

**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 Alistair Osborne on behalf of Porirua City Council
(Flood Hazard Modelling)**

Date: 10 February 2023

INTRODUCTION:

- 1 My name is Alistair Mark Osborne. I am employed as a Senior Hydraulic Modeller 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 (**PDP**) Chapter NH – Natural Hazards Chapter; primarily in relation to flooding hazard mapping.
- 3 I have been providing input into the flood hazard mapping for the PDP since 2021. This input includes managing the hydrological and hydraulic modelling and peer review programme and attendance at two public engagement meetings in June 2022 to present the flood hazard information to the community.
- 4 I am authorised to provide this evidence on behalf of the Council.

QUALIFICATIONS AND EXPERIENCE

- 5 I hold the qualification of a Master of Science (with Honours) from Victoria University, Wellington.
- 6 I have 19 years' experience in hydraulic and hydrological modelling in New Zealand. I have worked for both Engineering Consultancies and Councils.
- 7 I am a member of the New Zealand Hydrological Society.

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 it

while giving oral evidence before the Environment Court. 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.

SCOPE OF EVIDENCE

9 My statement of evidence covers the following matters:

9.1 The framework that Wellington Water and Council have applied to manage flood risk.

9.2 Comments on submission points as follows:

9.2.1 PCC Submission OS 14.1 by The Church of Jesus Christ of the Latter-day Saints Trust Board on flood inundation mapped on Lot 4 DP 54351, Okowai Rd.

9.2.2 PCC Submission OS 74.73 by the Greater Wellington Regional Council on flood hazard mapping in the Northern Growth Area.

9.2.3 PCC Submission OS 99.12 by Alan Collet on 42 Gray St, Pukerua Bay.

9.2.4 PCC Submission OS 115.1 by D Suzi Grindell on flood inundation layer on 21 Langwell Place, Papakowhai.

9.2.5 PCC Submission OS 115.2 by D Suzi Grindell on general comment on flood hazard layers across Papakowhai and runoff from a cliff facing Papakowhai Road.

- 9.2.6 PCC Submission OS 115.3 by D Suzi Grindell on general comment on flood hazard layers across Papakowhai and runoff from a cliff facing Papakowhai Road.

FLOOD HAZARD MAPS OVERVIEW

- 10 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 Aotea-Paremata, Mana, and Pukerua Bay, Browns Bay, and Bradeys Bay.
- 11 The maps in the Plan show flooding hazards in the following categories:
- 11.1 **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 PDP due to it being deep and fast flowing water.
- 11.2 **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 PDP 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.

11.3 **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 PDP, however it is important to manage its effects on damage to property, which we are doing by specifying minimum floor levels for habitable buildings.

12 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.

SUBMISSION OS 14.1, THE CHURCH OF JESUS CHRIST OF THE LATTER-DAY SAINTS TRUST BOARD, LOT 4 DP 54351, OKOWAI RD

13 Submission OS 14.1 by The Church of Jesus Christ of the Latter-day Saints Trust Board on flood inundation mapped on Lot 4 DP 54351, Okowai Rd, reports that the Ponding Overlay is incorrect and should not be considered a “natural” hazard due to the following factors:

13.1 The site was formed by filling during the construction of the Motorway network in the 1960s and 1970s so it is not natural;

13.2 The site is elevated with a steep slope adjacent to Okowai Road so it is not part of a flood plain;

13.3 It is unreasonable for the council to impose a Natural Hazard overlay on an undeveloped urban site when that site has been modified ready for development, but that development has not occurred yet.

- 14 Regarding the matter in 13.1, the “natural” hazard aspect of the flood layer relates to flooding that results from an extreme rainfall event rather than the natural or constructed nature of the flooded location..
- 15 Regarding the matter in 13.2, a detailed review of the site has confirmed this location is elevated with steep topography. The mapping should be changed at this location as shown in Figure 1 and Figure 2 images below.

Figure 2 Current flood hazard mapping



Figure 1 Proposed flood hazard mapping



- 16 Regarding the matter in 13.3, the remit of the Council is to ensure property owners are aware of the natural hazards that may impact their property. If suitable modelling (as has been undertaken in this situation) indicates that there is a flood hazard on the property then the Council must note this is the case for the safety of the current and future owners.

SUBMISSIONS OS 46.1, DEBRA ASHTON, 300C PAREMATA ROAD

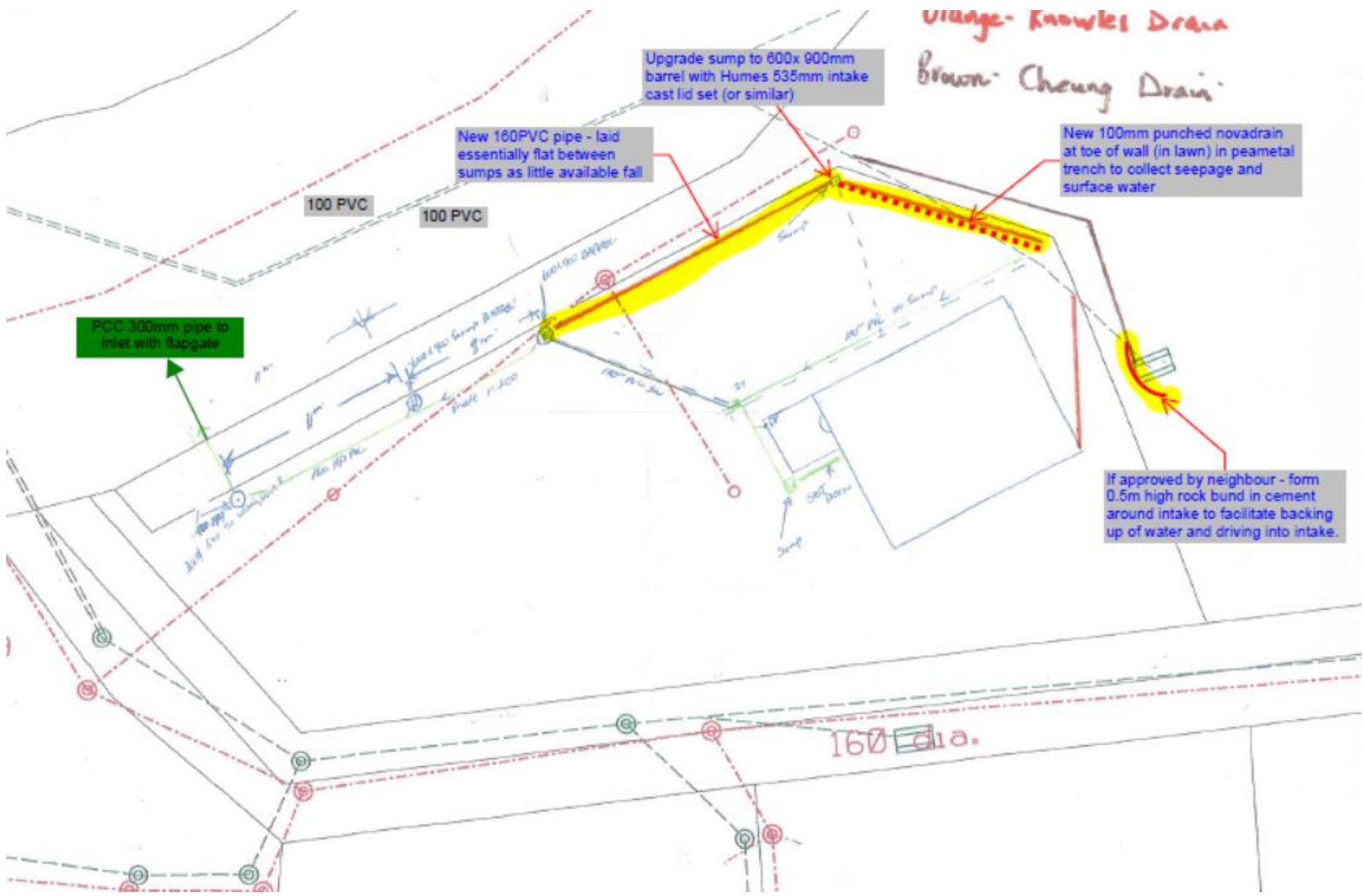
- 17 Submission OS 46.1 by Debra Aston of the property 300c Paremata Road, Whitby, notes that the flood mapping ponding overlay is applied in error.
- 18 The reason for this is reported ameliorative work that was undertaken by the Council in August 2019 to install new drainage on the property,

including commercial grade stormwater pipes, sumps and a non-return flap on the outlet pipe.

- 19 It is considered that this has eliminated any flood hazard and risks as is evident with on the ground conditions.
- 20 A review of the as-built plan covering the works described by the submitter along with the investigation¹ upon which the works were based has shown that the stormwater assets installed at the property extend along the boundary between 300c Paremata Rd and 300b Paremata Rd (refer to Figure 3 below).

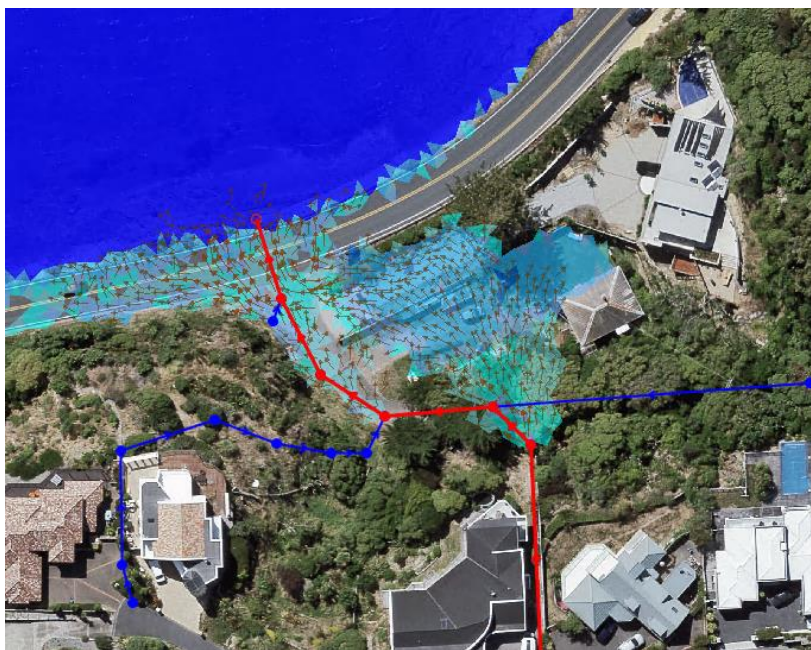
¹ Orogen, 2018. Debra and Joseph Knowles – Porirua City Council – 300B and 300C Paremata Road – Proposed Drainage Solution.

Figure 3 Proposed drainage solution at 300c Paremata Rd (source: 300c Paremata Road existing drainage improvements)



- 21 The as-built plan shows the pipes installed were no larger than 160mm in diameter.
- 22 The investigation upon which the works were based notes that ponding will occur on the property if the PCC drain, into which the new pipes are connected, is at capacity (full), or if the Inlet (Pauatahanui Inlet) restricts flow. The investigation reports that sea level rise will restrict the ability of the system to drain the property.
- 23 With consideration of these points, I disagree that the flood mapping ponding overlay is in error for the reasons outlined below.
- 24 A review of the model and the WWL GIS asset data shows that network upgrades done in 2019 was not available at the time of the stormwater model build and has not been included in the model or the current GIS asset data. However, I am confident that this will not affect the flood hazard mapping layers in this area.
- 25 Stormwater assets are generally designed to service frequent flooding and smaller magnitude events. The available as-built plans show a 160mm diameter pipe has been installed which is significantly smaller than the modelled 300mm diameter public network draining the area which does surcharge in the modelled scenario.
- 26 The modelled flooding that extends onto 300c Paremata Road is based on an extreme storm event, the 100-year ARI (with climate change, including sea level rise) event, and is a result of the stormwater network surcharging upstream of the property in 18 The Layline (refer to Figure 4 below).

Figure 4 Modelled stormwater overflows at 18 The Layline



27 The nature of this flooding (originating south of the property) shows that the installed network described by the submitter, extending along the western and northern boundary of the site, would not capture or alleviate the flooding generated from the surcharging network shown in the image above.

28 The lack of inclusion of a non-return gate in the model is unlikely to have an impact on the resultant flooding as our modelled scenario includes a high tide with 1m of sea-level rise. This will impede outflow from the network, as is noted by the investigation report described above, and would do so with or without a non-return gate in place.

SUBMISSIONS OS 48.1, JOHN SHARP, 64 EXPLORATION WAY, WHITBY

29 Submission OS 48.1 by John Sharp of the property 64 Exploration Way in Whitby requests that the Flood Hazard – ponding layer shown on the property is deleted.

30 The submitter has lived at the property for 31 years and no flooding or ponding has occurred during this time.

31 Wellington Water does not currently have suitable flood modelling output for this area so I accept that the current Flood Hazard – ponding map layer currently shown in the PDP should be removed. This mapping will be re-visited when suitable modelling is available.

**SUBMISSION OS 74.73, THE GREATER WELLINGTON REGIONAL COUNCIL,
NORTHERN GROWTH AREA**

32 Submission OS 74.73 by Greater Wellington Regional Council reports that current the PDP does not include ponding zones and overland flow paths in the Northern Growth Area. Their position is that areas covered by these flood hazard components will be subject to flooding so these components should be shown in the PDP. This is to ensure the PDP has regard to the Proposed RPS Change 1 Policy 29.

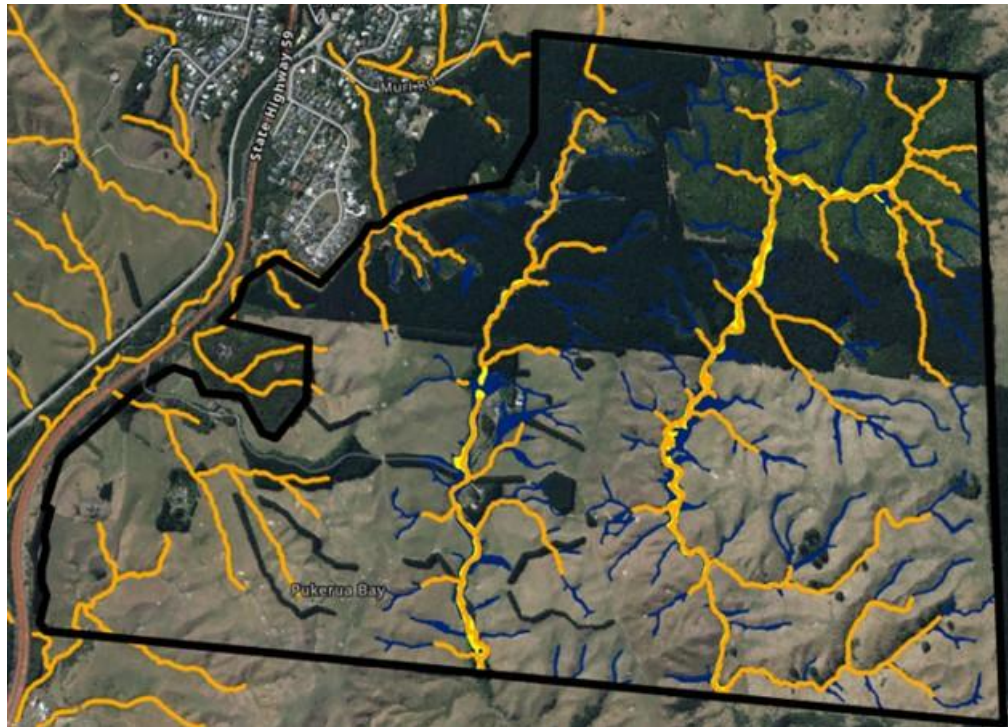
33 This is correct and suitable modelling will be undertaken to enable the development of ponding zones and overland flow paths for the Northern Growth Areas for inclusion in the PDP.

34 Need to refer to and explain relevance of the 2 figures below.

Figure 5 Current flood hazard mapping for the Northern Growth Area



Figure 6 Proposed flood hazard mapping for the Northern Growth Area



SUBMISSION OS 99.12, ALAN COLLET, 42 GRAY ST

35 Submission OS 99.12 by Alan Collet of the property 42 Gray St, Pukerua Bay, reports that the flood mapping in Pukerua Bay, especially in the vicinity of Pukemere Way and Gray St is flawed and not reflective of the true topography of the area. Alan Collet also had concerns regarding the as built drainage information applied in the Wellington Water stormwater model.

36 Regarding the modelled topography, based on discussions with Alan Collet I understand he has two concerns.

37 The first concern is that the model topography does not capture the site earthworks that took place at the time of the subdivision development, that lead to a portion of 42 Gray being filled to create a level building platform. This is not the case, and the modelled topography does capture the level building platform across 42 Gray St, above the stream gully at the rear of the property. This is shown in the Figure 7 below where the minimal variation in colour across the

highlighted section indicates minimal variation in elevation (that is, a level surface). This matches the surface seen in the aerial photograph and Google Streetview photo of the site (refer to Figure 8 and Figure 9 below).

Figure 7 Elevation at 42 Gray St

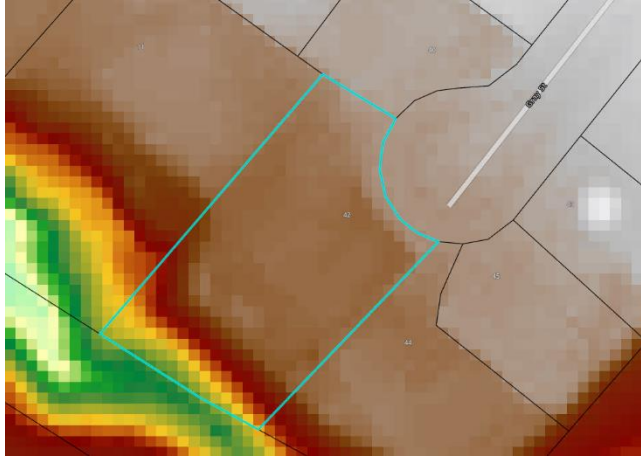


Figure 8 Aerial photograph of 42 Gray St

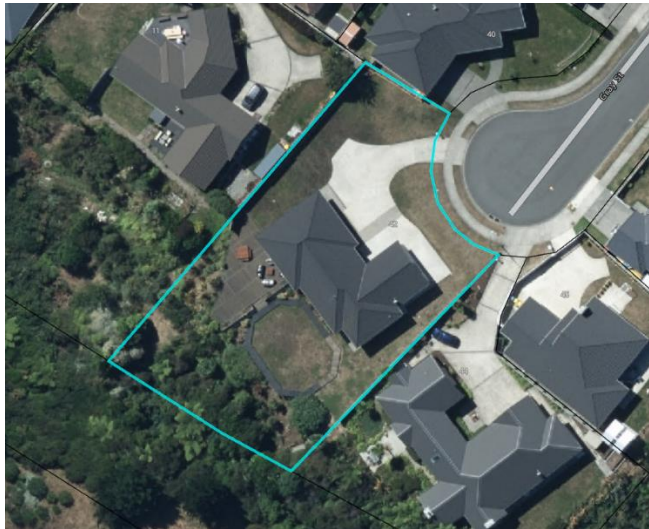


Figure 9 Google Streetview photo of 42 Gray St



- 38 The second concern is that the model topography does not adequately represent the crest of the grassy verge and driveways at the bottom of Gray St, for properties 42 and 44 Gray St. The impact of this is that the full storage capacity of the road carriageway in the cul-de-sac is not captured in the model.
- 39 This has been tested in the model with a more detailed representation of the cul-de-sac topography based on topographic information collected in 2015 (which was not available at the time of the model build). The outcome is that while there is a change to the modelled flooding, it does not fully remove it from 42 Gray St.
- 40 Regarding the second point raised in the submission about the accuracy of the asset information applied in the model, it has been found upon review of available as built plans that the dimensions for the sump lead pipes on Gray St in the Wellington Water GIS asset data and the stormwater model are incorrect. These have been updated in the model. No other network errors were found on Gray St or Pukemere Way, the area for which Wellington Water had as built plans.
- 41 I also met with Alan Collet on the 4th of October, 2022, to discuss his concerns with the flood hazard mapping layers. During this meeting Alan showed me the sump lead pipes that are present along Gray Street. I was able to confirm onsite that the Wellington Water GIS asset data applied in the stormwater model was incorrect. As noted above, this has been updated in the model.
- 42 As a result of the review of this property and associated modelling, it is proposed to change the flood hazard mapping to remove the majority of flooding across 42 Gray St. However, it has been noted that an overland flow path should be included at this location to ensure there is a clear path for water to flow from the cul-de-sac to the gully on the southern edge of the property, in the event of network blockages or an inability to carry runoff from an extreme event.

43 The current and proposed changes to the flood hazard mapping are shown in Figure 12 and **Error! Reference source not found.** below.

Figure 10 Current flood hazard mapping

Figure 11 Proposed flood hazard mapping



SUBMISSIONS OS 115.1, OS 115.2, OS115.3, D SUZI GRINDELL, 21 LANGWELL PLACE

44 Submissions OS 115.1, OS115.2, and OS115.3 by D Suzi Grindell of the property 21 Langwell Place, Papakowhai, report that the flood detention designation should be removed from the area in front of 21 Langwell Place northwards to the macrocarpa trees along Papakowhai Road. D Suzi Grindell's concern relate to perceived out-of-date topographic mapping which has caused inaccuracies in the flood mapping.

45 It is their opinion that in small floods and runoff the flooding mapping shown at the front of the section is exaggerated, rainfall does not generally flood this area and the existing installed drainage is sufficient to carry away any runoff from rainfall.

46 In addition, they have taken care to clear debris from drain gratings in the Langwell Pl, and the culvert entrance at the bottom of the walkway to ensure free drainage.

47 D Suzi Grindell also notes that they have only experienced two significant floods in the 40 years they have lived in Papakowhai, and

that these caused some shallow flooding at the bottom of Romesdale Rd which was considered to be due to loss of capacity because of high tides and debris blocking drains and pipes.

- 48 It is their belief that if the stormwater drainage system is properly maintained water would be able to drain away quickly.
- 49 Finally, D Suzi Grindell highlights that during periods of heavy rain, there is milky runoff from the cliff facing Papakowhai Rd, and that there is nothing in the flooding hazard maps that relates to this.
- 50 There are multiple points to be addressed in response to the submission by D Suzi Grindell, and I will respond to each below. However, in summary, I do not think any changes are required in response to this submission.
- 51 With regard to the comment on the out-of-date topography, I am unaware of the of any significant changes to the topography in the area of 21 Langell Pl, that would impact the flood mapping. The three images in Figures 12 - 14 below show an aerial photograph of the area, the modelled topography based on 2013 LiDAR, and the topography data collected in 2015 (which was not available at the time of modelling). There does not appear to any significant difference between them that would indicate out-of-date information.

Figure 12 Aerial photo PCC Urban Aerials (2016)



Figure 13 Model topography (LiDAR 2013)

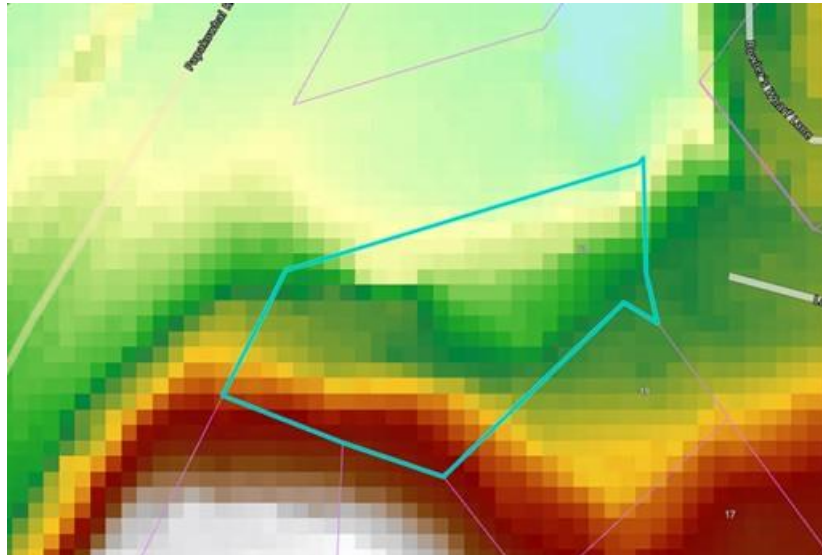
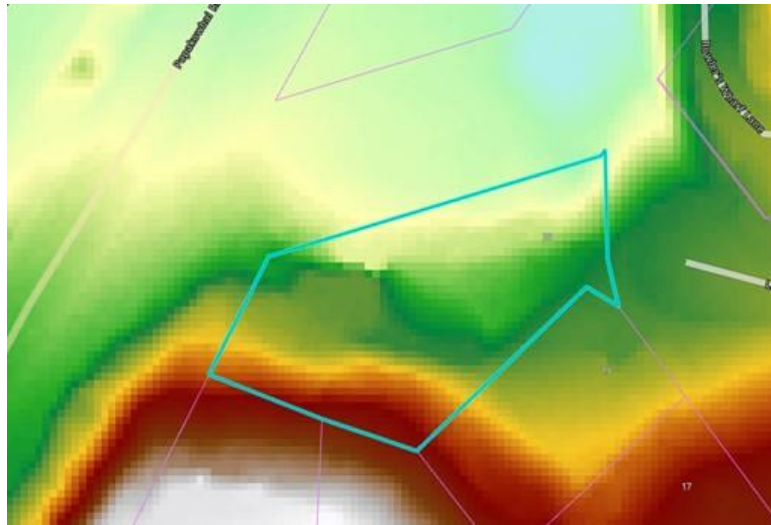
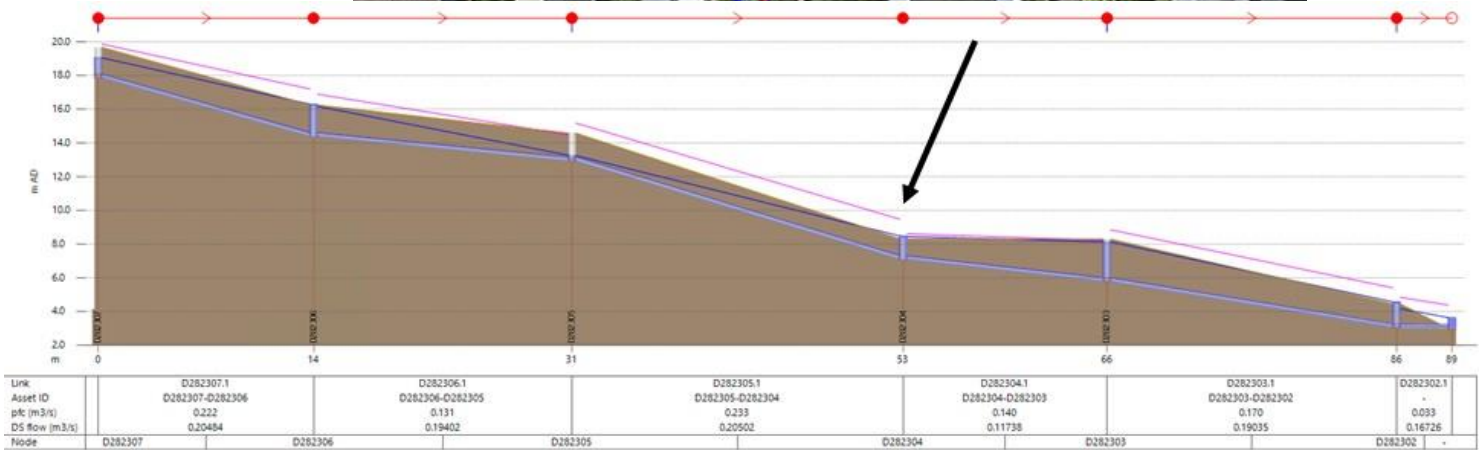
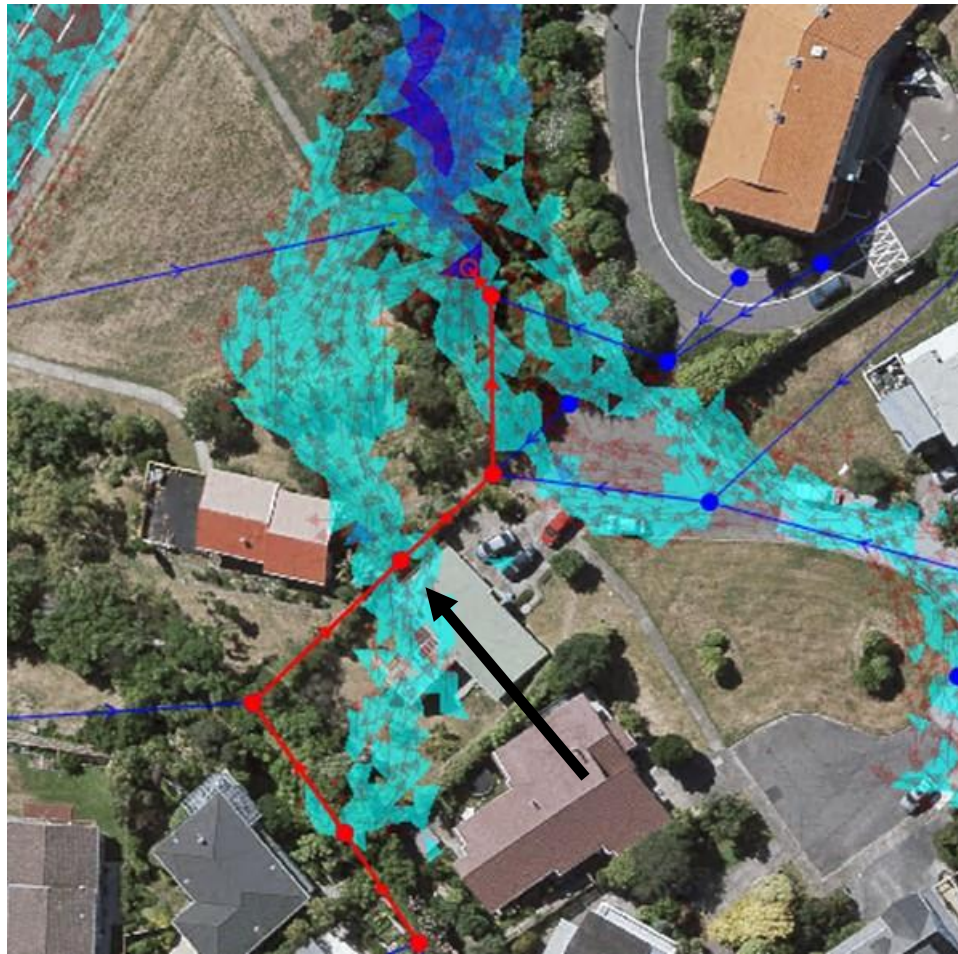


Figure 14 PCC 2015 LiDAR



52 In relation to the D Suzi Grindell's point that the flood mapping is exaggerated at the front of the section and that it does not generally flood and the existing installed drainage system is adequate, it is noted that the mapped flooding hazards are based on modelling of an extreme event (100-year ARI) with allowance for climate change, including 1 metre of sea level rise. In this event the Wellington Water stormwater model shows that the current network does not have capacity to contain the storm runoff. The image in Figure 15 below shows a stormwater manhole on the southern side of the 21 Langwell Pl property surcharging and spilling water that flows north across 21 Langwell Pl. This is combined with overland flow originating from an upstream manhole on 6 Thurso Gr that also surcharges during the modelled event.

Figure 15 Nodes surcharging onto the front portion of 21 Langwell Pl.



53 As a result, the flooding seen on 21 Langwell Pl is not due to flooding in the Langwell Pl cul-de-sac and cleaning the drain grates will not impact it – though it is encouraged. In addition to this the Wellington Water stormwater models assume a clean system with no blockages or

restrictions on street sumps or culvert entrances during the 100-year ARI with climate change simulation.

- 54 With regard to D Suzi Grindell’s comments relating to the lack of real events showing the modelled flooding I note that the flood hazard layers are based on a modelled scenario of an extreme event including climate change, and that rainfall records show that the area has not experienced an event of this magnitude in the past. However, I also note the model has been validated against available information for the 5th of May 2016 event. The results of this validation showed the model represented reported flooding during this event well.
- 55 As a result, I disagree that mapped flood hazard layers are exaggerated due to the lack of experience of similar flooding at 21 Langwell Pl.
- 56 Finally, with regard to the comment describing the milky runoff from the cliff facing Papakowahi Road. There is not adequate information to provide definitive comment, however the submitted description suggests that it is to do with groundwater seepage from the cliff face and as a result would not be related to the flooding hazard mapping.

Date: 10/02/2023



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