
40. A high-level assessment of the NoR in relation to the above objectives and policies is made in Section 8.3 of this report.

3.5.7 Resource Management (National Environmental Standards for Freshwater) Regulations 2020

41. The National Environmental Standards for Freshwater (“**NES F**”) are regulations under the Resource Management Act that details the consent classification for a range of activities that involve or impact freshwater in some way. Of particular interest for this report in assessing the stormwater aspects of the NoR are Sections 70 and 71 of the NES F which outlines conditions for the placement, use, alteration, extension, or reconstruction of a culvert in, on, over, or under the bed of any river or connected area to be considered a permitted activity. Section 70 generally indicates that any culvert must comply with the requirements of a “Stream Simulation” design as detailed in the New Zealand Fish Passage Guidelines (NIWA, 2018) in order to be considered a permitted activity, else under Section 71 it becomes a discretionary activity.

4 Existing Environment

42. The existing environment related to stormwater and flooding concerns is described in Section 4 of KiwiRail’s Technical Report G – Stormwater Flooding Assessment, including details of the drainage catchments, flood plains, land use, zoning and ecological conditions. We generally agree with the characterisation of the existing environment in Section 4 except for the description of existing ecology (Section 4.4 in Technical Report G), described below.
43. The requiring authority indicates that there are no identified sensitive aquatic environments within or immediately downstream of the Freight Hub site. In our opinion, this conclusion is premature considering KiwiRail’s lack of extensive and intensive ecological investigations across the Freight Hub site. However, ecological considerations are covered in much greater detail in the expert evidence prepared by Justine Quinn on behalf of the determining authority, and we defer to her evidence on these matters.

5 Data Collection and Assessment Techniques

44. Our evaluation of the requiring authority's data collection and assessment techniques focused on the two primary stages of assessment completed so far: the Multi Criteria Analysis ("**MCA**") and Decision Conferencing to determine a preferred Freight Hub location (Section 5.1), and the subsequent Stormwater Flooding Assessment of the preferred location that was carried out to support the establishment of the NoR designation area (Section 5.2).

5.1 Multi Criteria Analysis and Decision Conferencing

45. The primary MCA component of interest to our stormwater and flooding evidence is the "Resilience Assessment", included as Appendix F8 with the MCA documents submitted by the requiring authority. The Resilience Assessment details geotechnical (seismic and liquefaction) and regional stormwater/flooding hazards for the nine long-list sites. This evidence report evaluates only the stormwater/flooding components of the Resilience Assessment.
46. The stormwater/flooding assessment completed by the requiring authority relied primarily on Flood Extent Maps and Modelled Wet Areas Maps published by Horizons Regional Council. This was supplemented by available news reports, photographs, websites and journal articles about historical flooding events. Reliance on these data sources is considered appropriate for the purpose of the MCA.
47. The assessment methodology assigned a score from 1 to 5 to each potential Freight Hub location based on the estimated impact to resilience from geotechnical and flooding hazards, with 1 indicating low impact and 5 indicating high impact. The assigned scores accommodated both geotechnical and flooding hazard impact into a single number. For the purpose of the MCA process this is considered appropriate.
48. Further commentary on the MCA results for site selection are included in Section 6.3 of this evidence report.

5.2 NoR Stormwater Flooding Assessment

49. The methodology employed by the requiring authority in the Stormwater Flooding Assessment (Technical Report G) included a desktop and high-level modelling assessment of upstream and downstream hydrologic and hydraulic conditions at the preferred Freight Hub site (Site 3).
50. The assumptions made by the requiring authority in the high-level modelling assessment are described in Appendix A of Technical Report G. These assumptions were reviewed by the authors in a June 2020 meeting with the requiring authority's stormwater expert (Allan Leahy), and we are in agreement with the approach for the purpose of the NoR and impact assessment.
51. Further commentary on the results of the stormwater flooding assessment is included throughout Section 6.

6 Effects of the NoR

52. The requiring authority has provided a high-level assessment of potential stormwater effects resulting from the NoR in Technical Report G, considering both positive and negative effects. The effects are grouped into those that may occur during the construction period and those that may occur during operation of the Freight Hub. These groups of effects are evaluated for completeness and appropriateness in Sections 6.1 and 6.2 for construction phase and operational phase effects, respectively.

6.1 Construction Phase Effects

53. The primary potential effect during the construction phase, as identified in Technical Report G, is the discharge of sediment from the construction site, with associated impacts to aquatic organisms and habitat. The Technical Report acknowledges this potential effect, but generally dismisses the risk due to the lack of identified sensitive receiving environments downstream of the site, and due to the erosion and sediment control plan that will be developed prior to construction. We agree that this effect is best mitigated through a robust erosion and sediment control plan, to be provided by the requiring authority at the time of resource consent and engineering approval; however, we wish to emphasise that the lack of identified sensitive environments

downstream of the Freight Hub would not in any way reduce or eliminate the requirement to prevent sediment discharges.

54. Additional construction phase effects that will require mitigation include upstream and downstream flooding effects, and erosion effects to downstream watercourses. Both of these effects have been acknowledged in the operational phase in Technical Report G, but the potential for the effects to occur will be present through much of the construction phase as well. Mitigation of these effects should be put into place early in the construction phase, prior to modification of the existing topography and drainage pathways. This can be addressed generally through careful consideration in the staging of Freight Hub construction. This is especially pertinent given the submissions, further discussed in Section 9.1, for both the increase in runoff generated and the potential for contaminated runoff.
55. An additional aspect of stormwater effects to consider for the construction phase is the staging of stormwater quality treatment measures over the extended construction period and while portions of the site are operational. The primary treatment devices have been identified as the treatment wetlands located downstream of the Freight Hub, which is appropriate for a stabilised operational site. However, the treatment wetlands are likely not suitable to manage runoff from the construction site due to the high sediment loads from exposed earthworks, and therefore will not be in place to provide treatment for any operational/stabilised areas. Interim stormwater treatment measures may be required to service areas of the Freight Hub as they become operational, which can be addressed generally through careful consideration in the staging of Freight Hub construction.

6.2 Operational Phase Effects

56. The potential negative stormwater effects associated with operation of the Freight Hub, as detailed in Technical Report G provided by the requiring authority, include the following:
 - Increased risk of flooding to upstream areas, due to changes in the existing conveyance systems, to potential blockages in the proposed culverts, and to the general topography change that will result in a significantly higher site than existing (effectively serving as a dam);

- Increased risk of flooding to downstream areas due to more rapid passing of flows from upstream areas, loss of floodplain storage through site fill, and increased impervious surfaces generating more runoff;
 - Loss of stream system habitat and fish passage through piping of the existing watercourses on the site;
 - Deterioration of water quality in receiving systems due to the change in landuse on the site, both in terms of discharge of contaminated runoff and increased temperature of runoff;
 - Erosion of receiving watercourses due to a change in hydrology on the site.
57. An additional effect that is not explicitly discussed in Technical Report G, except for a brief mention in Appendix B, is the disruption of surface water – groundwater interaction through development of the site. Overall, the increase of impervious surfaces on the site, and lining of stormwater management facilities to prevent infiltration of contaminants into the groundwater, may reduce the volume of stormwater that locally soaks into the ground. On the scale of the NoR this would not be expected to significantly effect existing groundwater takes or nearby deep bores (although this requires further assessment), but the localised reduction of soakage may result in undesired settling of fill beneath the Freight Hub. Assessment of this effect is outside the scope of this report, and is recommended to be considered during detailed design.
58. In general, the negative stormwater effects for the operational phase of the Freight Hub, as detailed in Technical Report G and for the purpose of the NoR, adequately characterise the range of expected stormwater effects that require consideration for mitigation.
59. The potential positive stormwater effects associated with operation of the Freight Hub, as detailed in Technical Report G provided by the requiring authority, include the following:
- Reduced upstream flooding through upgrading of existing culverts under both the North Island Main Track and Railway Road
 - Improved fish passage through culvert upgrades

- Improved stream environment through reconstruction of selected stream reaches through the site
 - Reduced sediment loads through landuse change from rural to urban landuse and general stabilisation of exposed earth surfaces
 - Reduced load on public water supply system from on-site rainwater collection and reuse
 - Implementation of Best Management Practices to manage stormwater and flooding issues through comprehensive development of the site, rather than piecemeal development
60. Technical Report G notes that the positive effects summarised above “will be realised through the active consideration of them during the design and Site development phases.” Our opinion is that it is important to emphasise this statement, and understand that the positive stormwater effects are derived from the mitigation of the negative effects, and from the general assumption that the existing site conditions provide a poor to negligible ecological function.
61. The s92 response provided by the requiring authority, specifically Attachment 6 Stormwater, included additional clarification on the extent of the positive stormwater effects described in Technical Report G, the AEE, and other NoR documents. Specifically, the following points are clarified:
- The positive effect on fish passage from upgraded culverts is related primarily to the provision of permanent fish passage through the culverts, which is an improvement on the reported current conditions where passage is sometimes limited due to dry conditions and poor-quality stream form
 - The positive effect on stream environment relates only to the proposed restoration of the existing channel along the northern boundary of the site and is “not intended to imply there is an overall net positive gain”
 - The positive stormwater quality effects are associated primarily with the reduction of sediment and nutrient (i.e., nitrogen and phosphorus) contaminant loadings through removal of rural agricultural landuse
62. The s92 response clarifications on the positive effects were helpful and in our opinion better represent the complex and nuanced potential stormwater

effects of the Freight Hub. Although some ambiguities remain about several of the negative and positive effects relating to their extent and applicability to the site, in general the effects have been adequately described for the purpose of the NoR.

63. It is further noted, however, that there is a gap in identifying the effects during and following any possible future decommissioning of the Freight Hub site. This was not raised as part of the s92, but is relevant nonetheless; in particular, the risk of contamination discharge in stormwater runoff once the site is no longer being operated and maintained. It is expected that the potential for runoff contamination will persist after the site is decommissioned, incurring an obligation to restore the site to pre-development conditions, stabilise the site to mitigate contaminant mobilisation (similar to a landfill cap), or to maintain the stormwater management system until such time that contaminant risk is negligible.

6.3 Consideration of alternative sites, routes or methods

64. The MCA site selection assessment methodology assigned a score from 1 to 5 to each potential Freight Hub location based on the estimated impact to resilience from geotechnical and flooding hazards, with 1 indicating low impact and 5 indicating high impact. The assigned scores accommodated both geotechnical and flooding hazard impact into a single number; however, the scores appear to appropriately acknowledge the relative flooding impact at each site, and we do not dispute the Resilience Assessment results. The requiring authority does not ignore the potentially challenging flood risk conditions at Site 3, the preferred location, due to the adjacent Mangaone Stream, as it is ranked as the highest flood impact among the three short-listed sites. We generally support the assessment that the flood impact can be managed and resolved at the detailed design stage for the preferred Freight Hub location.
65. Alternative methods for the conceptual sizing of stormwater mitigation measures were not employed in the assessment of stormwater flooding conditions at the proposed Freight Hub site, as documented in Technical Report G; however, the methods and outcomes of the assessment are considered appropriate for the purpose of the NOR.

7 Mitigation of Effects

66. The potential for effects related to stormwater runoff from the Freight Hub site are present for the entire life cycle of the facility, including construction, initial opening, full build-out operations and ultimate decommissioning. The potential stormwater effects related to each of these periods have been discussed in Section 6. The requiring authority provides a proposal for mitigation of these effects for both the construction and operational phases in their Technical Report G submitted with the NoR, specifically section 6 of the Technical Report. The suitability of the proposed mitigation measures is discussed in Sections 7.1 and 7.2 below for construction and operational phases, respectively. No mitigation measures have been proposed for decommissioning of the site.
67. In addition to the mitigation of direct effects from stormwater runoff, the measures described by the requiring authority in Technical Report G have been used to support mitigation for other technical disciplines, specifically ecology and landscape and visual effects. These effects and their mitigation are discussed in detail in the evidence reports of Justine Quinn (ecology) and Chantal Whitby (landscape and visual effects); commentary on these effects related to the form or function of the stormwater mitigation measures is included in Section 7.3 of this report, primarily to support the evidence of Ms Quinn and Ms Whitby.

7.1 Mitigation of Construction Phase Effects

68. Mitigation of stormwater effects during the construction phase of the Freight Hub are proposed to include typical erosion and sediment control measures, such as staging of work to limit exposed earthworks areas, construction of clean water diversions around the site, stabilisation of exposed areas promptly after completion of earthworks, and use of the proposed stormwater attenuation basins for sediment capture. This level of detail is considered appropriate at the NoR stage. A detailed erosion and sediment control plan will need to be developed by the requiring authority as part of future resource consent and engineering approval applications, as per typical procedure, and this requirement is recommended to be captured in the NoR conditions for completeness.

69. Although not relevant at the NoR stage, we would like to point out that special consideration will need to be given to the existing waterways. Should any of the proposed stormwater features (i.e., attenuation basins) be used for erosion and sediment control, staging will need to be considered in detail, especially as it pertains to maintaining existing waterways and preventing sediment transfer.
70. Stormwater attenuation must also be provided during the construction phase, particularly since the construction of the Freight Hub will occur over many years and significant increases to stormwater runoff will occur during that period. Details on the staged management of increased stormwater runoff over the construction period are recommended to be required as part of future resource consent, building consent, and engineering approval applications by the requiring authority. Proposed mitigation measures should be included in the Stormwater Management Framework and encompass the entire construction phase(s).

7.2 Mitigation of Operational Phase Effects

71. The potential stormwater effects that could result from the NoR can be broadly grouped into those effects related to changes in the water balance of the site and those related to changes in the types and amounts of contaminants present in the stormwater discharge. For the purpose of this report, the first group of effects will be referred to as the stormwater quantity effects and the second group as the stormwater quality effects.
72. The stormwater quantity effects related to operation of the Freight Hub primarily include flooding and erosion in the areas upstream and downstream of the site, but also include the ecological connectivity and function of existing drainage pathways through the site, and the recharge of water into local groundwater aquifers. The proposed mitigation measures described in Technical Report G by the requiring authority generally address these effects; commentary on the suitability of the proposed measures is provided below:
 - Large culverts to maintain stream flows from the upstream catchment, thereby mitigating flood risk to upstream areas, have been conceptually provided in the NoR and are generally considered acceptable for flood mitigation purposes. Sizing of the culverts needs to be confirmed as part of the Stormwater Management Framework as they will be required for Construction and Operational phases. The

effect of piping open drain flow will need to be assessed, which includes velocity, erosion, and potential flooding effects due to concentration of flows.

- Stormwater detention to control runoff peak flows, thereby mitigating flood risk to downstream areas, has been provided at a conceptual level with the proposed attenuation facilities. The level of detail provided is considered appropriate for the NoR. However, other factors in the Mangaone Stream system may require additional control of peak flows or runoff volumes—for example, flow capacity limitations may be present downstream. This needs to be confirmed with Horizons Regional Council at the resource consenting stage. No comment was provided specifically on this in the submissions.
- Potential flooding effects related to loss of floodplain storage through site filling are not well characterised, and there is no clear mitigation offered for these effects that consider the extent of floodplain storage loss. Encroachment of the site into the 0.5% AEP flooded area of the Mangaone Stream, as indicated in the NoR submission, may create flooding effects for areas located upstream of the Freight Hub along Mangaone Stream, including Bunnythorpe, or immediately downstream of the Freight Hub. Potential mitigation measures for these effects should be identified in the Stormwater Management Framework that is recommended to be required in the NoR conditions.
- Downstream erosion effects are generally dismissed in Technical Report G due to the requiring authority's understanding that all streams within the area, including the Mangaone Stream, have been highly modified. We do not agree with this assessment of the erosion effect, and the requiring authority has not provided a robust assessment of the affected streams to support this claim. Regardless of the historical legacy of stream modification, increases in stormwater volume has the potential to incur erosion in downstream watercourses, leading to sediment releases and damage to aquatic and riparian habitats. Site visits also reveal that some of the waterways through the site are not well formed, and therefore channelising this flow will likely cause an effect downstream.

- The ecological connectivity of streams from downstream of the NoR to upstream areas is conceptually provided in Technical Report G through indication that fish passage measures can be incorporated into the culverts at the design stage. It is recommended that the NoR conditions include the requirement that the culverts be designed according to the "Stream Simulation" methodology to provide what is currently considered to be the most effective means of fish passage, particularly considering the extreme length of the proposed culverts.
- Stormwater effects to groundwater are proposed to be considered as part of the Stormwater Management Framework outlined in Technical Report G; no details on potential effects are provided with the NoR submission.

73. The stormwater quality effects related to operation of the Freight Hub primarily include social and ecological impacts from impaired water quality. The proposed mitigation measures described in Technical Report G by the requiring authority generally address these effects; commentary on the suitability of the proposed measures is provided below:

- Preliminary sizing of stormwater treatment wetlands has been provided with the NoR submission, to be co-located with the proposed detention facilities. The level of detail provided for the stormwater wetlands is considered appropriate at this stage.
- Discussion of additional at-source contaminant management is also included in Technical Report G, including additional Low Impact Development stormwater techniques (i.e., raingardens, stormwater reuse), and the isolation of high-risk contaminant areas such as fuel storage areas, log yard, refueling areas and hazardous substance storage areas. The level of detail provided is considered appropriate at this stage, as these mitigation measures will typically not impact the overall designation area. As well, these measures are proposed to be considered as part of the Stormwater Management Framework outlined in Technical Report G.

74. We generally support the proposed stormwater mitigation measures detailed by the requiring authority, with the caveat that the level of detail provided is sufficient only for the purpose of confirming the NoR designation. Significant design and assessment work remains to be completed by the requiring

authority to deliver on the assumptions stated in Technical Report G in the NoR application.

7.3 Mitigation of Ecology and Landscape Effects

75. The primary ecology effects resulting from stormwater effects include fish passage obstruction, impaired habitat from poor water quality, and impacts to existing wetlands that may exist on the site. The first two of these effects are already sufficiently addressed throughout this report. Impacts to existing wetlands on the site is not explicitly considered in this evidence report; however, to support the evidence of Ms Quinn on this matter it is important to understand the form and function of a typical stormwater treatment wetland in considering the ability of the wetland to provide ecological function comparable to a natural wetland (see paragraph 77).
76. In general, assessment of landscape and visual effects is not explicitly considered in this evidence report; however, to support the evidence of Ms Whitby on this matter it is important to understand the form and function of a typical stormwater treatment wetland in considering the ability of the wetland to provide “natural character” (see paragraph 77).
77. A stormwater treatment wetland does not support a water balance or contaminant profile comparable to a natural wetland. Stormwater wetlands are inundated more frequently and to a greater depth than typical natural wetlands, which can effect both the habitat preferences of aquatic organisms and the range of plant species that can survive in the wetland. By design, stormwater wetlands also receive water that has higher levels of contaminants than typical natural wetlands, with similar resulting effects to habitat preferences for aquatic organisms and range of suitable plant species. These differences between engineered stormwater wetlands and natural wetlands will impact the mitigation effectiveness for both ecology and landscape effects, as described more completely in the evidence reports of Ms Quinn and Ms Whitby. It will be important that, as part of the Stormwater Management Framework, all objectives are met in terms of stormwater quantity and quality management, ecological and landscape effects.

8 Summary of NoR Effects and Mitigation Assessment against Statutory Framework

78. Sections 6 and 7 of this report include a technical assessment of the effects and mitigation of the NoR with respect to stormwater management and associated topics. This assessment was completed in the context of the Statutory Framework outlined in Section 3.5 of this report. For completeness and ease of reference, a summary of the assessment relevant to each of the key planning documents is presented in this section.

8.1 Palmerston North City Council District Plan

79. Assessment of the NoR against the PNCC District Plan was completed in the context of an anticipated "industrial" zoning for the NoR in the future, away from the predominately rural zoning that exists currently. Many of the District Plan provisions will become relevant only as the NoR moves forward into design; however, some concerns identified include:

- Downstream erosion: there is insufficient evidence provided in the NoR submission to determine if the proposed stormwater mitigation will be effective in minimising incremental stream erosion
- Natural hazards: the potential effects of the Freight Hub on the flooded area of the Mangaone Stream under the 0.5% AEP event remain unclear, and it is recommended that this be assessed as part of the Stormwater Management Framework

80. Portions of the NoR are currently zoned under section 12A of the District Plan as the North East Industrial Zone. The District Plan provisions for the North East Industrial Zone require attenuation for the 1% AEP rainfall event, with is consistent with what has been provided in the NoR. The District Plan also requires retention of the first 5 mm of a 24-hour rainfall event, and the reservation of 10% of total site area for the purpose of stormwater management. If the entire NoR is assessed against these criteria, the space allocated for stormwater management may be inadequate; however, it is not clear that this will be the case, particularly since the entire NoR site is not currently zoned under section 12A.

8.2 Horizons Regional Council One Plan

81. The policies and objectives of the Horizons Regional Council One Plan, some of which are summarised in Section 3.5.5 of this report, relate broadly to the potential flooding, erosion and ecological effects of stormwater discharges. It is our opinion that the NoR currently considers these potential effects at an appropriate level of detail, with the understanding that significant analysis and design will be undertaken by the requiring authority during detailed design to confirm the extent and magnitude of the effects and associated mitigation. This understanding is represented through the completion of the proposed Stormwater Management Framework, described in Appendix B of Technical Report G, which is recommended to be explicitly included in the NoR conditions.

8.3 National Policy Statement for Freshwater Management 2020

82. A summary of our assessment of the NoR effects and mitigation in relation to some of the relevant policies of the NPS FM are included in the paragraphs below.

83. Policy 3: 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.

- The NoR does consider effects on a whole-of-catchment basis, but with a particular focus on the watercourses that flow through the site as opposed to effects to downstream areas. Generally, the impacts of the proposed activity on the downstream receiving environment are not well detailed in the NoR, and the proposed mitigation is highly conceptual in nature. However, there is significant latitude to enhance stormwater management performance of the proposed activity as part of the development of the Stormwater Management Framework in a manner that does not impact the overall land requirement or layout of the site.

84. Policy 4: Freshwater is managed as part of New Zealand's integrated response to climate change.

- Climate change in line with the requirements of the PNCC Engineering Standards for Land Development has been considered in the requiring authority's technical documentation for the purpose of flood mitigation and conveyance.
85. Policy 5: Freshwater is managed through a National Objectives Framework to ensure that the health and well-being of degraded water bodies and freshwater ecosystems is improved, and the health and well-being of all other water bodies and freshwater ecosystems is maintained and (if communities choose) improved.
- It is noted in the NoR documentation that the current health of the watercourses on the site is poor with negligible ecological value (although this is questioned in the ecology evidence of Ms Quinn). Although mitigation and enhancement is provided in localised areas, such as the section of naturalised stream adjacent to the north boundary of the NoR, as a whole the NoR has not sufficiently demonstrated that the health and wellbeing of freshwater will be maintained or enhanced within the site boundaries, due primarily to the significant reduction in overall stream length and habitat area.
86. Policy 7: The loss of river extent and values is avoided to the extent practicable.
- The extent of river loss on the NoR site is high. Although this may be unavoidable considering the proposed activity, the mitigation outlined in the NoR documents does not appear to be proportional to the extent of the river loss, as measured through total length of channel, and the ecological values of the existing watercourses are not well understood by the requiring authority.
87. Policy 9: The habitats of indigenous freshwater species are protected.
- Similar to Policy 7, the ecological values of the existing watercourses are not well understood by the requiring authority, and the potential impacts to existing habitats are not well quantified, either within the NoR site or in downstream environments.
88. Policy 13: The condition of water bodies and freshwater ecosystems is systematically monitored over time, and action is taken where freshwater is degraded, and to reverse deteriorating trends.

- Consideration of this policy should be made in the NoR conditions through the requirement for long-term monitoring of the stormwater management system and the affected and receiving environments.
89. In general, the NoR does not provide enough evidence to show that it meets the NPS FM; however, we do believe that the detail of assessment undertaken is appropriate for the NoR. The Stormwater Management Framework that is recommended to be required in the NoR conditions will need to give effect to the NPS FM.

8.4 Resource Management (National Environmental Standards for Freshwater) Regulations 2020

90. The requiring authority has noted throughout the NoR documents that culverts will be designed and installed with consideration of fish passage. The NES F would require that this be done in accordance with “stream simulation” culvert requirements as detailed in the New Zealand Fish Passage Guidelines to be considered a permitted activity. There is insufficient information in the NoR documents to determine the activity classification at this time, but it is expected that this information would be provided by the requiring authority during further consenting stages.
91. The NoR includes several large culverts that will effectively replace the existing watercourses on the site, including one in excess of 600 metres in length. Key concerns around these long culverts include the following:
- The interior of the culvert will be permanently dark, which may impact the behaviour of fish species and their willingness to pass through the entire length of the culvert. The effect of light on the passage behaviour of fish are poorly understood in industry and academia, particularly over the extreme lengths proposed in the NoR, and a precautionary approach is recommended when assessing effects and designing the culverts.
 - The ability of any authority to effectively maintain fish passage conditions within a culvert of these lengths will be limited; provisions for maintenance access should be included when these culverts are designed, such that inspections and maintenance can be carried out in a manner that is safe and cost-effective.

- The requirement to provide a culvert width to accommodate the entire bankfull channel of the existing watercourses, with an appropriate amount of substrate embedment or an open culvert bottom, may incur significant cost to the requiring authority which may not have been fully anticipated. It is recommended that these dimensions be established as part of the Stormwater Management Framework early in the design phase to reduce this risk.

9 Review of Submissions

92. There were a total of 24 submissions relating to stormwater and flooding elements of the NoR. Our analysis of the submissions is categorised under the following sub-topics:

- stormwater and flooding effects;
- environmental effects; and,
- use, storage or transport of hazardous substances.

9.1 Stormwater and flooding effects

93. Many of the submissions have highlighted the existing flood hazard, which includes the lack of adequate infrastructure to service the current level of development. Submitters either oppose the NoR because they state it will worsen the existing situation, or state that the development will provide an opportunity to improve the infrastructure in the area.

94. Eighteen submissions¹ oppose the NoR due to concerns that the development will worsen the existing flood hazard, which has been noted to occur in the vicinity of Clevely Line (**S1/Watson, S4/Hill, S81/Tipene**), Te Ngaio Road (**S1/Watson, S61/O'Reilly**), Kairanga-Bunnythorpe Road (**S4/Hill**), and Sangsters Road (**S4/Hill**).

95. **S22/F.Hurley, S26/P.Hurley** and **S86/J.Hurley** specifically note that wastewater overflows currently occur during rainfall events, likely due to cross-connections

¹ S1/Watson, S2/Bradley, S4/Hill, S22/F.Hurly, S26/P.Hurly, S36/Thompson, S37/I.Harvey, S38/L.Harvey, S47/Fox, S61/O'Reilly, S62/Chapman, S70/Thomas-Crowther, S77/Bent, S81/Tipene, S84/Carey, S86/J.Hurly, S89/Houghton.

between the existing stormwater and wastewater networks or high infiltration and inflow into the wastewater network.

96. Three submissions² flag the potential development as an opportunity to improve infrastructure in the area. Although flooding currently occurs, controls imposed upstream to protect the rail hub may provide additional benefit to the downstream catchment.

Response

97. This evidence has been prepared to evaluate whether or not enough space has been designated to appropriately mitigate stormwater/flooding concerns. As such, we understand that detailed assessment of stormwater effects and design of mitigation measures has not yet been undertaken. We agree with **S4/Hill**, **S47/Fox**, **S61/O'Reilly** and **S77/Brent** that further assessment is required; however we do not believe this to be necessary for the NoR and is best addressed at the regional consenting stage.
98. Although we understand that the designated area is located within flood prone land, the applicant will need to give effect, at a minimum, to Objective 9-1 of the One Plan (refer paragraph 36). The policies under Chapter 9 of the One Plan relate to mitigating risk caused by building within a floodplain. **S20/Horizons** refers to a high-level meeting between KiwiRail and Horizons Regional Council to discuss stormwater effects. The submission does not comment on whether or not technical work is sufficient to inform an assessment of environmental effects, but support the NoR regardless.
99. The submissions have also raised specific concerns around a possible combined system in the area that results in wastewater overflows. Although it is not the responsibility of KiwiRail to resolve these existing issues, we agree that this issue needs to be considered and that the situation should not be worsened as a result of development, for example through exacerbation of flooding impacts from the Mangaone Stream that may be affecting the piped reticulation. This may require further assessment and network upgrades by the Palmerston North City Council to enable development to move forward.
100. We further recommend that Palmerston North City Council undertake an assessment of the wastewater overflows noted to have occurred, and

² S18/Stafford, S23/Tate, S24/Z.Park.

comment on what upgrades would be required in order to facilitate the KiwiRail development.

101. We do not believe that sufficient analysis has been undertaken to determine if the mitigation proposed by the development will improve flooding conditions downstream. Similar to the above, it is also not the responsibility of KiwiRail to improve conditions downstream of the site. This may be an outcome of development, but should not be considered a reason to proceed unless this aligns with other infrastructure works planned for the area. We therefore recommend that Palmerston North City Council review potential infrastructure upgrades that may benefit from KiwiRail development.

9.2 Environmental effects

102. Several submissions have highlighted the potential risks to the environment as a result of general development of the site, as well as specific operations proposed in the area. Similar to the flooding effects discussed above, submitters either oppose³ the NoR because they believe the change in land use will degrade the existing waterways, or support⁴ the NoR because they believe that, based on the submission by KiwiRail, they will improve the natural environment.
103. The submissions are in general accordance with the points raised in paragraphs 72 and 73 regarding mitigation of operational phase stormwater effects, i.e., that stormwater mitigation is possible but dependent on effective design and implementation, which will be clarified through the proposed Stormwater Management Framework and detailed design.

Response

104. This evidence has been prepared to evaluate whether or not sufficient consideration has been given to the environmental effects posed by the development. As per our response in paragraphs 60 through 62, we do not believe that the proposed mitigation concepts provide the full benefits highlighted in the submission. However, although the full range of benefits may not be realised, we do believe that the development can be properly managed in such a way that the environmental effects are minimised.

³ S22/F.Hurley, S81/Tipene

⁴ S20/Horizons, S23/Tate, S24/Z.Park, S74/A.Park

9.3 Effects of hazardous substances

105. Several submissions highlighted the risk posed by storage of hazardous chemicals onsite. Two submissions in particular (**S1/Watson** and **S72/O'Keeffe&Butts**) are relevant to stormwater in that runoff generated from the site could be contaminated prior to leaving the site. In addition to that, HAIL activities were also identified and could result in contaminated runoff during construction. **S72/O'Keeffe & Butts** explicitly mentions groundwater and the lack of assessment on the effect of contaminated runoff to the existing bores.

Response

106. This evidence has been prepared to evaluate whether or not sufficient consideration has been given to the environmental effects posed by the development, and extends to the effects of hazardous substances that may be contained on site. Although we agree that there is a gap in the assessment of effects relating to hazardous substances and their effect on the surrounding environment, we believe that mitigation measures do exist that can reduce the risk of impact on the receiving environment, particularly as it pertains to stormwater runoff generated on site, and that these measures will not materially affect the designation area.
107. Assessment of the effect of contaminated runoff on existing bores is outside of the scope of this report, and is recommended to be required at the resource consenting stage.

10 Draft Requirement Conditions

108. The requiring authority provided Draft Conditions for the NoR with their original submission, which were subsequently revised based on the s92 request submitted by the territorial authority, dated 15 February 2021. The suitability of the Draft Conditions to achieve the desired stormwater outcomes for the NoR are assessed in this section, and additional Conditions are recommended where necessary. The Draft Conditions that cover the topic of stormwater include items 33 through 40, as detailed in Appendix C of the requiring authority's submission.
109. Prior to submission of the s92 request by the territorial authority, the territorial authority met with the requiring authority's planning and technical team to

discuss general stormwater requirements for the NoR (meeting date 25 June 2020 at PNCC office). The key requirement that was communicated to the requiring authority was the need for a detailed assessment to evaluate effects of development and mitigation required so as not to accelerate or worsen flooding or water quality issues to other properties. The outcome of this meeting was the content of Appendix A and B in Technical Report G Stormwater Flooding Assessment, as submitted with the NoR, outlining the assumptions, requirements, and indicative outline for a Stormwater Management Framework.

110. The Draft Conditions strays from the agreed approach outlined in Technical Report G, requiring a Stormwater Management Report and Stormwater Management and Monitoring Plan instead of the more detailed, comprehensive and relevant Stormwater Management Framework. The requiring authority clarifies in Attachment 6 of their s92 response that the Draft Conditions incorporate the elements of the Stormwater Management Framework that are relevant to the NoR specifically, while excluding other elements that are not directly relevant to the designation. For the purpose of clarity and consistency it is recommended that the requirements and content of the Stormwater Management Framework as described in Technical Report G be incorporated into the NoR Conditions in place of the current provisions.
111. With particular regard to potential decommissioning of the Freight Hub, it is recommended that the NoR conditions related to the Stormwater Management Framework include the requirement for a robust assessment to demonstrate the whole-of-life effects of the Freight Hub, in particular, how the risk of contaminated runoff can be mitigated should the site be decommissioned.
112. With particular regard for mitigation of downstream erosion effects, it is recommended that the NoR conditions related to the Stormwater Management Framework include the requirement for a robust erosion assessment to demonstrate the effectiveness of the proposed stormwater system in mitigating this effect. The assessment should address all phases of the Freight Hub, from construction to operation through to decommissioning.
113. With particular regard to stormwater attenuation and mitigation associated with the increase in stormwater quantity, it is recommended that the NoR

conditions related to the Stormwater Management Framework include the requirement for quantity management during the entire construction phase.

114. With particular regard to floodplain storage and proposed site work, it is recommended that the NoR conditions related to the Stormwater Management Framework include the requirement for a robust assessment of effects related to loss of floodplain storage.
115. The Stormwater Management Framework is recommended to be provided by the requiring authority to the territorial authority at the earliest review opportunity available to confirm the proposed approach before significant design effort is expended. This review opportunity is recommended to occur prior to any resource consent, building consent or engineering approvals applications submitted by the requiring authority.

11 Conclusions

116. Overall, we generally agree that the stormwater flooding assessment (Technical Report G and related s92 response clarifications) provided by the requiring authority is sufficient for the purpose of the NoR, and support approval of the NoR with the inclusion of the Stormwater Management Framework in the NoR conditions, amended as per Section 10, as a requirement for future submissions.



David Arseneau

18 June 2021



A. Reiko Baugham

18 June 2021