Before the Hearings Panel
At Porirua City Council

Under	Schedule 1 of the Resource Management Act 1991
In the matter of	the Proposed Porirua District Plan
Between	**Various**
	Submitters
And	**Porirua City Council**
	Respondent

Statement of evidence of Nadia Nitsche on behalf of Porirua City Council (Flood Hazard Modelling)

Date: 5 November 2021

INTRODUCTION:

1 My full name is Nadia Caron Nitsche. I am employed as a Modelling manager at Wellington Water Ltd (**Wellington Water**).

2 I have prepared this statement of evidence on behalf of the Porirua City Council (**Council**) in respect of technical related matters arising from the submissions and further submissions on the Proposed Porirua District Plan (**the Plan**).

3 Specifically, this statement of evidence relates to the matters in Chapter NH – Natural Hazards Chapter of the Plan.

4 I am authorised to provide this evidence on behalf of the Council.

QUALIFICATIONS AND EXPERIENCE

5 My qualifications are a BEng (Civil Engineering) from University of Cape Town, South Africa, and a MEng (Civil Engineering) specialising in Hydraulics and Hydrology from Stellenbosch University, South Africa.

6 I have over 20 years' experience in hydraulic, hydrological modelling and flood risk assessments. Most of this has been in New Zealand but I have several years' experience in other countries. My experience is split between consultancies and councils.

7 I am a Chartered Engineer with Engineering New Zealand and a member of the New Zealand Water and Waste Association.

Code of conduct

8 I have read the Code of Conduct for Expert Witnesses set out in the Environment Court's Practice Note 2014. I have complied with the Code of Conduct in preparing my evidence and will continue to comply with

during this hearing. My qualifications as an expert are set out above. Except where I state I rely on the evidence of another person, I confirm that the issues addressed in this statement of evidence are within my area of expertise, and I have not omitted to consider material facts known to me that might alter or detract from my expressed opinions.

SUMMARY

9 I have been asked by the Council to provide evidence in relation to the appeal on Section 32 Evaluation Report Part 2 – Natural Hazards, which primarily relates to the flooding hazard mapping.

10 I will discuss my previous involvement with the Plan, setting out the overarching framework that we have applied to manage flood risk in a considered and responsive manner. I will then consider the various submissions; finding that some submission points should be accepted, and that some have insufficient information.

INVOLVEMENT WITH THE PROPOSED PLAN

11 I have been involved in managing the hydrological and hydraulic modelling and the peer review programme to provide the flood hazard mapping in the Plan.

12 The flood hazard maps are based on the outputs from validated hydraulic models, flood records and feedback from the community. The hydraulic models were developed based on the Wellington Water Hydraulic Modelling Specification (Wellington Water 2017). The modelled catchments are Pauatahanui Stream Catchment, Titahi Bay Catchment, Porirua Central Business District Catchment, Taupo Stream Catchment and Cannons Creek Catchment. These catchments cover all locations where flooding hazards are proposed to be mapped into the Plan, and therefore, all locations listed in the relevant submissions.

13 The maps in the Plan show flooding hazards in the following categories:

13.1 **Stream Corridors** – typically consists of a no-build buffer of 5m either side of the stream centreline. Open water courses in urban areas were selected to be included in the stream corridor layer alongside contributing branches in the upper reaches of stormwater catchments. Flooding in stream corridors is the most hazardous of the three types we have identified in the Plan due to it being deep and fast flowing water.

13.2 **Overland Flowpaths** – these convey stormwater when the pipe or stream network capacity is exceeded or blocked, often due to heavy rain. The flowpaths were identified and mapped using the modelled results backed up with flood records considering depth and velocity to identify hydraulically significant paths. They are identified in the Plan as no build areas to ensure that buildings do not impede the flow of water and to prevent property damage, which can be extensive in these locations. This type of flooding is generally less hazardous than in stream corridors as the water is shallower and slower.

13.3 **Inundation/Ponding** - these are the low velocity flood extents which have ponding deeper than 50mm. This is the least hazardous of the three types of flooding included in the Plan, however it is important to manage its effects on damage to property, which we are doing by specifying minimum floor levels for habitable buildings.

14 All flood hazards - streams, overland flow paths and inundation – have been mapped for the extreme event of the 100-year Annual Return Interval including Climate Change.

15 I attended the five public engagement meetings in May, July and August 2018 to present the flood hazard information on behalf of Wellington Water and Porirua City Council to the community and receive feedback on the validity of the mapping.

SCOPE OF EVIDENCE

16 My statement of evidence addresses the submissions opposing flood layers as set out below:

16.1 PCC Submission Nr 118 by Paul and Julia Botha on 10A The Track, Plimmerton.

16.2 PCC Submission Nr 238 by Grant Abdee on 153B Rawhiti Road, Pukerua Bay.

16.3 PCC Submission Nr 59 by Calibre Ltd for further site-specific investigation of flood risk from Kenepuru Landing.

16.4 PCC Submission Nr 231 by John Carrad for the property of Mt Welcome, Pukerua Bay.

16.5 PCC Submission Nr 241 by The Neil Group Limited and Gray Family opposes the stream corridors and flood inundation layers on the property of Kakaho – Gray Lands, Plimmerton.

16.6 PCC Submission Nr 242 by Pukerua Property Group opposes the stream corridors and flood inundation layers on the property of Mt Welcome Station, Pukerua Bay.

16.7 PCC Submission Nr 158 by Steve Grant of 99-109 Saint Andrews Road, Plimmerton.

SUBMISSION NR 118, BOTHA, 10A THE TRACK

17 Submission 118 by Paul and Julia Botha on the property 10A The Track, Plimmerton, reports that the overland flow path and inundation/ponding information which is shown in the Plan for their property contains an error due to the incorrect placement on the maps of a KiwiRail culvert connecting a fragment of Taupo swamp on their property to the main Taupo swamp body.

18 It is evident that this is indeed a mapping error; reflecting the fact that not every KiwiRail culvert has been surveyed.

19 Figure 1 below shows the correct location of the culvert. I recommend that the Plan is updated to reflect the correct location of the culvert. This will require changes to the maps, which I will present to Commissioners at the hearing.

Figure 1: Flood mapping included in the Plan showing actual location of storm event

20 Another point was raised by this submitter relating to ponding, as follows*: The flood maps show ponding in a watercourse on the property that generally only flows during a rain event. The ponding is shown in areas which are up to 65m greater in elevation than the swamp into which they drain. It is difficult to imagine how this ponding has been determined.*

21 The “ponding layer” indicates inundation that is greater than 50mm in a 100-year event plus Climate Change and which has low velocity flows (as shown by the red arrows in Figure 2 below). This is a lower hazard risk than the streams and overland flow paths.

22 As the ponding is based on a verified model, I consider that this part of the submission should not be accepted and that this part of the inundation/ponding mapping should remain as notified.

23 However, if Commissioners consider that there is sufficient scope, I recommend that the term ‘Ponding’ in the Plan be replaced with ‘Inundation’ to provide greater clarity to Plan users.

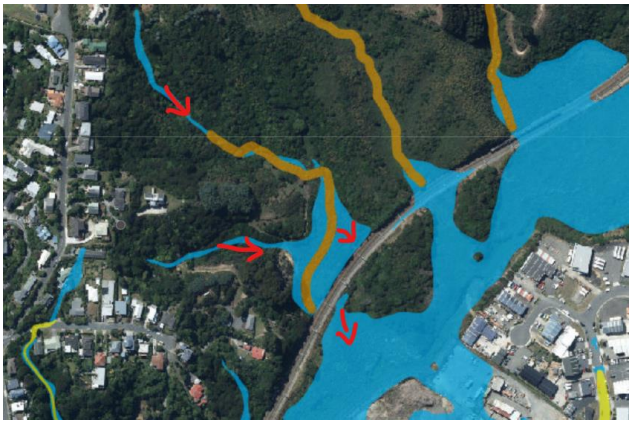

Figure 2: Flood mapping included in the Plan showing the flow of the inundation at 10 A The Track

SUBMISSION NR 238, ABDEE, 153B RAWHITI ROAD, PUKERUA BAY

24 Submission Nr 238 by Grant Abdee of the property of 153B Rawhiti Road Pukerua noted that the Hazard and Risks overlays “Flood Hazard-Ponding” map highlights two areas but does not highlight the stormwater runoff which results in scour and erosion damage on their property.

25 The inundation mapping shown on the property (seen in Figures 3 and 4 below) shows the low velocity flood extents that are greater than 50mm

for the extreme events of 100 year plus Climate Change. It will not represent the sheet flow that can occur for lower than 50mm stormwater flooding.

26 The stormwater drain on the property is represented in the model and shows that this is under capacity in a 10-year event as well as a 100-year event and will flood adjacent low-lying properties. This is reconfirmed with the evidence provided in this submission.

27 I do not consider that any changes to the Plan are required in response to this submission.

Figure 3: Flood Depth Mapping including less than 50mm flooding

Figure 4: Inundation Layer for the Flood Mapping showing flooding above 50mm

SUBMISSION NR 59, CALIBRE LTD, KENEPURU LANDING

28 Further site-specific investigation of flood risk from Kenepuru Landing PCC Submission Nr 59 by Calibre Ltd stated that the Kenepuru Landing site in the Plan's Maps are based on predevelopment information.

29 This is correct and the maps will be updated to reflect the post development changes in the flood hazard both at the site and downstream. Kenepuru Landing and Wellington Water have already

completed significant stormwater modelling to determine the new flood extent and levels.

30 The changes in runoff from the site before and after the proposed development show that because of the proposed detention ponds, there is a reduction in flow both in network and surface flows at the property as well as at the downstream properties.

31 I recommend that this submission point is accepted and that the flood hazard mapping is updated to reflect the more recent modelling that is shown in figures 5 and 6, below. I will bring the relevant maps reflecting this modelling to the hearing.

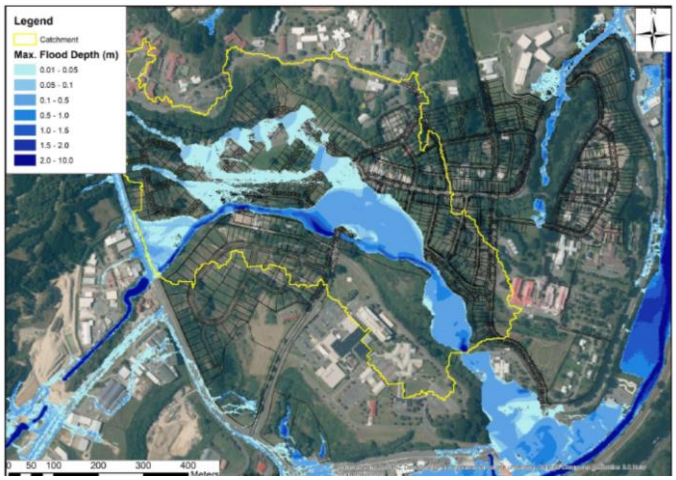

Figure 5: Modelled maximum flood depth for the 100-year event with climate change – pre development

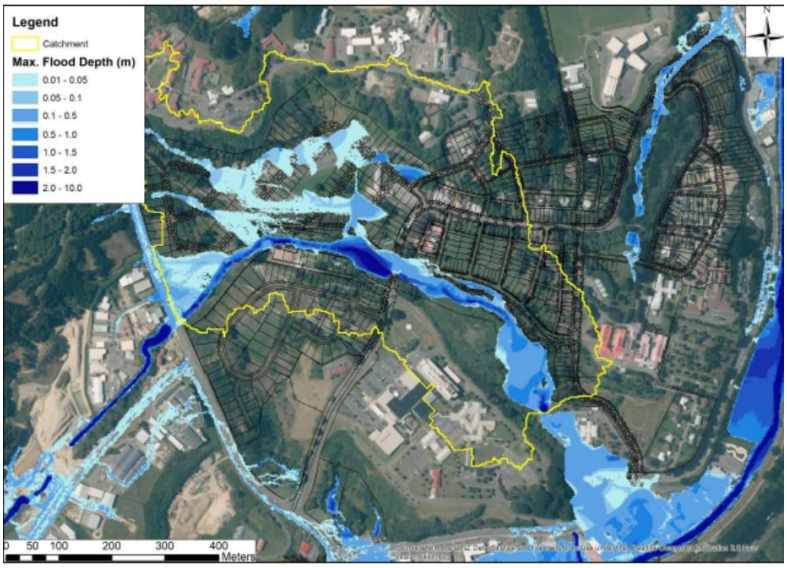

Figure 6: Modelled maximum flood depth for the 100-year event with climate change – post development

32 The submitter also requested that the Planning Maps be amended to remove the "Flood Hazard - Stream Corridor" overlay from Lot 1509 DP 533884. I agree with this submission point as the Overlay in Lot 1509 DP 533884 on the Kenepuru Landing site is not a stream and will become a stormwater attenuation area for PCC and Kenepuru Landing. I recommend that the Plan is amended to reflect this information.

SUBMISSION NR 231, CARRAD, MT WELCOME

33 Submission Nr 231 by John Carrad opposed the stream corridors and flood inundation layers on the property of Mt Welcome, Pukerua Bay. The submission is not clear on what is opposed, and no evidence has been provided to oppose the stream corridors and flood inundation layers.

34 Appendix 1 of the submission shows the indicative new residential development structure plan. The structure plan indicates wetland and stream offset areas which are in the same location as per the Plan's maps.

35 The flood inundation and stream layers have been mapped using information from the Lidar. There does not seem to be a difference between the modelling and the plans that have been provided by the submission as can be seen in Figures 7 and 8, below.

Figure 7: Flood Hazard Mapping in the Plan indicating modelled stream corridors

Figure 8: Proposed Development Plan in submission indicating wetland and streams

36 Because of the limited information in the submission, I am not able to recommend any changes to the Plan.

SUBMISSION NR 241, THE NEIL GROUP LTD AND GRAY FAMILY, KAKAHO-GRAY LANDS

37 Submission 241 by The Neil Group Limited and Gray Family opposes the stream corridor and flood inundation/ponding layers on the property of Kakaho – Gray Lands. Most of this land has not been modelled and mapped yet, but on the northern boundary there has been some modelling which has resulted in a stream corridor and some inundation being mapped in the Plan.

38 Water from both the stream corridor and inundation/ponding flows downstream to James Stream through Plimmerton, and then goes out to the sea.

39 It is not clear from the submission if there is a basis for the opposition to the mapping on these properties. Accordingly, I do not recommend any changes to the Plan in response to this submission.

SUBMISSION 242, PUKERUA PROPERTY GROUP, MT WELCOME STATION, PUKERUA BAY

40 Submission 242 by Pukerua Property Group opposes the stream corridors and flood inundation layers on the property of Pukerua Bay – Mt Welcome Station.

41 Appendix 7 of the submission provides a memo by RMA Ecology by Tony Payne and Graham Usher detailing the preliminary survey results undertaken assessing the ecological values on site. The site investigation was mapped and provides evidence that the mapped stream corridors correspond quite closely to the stream corridors mapped in the Hazard Mapping in the Plan as shown in figures 9 and 10 below.

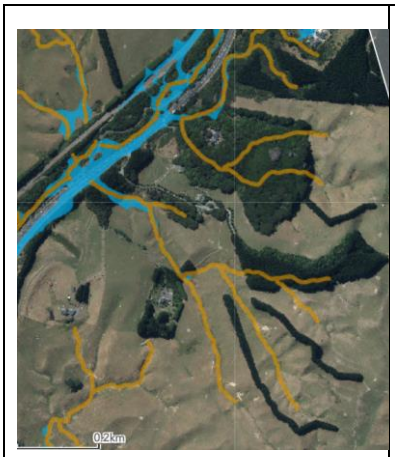

Figure 9: Flood Hazard Mapping in the Plan indicating modelled stream corridors

Figure 10: Mapped stream corridors in Ecology report for Mt Welcome Station

42 No other evidence has been provided to clarify the opposition to the stream corridor layer as well as the flood inundation layer. Accordingly, I am not recommending any changes to the Plan for this submission point.

SUBMISSION 158, GRANT, 99-109 ST ANDREWS ROAD, PLIMMERTON

43 Submission 158 by Steve Grant of 99-109 Saint Andrews Road, Plimmerton seeks an indication of any proposed flood mitigation by Council for themselves and other upstream property owners prior to accepting any condition on flood mitigation. The submission also noted that in a recent large storm, no flooding occurred. I understand that the reporting planner will address the flood mitigation query. I will focus on the frequency of flooding.

44 The property 99 – 109 Saint Andrews is directly adjacent to Taupo Stream. As shown in the figures 11, 12 and 13 below, the property is at the convergence of three catchments. The southern part of James Street and St Theresa's Church and school are drained under St Andrews Road to the main Taupo Stream channel.

45 The modelling indicates that this property does not flood in the 10 Year Storm event. The recent November 2020 event was greater than a 10 Year Storm event but less than a 100-year event and so may have not been extreme enough to result in flooding on this property.

46 The modelling also shows that in a 100 year event the entire area around southern James Street, including St Theresa Church, the school and adjacent vacant land, is inundated. This has been documented by photos from large storm events in May and November 2016 and the modelling of the validation events aligns well with the reported flooding as shown in the figures below.

47 Based on this information, I recommend that the submission point is not accepted and that the Plan maps remain unchanged.

Figure 11: Flood Depth Mapping indicating modelled flood depths for 10 year

Figure 12: Flood Depth Mapping indicating modelled flood depths for 100-year including Climate Change

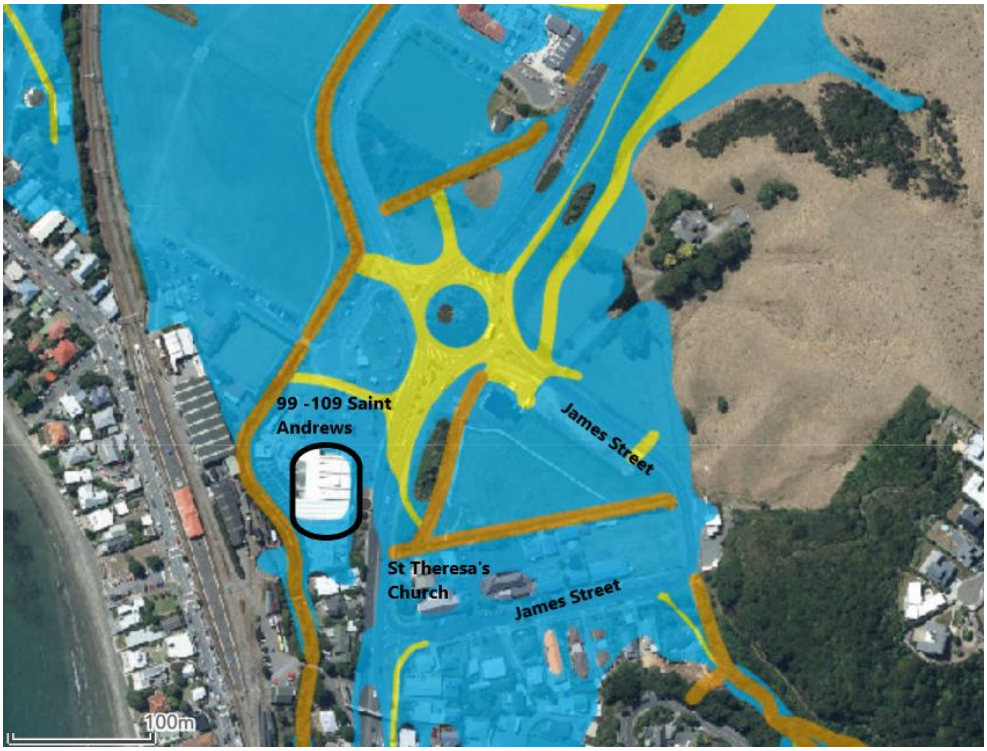

Figure 13: Flood Hazard Mapping in the Plan indicating modelled stream corridors, overland flowpaths and inundation for 100 year including Climate Change

CONCLUSION

48 Submissions 59 and 118 correctly pointed out errors in the mapping. This will be corrected and will be reflected in the updated Wellington Water mapping. I recommend that the Plan decisions reflect these changes and will bring proposed maps to the hearing to support the Commissioners.

49 I consider that there is not enough evidence provided in Submissions 158, 231, 241, 242 to grant amendments to the hazards and flooding mapping of the Plan.

Date: 5/11/2021

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