

## **Appendix B1: Flood modelling evidence of Mr Alistair Osborne**

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**Before the Hearings Panel  
At Hutt City Council**

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|-------------------------|------------------------------------------------|
| <b>Under</b>            | Schedule 1 of the Resource Management Act 1991 |
| <b>In the matter of</b> | The Proposed Lower Hutt District Plan          |
| <b>Between</b>          | <b>Various</b>                                 |
|                         | <b>Submitters</b>                              |
| <b>And</b>              | <b>Hutt City Council</b>                       |
|                         | <b>Respondent</b>                              |

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**Statement of evidence of Alistair Osborne on behalf of Hutt City Council  
(Flood Hazard Modelling)**

**Date: 20<sup>th</sup> July 2026**

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## **INTRODUCTION:**

- 1        My name is Alistair Mark Osborne. I am employed as a Principal Stormwater Modeller at Tiaki Wai (previously Wellington Water).
- 2        I have prepared this statement of evidence on behalf of the Hutt City Council (**Council**) in respect of technical matters arising from the submissions and further submissions on Hutt City Council's District Proposed District Plan (PDP) in relation to flooding hazard modelling and mapping.
- 3        I have been providing input into the flood hazard mapping for the PDP since 2023. This input includes managing the hydrological and hydraulic modelling, peer review programme, and development of flood hazard mapping based on model output.
- 4        In preparation of this evidence, I have reviewed the Natural Hazards chapter of the PDP, and the Submissions and Further Submissions referred to in Section 22.
- 5        I am authorised to provide this evidence on behalf of the Council.

## **QUALIFICATIONS AND EXPERIENCE**

- 6        I hold the qualification of a Master of Science (with Honours) from Victoria University, Wellington.
- 7        I have 21 years' experience in hydraulic and hydrological modelling in New Zealand. I have worked for both Engineering Consultancies and Councils.
- 8        I am a member of the New Zealand Hydrological Society and Water New Zealand.

## **Code of conduct**

- 9 I have read the Code of Conduct for Expert Witnesses set out in the Environment Court's Practice Note 2023. 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 Hearings Panel. 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**

- 10 My statement of evidence covers the following matters:
- 10.1 The framework that Tiaki Wai and Council have applied to manage flood risk. This will include comments on the following items:
    - 10.1.1 How the hydraulic modelling has been undertaken
    - 10.1.2 The topographic information applied in the hydraulic modelling.
    - 10.1.3 The hydrological approach adopted in the hydraulic modelling, and design event selection.
    - 10.1.4 The climate change scenario adopted in the hydraulic modelling.
    - 10.1.5 Freeboard.
    - 10.1.6 The hazard classification scheme that has been applied to the results from the hydraulic modelling to develop the flood hazard overlays for the PDP.

- 10.1.7 The difference between the flood hazard overlays presented in the Draft District Plan and the flood hazard overlays presented in the PDP.
- 10.2 Comments on submission points pertaining to the PDP flood hazard overlays.
- 10.3 I note that the flood hazard overlays comprise data from the three different sets of modelling, as follows:
- (a) Tiaki Wai stormwater hydraulic modelling;
  - (b) Greater Wellington Regional Council (GWRC) hydraulic modelling for Te Awa Kairangi/Hutt River;
  - (c) GWRC hydraulic modelling for the Waiwhetu Stream;
- 10.4 Results from these three datasets have been classified into hazard categories separately and then combined into the flood hazard overlays presented in the PDP.
- 10.5 I only have working knowledge of the Tiaki Wai stormwater hydraulic models, so cannot speak with expertise on the GWRC models.
- 10.6 I am familiar with the hazard classification approach that has been applied to the modelling results from all three datasets, and I have access to, and have reviewed, the individual GWRC flood hazard overlays, prior to their combination with the Tiaki Wai generated overlays.

- 10.7 A list of the documents I have used and reference in this document is provided in Section 22.

## **FLOOD HAZARD MODELLING AND MAPPING**

### **11 How the hydraulic modelling has been undertaken:**

- 11.1 Tiaki Wai (previously Wellington Water) has generated flood hazard overlay data from hydraulic models developed based on the Wellington Water Regional Stormwater Hydraulic Modelling Specifications. The models have been validated and peer reviewed.
- 11.2 The flood hazard overlays for the PDP are based on the outputs from validated hydraulic models, flood records and feedback from the community.
- 11.3 Six hydraulic models have been developed to model the Hutt City stormwater catchments. The models are as follows:
- 11.3.1 Stokes Valley – modelling initiated in 2016 and completed in 2022.
- 11.3.2 Black Creek (Wainuiomata) - modelling initiated in 2018 and completed in 2022.
- 11.3.3 Eastern Lower Hutt - modelling initiated in 2019 and completed in 2022.
- 11.3.4 Petone (including the western hills from Korokora to Normandale) - modelling initiated in 2017 and completed in 2022.
- 11.3.5 East Harbour – modelling initiated in 2020 and completed in 2024

11.3.6 Western Hills – modelling initiated in 2021 and completed in 2024

11.4 Tiaki Wai (previously Wellington Water) and Hutt City Council ran eleven public engagement sessions on natural hazards in the Hutt Valley in 2021. I attended four of the public engagement meetings to present the flood hazard information on behalf of Wellington Water and Hutt City Council to the community and receive feedback on the validity of the mapping. Feedback from the community engagement sessions generally supported the modelled flood extents and provided some additional validation of the modelling. There was no significant opposition that required a review of, and changes to the modelling.

11.5 In addition to the community engagement described above, additional information for the East Harbour modelling was obtained from the public through engagement via social pinpoint site ([Managing Flood Risks Eastbourne | Social Pinpoint \(mysocialpinpoint.com\)](https://www.mysocialpinpoint.com/)). The site went live in March 2022 for three months, but is still accessible now at the link above.

## 12 **The topographic information applied in the hydraulic modelling.**

12.1 Topographic representation of the modelled catchments comprises a critical component of the stormwater hydraulic models. Digital Elevations Models (DEMs) developed from aerial LiDAR surveys have been applied in the hydraulic models to represent topography.

12.2 The development of the hydraulic models for the Hutt City stormwater catchments has been completed over a period of 8 years (from 2016 to 2024), and DEMs generated from two

different aerial LiDAR surveys have been applied in the models.

12.3 The list below provides the DEMs (and aerial LiDAR survey) used for each model:

12.3.1 Stokes Valley – DEM generated from the 2013 aerial LiDAR survey.

12.3.2 Black Creek (Wainuiomata) - DEM generated from the 2013 aerial LiDAR survey.

12.3.3 Eastern Lower Hutt – a combined DEM generated from the 2013 and 2016 aerial LiDAR surveys.

12.3.4 Petone – DEM generated from the 2013 aerial LiDAR survey.

12.3.5 East Harbour – a combined DEM generated from the 2013 and 2016 aerial LiDAR surveys.

12.3.6 Western Hills – DEM generated from the 2013 aerial LiDAR survey.

### 13 **Hydrological approach adopted in the hydraulic modelling, and design event selection.**

13.1 The hydrological approach applied in the hydraulic modelling provides a representation of how rainfall is converted to runoff in the model environment.

13.2 The hydrological approach applied in the models follows the Wellington Water Hydraulic Modelling Specification and the Wellington Water Reference Guide for Design Storm Hydrology.

- 13.3 The design storm selected for the stormwater model simulations used to generate results for the flood hazard overlays is the 1% Annual Exceedance Probability (AEP) rainfall event including an allowance for climate change.
- 13.4 The 1% AEP rainfall event is a storm that has a 1% chance of occurring in any one year. It is also commonly referred to as 1 in 100 year (or 1:100 year) event
- 13.5 The 1% AEP event is considered an industry standard event for use in flood modelling, and it aligns with the Tiaki Wai stormwater level of service target of no habitable floor flooding in the 1% AEP event (including climate change).
- 13.6 The use of AEP also allows the calculation of exposure probability. For example, there is approximately a 25% chance of a property experiencing a 1% AEP rainfall event across the duration of a 30-year mortgage.

**14 The climate change scenario adopted in the hydraulic modelling.**

- 14.1 Climate change has been allowed in the hydraulic modelling by adjusting the rainfall and the sea-level (as represented by a tidal boundary) applied in the model.
- 14.2 Rainfall has been adjusted by increasing the current 1% AEP design rainfall by 35%, which is equivalent to the RCP 8.5 scenario provided by NIWA HIRDS version 4, for Hutt City 100 years from now (the 2130 date horizon).
- 14.3 The 35% increase in rainfall has been calculated by interpolating the projected temperature increase along RCP 8.5 in the Wellington Region from 2100 to 2130. Information

for this was derived from a NIWA report published in 2017<sup>1</sup>. The total temperature increase was estimated to be just below 4.5°C. The report also provided a percentage rainfall increase (8%) for each degree of warming. The total rainfall increase was calculated to be approximately 35%, so was rounded to 35% for simplicity.

- 14.4 Sea-level has been adjusted by an increase of 1.59m. This value has been generated using the [Takiwa-NZ Searise website](https://environment.govt.nz/publications/coastal-hazards-and-climate-change-guidance/), following the SSP5 8.5 projection pathway to the year 2130. The value also includes the projected vertical land movement for the Petone foreshore. This approach has been adopted based on recommendations in the 2023 guidance document on coastal hazards and climate change from the Ministry for the Environment (<https://environment.govt.nz/publications/coastal-hazards-and-climate-change-guidance/>).
- 14.5 The date horizon for the projected climate change is 2130. This means the rainfall has been adjusted to a value that is projected to be the 1%AEP design rainfall in the year 2130. It should be noted that this rainfall can occur now, but it would be an event larger than a 1%AEP event (that is, it has a lower probability of occurring).
- 14.6 Regarding sea-level rise, the projected increase of 1.59m (including vertical land movement) is representative of how much higher mean sea-level will be relative to the current mean sea-level.

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<sup>1</sup> Climate change and variability – Wellington Region. Prepared for Greater Wellington Regional Council. NIWA (2017)

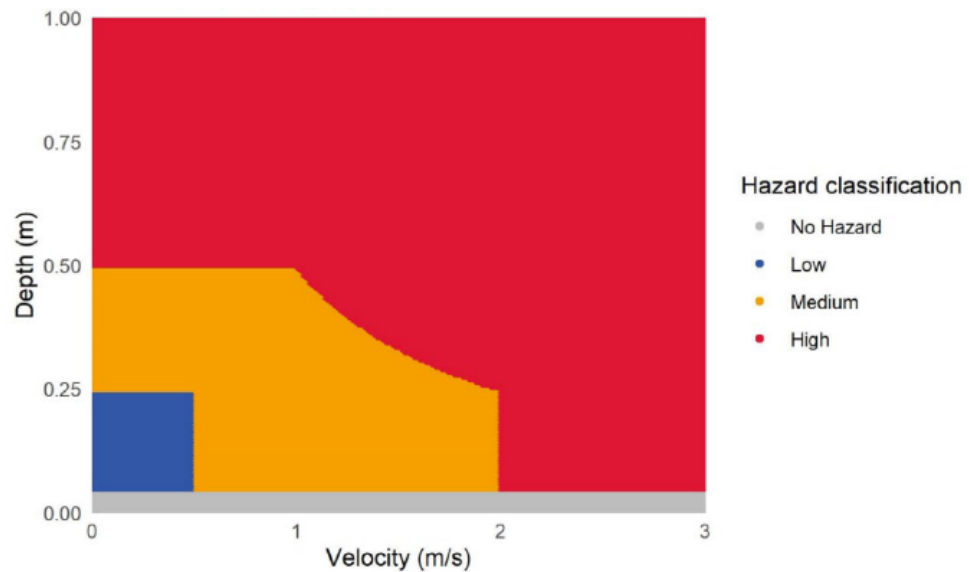
## 15      **Freeboard**

- 15.1      Freeboard is an additional allowance that is included in the models to take into account unknowns or residual risks during flood events, including, but not limited to:
- Blocked culverts
  - Sediment build-up
  - Wave generation from vehicles
- 15.2      To establish suitable freeboard values, sensitivity analyses have been carried out by simulating different scenarios in the models.
- 15.3      The scenarios are depending on the catchment but typically include testing the sensitivity of the model results to inlet blockages, culvert blockages, variation in the design rainfall event, increased surface roughness, or altered tailwater/sea level assumptions.
- 15.4      The results of the sensitivity analyses are then used to determine the appropriate additional flood depths to apply in the models. Typically, 200mm freeboard suitably accounted for these residual risks.
- 15.5      A final model simulation is then completed using the using the derived freeboard amounts to assess how the impacts of the residual risks would propagate beyond the location of their occurrence.
- 15.6      Further details on the Tiaki Wai freeboard approach can be found in the Wellington Water Hydraulic Modelling Specifications.

- 15.7 Regarding the impact of the freeboard allowance on the flood hazard overlays, freeboard is only incorporated into the low hazard overlay. It is not considered in the medium and high hazard categories.

16 **Flood Hazard Classification**

- 16.1 The flood hazard classification has been completed following the approach set out in the GWRC Flood Hazard Planning Guidance (2023) document.
- 16.2 The approach outlined below describes the process applied to the Tiaki Wai stormwater modelling results prior to their combining with the GWRC flood hazard overlays for Te Awa Kairangi/Hutt River and the Waiwhetu Stream.
- 16.3 The hazard classification process has used the depth, velocity, and depth-velocity product results from the stormwater hydraulic model simulations of the 1% AEP event including allowance for climate change.
- 16.4 The figure below shows the depth-velocity-hazard relationship that has been applied to develop the three hazard categories from the model results.



Source: *Greater Wellington Flood Hazard Overlays – Hutt City Council District Plan memo. 2024*

16.5 In addition to the model results applied in hazard classification process, two additional datasets have been applied to the flood hazard overlays:

16.5.1 The freeboard allowance has been included in the low hazard category, effectively increasing its extent.

16.5.2 Manually generated stream corridors have been included in the high hazard category. The stream corridors have been generated from multiple sources including modelled streams, Tiaki Wai stormwater asset data, and the review of aerial photography.

16.6 Post-processing has been undertaken to generalise (smooth) the edges of hazard overlays and remove small islands of one overlay sitting within the overlay of a different hazard category. Further details of this post-processing can be found

in the WWL\_Flood\_hazard\_process\_Memo<sup>2</sup> developed by Stantec on behalf of Tiaki Wai (previously Wellington Water).

**17      Difference between the flood hazard overlays presented in the Draft District Plan and the flood hazard overlays presented in the PDP**

17.1      The difference between the flood overlays presented in the Draft District Plan and the PDP stem from the two changes in approach listed below.

17.1.1      A change in the climate change allowance.

17.1.2      A change in the hazard classification approach.

17.2      Regarding the climate change allowance:

17.2.1      The PDP flood hazard overlays have been generated from model simulations that applied the approach outlined in Section 14. The Draft District Plan, however, applied the standard Tiaki Wai approach of increasing current rainfall by 20% (approximately equivalent to RCP 4.5 to 2130), and raising seal level by 1m (a previously established nominal value for the Wellington region). The 1m increase is now approximately equivalent to projected sea-level rise associated with SSP3-7.0, including vertical land movement, to 2130.

17.2.2      The change was made due to the release of the new MfE Coastal Hazard and Climate Change Guidance document, which recommended SSP5-

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<sup>2</sup>

[https://hccpublicdocs.azurewebsites.net/api/download/d764466f20cf454ba1010adf695ed15f/\\_dplanreview/2418b24e13451956440fa1cf1f98f86fd7c1](https://hccpublicdocs.azurewebsites.net/api/download/d764466f20cf454ba1010adf695ed15f/_dplanreview/2418b24e13451956440fa1cf1f98f86fd7c1)

8.5M for projecting sea-level rise in the context of Land-use planning controls for existing coastal uses and assets. The rainfall increases described in Section 14 were then selected to align the rainfall RCP scenario to the sea-level SSP scenario.

17.3 Regarding the hazard classification approach:

17.3.1 The PDP flood hazard overlays have been generated using the hazard classification system described in Section 16. The Draft District Plan, however, applied the standard Tiaki Wai classification system of Inundation, Overland Flow Paths, and Stream Corridors. Key differences between the two systems are described below:

- (a) The GWRC Flood Hazard Guidance applies depth and velocity thresholds across all categories.
- (b) The Tiaki Wai approach applies a depth-velocity product threshold for the Inundation category (that is, all flooding with a depth-velocity product below a given value is considered Inundation); flooding with a depth-velocity product above the Inundation threshold initiates the overland flow path category which is then finalised through manual delineation of overland flow paths based on catchment characteristics; finally, manually generated stream corridors independent of modelling output comprise the stream corridor category.

- (c) In both approaches the freeboard allowance is only included in the low hazard and Inundation categories.

## COMMENTS ON SUBMISSIONS AND FURTHER SUBMISSIONS

### SUBMISSION SUMMARY

- 18 Approximately 90 submissions have been received in relation to the PDP flood hazard overlays. A number of these submissions raise common questions, concerns, and themes regarding the proposed overlays. To assist in responding consistently and efficiently, a number of these common themes are summarised below, together with corresponding responses. These issue summaries and responses are referenced, where applicable, within the individual submission responses.
- 19 While I have developed the common issue summaries, each submission has been reviewed and considered individually. The response to each submission reflects my understanding of the matters raised by the submitter and the reasons provided in support of their position. The use of standardised responses for recurring issues is intended to improve the clarity, consistency, and efficiency of the reporting process.
- 20 **Common Issues Raised**
- 20.1 **A lack of historical flooding**
- Multiple submitters have noted that their properties or localities have not previously been affected by flooding.
  - While previous flooding at a property is useful in model validation and a good indicator of future flood risk, the

lack of previous flooding does not preclude future flood risk

- The modelling undertaken for PDP flood hazard overlays simulates an extreme, future event that has not previously occurred in the Hutt City stormwater catchments. Please refer to Sections 13 and 14 for additional information on the simulated event.

**20.2 Flood overlay does not reflect local topography or site conditions**

- Multiple submitters have noted that the flood hazard overlays do not reflect the local topography or site conditions of their properties.
- The flood hazard overlays are based on physics-based hydraulic modelling that uses LiDAR-derived terrain models (DEMs). The information was considered the best available topographic information available at the time of the model builds.
- There will almost certainly be some locations the catchment landform has changed at specific due to earthworks and development. Location specific changes are discussed below in relation to individual submission responses.

**20.3 Flooding is caused by stormwater infrastructure deficiencies rather than natural flooding**

- Multiple submitters have noted that the observed flooding in the Hutt City stormwater catchment, including the observations that have been used to validate the modelling, has been due to stormwater

infrastructure inefficiencies or failures, such as culvert or sump blockages and similar.

- The hydraulic models assume a clean and functioning stormwater network and the modelled flooding is predicted under those assumptions. I do note that, however, that because the low flood hazard overlay includes results from the freeboard simulations, some of the extents of this overlay may be impacted by the culvert blockages tested in the sensitivity analyses. Please see Section 15 for information on the Tiaki Wai approach to freeboard.
- This is because the simulated design event is beyond the designed capacity of the infrastructure, that is the ability of the infrastructure to capture and carry stormwater.
- In general, stormwater infrastructure in the Wellington Region is designed to capture and convey the 10% AEP design event (not including climate change). However, historically installed infrastructure regularly does not achieve this.
- Use of observations made of flooding that is a result of infrastructure failure is still suitable in for model validation as it is indicative of where water will flow and collect if it is not contained by the stormwater infrastructure.

#### 20.4 **The hydraulic models contain assumptions and limitations that reduce reliability**

- Multiple submitters have questioned the accuracy of the modelling due to the limitations and assumptions associated with the models, and as a result, the

suitability of using their output for the flood hazard overlay mapping.

- I note that there are limitations in the models and that some model information is assumed. This is because they have been developed within the constraints of time, budget, and available information. However, to manage these limitations and assumptions the models have been built in compliance with accepted modelling specifications (the *Wellington Water Hydraulic Modelling Specification*), have undergone validation, sensitivity testing, and independent review.
- I believe the models represent the best available information available for the PDP and that the model outputs are suitable for District Plan purposes.

**20.5 Climate change assumptions are excessive or unrealistic**

- Multiple submitters have raised the concern that the climate change assumptions are excessive or unrealistic.
- The climate change approach adopted in the modelling were selected through discussions with HCC and GWRC, with the aim of aligning with MfE recommendations for sea-level rise, and GWRC requirements for rainfall. Please see Section 14 for additional information.

**20.6 Property-specific mitigation has not been recognised**

- Multiple submitters have noted that property specific mitigations (such as raised floor levels, fences, retaining walls, and private drainage) have not been considered in the modelling.

- I note that there are limitations to the modelling, and it is generally not possible to include property specific mitigations due to lack of available and suitable information, and time and budget constraints. However, site specific mitigations would be considered when site specific work requiring a resource consent is undertaken.

#### 20.7 **Future infrastructure improvements should be reflected in the overlays**

- Multiple submitters have noted that currently proposed infrastructure upgrades, along with potential future flood mitigation work, have not been considered in the modelling used for the flood hazard overlays.
- Future work is generally not incorporated into the modelling used for the District Plan overlays until it has been completed. This is because of potential changes that can occur in the scheduling and design of upgrades prior to their completion.
- There is a pathway via the Plan Change process for changes to the flood hazard overlays due to infrastructure upgrades or mitigation work to be incorporated in the District Plan.

#### 20.8 **Flood hazard boundaries appear inaccurate**

- Multiple submitters have asserted that the flood hazard overlays appear inaccurate.
- The flood hazard overlays have been generated by applying the GWRC Flood Hazard Planning Guidance approach to classify model results into the low, medium, and high categories presented in the PDP.

- Post-processing has been undertaken to generalise (smooth) the edges of hazard overlays and remove small islands of one overlay sitting within the overlay of a different hazard category. Further details of this post-processing can be found in the WWL\_Flood\_hazard\_process\_Memo<sup>3</sup> developed by Stantec on behalf of Tiaki Wai (previously Wellington Water).

## 21 Issues not raised by submitters

- 21.1 An error has been found in the PDP flood hazard overlays while reviewing the submissions. During the hazard classification and mapping process, the open channels represented in the East Harbour stormwater model were not included in the flood hazard overlays as high hazard (see Stream Corridors in Section 16.5), as has been done for the remainder of modelled catchments.
- 21.2 One missing stream corridor was also identified in flood hazard overlays in Wainuiomata.
- 21.3 I recommend updating the flood hazard overlays to include the East Harbour stormwater model open channels as high hazard areas, and the missing stream corridor identified in Wainuiomata.

**22.1 Adrian Palmer Family Trust (315) - Various**

- The submitter opposes the flood hazard overlays mapped on 18 locations owned by the submitter. No reasons or evidence is provided in support of removing the flood hazard overlays. A review of the locations shows that the modelled flooding is reasonable/expected given the event simulated
- I recommend the flood hazard overlays remain unchanged at the locations specified in the submission.

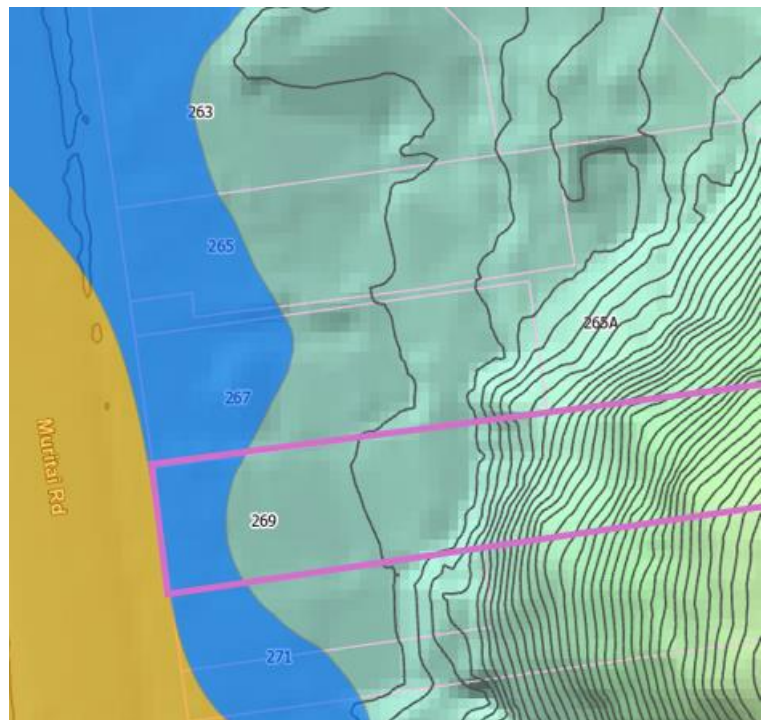
**22.2 Allison Thwaite (250) – Manor Park**

- The submitter notes that their property or locality has not previously been affected by flooding.
- Please see Section 20.1.
- In addition to the above, it is noted that the predominance of the high flood hazard overlay in Manor Park is due to flooding from the Hutt River, as modelled by GWRC. However, Wellington Water modelling also indicates there is potential for flooding originating from the Western Hills above Manor Park.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

22.3      **Andrew Robinson and Robyn Robinson (380, F09) - 269**  
**Muritai Rd Eastbourne**

- The submitter opposes the medium flood hazard overlay mapped on their property due to a broad range of concerns. Issues relating to the flood hazard overlays are listed below:
  - There is no history of flooding at their property, or limited historical basis, that provides compelling evidence for this overlay on the applicant properties.
  - No accurate future modelling that provides compelling evidence for this overlay on the applicant properties. The hydraulic models contain assumptions and limitations that reduce reliability.
  - The flood zone outline on the submitter's property bears no resemblance to any historical flooding or the topography of the property.
  - Any surface flooding has been caused by stormwater infrastructure deficiencies rather than natural flooding.
  - The supporting documentation highlights the hydraulic models contain assumptions and limitations that reduce reliability.
  - Property-specific mitigation has not been recognised.

- Future infrastructure improvements should be reflected in the overlays.
- These issues are addressed in Sections 20.1, 20.2, 20.3, 20.4, 20.6, 20.7, 20.8.
- Further, a review of the flood hazard overlays at the submitter's property in the context of available topographic contours shows the overlays are sensible relative to the topography. Please see the image below, the submitter's property is outlined in magenta.



- Alongside the common issues listed above the submitter has also highlighted the following points in support of their submission:
  - The suggested 1% AEP or 1 in 100-year flood analysis by Wellington Water is noted as best practice in the PDP but is hypothetical and not proven fact.

- The Council (and by extension Tiaki Wai) misuses and misrepresents feedback to generate the flood hazard overlays, with particular reference to the Social Pinpoint campaign.
- Please see Section 13 for information regarding the 1% AEP event. I note that while it is a hypothetical event, the science behind the calculation of the rainfall values applied is well established and adopted globally. I do not believe there is currently better information available to use for predicting extreme events.
- The Social Pinpoint campaign was set up specifically to collect information for use in validating the hydraulic modelling, and this stated in the introductory pop-up of the website.
- I note also that there is no direct link between the community feedback and the PDP flood hazard overlays.
- The community feedback was used for validating the hydraulic modelling which, once reviewed and accepted, was then used to simulate the extreme event. The outputs of this simulation were then used the hazard classification process, with no reference back to the community feedback during the classification process.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

#### 22.4 **Anish Punjabi (141) – Ford Road, Manor Park**

- The submitter raises concerns regarding the accuracy of the modelling due to the limitations and assumptions

associated with the models, and their appropriateness for use in the PDP context.

- Please see Section 20.4.
- In addition to the above, it is noted that the predominance of the high flood hazard overlay in Manor Park is due to flooding from the Hutt River, as modelled by GWRC. However, Tiaki Wai modelling also indicates there is potential for flooding originating from the Western Hills above Manor Park.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.5      Antony and Penelope Orbell (281) - 3 Ngaio St, Eastbourne**

- The submitter raises a broad range concerns and queries. Issues relating to the flood hazard overlays are listed below:
  - Flooding is caused by stormwater infrastructure deficiencies rather than natural flooding.
  - Future infrastructure improvements should be reflected in the overlays.
  - Property-specific mitigation has not been recognised.
- Please see Sections 20.3, 20.6, and 20.7.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.6 Argosy Property No.1 Limited (237) - Various**

- The submitter does not request any changes to the flood hazard overlays.
- I recommend the flood hazard overlays remain unchanged at the locations specified in the submission.

**22.7 Barbara Sullivan (351) - 89 Oroua Street, Eastbourne**

- The submitter raises a broad range concerns and queries. Issues relating to the flood hazard overlays are listed below:
  - Flooding is caused by stormwater infrastructure deficiencies rather than natural flooding.
  - The hydraulic models contain assumptions and limitations that reduce reliability.
  - Future infrastructure improvements should be reflected in the overlays.
  - Property-specific mitigation has not been recognised.
- Please see Sections 20.3, 20.4, 20.6, and 20.7.
- In addition to the above, the submitter has also noted that “the relevant High Flood Hazard overlay does not accord with zones illustrated on the map titled “91 Oroua Street” on page 59 of “The East Harbour

Stormwater Catchment – Model Build Report” prepared for HCC by Wellington Water (“the WW Report”).

- This is because the modelled flooding shown in the report image referenced relates to simulated flooding during the February 2004 event, which is a smaller event than what has been simulated to generate the flood hazard maps.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.8 Beverley and Oliver Driver (242) - 57A Hautana Street, Woburn**

- The submitter opposes the high flood hazard overlay mapped on their property, highlighting local topography and no previous flooding
- Please see Sections 20.1 and 20.2.
- Further, the high flood hazard overlay is present on the submitter’s property due to the stream (and represented stream corridor) at the rear of the property.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

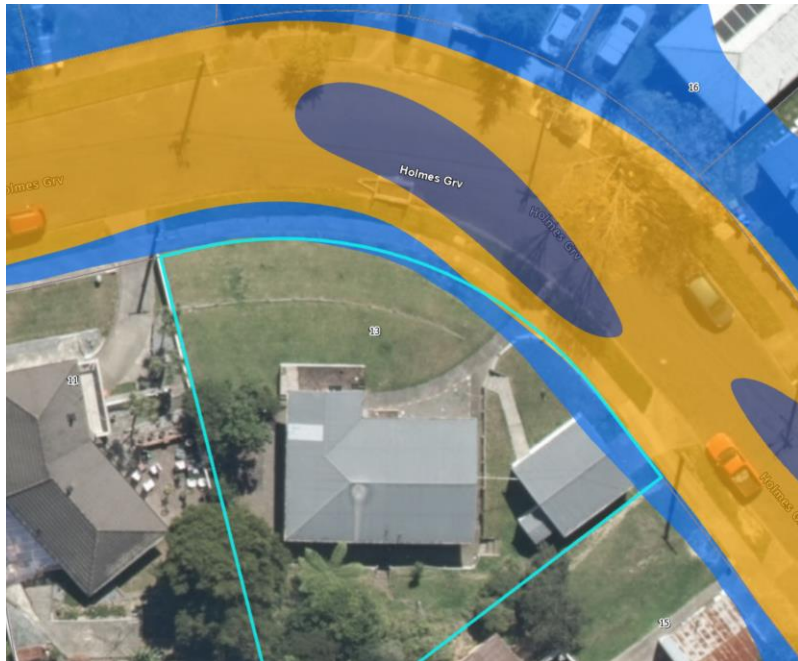
**22.9 Bhuvi Punjabi (144) – Ford Road, Manor Park**

- The submitter raises concerns regarding the accuracy of the modelling due to the limitations and assumptions associated with the models, and their appropriateness for use in the PDP context.

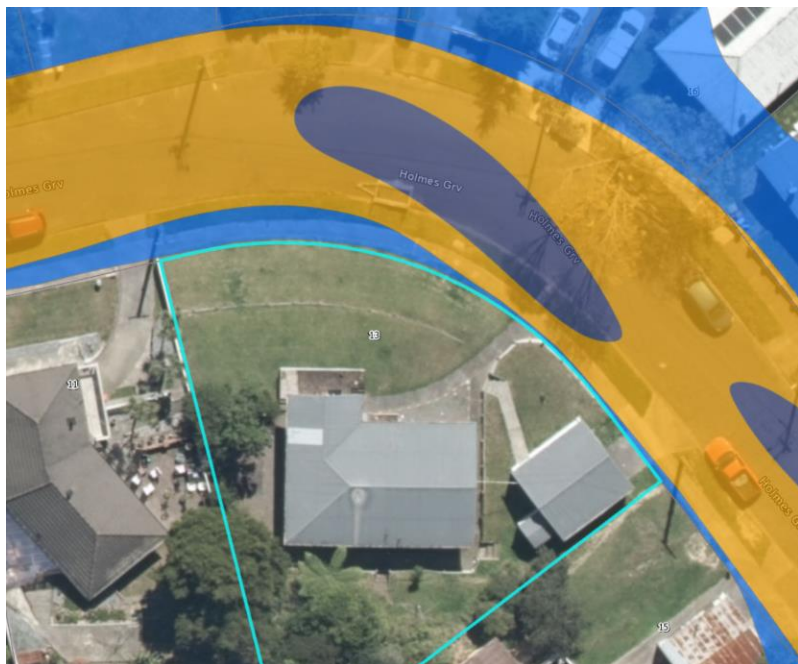
- Please see Section 20.4.
- In addition to the above, it is noted that the predominance of the high flood hazard overlay in Manor Park is due to flooding from the Hutt River, as modelled by GWRC. However, Tiaki Wai modelling also indicates there is potential for flooding originating from the Western Hills above Manor Park.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.10 Brett Osborne (464) - 13 Holmes Grove, Naenae**

- The submitter supports with amendments the flood hazard overlays in the vicinity of their property. They requested that the overlays are refined based on the site photographs showing a retaining at the edge of the property would contain the flooding within the road parcel.
- I have reviewed the location of the property in the modelling and the flood hazard overlays and note that property is intersected by the flood hazard overlays due to the processing of the flood hazard overlays to smooth them, rather than modelled flooding extending onto the property.
- As a result, and with consideration of the site photographs, I believe it is acceptable to edit the flood hazard overlays to sit within the road parcel at this location.
- Below are images of the current and proposed flood hazard overlays



Current PDP flood hazard overlays (464)



Proposed update to PDP flood hazard overlays (464)



Legend for the flood hazard overlays

**22.11 Chakrin Gangodawila (88) - 11 Martha Turnell Cres, Manor Park**

- The submitter raises multiple concerns. Issues relating to the flood hazard overlays are listed below:
  - Flooding is caused by stormwater infrastructure deficiencies rather than natural flooding.
  - The hydraulic models contain assumptions and limitations that reduce reliability.
- Please see Sections 20.3 and 20.4.
- In addition to the above, the submitter has also noted the flood risk associated with the Hutt River and work done to mitigate this risk.
- I am unable to provide comment on this as the modelling and mitigation work has been carried out by GWRC, and I am not familiar with it. However, Tiaki Wai modelling also indicates there is potential for flooding originating from the Western Hills above Manor Park.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.12 Charmi Mistry (392) - 2/1 Helvetia Grove, Naenae**

- The submitter opposes the flood hazard overlays mapped on their property and seeks reconsideration and

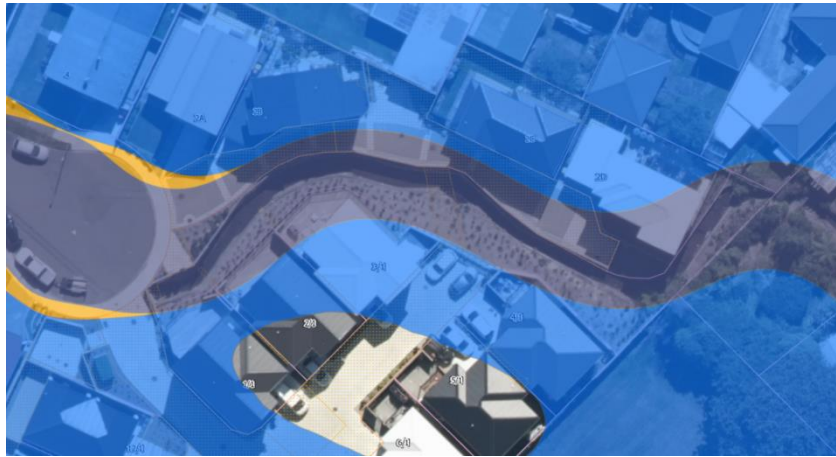
removal of the overlays, as the property was developed recently and the house was completed in 2024. As a result, it is unlikely any flood mitigation work completed as part of the development has been included in the modelling.

- I have reviewed the property in the flood modelling and the hazard overlays and can confirm the development work is not included in the model.
- I also visited the location, view the property and stream from the street and start of the driveway, as well as assessing the upstream catchment above the development.
- Following the site visit I believe it is acceptable to re-delineate the stream corridor to constructed extent as requested in the submission. However, I do not believe removal of the low flood hazard overlay is appropriate as there is no obvious mitigation in place to stop the shallow flooding arriving at the development from the upstream catchment.
- I do note however, that given the age of the development, the constructed buildings will likely have been required to meet a minimum floor which will set them above modelled flooding. However, the adopted modelling approach does not generally include or account for the presence residential buildings<sup>4</sup>.

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<sup>4</sup> Regional Stormwater Hydraulic Modelling Specifications. Wellington Water, 2023

- Below are images of the current and proposed flood hazard overlays.



Current PDP flood hazard overlays (392)



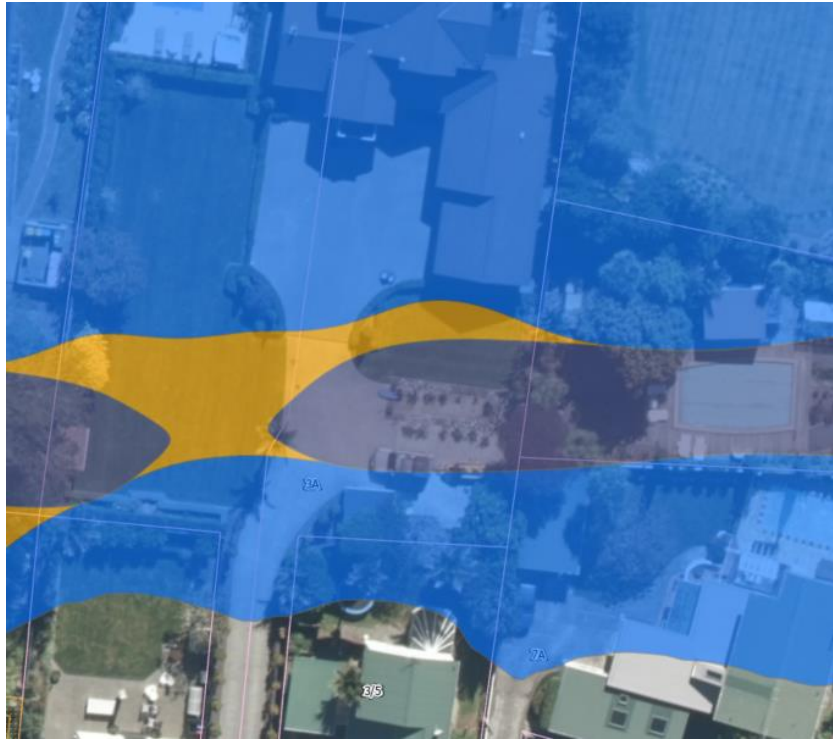
Proposed update to PDP flood hazard overlays (392)



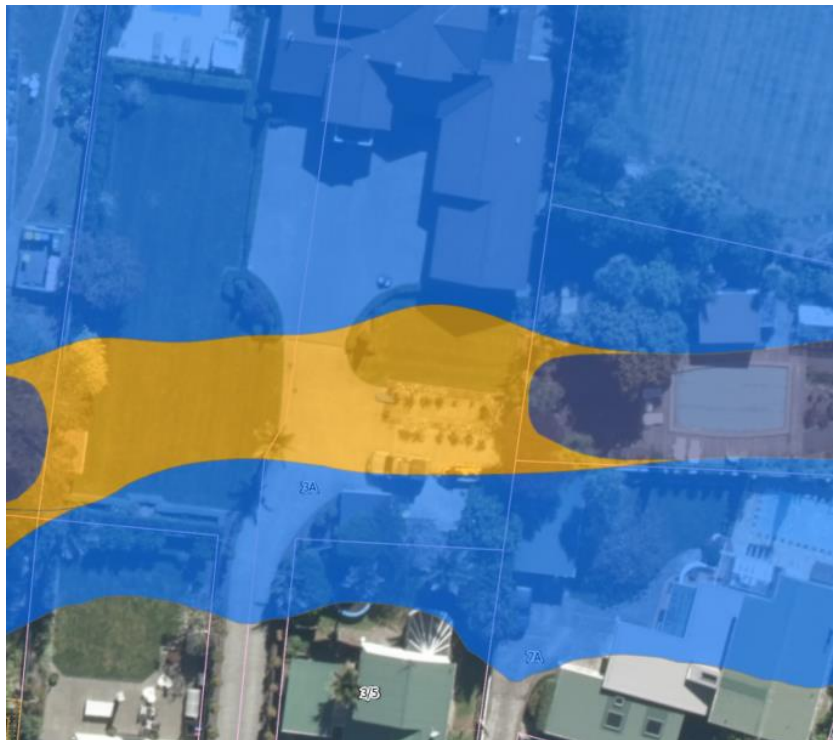
Legend for the flood hazard overlays

22.13 **Chris Moore (448) - 3A Nikau Grove, Woburn**

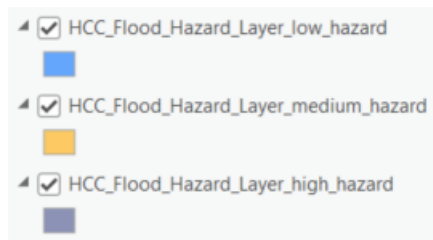
- The submitter opposes the flood hazard overlays mapped on their property for the following reasons.
  - Lack of historical flooding.
  - Climate change assumptions are excessive or unrealistic.
  - Future infrastructure improvements should be reflected in the overlays.
- Please see Sections 20.1, 20.5, and 20.7 for commentary on these issues.
- I have reviewed the modelling at the submitter's property, and the flood hazard overlays have been mapped as they are because of surface flow arriving from the east (originating from Ludlam Cr and beyond) and the presence of a stream corridor on the property.
- However, I visited the property and found the stream corridor was no longer present and the channel had been piped beneath the property.
- I recommend the removal the high flood hazard overlay from the submitter's property, replacing it with the medium flood hazard overlay.
- Below are images of the current and proposed flood hazard overlays.



Current PDP flood hazard overlays (448)



Proposed update to PDP flood hazard overlays (448)



Legend for the flood hazard overlays

#### 22.14 **Christine Potaka-Kelly (84) – Manor Park**

- The submitter notes that their property or locality has not previously been affected by flooding.
- Please see Section 20.1.
- In addition to the above, it is noted that the predominance of the high flood hazard overlay in Manor Park is due to flooding from the Hutt River, as modelled by GWRC. However, Tiaki Wai modelling also indicates there is potential for flooding originating from the Western Hills above Manor Park.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

#### 22.15 **Christopher John McHaffie and Mary Anne Malone (278) - 9 Ngaio St, Eastbourne**

- The submitter raises a broad range concerns and queries. Issues relating to the flood hazard overlays are listed below:
  - Flooding is caused by stormwater infrastructure deficiencies rather than natural flooding.

- Future infrastructure improvements should be reflected in the overlays.
  - Property-specific mitigation has not been recognised.
- Please see Sections 20.3, 20.6, and 20.7.
  - I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.16 Craig Davis (112) – 10 Campbell St, Petone**

- The submitter supports with amendment the flood hazard overlays mapped at their property; however, they disagree with the specific hazard classifications and approach the method of classification. They note the property is built on well-draining ground and has no history of flooding.
- The modelling and hazard classification approach used to develop the flood hazard overlays is discussed in Sections 11 to 17, and commentary on the lack of historical flooding is provided in Section 20.1.
- I have reviewed the flood hazard overlays and modelling results at submitter's property and note the high and medium flood hazard overlays are present due to the significant flood depths modelled at this location.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.17      Damon Smith (27) - 99 Oroua St, Eastbourne**

- The submitter opposes the high flood hazard overlay on their property, noting there is an error in the relevant model build report (flooding report).
- The community feedback discussed in the reporting was used for validating the hydraulic model which, once reviewed and accepted, was then used to simulate the extreme event. The outputs of this simulation were then used the hazard classification process, with no reference back to the community feedback during the classification process.
- Further, I have reviewed the error that has been described alongside the model report and the mapped flooding and do not believe it would have a material impact on the model output.
- The submitter's property would still be affected by flooding during the simulated event if the reporting error was corrected and taken in account in the model validation.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.18      Dave and Michaela O'Donovan (37)**

- The submitter opposes the high flood hazard overlay mapped across most of the residential areas between Jackson St and the Esplanade, and requests the classification is reduced to medium.

- They note the high hazard classification is a result of the projected sea-level rise and the cascading effect of raised groundwater reducing the effectiveness of the stormwater network.
- They also highlight that the Council has recognised this and is looking to address when needed with future pump stations.
- As noted in Section 20.7 the modelling cannot account for future infrastructure improvements until they are constructed.
- Similarly, the modelling does not allow a reduction in network effectiveness due to groundwater, and as discussed in Section 20.3 applies a fully functioning system.
- Therefore, while the high flood hazard overlay present over most of the residential areas between Jackson St and the Esplanade, is likely in part due to the projected sea-level rise, it is not due to a reduction in the network's effective because of groundwater. Rather it would be due to the network's inability to drain out at the coast because of the high sea-level.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.19 David James Clode (227) - 26 Kowhai Street, Naenae**

- The submitter opposes the flood hazard overlays mapped on their property because they will restrict their ability to add value to their property, and there has historically not been flooding at their location.

- A review of the model results at the submitter's property shows that during the simulated design event, the modelling generates results that fall within the High Hazard category of Flood Hazard Planning Guidelines.
- Please see Section 20.1 in relation to the non-occurrence of historical flooding.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.20 David Surrey (427) - Various**

- The submitter requests a review of the climate change approach adopted in the modelling for the flood hazard overlays.
- It is acknowledged that the use of a different, less extreme, RCP scenario would reduce the area impacted by the flood hazard overlays. However, Section 20.5 (and Section 14) provides an explanation of the why the adopted RCP scenario was selected.
- I do not hold a position regarding the submitter's request to adopt a different RCP scenario.

**22.21 Dieter Engel (475)**

- The submitter supports with amendment the rainfall predictions noted in Natural Hazards chapter of the PDP. However, they asked for improved transparency on how the 35% rainfall increase was derived.
- This information is provided in Section 14.

**22.22 Don Setungamudalige (151) - Martha Turnell Grove, Manor Park**

- The submitter supports with amendments the flood hazard overlays in the locality of the property. However, they raise the concerns listed below:
  - Flooding is caused by stormwater infrastructure deficiencies rather than natural flooding.
  - The hydraulic models contain assumptions and limitations that reduce reliability.
- Please see Sections 20.3 and 20.4.
- In addition to the above, the submitter has also noted the flood risk associated with the Hutt River and work done to mitigate this risk.
- I am unable to provide comment on this as the modelling and mitigation work has been carried out by GWRC, and I am not familiar with it. However, Tiaki Wai modelling also indicates there is potential for flooding originating from the Western Hills above Manor Park.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.23 Edward and Sarah-Kaye Oosterbaan (114) - 5 Herbert St, Melling**

- The submitter opposes the high hazard flood hazard overlay mapped on their property primarily because they

consider the climate change assumptions excessive or unrealistic.

- Section 20.5 (and Section 14) provides an explanation of the why the adopted RCP scenario was selected.
- Further, while the NZ SeaRise method is still under peer review, it was (and possibly is still) the best information available for projecting sea-level rise at a given location.
- The submitter also recommends retaining the GWRC “inundation maps as the authority for high natural hazard designation”. It is not clear which mapping this refers to so I cannot provide comment on it. However, the PDP flood hazard overlays include modelling of the Hutt River undertaken by GWRC. When the flood hazard results from this modelling is considered independent of the Tiaki Wai stormwater modelling, the submitter’s property is still affected by the high flood hazard category.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.24 EPG Davies Holding Company Limited (107) - 27 Cornish St, Korokoro**

- The submitter raises multiple concerns and opposes the high hazard flood hazard overlay mapped on their property. In support of their opposition, the submitter states that no evidence to support the zoning has been provided, and that flooding is caused by stormwater

infrastructure deficiencies, and can be mitigated by channel and culvert maintenance.

- Alongside the information provided in Section 20.3, a review of the flood modelling in the vicinity of the property identified by the submitter shows that during the simulated design event, the modelling generates results that fall within the High Hazard category of Flood Hazard Planning Guidelines.
- It is also noted that reporting on the nature and development of the hydraulic modelling and the hazard classification approach were made available at the time of the notification of the PDP.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.25 Fiona Christeller (375) - 18 & 18A Taungata Road, York Bay**

- The submitter opposes the flood hazard overlays mapped on their property as they do not consider them to be an accurate representation of what would occur if the stream was to flood.
- Please see Sections 1.2 and 1.4 for information how the modelling accounts for local topography and the limitations associated with the modelling.
- I have reviewed the location of the submitter's property relative to the flood hazard overlays and note there is an error in the flood hazard overlays at this location as they do not include the full extent of the stream described in the submission and represented in the model (see Section 21).

- I recommend the flood hazard overlays are updated to include the missing stream corridors. In the interim, I recommend the flood hazard overlays remain unchanged.
- Below are images of the current flood hazard overlays and the recommended update including stream corridors.



Current PDP flood hazard overlays (375)



Recommended inclusion of East Harbour stream corridors in the PDP flood hazard overlays (375)



Legend for the flood hazard overlays

22.26 **Grant and Kristin Gunn (Trustees Of The Gunn Family Trust) (369, F07)) - 95 Oroua St, Eastbourne**

- The submitter opposes the flood hazard overlays mapped on their property and locality for the following reasons:
  - Flood overlay does not reflect local topography or site conditions.

- Flooding is caused by stormwater infrastructure deficiencies rather than natural flooding.
  - The hydraulic models contain assumptions and limitations that reduce reliability.
  - Property-specific mitigation has not been recognised.
  - Future infrastructure improvements should be reflected in the overlays.
  - Flood hazard boundaries appear inaccurate.
- Please see Sections 20.2, 20.3, 20.4, 20.6, 20.7, and 20.8.
  - In addition to the concerns raised above, the submitter also asserts the following:
    - The model is not designed to assess coastal processes.
    - The purpose of the model is infrastructure planning, not zoning.
    - The model build report recommends further verification.
    - The 1% AEP event analysis lacks context.
  - The submitter is correct in noting the model is not designed to assess coastal processes, and it is not do this. The flood hazard overlays have been derived from

modelling that simulates extreme rainfall in the Hutt City stormwater catchments.

- The tidal boundary in the modelling (which is adjusted for projected sea-level rise due to climate change) is included because all the stormwater networks, ultimately, drain towards the sea and it is important to assess the impact of high sea-levels impeding the ability of the stormwater network to discharge to the sea.
- Regarding the purpose of the modelling, the 2<sup>nd</sup> paragraph of the Model Build report states that “the model is to be used for the generation of flood hazard maps”. These maps have then been used for the PDP flood hazard overlays.
- Regarding the report recommending further verification, the purpose of this statement is to highlight that the model has been developed as best as possible within the constraints noted in Section 20.4, however if the model is to be used for site or asset specific investigations, then the model information should be cross checked at the given location.
- Please see Section 13 for information on the 1% AEP event.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.27 Greater Wellington Regional Council (452, F38)**

- The submitter has requested the inclusion of an additional flood hazard overlay extent covering Te Awa Kairangi/Hutt River within the corridor of the stopbanks.

- The additional overlay extent is representative of the high hazard within the river corridor. Inclusion is consistent with the GWRC Flood Hazard Planning Guidance which describe River Corridors as high hazard.
- I support the submission.

**22.28 Hamish Hill (240) - 69 Cedar Street, Maungaraki**

- The submitter supports with amendment the flood hazard overlays, requesting a review of the method of assessment for flood hazard.
- Details regarding the hydraulic modelling and hazard classification approach can be found in Sections 11 and 16.
- A review of the submitter's property relative to the flood hazard overlays shows the property is impact by low and high hazard.
- The high hazard is associated with the stream corridor that has been mapped in the gully immediately adjacent to their property. Rules associated with the high flood hazard overlay apply only to the land covered by the stream corridor/high hazard extent.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.29 Ian and Raylene Caddis (433) - 618 Marine Drive Days Bay**

- The submitter raises multiple concerns listed below regarding the flood hazard overlays:

- Flooding is caused by stormwater infrastructure deficiencies rather than natural flooding.
  - The hydraulic models contain assumptions and limitations that reduce reliability.
  - Future infrastructure improvements should be reflected in the overlays.
- Please see Sections 20.3, 20.4, and 20.7.
  - The submitter has also noted that the relevant model build report contains multiple errors. This is unfortunate; however, it does not have an impact of the flood hazard overlays.
  - I note the report was in draft at the time of the PDP notification.
  - I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.30 Ian Carson and Lynette Carson (120) - 4 Redvers Drive, Belmont**

- The submitter opposes the high flood hazard overlay mapped on their property due to a lack of historical flooding, particularly since the local stormwater system was upgraded.
- Section 20.1 provides commentary on the lack of historical flooding.

- I am not familiar with the work on the stormwater network, however, given the dates provided in the submission it is likely that any mitigation work will have been included in the modelling, which was begun in 2021.
- However, following a review of the property and the surrounding area and the hydraulic modelling, the area covered by the high flood hazard overlay does not appear to be materially different from the surrounding areas, and there is no stream corridor present. I believe it would be acceptable to change it to medium hazard.
- I recommend the high flood hazard overlay on the submitter's property and adjacent property is subsumed into the surround medium flood hazard overlay.
- Below are images of the current and proposed flood hazard overlays.



Current PDP flood hazard overlays (120)



Proposed update to PDP flood hazard overlays (120)



Legend for the flood hazard overlays

#### 22.31 **Jacob McInteer (108) - 42 Bolton St, Petone**

- The submitter opposes in the part the flood hazard overlays, and requests that the high hazard flood hazard overlay on their property is changed to medium hazard. They recommend site specific surveying of ground levels to determine the suitability of the high hazard classification.
- The submitter has also provided a survey plan with their submission.
- The high hazard classification at the submitter's property is due to high modelled flood depths (>0.5m) at the rear of the property. Both the provided survey plan and the modelled topography show a 0.5m difference in ground

levels across the property, which is reflected in the change from medium hazard to high hazard on the property.

- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.32 Jason Westerby (16) - 55 Laings Road, Hutt Central**

- The submitter raises the concern that the flood hazard overlays mapped on their property do not reflect local topography or site conditions.
- Alongside the explanation provided in Section 20.2, it is noted that while the model topography may not fully represent the full increase in ground level at the rear of the submitter's property, a general increase is present in the modelled topography. This is reflected in extents of high and medium hazard overlays which skirt around the edges of the rear of the property. The modelling indicates there is a low point along the boundary of 55 and 57 Laings Road where surface water flow is concentrated when the culvert beneath the property is overtopped. Modelling indicates the surface water extends onto the property to varying degrees, reflected in the gradation of hazard from high to low across the property.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.33 Jennifer Gray (277) - 272 Muritai Road, Eastbourne**

- The submitter raises a broad range concerns and queries. Issues related to the flood hazard overlays are listed below:
  - Flooding is caused by stormwater infrastructure deficiencies rather than natural flooding.
  - Future infrastructure improvements should be reflected in the overlays.
  - Property-specific mitigation has not been recognised.
- Please see Sections 20.3, 20.6, and 20.7.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.34 Jeremy Lovell-Smith (486) - 93 Oroua St, Eastbourne**

- The submitter raises a broad range concerns and queries. Issues related to the flood hazard overlays are listed below:
  - Flooding is caused by stormwater infrastructure deficiencies rather than natural flooding.
  - The hydraulic models contain assumptions and limitations that reduce reliability.

- Future infrastructure improvements should be reflected in the overlays.
  - Property-specific mitigation has not been recognised.
- Please see Sections 20.3, 20.4, 20.6, and 20.7.
- In addition to the above, the submitter has also noted that “the relevant High Flood Hazard overlay does not accord with zones illustrated on the map titled “91 Oroua Street” on page 59 of “The East Harbour Stormwater Catchment – Model Build Report” prepared for HCC by Wellington Water (“the WW Report”)”
- This is because the modelled flooding shown in the report image referenced relates to simulated flooding during the February 2004 event, which is a smaller event than what has been simulated to generate the flood hazard maps.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.35 Joe Jeffries (514)**

- The submitter opposes applying a ‘high’ hazard ranking based on a 1.59m sea level rise because it does not reflect a high risk based on probability today.
- Further, the submitter recommends deleting the “High, Medium and Low categorisations for overlays and instead rename the natural hazard overlays around the information they are based on.”

- Please see Section 20.5 for comments on the adopted climate change projection, and Section 16 for information on the flood hazard classification approach.
- I do not hold a position regarding the submitter's request to adopt a different RCP scenario or hazard classification approach.

**22.36 Joerg Bruemmer (110) - 94 Pomare Rd, Tirohanga**

- The submitter opposes the high flood hazard overlay that has been mapped on their property because the stream does not present a risk to their home.
- The mapped high flood hazard overlay is present on the submitter's property is due to the presence of a stream (and associated stream corridor). The high hazard overlay is only applicable to the land covered by the overlay.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.37 John Burroughs (499) - 97 Norton Park Grove, Waterloo**

- The submitter opposes the high flood hazard overlay that has been mapped on their property because the stream does not present a risk to their home.
- A review of the modelling shows flow stays within the stream corridor during the simulate extreme event. However, the presence of the stream corridor results in the high hazard classification.

- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.38 John Wadham (122) - 23 Pomare Road, Tirohanga**

- The submitter has highlighted previous work by Tiaki Wai (previously Wellington Water) in relation to draft district plan flood hazard overlays at the submitter's property.
- The submitter challenged the Draft District Plan flood hazard overlays in 2023. A visit to the submitter's property indicated the topography applied in the modelling lacked detail due to LiDAR limitations in penetrating dense vegetation.
- Additionally, it was found that the subcatchment loading approach for the location was not suitable.
- The model topography and subcatchment hydrology was updated in the model following the site visit, which removed flooding from the property in the model. As a result, the property was not covered by any flood hazard overlay in the PDP as notified.
- I do not hold a position regarding the submitter's opposition to the slope hazard overlays as it is not my expertise.

**22.39 Jon Harris (457) - 404 Muritai Rd, Eastbourne**

- The submitter raises multiple concerns. Issues related to the flood hazard overlays are listed below:
  - There is no history of flooding at their property.

- The hydraulic models contain assumptions and limitations that reduce reliability.
  - Property-specific mitigation has not been recognised.
- Please see Sections 20.1, 20.4, and 20.6.
- In addition to the above, the submitter also comments that there was no flooding at their property in the winter of 2022, where all three winter months received rainfalls over 150% above the standard, respective monthly averages.
- It is noted that the modelled event used as the basis of the flood hazard overlays is a discrete, extreme storm event, that does not explicitly consider seasonal impacts on how wet or dry the modelled area is.
- Further, the percentage increases described in the submission are not directly comparable to the 35% uplift applied to the modelled rainfall event. The increases described in the submission relate to monthly and seasonal rainfall totals, whereas the model event is a discrete 12-hour rainfall event with an AEP of 1%, that could occur at any time during the year.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.40 Julius Korent and Joanne Korent (199) - 56 Mary Huse  
Grove, Manor Park**

- The submitter raises multiple concerns. Issues related to the flood hazard overlays are listed below:
  - Flooding is caused by stormwater infrastructure deficiencies rather than natural flooding.
  - The hydraulic models contain assumptions and limitations that reduce reliability.
- Please see Sections 20.3 and 20.4.
- In addition to the above, the submitter has also noted the flood risk associated with the Hutt River and work done to mitigate this risk.
- I am unable to provide comment on this as the modelling and mitigation work has been carried out by GWRC, as I am not familiar with it. However, Tiaki Wai modelling also indicates there is potential for flooding originating from the Western Hills above Manor Park.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.41 Kate Harris (454) - 404 Muritai Rd, Eastbourne**

- The submitter raises multiple concerns. Issues related to the flood hazard overlays are listed below:
  - There is no history of flooding at their property.

- The hydraulic models contain assumptions and limitations that reduce reliability.
  - Property-specific mitigation has not been recognised.
- Please see Sections 20.1, 20.4, and 20.6.
- In addition to the above, the submitter also comments that there was no flooding at their property in the winter of 2022, where all three winter months received rainfalls over 150% above the standard, respective monthly averages.
- It is noted that the modelled event used as the basis of the flood hazard overlays is a discrete, extreme storm event, that does not explicitly consider seasonal impacts on how wet or dry the modelled area is.
- Further, the percentage increases described in the submission are not directly comparable to the 35% uplift applied to the modelled rainfall event. The increases described in the submission relate to monthly and seasonal rainfall totals, whereas the model event is a discrete 12-hour rainfall event with an AEP of 1%, that could occur at any time during the year.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.42 Katrina Jacobsen (398) - 7 Wyndrum Ave, Waterloo**

- The submitter requests that the high flood hazard overlay mapped on their property be changed to

medium hazard because the stream is narrow and does not present a risk to their home.

- A review of the modelling shows flow stays within the stream corridor during the simulate extreme event. However, the presence of the stream corridor results in the high hazard classification.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.43 Kelvin Sanderson (95) - 129 Cuba St, Petone**

- The submitter opposes the high flood hazard overlay that has been mapped on their property.
- The high flood hazard overlay at the submitter's property is due to high modelled flood depths (>0.5m) at, and in the vicinity of, their property.
- The submitter also raises the possibility of future hazard mitigation work. Please see Section 20.7.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.44 Kris Philip Connell (F03) - 269 Muritai Rd, Eastbourne**

- The submitter has made a submission in support of submission 380 and F09 by Andrew Robinson and Robyn Robinson.
- Please see Section 22.3.

**22.45 Kulbushan Joshi (2) – 3 Hastings Gr, Wainuiomata**

- The submitter opposes the low flood hazard overlay mapped on the specified property. No reason is given.
- I have reviewed the flood hazard overlays at the submitter's property, and the low flood hazard overlay is present due to the local topography, which indicates overland flow would drain through the site from the hillside above Hastings Gr.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.46 Lars Schmidt (480) - 227 Marine Drive, Lowry Ba**

- The submitter raises multiple concerns. Issues related to the flood hazard overlays are listed below:
  - Flooding is caused by stormwater infrastructure deficiencies rather than natural flooding.
  - The hydraulic models contain assumptions and limitations that reduce reliability.
- The submitter also asserts that the flood zone layout "is arbitrary at best as it is against hydrodynamic principles".
- Alongside Sections 20.3 and 20.4, I can also confirm that the modelling used to generate data for the flood hazard overlays has been completed using specialist hydrodynamic modelling software.

- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.47 Laura Skilton (314) - Petone**

- The submitter notes that there is a lack of a definition for the “1% Flood Annual Exceedance Probability level”, suggests alternatives considerations for hazard mapping.
- Please see Section 13 for information on the 1% AEP event.
- The approach of applying design rainfall for developing the flood hazard overlays is because flooding in Lower Hutt is driven by river flows or extreme rainfall over the district. The probability of a given river flow or rainfall occurring in a given year is calculated through frequency analyses of available recorded flow and rainfall data.
- I recommend the use of the 1% AEP event in modelling for the flood hazard overlays is retained.

**22.48 Lin Streefkerk (297) – Manor Park**

- The submitter notes that their property or locality has not previously been affected by flooding.
- Please see Section 20.1.
- In addition to the above, it is noted that the predominance of the high flood hazard overlay in Manor Park is due to flooding from the Hutt River, as modelled by GWRC. However, Tiaki Wai modelling also indicates there is potential for flooding originating from the Western Hills above Manor Park.

- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.49 Lisa Bowker (17) - 438 Muritai Road, Eastbourne**

- The submitter opposes the use of flood hazard overlays in the PDP, noting that there has historically been no flooding at their property.
- Please Section 20.1.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.50 Lisa Caddis (252) - 297 Muritai Road, Eastbourne**

- The submitter raises multiple concerns. Issues related to the flood hazard overlays are listed below:
  - There is no history of flooding at their property.
  - Flooding is caused by stormwater infrastructure deficiencies rather than natural flooding.
- Please see Sections 20.1 and 20.3.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.51 Louise Kay Cameron (279) - 13 Karamu Street, Eastbourne**

- The submitter raises a broad range concerns and queries. Issues related to the flood hazard overlays are listed below:
  - Flooding is caused by stormwater infrastructure deficiencies rather than natural flooding.
  - Future infrastructure improvements should be reflected in the overlays.
  - Property-specific mitigation has not been recognised.
- Please see Sections 20.3, 20.6, and 20.7.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.52 Lynn Kelleher (280) - 5 Karamu Street, Eastbourne**

- The submitter raises a broad range concerns and queries. Issues related to the flood hazard overlays are listed below:
  - Flooding is caused by stormwater infrastructure deficiencies rather than natural flooding.
  - Future infrastructure improvements should be reflected in the overlays.
  - Property-specific mitigation has not been recognised.
- Please see Sections 20.3, 20.6, and 20.7.

- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

22.53 **Manor Park and Haywards Residents Community Incorporated Society (377, F10) - 30 Benmore Crescent Manor Park**

- The submitter opposes the flood hazard overlays mapped over 30 Benmore Crescent because the modelling does not account for the significant earthworks that have taken place at the location.
- A comparison of the modelled topography at 30 Benmore Cr against a DEM generated from the 2025 LiDAR survey confirms the modelling does not account the new earthworks, which may materially change modelled flooding across the site.
- I have reviewed a flood modelling report<sup>5</sup> covering work completed by an independent party for the site.
- The flood modelling carried out for the site in 2022 uses RCP 8.5 to 2100 to increase rainfall due to climate change (which the author notes was acceptable at the time of the modelling) and a concurrent flow in the Hutt River of 2300m<sup>3</sup>/s (0.23% AEP).
- The Tiaki Wai modelling uses the RCP 8.5 to 2130 scenario to increase rainfall due to climate change, and a concurrent flow of 1244m<sup>3</sup>/s (10% AEP) in the Hutt River.

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<sup>5</sup> *Benmore Crescent Proposed Industrial Park Flood Assessment*. River Edge Consulting Limited, 2022

- While the Hutt River flow is significantly lower in the Tiaki Wai model, the higher rainfall (due to the climate change allowance) results in greater flows from the Dry Creek Catchment (55m<sup>3</sup>/s) relative to the independent modelling for the site (30m<sup>3</sup>/s).
- The Tiaki Wai modelling also shows the area receives overland flow from two adjacent catchments to the northeast; the catchment above the Holcim Ready-Mix Concrete site, and the Haywards Hill. These do not appear to be included in the flood modelling for 30 Benmore Cr.
- As a result, the independent flood modelling is potentially underestimating the flow arriving at the site.
- However, as noted above, the Tiaki Wai modelling does not take into account the earthworks that have taken place, so it is currently not possible to establish if it is acceptable to remove the flood hazard overlays from the site (with the exception of the stream corridor for Benmore Stream).
- Acknowledging the earthworks that have taken place, I recommend changing all the flood hazard overlays within the site to the low flood hazard overlay (with the exception of the stream corridor for Benmore Stream) until the Tiaki Wai modelling can be updated to include the site works or the independent modelling is updated to include the higher rainfall, and adjacent catchments.

22.54 **Mark Blackham (450) - 396 Muritai Road, Eastbourne**

- The submitter opposes the medium flood hazard overlay mapped on their property due to a broad range of

concerns. Issues related to the flood hazard overlays are listed below:

- There is no history of flooding at their property, or limited historical basis, that provides compelling evidence for this overlay on the submitter's property.
  - No accurate future modelling that provides compelling evidence for this overlay on the submitter's property. The hydraulic models contain assumptions and limitations that reduce reliability.
  - The flood zone outline on the submitter's property bears no resemblance to any historical flooding or the topography of the property.
  - Any surface flooding has been caused by stormwater infrastructure deficiencies rather than natural flooding.
- These issues are addressed in Sections 20.1, 20.2, 20.3, 20.4.
  - Further, a review of the flood hazard overlays at the submitter's property in the context of available topographic contours shows that the nature of the overlays, a high hazard area surrounded by a medium hazard area, itself surrounded by a low hazard area, reflect an area of ponding that would be expected based on the local topography.

- Alongside the common issues listed above the submitter has also highlighted the following points in support of their submission:
  - The suggested 1% AEP or 1 in 100-year flood analysis by Wellington Water is noted as best practice in the PDP but is hypothetical and not proven fact.
  - The Council has undertaken stormwater mitigation work to reduces stormwater flooding in the area.
- Please see Section 13 for information regarding the 1% AEP event. I note that while it is a hypothetical event, the science behind the calculation of the rainfall values applied is well established and adopted globally. I do not believe there is currently better information available to use for predicting extreme events.
- I have undertaken a review of the Council stormwater mitigation work described in the submission and note that the large stormwater drain and pump station are represented in the modelling that has been used to generate output for the flood hazard overlays.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.55 Mark Gunkel and Evangeline Gunkel (7)**

- The submitter opposes in part the flood hazard overlays mapped on their property; however, no address has been specified. They have expressed concern regarding the following issues:

- The overlays are based on computer modelling, not site-specific assessments.
  - It is not clear how the hazard classification has been completed.
  - The mapping they have viewed does not distinguish between different levels of hazard.
- Please see the explanatory sections 11 and 16 for commentary on the modelling and flood hazard classification approach. Further, supporting documentation covering the model build and hazard classification process is available from the Council.
- Further, the flood hazard overlays presented in the PDP do distinguish between different levels of hazard; low, medium, and high.
- I acknowledge the limitations and assumptions associated with the hydraulic modelling and the constraints that do not enable site-specific assessments for all locations during the modelling and hazard classification process. Please see Section 20.4.
- Tiaki Wai (previously Wellington Water) and the Council did undertake community engagement sessions with allowed for the public to review the flood modelling output prior to the development of the flood hazard overlays. These sessions, and the information provided them, also provided the opportunity for the public to request property visits to sense check the model results at a given property.

- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.56 Mary Lynskey and Christopher Lynskey (213) - 2 Cheviot Road, Lowry Bay**

- The submitter opposes the low and medium flood hazard overlays mapped on their property due to flood mitigation they have undertaken (based on Council advice), and stormwater infrastructure work in the catchment above their property.
- Considering the timing of the work described in the submission I expect the outcomes have been included in the modelling (I cannot confirm without more details regarding the work).
- If the outcomes have been included, then the modelled flooding occurs even with these outcomes in place, most likely due to the extreme nature of the modelled rainfall event.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.57 Michael Kerslake (501) - 12 Ngaio St Eastbourne**

- The submitter raises a broad range concerns and queries. Issues relating to the flood hazard overlays are listed below:
  - Flooding is caused by stormwater infrastructure deficiencies rather than natural flooding.

- Future infrastructure improvements should be reflected in the overlays.
  - Property-specific mitigation has not been recognised.
- Please see Sections 20.3, 20.6, and 20.7.
  - I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.58 Michael Rachlin (232, F04)**

- The submitter requests that the flood hazard overlays are amended to clearly identify Overland Flowpaths, Stream Corridors, and Ponding/inundation areas.
- Please see Section 16 for information on the adopted flood hazard classification approach.
- I do not hold a position on the submitter's request.

**22.59 Michelle Fisher (489) - 283 Muritai Road, Eastbourne**

- The submitter has expressed concern regarding the medium flood hazard overlay mapped on their property, specifically that it may have been developed simply from a review of the topography.
- It is noted that flood hazard overlays shown the property have been developed from modelling results. The modelling undertaken to generate this information is physics based, hydrodynamic modelling. I can confirm that the flood hazard overlays have not been generated from review of the local topography.

- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

22.60 **Mike Humphrey and Nic Hill (224) - 192 Normandale Road, Normandale**

- The submitter opposes the flood hazard overlay mapped on their property because of the following reasons:
  - They consider the overlay overstates the probability and impact of flooding.
  - The stream on, or adjacent to, their property does not present a risk to their home.
  - The mapping is incorrect at the road upstream of their property.
  - The PDP assumes all stream corridors are at high risk of flooding.
- I have reviewed the flood hazard overlay mapped at the submitter's property, and it is mapped due to the presence of the stream (and associated stream corridor) as is confirmed by the submission.
- Stream corridors represent a zone of high hazard due to the potential for high and/or fast flow, and erosion risk. Rules associated with the high flood hazard overlay apply only to the land covered by the stream corridor/high hazard extent.
- The incorrect mapping on the road upstream of the property is because the culvert beneath the road is not

represented in the model. I am unsure of the reason for this, possibly because information regarding the culvert was not available at the time of the model build.

- If the culvert was present in the model, it may convey all the runoff beneath the road, however runoff would still enter the stream corridor mapped on the property which would remain unchanged.
- I believe the land covered stream corridors should be avoided for development or careful consideration given to work within the corridor. I understand that the rules within the PDP provide the framework to ensure this.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.61 Mukesh Chandra (201) – Manor Park**

- The submitter notes that their property or locality has not previously been affected by flooding.
- Please see Section 20.1.
- In addition to the above, it is noted that the predominance of the high flood hazard overlay in Manor Park is due to flooding from the Hutt River, as modelled by GWRC. However, Tiaki Wai modelling also indicates there is potential for flooding originating from the Western Hills above Manor Park.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.62 Natural Hazards Commission (327)**

- The submitter has recommended the inclusion of an explanation of freeboard, and consideration of residual risk with regard to natural hazards.
- Section 15 provides an explanation of the Tiaki Wai approach to freeboard in their stormwater hydraulic models.
- The inclusion of freeboard is a consideration of residual flood risk in the context of the stormwater networks.
- The Tiaki Wai stormwater modelling does not account for residual flood risk from Te Awa Kairangi/Hutt River, as it is expected that this covered by GWRC.

**22.63 Neha Punjabi (140)**

- The submitter raises concerns regarding the accuracy of the modelling due to the limitations and assumptions associated with the models, and their appropriateness for use in the PDP context.
- Please see Section 20.4.
- In addition to the above, it is noted that the predominance of the high flood hazard overlay in Manor Park is due to flooding from the Hutt River, as modelled by GWRC. However, Tiaki Wai modelling also indicates there is potential for flooding originating from the Western Hills above Manor Park.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

22.64 **Nicola Stent and Stuart Stent (393) - 6A Oriental St, Petone**

- The submitter opposes the medium and high flood hazard overlays mapped on their property.
- A review of the flood modelling in the vicinity of the property identified by the submitter shows that during the simulated design event, the modelling generates results (depths >0.5m) that fall within the high Hazard category of Flood Hazard Planning Guidelines.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

22.65 **Orlando & Franziska Ravera (459)**

- The submitter opposes the high flood hazard overlay that has been mapped on their property because the stream does not present a risk to their home.
- No address is given for the property however, comments in the submission indicate there is a stream on or near their property which will be the cause of the high flood hazard overlay.
- The high hazard overlay is only applicable to the land covered by the overlay.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

22.66 **Palmer and Cook Developments Ltd (316) - 27 Waterloo Road, Hutt Central**

- The submitter opposes flood hazard overlay that has been mapped on their property.
- A review of the flood modelling at the submitter's property shows that during the simulated design event, the modelling generates results that fall within the medium hazard category of Flood Hazard Planning Guidelines.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

22.67 **Pamodh Panagoda (154) - 14 Martha Turnell Cres, Manor Park**

- The submitter raises multiple concerns. Issues relating to the flood hazard overlays are listed below:
  - Flooding is caused by stormwater infrastructure deficiencies rather than natural flooding.
  - The hydraulic models contain assumptions and limitations that reduce reliability.
- Please see Sections 20.3 and 20.4.

- In addition to the above, the submitter has also noted the flood risk associated with the Hutt River and work done to mitigate this risk.
- I am unable to provide comment on this as the modelling and mitigation work has been carried out by GWRC, as I am not familiar with it. However, Tiaki Wai modelling also indicates there is potential for flooding originating from the Western Hills above Manor Park.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.68 Patricia Cleland (367) - 8 Cheviot Road, Lowry Bay**

- The submitter opposes the high flood hazard overlay mapped on their property, stating the hazard areas “must be interrogated for justification, transparency, and evidence”.
- I believe the modelling approach of Tiaki Wai works to achieve this with the requirement to manage model limitations and assumptions through the processes described in Section 20.4, along with the publication of the model build and hazard classification reporting.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.69 Patsy Jorgensen (208) - 28 Kotari Road, Days Bay**

- The submitter opposes the low flood hazard overlay mapped across the upper part of Kotari Rd because of the following reasons.

- A lack of historical flooding.
  - Incorrect mapping of the stream on the stream on the northern side of Kotari Rd and the southern side of their property boundary.
- Please see Section 20.1 for commentary on the lack of historical flooding.
- Regarding the incorrect mapping, I have reviewed the relevant hydraulic model and can confirm there is an error in the flood hazard overlays at this location as they do not include the stream corridors described in the submission and represented in the model (see Section 21). The high flood hazard overlays in the vicinity of Kotari Rd is due to high modelled depths and/or velocity.
- I recommend the flood hazard overlays are updated to include the missing stream corridors. In the interim, I recommend the flood hazard overlays remain unchanged.
- Below are images of the current flood hazard overlays and the recommended update including stream corridors.



Current PDP flood hazard overlays (208)



Recommended inclusion of East Harbour stream corridors in the PDP flood hazard overlays



Legend for the flood hazard overlays

**22.70 PBJ Properties Ltd (476) - 23 Fitzherbert St, Petone**

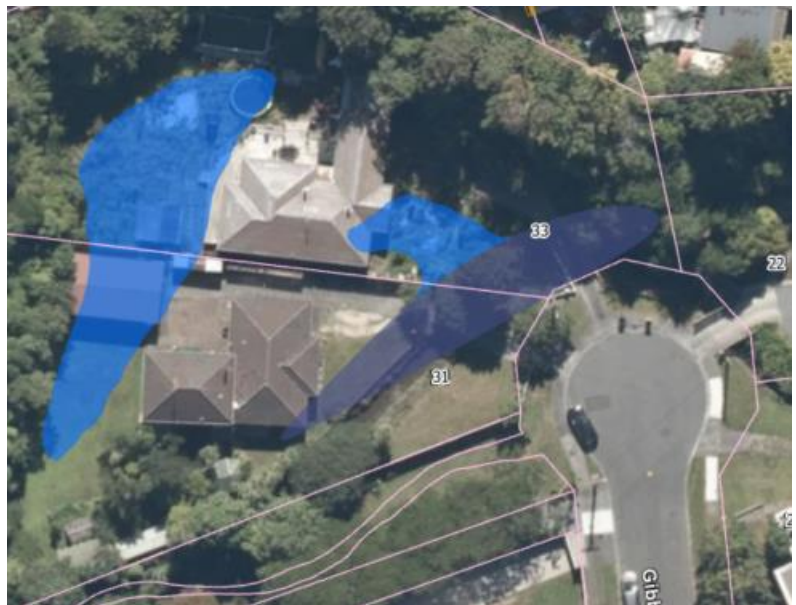
- The submitter opposes the high flood hazard overlay area on their property, asking what the documented evidence is for the decision to categorise the area as such, and why these specific areas are targeted.
- The extent of high flood hazard overlay has been set by hydraulic modelling and the Flood Hazard Planning Guidelines, both of which have associated documentation published for them. Further, areas have not been targeted, but rather have been identified through hydraulic modelling.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.71 Peter Borley (145) -31 Gibbs Crescent, Wainuiomata**

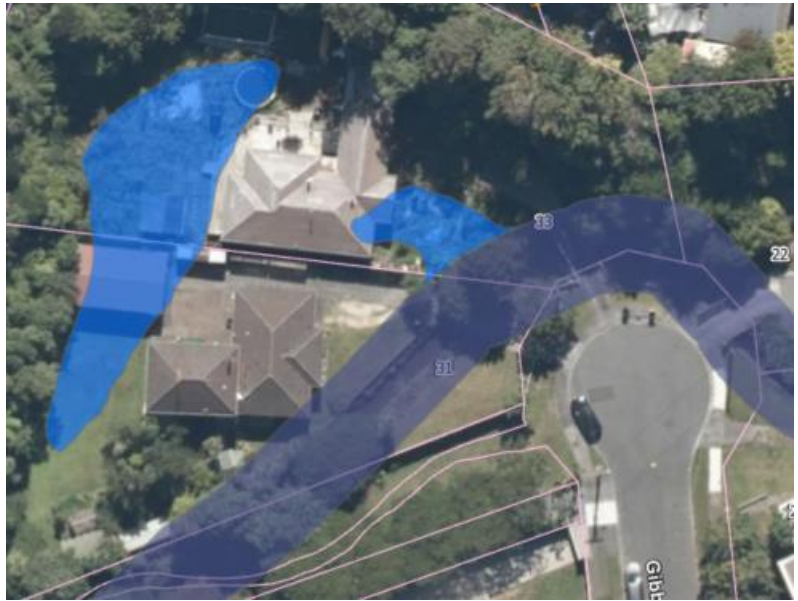
- The submitter opposes the flood hazard overlays mapped on their property as previous work on the stream by the Council has been successful to date in mitigating flood effects.
- I am not familiar with the work on the stream by the Council, however, given the dates provided in the submission it is likely that any mitigation work will have

been included in the modelling, which was begun in 2018.

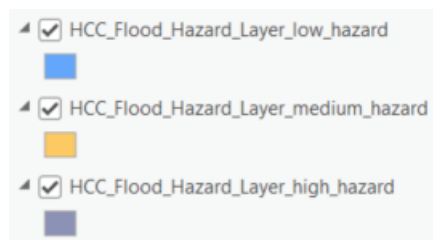
- However, I have reviewed the location of the submitter's property relative to the flood hazard overlays and note there is an error in the flood hazard overlays at this location as they do not include the full extent of the stream described in the submission (see Section 21).
- I recommend the flood hazard overlays are updated to include the missing stream corridors. In the interim, I recommend the flood hazard overlays remain unchanged.
- Below are images of the current flood hazard overlays and the recommended update including stream corridors.



Current PDP flood hazard overlays (145)



Recommended inclusion of a stream corridor in the PDP flood hazard overlays (145)



Legend for the flood hazard overlays

**22.72 Philip King (125) - 238 Marine Drive, Lowry Bay**

- The submitter notes that their property or locality has not previously been affected by flooding.
- Please see Section 20.1.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.73 PTL Trust (397) - 212 Marine Drive, Lowry Bay**

- The submitter notes that their property or locality has not previously been affected by flooding.
- Please see Section 20.1.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.74 Rafael Gonzalez-Montero (175) – Manor Park**

- The submitter notes that their property or locality has not previously been affected by flooding.
- Please see Section 20.1.
- In addition to the above, it is noted that the predominance of the high flood hazard overlay in Manor Park is due to flooding from the Hutt River, as modelled by GWRC. However, TiakiWai modelling also indicates there is potential for flooding originating from the Western Hills above Manor Park.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.75 Richard Kelly (463) - 10 Bunratty Grove, Wainuiomata**

- The submitter opposes the flood hazard overlays mapped on their property because of a lack of historical flooding and the representation of a small stormwater drain as being high hazard.
- Section 20.1 provides commentary on the lack of historical flooding.

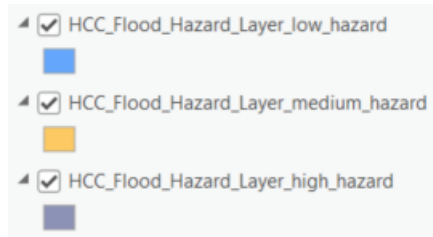
- I have reviewed the submitter's property in the flood model and the flood hazard overlays.
- The high flood hazard overlay is only present because the short stormwater drain in the reserve adjacent to the submitter's property has been designated as a stream corridor.
- I agree with the submitter that this drain should not represent a stream corridor, and the model results in the area do not reach depths or speeds that would be classified as high or medium hazard as per the hazard classification guidance document.
- I recommend removing the high flood hazard overlay at this location and replacing it with the low hazard overlay.
- Below are images of the current PDP flood hazard overlays and proposed updates relative to this submission.



Current PDP flood hazard overlays (463)



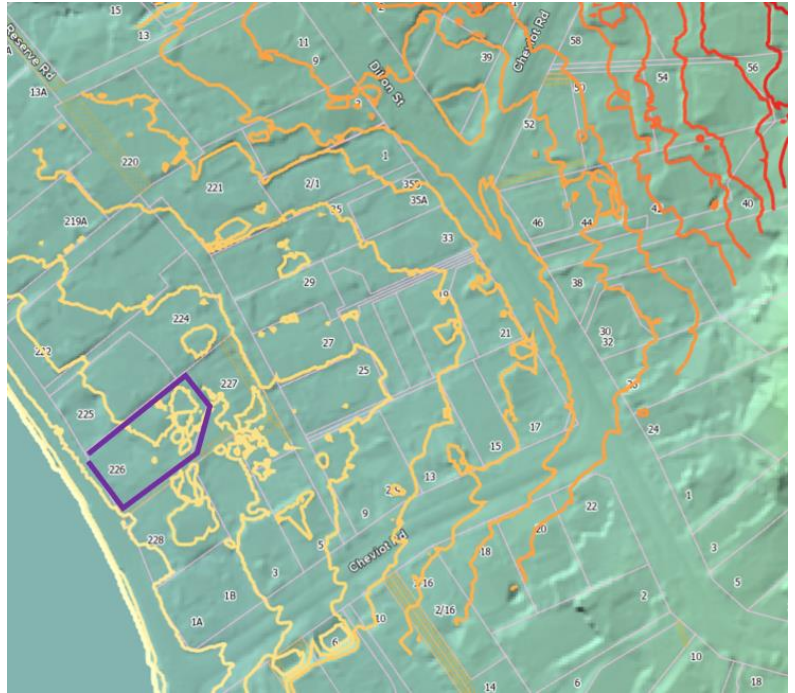
Proposed update to PDP flood hazard overlays (463)



Legend for the flood hazard overlays

**22.76 Richard Kemp and Honor Kemp (25) - 226 Marine Drive, Lowry Bay**

- The submitter states that their property has not previously been affected by flooding, noting that there are no watercourses nearby that could give rise to flooding.
- Please see Section 20.1 regarding the non-occurrence of historical flooding.
- A review of the hydraulic modelling indicates flooding at the site is generated from runoff from the hill catchment above Cheviot Rd.
- Further, a review of available topographic contours shows that the property and adjacent properties sit in a low point in the catchment the was likely the old flow path for runoff draining from the hills.
- The image below shows the location of the property relative to the topographic contours (themed by decreasing elevation).



- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.77 Rohan Kulkarni (3) - 1/48, 2/48, and 52N Stanley St, Wainuiomata**

- The submitter opposes the flood hazard overlay mapped at their property and surplus land.
- Hydraulic modelling of the locality shows there is flooding at the property and surplus land during the simulated extreme event.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.78 Rowan Swain & Kim Weber-Swain (317) - 273 Muritai Road, Eastbourne**

- The submitter opposes the flood hazard overlays at their property and locality for the following reasons:

- There is no history of flooding at their property, or limited historical basis, that provides compelling evidence for this overlay on the applicant properties.
  - No accurate future modelling that provides compelling evidence for this overlay on the applicant properties. That is, the hydraulic models contain assumptions and limitations that reduce reliability.
  - The flood zone outline on the submitter's property bears no resemblance to any historical flooding or the topography of the property.
  - Any surface flooding has been caused by stormwater infrastructure deficiencies rather than natural flooding.
  - Future infrastructure improvements should be reflected in the overlays.
- These issues are addressed in Sections 20.1, 20.2, 20.3, 20.4, and 20.7.
- Alongside the issues listed above the submitter has also highlighted the following points in support of their submission:
  - The suggested 1% AEP or 1 in 100-year flood analysis by Wellington Water is noted as best practice in the PDP but is hypothetical and not proven fact.

- Please see Section 13 for information regarding the 1% AEP event. I note that while it is a hypothetical event, the science behind the calculation of the rainfall values applied is well established and adopted globally. I do not believe there is currently better information available to use for predicting extreme events.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.79      Sensible Solutions for Eastbourne (383) - Various**

- The submitter comprises a group of residents who oppose the flood hazard overlays for the following reasons.
  - There is no history of flooding at their property, or limited historical basis, that provides compelling evidence for this overlay on the applicant properties.
  - No accurate future modelling that provides compelling evidence for this overlay on the applicant properties. The hydraulic models contain assumptions and limitations that reduce reliability.
  - The flood zone outline on the submitter's property bears no resemblance to any historical flooding or the topography of the property.
  - Any surface flooding has been caused by stormwater infrastructure deficiencies rather than natural flooding.

- The supporting documentation highlights the hydraulic models contain assumptions and limitations that reduce reliability.
  - Property-specific mitigation has not been recognised.
  - Future infrastructure improvements should be reflected in the overlays.
- These issues are addressed in Sections 20.1, 20.2, 20.3, 20.4, 20.6, 20.7, 20.8.
- Alongside the common issues listed above the submitter has also highlighted the following points in support of their submission:
  - The suggested 1% AEP or 1 in 100-year flood analysis by Wellington Water is noted as best practice in the PDP but is hypothetical and not proven fact.
  - The Council (and by extension Tiaki Wai) misuses and misrepresents feedback to generate the flood hazard overlays, with particular reference to the Social Pinpoint campaign.
- Please see Section 13 for information regarding the 1% AEP event. I note that while it is a hypothetical event, the science behind the calculation of the rainfall values applied is well established and adopted globally. I do not believe there is currently better information available to use for predicting extreme events.

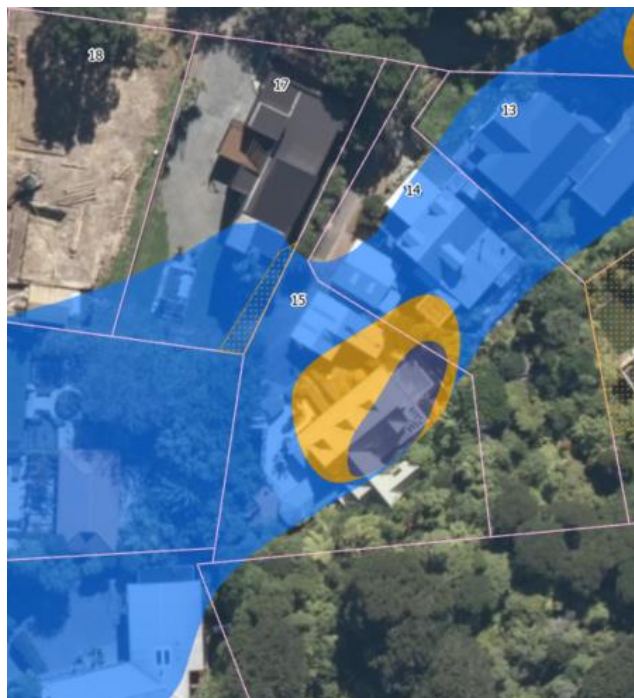
- The Social Pinpoint campaign was set up specifically to collect information for use in validating the hydraulic modelling, and this stated in the introductory pop-up of the website.
- I note also that there is no direct link between the community feedback and the PDP flood hazard overlays.
- The community feedback was used for validating the hydraulic modelling which, once reviewed and accepted, was then used to simulate the extreme event. The outputs of this simulation were then used the hazard classification process, with no reference back to the community feedback during the classification process.
- I recommend the flood hazard overlays remain unchanged at the locations specified in the submission.

**22.80 Stephanie Middleton (352) - 15 Whiorau Grove, Lowry Bay**

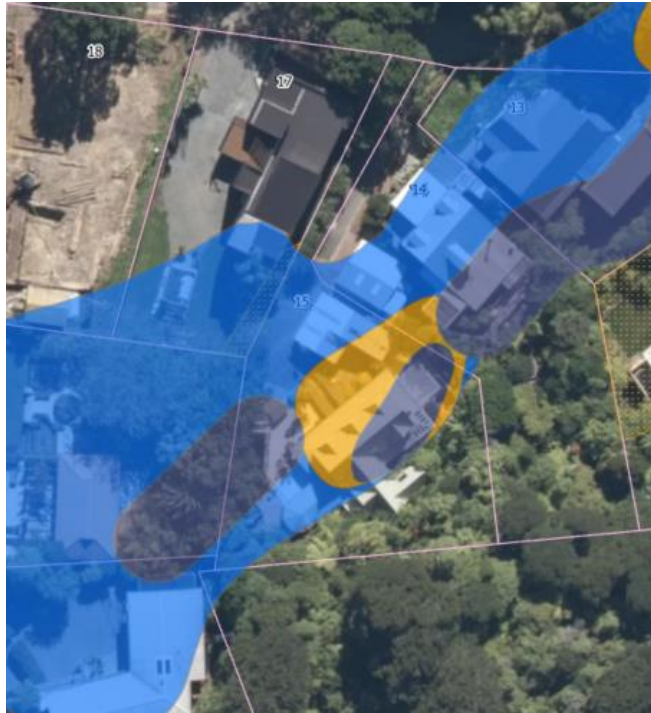
- The submitter opposes the high flood hazard overlay mapped on their property for the following reasons:
  - A lack of historical flooding.
  - Climate change assumptions are excessive or unrealistic.
- Please see Sections 20.1 and 20.5 for commentary on these issues.
- In addition to the above, the submitter also notes the high flood hazard overlay associated with the stream corridor is only restricted to their property, while in

reality the stream runs through multiple other properties.

- I have reviewed the relevant hydraulic model and can confirm there is an error in the flood hazard overlays at this location as they do not include the full extent of the stream described in the submission and represented in the model (see Section 21).
- I recommend the flood hazard overlays are updated to include the missing stream corridors. In the interim, I recommend the flood hazard overlays remain unchanged.
- Below are images of the current flood hazard overlays and the recommended update including stream corridors.



Current PDP flood hazard overlays (352)



Recommended inclusion of East Harbour stream corridors in the PDP flood hazard overlays (352)

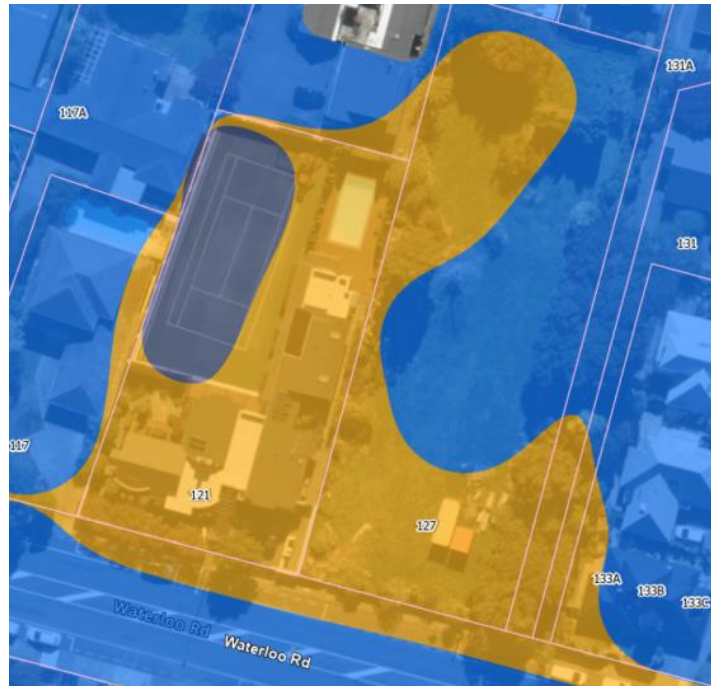


Legend for the flood hazard overlays

**22.81 Stephen Flaunty (34) - 121 Waterloo Road, Hutt Central**

- The submitter opposes the flood hazard overlay mapped at their property for the following reasons:
  - A lack of historical flooding.
  - The flood modelling is inaccurate.

- Property-specific mitigation has not been recognised.
- Please see Sections 20.1, 20.4, and 20.6 for commentary on these issues.
- A review of the model results show flooding arrives at the property from upstream of the property. The high flood hazard shown over the tennis court is due to modelled topography showing this area as lower than the adjacent ground. As a result, the modelled flooding is deeper as it crosses the tennis court, leading to the high hazard classification.
- Further, regarding the comments in the submission on the local drainage that has been installed, while this has not been included in the modelling, is it unlikely to have a material impact on flood levels during the simulated event. This is because the surrounding public stormwater network is entirely overwhelmed in the event, so there would be nowhere for the private drainage to discharge to.
- However, the high flood hazard on the submitter's property is small and the result of locally specific conditions, the lower ground of a single tennis court. As a result, I recommend removing the high flood hazard overlay mapped across the tennis court and replacing it with the medium flood hazard overlay.
- Below are images of the current PDP flood hazard overlays and proposed updates relative to this submission.



Current PDP flood hazard overlays (34)



Proposed update to PDP flood hazard overlays (34)



## Legend for the flood hazard overlays

### 22.82 **Summerset Group Holdings Limited (326) - Various**

- The submitter opposes the high flood hazard overlay mapped at the location specified in the submission.
- They note there are multiple small, isolated area of high flood hazard with broader areas of medium and low flood hazard, ask for consideration of whether the small, isolated areas are appropriate.
- Further, the submitter highlights the change in flood hazard classification at the location specified in the submission between the Draft District Plan and the PDP.
- The change in flood hazard classification is discussed in Section 17.
- Regarding the small, isolated areas of high flood hazard, I note that during the hazard classification process, some filtering of these types of areas was undertaken. This is set out in Section 2.2 of WWL\_Flood\_hazard\_process\_Memo<sup>6</sup>, which notes the “tool’s aim is to integrate islands of different hazard classes with the surrounding class if the island is 150m<sup>2</sup> or smaller.”, indicating an area threshold of 150m<sup>2</sup>.
- I recommend the flood hazard overlays remain unchanged at the locations specified in the submission.

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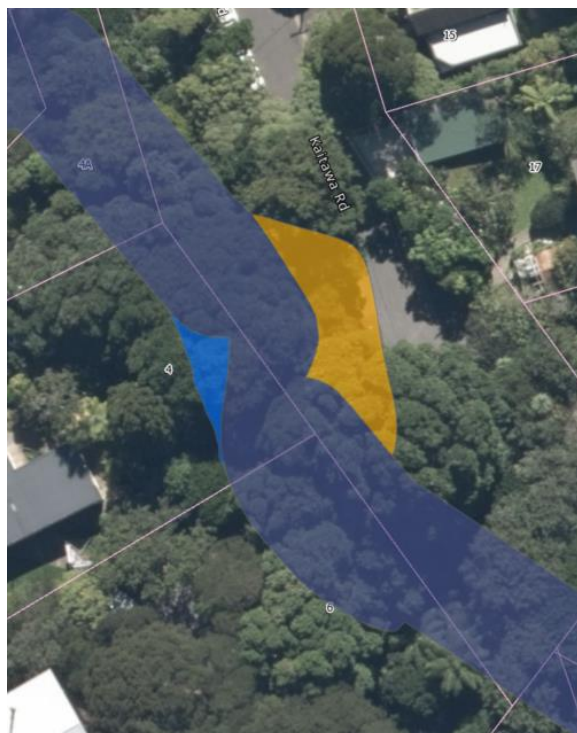
[https://hccpublicdocs.azurewebsites.net/api/download/d764466f20cf454ba1010adf695ed15f/\\_dplanreview/2418b24e13451956440fa1cf1f98f86fd7c1](https://hccpublicdocs.azurewebsites.net/api/download/d764466f20cf454ba1010adf695ed15f/_dplanreview/2418b24e13451956440fa1cf1f98f86fd7c1)

22.83      **Susan Ewart (423) - 4 Kaitawa Road, York Bay**

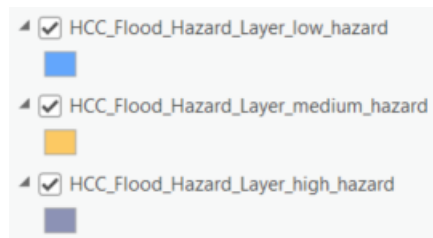
- The submitter opposes the high flood hazard overlay mapped at their property for the following reason:
  - A lack of historical flooding.
- Please see Section 20.1 for commentary on this.
- The submitter notes that there is a stream adjacent to their property but not within it, and that the high flood hazard overlay does not extend into other properties through which the stream flows.
- They also highlight that the stream is well below their property and the road.
- I have reviewed the relevant hydraulic model and can confirm there is an error in the flood hazard overlays at this location as they do not include the full extent of the stream described in the submission and represented in the model (see Section 21).
- I recommend the flood hazard overlays are updated to include the missing stream corridors. In the interim, I recommend the flood hazard overlays remain unchanged.
- Below are images of the current flood hazard overlays and the recommended update including stream corridors.



Current flood hazard overlays (423)



Recommended inclusion of East Harbour stream corridors in the PDP flood hazard overlays (423)



Legend for the flood hazard overlays

22.84 **Te Karearea Ltd and Roscoe Ice Cream Ltd (447) - 30 Benmore Crescent, Manor Park**

- The submitter opposes the flood hazard overlays mapped over 30 Benmore Crescent because the modelling does not account for the significant earthworks that have taken place at the location.
- A comparison of the modelled topography at 30 Benmore Cr against a DEM generated from the 2025 LiDAR survey confirms the modelling does not account the new earthworks, which may materially change modelled flooding across the site.
- I have reviewed a flood modelling report<sup>7</sup> covering work completed by an independent party for the site.
- The flood modelling carried out for the site in 2022 uses RCP 8.5 to 2100 to increase rainfall due to climate change (which the author notes was acceptable at the time of the modelling) and a concurrent flow in the Hutt River of 2300m<sup>3</sup>/s (0.23% AEP).

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<sup>7</sup> Benmore Crescent Proposed Industrial Park Flood Assessment. River Edge Consulting Limited, 2022

- The Tiaki Wai modelling uses the RCP 8.5 to 2130 scenario to increase rainfall due to climate change, and a concurrent flow of 1244m<sup>3</sup>/s (10% AEP) in the Hutt River.
- While the Hutt River flow is significantly lower in the Tiaki Wai model, the higher rainfall (due to the climate change allowance) results in greater flows from the Dry Creek Catchment (55m<sup>3</sup>/s) relative to the independent modelling for the site (30m<sup>3</sup>/s).
- The Tiaki Wai modelling also shows the area receives overland flow from two adjacent catchments to the northeast; the catchment above the Holcim Ready-Mix Concrete site, and the Haywards Hill. These do not appear to be included in the independent modelling for 30 Benmore Cr.
- As a result, the independent flood modelling is potentially underestimating the flow arriving at the site.
- However, as noted above, the Tiaki Wai modelling does not take into account the earthworks that have taken place, so it is currently not possible to establish if it is acceptable to remove the flood hazard overlays from the site (with the exception of the stream corridor for Benmore Stream).
- Acknowledging the earthworks that have taken place, I recommend changing all the flood hazard overlays within the site to the low flood hazard overlay (with the exception of the stream corridor for Benmore Stream) until the Tiaki Wai modelling can be updated to include the site works or the independent modelling is updated to include the higher rainfall, and adjacent catchments.

**22.85      The Francis Family Trust (443) - 1 Military Road, Boulcott**

- The submitter opposes the low flood hazard overlay mapped on their property because other areas in the vicinity of the property are not affected.
- I note multiple other properties adjacent and across the road from the submitter's property are impacted by the low flood hazard overlay.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.86      Tim Louis (106) - 9 Woodvale Gr, Fairfield**

- The submitter opposes the high flood hazard overlay mapped on their property because the stream does not present a risk to their home.
- The mapped high flood hazard overlay is present on the submitter's property is due to the presence of a stream (and associated stream corridor). The high hazard overlay is only applicable to the land covered by the overlay.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.87      Tom Brodie (11) – 438 Muritai Rd, Eastbourne**

- The submitter notes that their property or locality has not previously been affected by flooding.

- Please see Section 20.1.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.88 Tom Hudig (288) – 48 Victoria St, Petone**

- The submitter requests that the high flood hazard overlay is removed from their property as nearby properties in the surrounding are not affected in the same way.
- Hydraulic modelling indicates this area is impacted by flooding 0.25m to 0.5m deep leading to the medium hazard classification, with a very small amount of deeper flooding on the northwest corner of the submitter's property, leading to a small portion of high hazard.
- The lack of flooding shown on the nearby properties noted in the submission is due to the representation of the large buildings as voids in the model on these sites. Further discussion on this can be found in the Wellington Water Stormwater Modelling Specifications.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.89 Tony Brenton-Rule (268) - 10 Ngaio Street, Eastbourne**

- The submitter raises a broad range concerns and queries. Issues relating to the flood hazard overlays are listed below:

- Flooding is caused by stormwater infrastructure deficiencies rather than natural flooding.
  - Future infrastructure improvements should be reflected in the overlays.
  - Property-specific mitigation has not been recognised.
- Please see Sections 20.3, 20.6, and 20.7.
  - I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.90 TTL Trust (412) - 18 Saulbrey Grove Woburn**

- The submitter opposes the low flood hazard overlay mapped on their property because of a lack of historical flooding at their property.
- Please see Section 20.1 for commentary on this.
- I have also reviewed the modelling in the vicinity of the submitter's property and the high flood hazard overlay is present due to high (>0.5m) flood depths modelled at this location during the simulated event.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.91 Upul Priyankara Angulugaha Gamage & Hewawasan  
Sarukkalige Yashani Pradeepika Fernando (381) – 36 Manor  
Park Rd, Manor Park**

- The submitter requests that the flood hazard overlays are amended at their property.
- The flood hazard overlays have been mapped at the submitter's property due to high modelled flood depths at the location.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

**22.92 Verity Doak (89) - 2/196 Waiwhetu Road, Waterloo**

- The submitter contends that the future climate change scenario used for the flood hazard overlays is too punitive for property owners as it represents a future hazard.
- The climate change approach has been adopted based on consideration of best practice guides and discussion with the Council and GWRC (Section 20.5).
- Use of a different climate change scenario, or lack thereof, may or may not, results in a different hazard classification at the submitter's property, however this exercise would be need to be completed to establish if this is the case.
- In the context of the adopted climate change scenario for the PDP flood hazard overlays, I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

22.93 **Vicki McCabe (38) - Ford Road, Manor Park**

- The submitter notes that their property or locality has not previously been affected by flooding.
- Please see Section 20.1.
- In addition to the above, it is noted that the predominance of the high flood hazard overlay in Manor Park is due to flooding from the Hutt River, as modelled by GWRC. However, Tiaki Wai modelling also indicates there is potential for flooding originating from the Western Hills above Manor Park.
- I recommend the flood hazard overlays remain unchanged at the location specified in the submission.

22.94 **Waste Management NZ Limited (461, F39) - 30 Benmore Crescent, Manor Park**

- The submitter supports in part the flood hazard overlays mapped over 30 Benmore Crescent. They highlight that the current PDP flood hazard overlays is based on modelling that does not account for the significant earthworks that have taken place at the location.
- A comparison of the modelled topography at 30 Benmore Cr against a DEM generated from the 2025 LiDAR survey confirms the modelling does not account the new earthworks, which may materially change modelled flooding across the site.

- I have reviewed a flood modelling report<sup>8</sup> covering work completed by an independent party for the site.
- The flood modelling carried out for the site in 2022 uses RCP 8.5 to 2100 to increase rainfall due to climate change (which the author notes was acceptable at the time of the modelling) and a concurrent flow in the Hutt River of 2300m<sup>3</sup>/s (0.23% AEP).
- The Tiaki Wai modelling uses the RCP 8.5 to 2130 scenario to increase rainfall due to climate change, and a concurrent flow of 1244m<sup>3</sup>/s (10% AEP) in the Hutt River.
- While the Hutt River flow is significantly lower in the Tiaki Wai model, the higher rainfall (due to the climate change allowance) results in greater flows from the Dry Creek Catchment (55m<sup>3</sup>/s) relative to the independent modelling for the site (30m<sup>3</sup>/s).
- The Tiaki Wai modelling also shows the area receives overland flow from two adjacent catchments to the northeast; the catchment above the Holcim Ready-Mix Concrete site, and the Haywards Hill. These do not appear to be included in the independent modelling for 30 Benmore Cr.
- As a result, the independent flood modelling is potentially underestimating the flow arriving at the site.
- However, as noted above, the Tiaki Wai modelling does not take into account the earthworks that have taken

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<sup>8</sup> *Benmore Crescent Proposed Industrial Park Flood Assessment*. River Edge Consulting Limited, 2022

place, so it is currently not possible to establish if it is acceptable to remove the flood hazard overlays from the site (with the exception of the stream corridor for Benmore Stream).

- Acknowledging the earthworks that have taken place, I recommend changing all the flood hazard overlays within the site to the low flood hazard overlay (with the exception of the stream corridor for Benmore Stream) until the Tiaki Wai modelling can be updated to include the site works or the independent modelling is updated to include the higher rainfall, and adjacent catchments.

#### 22.95 **Winstone Aggregates (444) – Belmont Quarry**

- The submitter opposes the flood hazard overlays mapped over the Belmont Quarry, as the overlays are static and will not reflect the evolving nature of the quarry landform.
- I believe this is a valid reason and support the removal of the flood hazard overlays within the quarry extent.

## 23 **References**

- *Benmore Crescent Proposed Industrial Park Flood Assessment*. River Edge Consulting Limited, 2022
- *Black Creek Stormwater Model Build*. Stantec, 2022
- *Climate change and variability – Wellington Region. Prepared for Greater Wellington Regional Council*. NIWA, 2017

- *Coastal hazards and climate change guidance*. Ministry for the Environment, 2024
- *Eastern Lower Hutt Stormwater Model Build*. Stantec, 2022
- *Flood Hazard Planning Guidance*. Greater Wellington Regional Council, 2023
- *Greater Wellington Flood Hazard Overlays – Hutt City Council District Plan memo*. Greater Wellington Regional Council, 2024
- *Petone Stormwater Model Build*. Stantec, 2023
- *Practice Note 2023*. Environment Court of New Zealand, 2022
- *Proposed District Plan / Part 2 – District Wide Matters / HAZARDS AND RISKS / Natural Hazards*. Hutt City Council, 2024
- *Regional Stormwater Hydraulic Modelling Specifications*. Wellington Water, 2023
- *Stokes Valley*. Stantec, 2023
- [Takiwa-NZ Searise website](#), Takiwa, 2022
- *The East Harbour Stormwater Catchment: Model Build Report*. Wellington Water, 2024
- *Western Hills Stormwater Catchment: Model Build Report*. Wellington Water, 2025.
- *WWL\_Flood\_Hazard\_Process\_Memo*. Stantec, 2024



## **Appendix B2: Coastal inundation evidence of Dr Scott Stephens**

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**Before the Hearings Panel  
At Hutt City Council**

**Under**                      Schedule 1 of the Resource Management Act 1991

**In the matter of**        the Proposed Lower Hutt District Plan

**Between**                **Various**

**Submitters**

**And**                      **Hutt City Council**

**Respondent**

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**Statement of evidence of Dr Scott Alexander Stephens on behalf of Hutt City  
Council**

**Date: 20 July 2026**

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## INTRODUCTION

- 1        My full name is Scott Alexander Stephens.
- 2        I am employed by Earth Sciences New Zealand (ESNZ) as Principal Scientist – Coasts and Estuaries, and also hold the role of Chief Scientist – Multi-hazard Risk and Resilience, based in Hamilton. ESNZ was formed through the bringing together of the National Institute of Water and Atmospheric Research (NIWA) and GNS Science. Where relevant to this evidence I refer to my former employer, NIWA.
- 3        I have prepared this statement of evidence on behalf of Hutt City Council in respect of technical matters arising from submissions and further submissions on the coastal hazard provisions of the Proposed Lower Hutt District Plan (“the PDP”).
- 4        Specifically, this evidence relates to the Coastal Hazard Overlays – Inundation (the High and Medium Coastal Hazard Overlays) in Chapters NH – Natural Hazards and CE – Coastal Environment of the PDP, which are informed by the coastal inundation and sea-level rise assessment for the Hutt City District (Andrews et al. 2023<sup>1</sup>).
- 5        I am authorised to provide this evidence on behalf of the Council.

## QUALIFICATIONS AND EXPERIENCE

- 6        I hold a Doctor of Philosophy in Earth Science from the University of Waikato (2001).
- 7        I am a coastal-hazards scientist with approximately 25 years’ experience in this field. I specialise in extreme sea-level and wave analysis, extreme-value and joint-probability statistical techniques, and the mapping of coastal hazards for adaptation to sea-level rise.

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<sup>1</sup> Andrews, C., Xu, Z., Wadhwa, S. (2023) Coastal inundation and sea level rise assessment for the Hutt City District, Prepared for Hutt City Council, June 2023, 51p.

- 8 I joined NIWA in 2001. I have held the positions of Coastal and Estuarine Physical Processes Scientist (2001–2015), Group Manager – Coastal and Estuarine Physical Processes (2016–2019) and Assistant Regional Manager, Hamilton (2019–2021). In 2021 I became Chief Scientist – Coasts and Estuaries, and in 2026 within ESNZ I hold positions of Principal Scientist – Coasts and Estuaries, and also Chief Scientist – Multi-hazard Risk and Resilience at ESNZ.
- 9 I am a co-author of the Ministry for the Environment’s Coastal hazards and climate change: Guidance for local government (2017 and 2024). I lead the Future Coasts Aotearoa MBIE Endeavour programme, and I have authored or co-authored numerous peer-reviewed papers and consultancy reports on coastal hazards, extreme sea levels and sea-level rise.
- 10 I have calculated extreme sea-level heights and their frequencies around the coastline of New Zealand for the purposes of national-scale coastal hazard assessments.
- 11 I have previously provided coastal inundation expert evidence for Hutt City Council in relation to Proposed Plan Change 56 (2023).

## **CODE OF CONDUCT**

- 12 I have read the Code of Conduct for Expert Witnesses set out in the Environment Court’s Practice Note 2023. 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 Hearings Panel. 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.

## **INVOLVEMENT WITH THE PROPOSED DISTRICT PLAN**

- 13 The Coastal Hazard Overlays – Inundation in the PDP are informed by the coastal inundation and sea-level rise assessment for the Hutt City District (Andrews et al. 2023) – hereafter “the 2023 assessment”. I did not formally participate in the 2023 Assessment. I

helped to scope the project, and I undertook an informal advisor role to the staff who undertook the assessment. The 2023 assessment leveraged datasets and methods from previous NIWA coastal hazards assessments where I was directly involved.

14 As noted above, I provided coastal inundation expert evidence for Plan Change 56.

## **SUMMARY**

15 I have been asked by Hutt City Council to provide evidence in relation to submissions on the Coastal Hazard Overlays – Inundation in the PDP.

16 The principal issues addressed in this statement of evidence are:

- the technical basis for the High and Medium Coastal Hazard Overlays;
- responses to the principal technical themes raised in submissions that challenge the accuracy of, or seek changes to, the overlays;
- the effect (if any) of existing coastal protection works, including the Tupua Horo Nuku / Eastern Bays shared path, on the modelled inundation;
- the sea-level rise scenarios adopted, and the sensitivity of the mapping to those scenarios; and
- how the modelled hazard events relate to the National Policy Statement on Natural Hazards.

17 In summary, in my opinion the overlays are based on robust and current methodology that is consistent with national policy and guidance. I do not recommend changes to the hazard mapping in response to the submissions, other than the potential for localised refinement of the High Coastal Hazard Overlay if as-built coastal edge levels were incorporated into the underlying digital elevation model, as discussed below.

## SCOPE OF THIS EVIDENCE

18 I have not discussed matters raised in submissions that are outside my area of expertise as a coastal hazards scientist. My role has been limited to assessing coastal hazard exposure and the spatial extent of coastal hazard areas. I accordingly do not address matters raised that relate to planning, legal, economic, insurance, property value, enforcement, consultation and policy considerations associated with the use of hazard information within the District Plan. Where the appropriate response to a submission is a planning or policy judgement rather than a question of coastal hazard science, I identify that but do not express an opinion on it.

## RESPONSE TO SUBMISSIONS

19 I have reviewed the submissions and further submissions listed in Table 1. I have grouped the matters raised into themes: themes challenging the accuracy of the overlays (Table 2); themes addressing coastal protection works or local adaptations (Table 3); themes addressing rules or downstream implications (Table 4, most of which fall outside my area of expertise); and submissions in support of the overlays (Table 5). I respond below to the themes that raise matters of coastal hazard science.

*Table 1. Submissions reviewed.*

| Submitter                          | Submission number | Specific sites or areas                                                                                                                                                                                                                                                         |
|------------------------------------|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Adrian Palmer Family Trust         | 315               | 9 Toop St, Gracefield; 2-10 Wareham Place, Seaview; 2 Jackson Street, Petone; 10, 29 Udy Street, Petone; 6 Regent Street, Petone; 85 Fitzherbert St, Petone; 127 Gracefield Road, Gracefield; 411-413 Cuba Street, Alicetown; 21 Meachen Street, Seaview; 140 Hutt Road, Petone |
| Andrew Robinson and Robyn Robinson | 380, F09          | 269 Muritai Rd Eastbourne                                                                                                                                                                                                                                                       |
| Antony and Penelope Orbell         | 281               | 3 Ngaio St Eastbourne                                                                                                                                                                                                                                                           |
| Argosy Property No. 1 Ltd          | 237               | 39 Randwick Road Moera; 147 Gracefield Road Gracefield; 19 Barnes Street Seaview                                                                                                                                                                                                |

| Submitter                                      | Submission number | Specific sites or areas                                                                                                       |
|------------------------------------------------|-------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Christopher John McHaffie and Mary Anne Malone | 278               | 9 Ngaio St Eastbourne                                                                                                         |
| David Surrey                                   | 427               | No                                                                                                                            |
| Grant and Kristin Gunn                         | 369               | 95 Oroua St Eastbourne                                                                                                        |
| Ian and Raylene Caddis                         | 433               | 618 Marine Drive Days Bay                                                                                                     |
| Jennifer Gray                                  | 277               | 272 Muritai Road Eastbourne                                                                                                   |
| Joe Jeffries                                   | 514               | No                                                                                                                            |
| Kelvin Sanderson                               | 95                | 129 Cuba St Petone                                                                                                            |
| Kris Philip Connell                            | F03               | 269 Muritai Rd Eastbourne                                                                                                     |
| Lars Schmidt                                   | 480               | 227 Marine Drive Lowry Bay                                                                                                    |
| Laura Skilton                                  | 314               | Petone                                                                                                                        |
| Louise Kay Cameron                             | 279               | 13 Karamu Street Eastbourne                                                                                                   |
| Lynn Kelleher                                  | 280               | 5 Karamu Street Eastbourne                                                                                                    |
| Mary Spiers and Samuel Spink                   | 479               | 267 Muritai Road Eastbourne                                                                                                   |
| Michael Kerslake                               | 501               | 12 Ngaio St Eastbourne                                                                                                        |
| Natural Hazards Commission                     | 327, F15          | No                                                                                                                            |
| Nicola Stent and Stuart Stent                  | 393               | 6A Oriental St Petone                                                                                                         |
| PBJ Properties Ltd                             | 476               | 23 Fitzherbert St Petone                                                                                                      |
| Philip King                                    | 125               | 238 Marine Drive Lowry Bay                                                                                                    |
| PTL Trust                                      | 397               | 212 Marine Drive Lowry Bay                                                                                                    |
| Richard Kemp and Honor Kemp                    | 25                | 226 Marine Drive Lowry Bay                                                                                                    |
| Ron Beernink and Glenda McCallum               | 303               | 42 Fitzherbert St Petone                                                                                                      |
| Sensible Solutions for Eastbourne              | 383               | 376, 1/376a, 2/376a, 396 Muritai Rd, Eastbourne; 95 Oroua St, Eastbourne; 15 Marine Pde, Eastbourne; 12 Puriri St, Eastbourne |
| Tom Hudig                                      | 288               | 11 Aurora St, Petone; 48 Victoria St, Petone; 231 Marine Drive, Lowry Bay                                                     |

| Submitter         | Submission number | Specific sites or areas  |
|-------------------|-------------------|--------------------------|
| Tony Brenton-Rule | 268               | 10 Ngaio Street          |
| TTL Trust         | 412               | 18 Saulbrey Grove Woburn |

Table 2. Themes challenging the accuracy of the overlays.

| Theme                                                                                                                                                                                        | Submission numbers                                                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|
| 1. Remove coastal hazard overlays from specific properties or areas                                                                                                                          | 025, 095, 125, 288, 315, 369, 380, 383, 393, 397, 412, 433, 476, F07 |
| 2. Property has experienced no historical coastal inundation or hazard impacts                                                                                                               | 025, 125, 288, 393, 397, 412                                         |
| 3. Insufficient evidence, modelling, peer review, transparency, or explanation of how overlays were derived                                                                                  | 383, 433, 476, 480, F03, 369, 380, 427, F07                          |
| 4. Questioning consistency of overlay application between neighbouring properties                                                                                                            | 288, 380, 479                                                        |
| 5. Hazard categories (High/Medium/Low) are misleading and should be revised or replaced with probability-based descriptions                                                                  | 380, 514                                                             |
| 6. Risk should be assessed and managed at the individual property scale rather than primarily through mapped hazard overlays and plan-wide controls (raise site and area-specific critiques) | 237, 327, 514, F15, 427, F07, F09                                    |

Table 3. Themes addressing coastal protection works or local adaptations

| Theme                                                                                                                                           | Submission numbers                               |
|-------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| 7. Existing coastal protection works (Tupua Horo Nuku/shared path/seawall) reduce risk and should be reflected in the overlays                  | 025, 268, 279, 280, 288, 397, 480, 501           |
| 8. Existing adaptation actions, homeowner mitigation measures and local observations should reduce hazard ratings or overlay extent             | 268, 277, 278, 279, 280, 281, 369, 380, 501, F07 |
| 9. Natural coastal processes (gravel accretion/progradation, shoreline growth) are reducing coastal hazard risk and are not properly recognised | 268, 277, 278, 279, 280, 281, 380, 501, F03      |

Table 4. Themes addressing rules or downstream implications.

| Theme                                                                                                                                   | Submission numbers                                              |
|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
| 10. Coastal hazard overlays may adversely affect insurance, property values, property rights and financial wellbeing.                   | 025, 268, 279, 281, 369, 380, 393, 397, 412, 433, 480, F03      |
| 11. Overlays create unnecessary restrictions on development, redevelopment, additions, subdivision or business activities               | 095, 237, 314, 315, 393, 514, F03, 303, 369, 380, 427, F07, F09 |
| 12. Request for more flexible rules allowing additions, conversions and redevelopment in coastal hazard areas where risk can be managed | 237, 315, 514, 427, F09                                         |
| 13. Request for industrial/commercial carve-outs or recognition of economic importance of industrial land in coastal hazard areas       | 237, 315                                                        |
| 14. Council should focus more on mitigation infrastructure and hazard reduction than regulatory overlays                                | 095, 268, 278, 279, 280, 281, 501, 277, 278, 369, 380, F07, F09 |
| 15. Stormwater, drainage and infrastructure management are major contributors to current flooding risk                                  | 268, 278, 279, 280, 281, 433, 277, 278, 369, 380, F07, F09      |
| 16. Need for clearer communication, consultation, engagement and explanation to property owners                                         | 268, 278, 279, 280, 281, 433, 501, 369, 380, 427, F07           |
| 17. Recognition of continued urban growth and development opportunities in coastal areas despite hazard overlays                        | 303, 427, 514                                                   |

Table 5. Submissions in support of coastal hazard overlays.

| Theme                                                                                                 | Submission numbers |
|-------------------------------------------------------------------------------------------------------|--------------------|
| 18. Support for retaining or strengthening coastal hazard overlays and precautionary planning         | 314, 327, F15      |
| 19. Support for stronger controls on intensification, subdivision and new development in hazard areas | 303, 314, 327, F15 |
| 20. Climate change and sea-level rise should remain central to hazard planning                        | 314, 327, F15      |
| 21. Need to manage residual risk even where protection structures exist                               | 327, F15           |

| Theme                                                                              | Submission numbers |
|------------------------------------------------------------------------------------|--------------------|
| 22. Preference for adaptive planning and long-term resilience over overlay removal | 327, F15           |
| 23. Use of natural systems and green infrastructure as hazard mitigation           | 303, 327, F15      |
| 24. Need for clear evacuation and life-safety considerations in hazard areas       | 314, 327, F15      |

## **THEMES CHALLENGING THE ACCURACY OF THE OVERLAYS (TABLE 2)**

### **THE TWO OVERLAYS**

- 20 It is helpful to first summarise what the two overlays represent. The High Coastal Hazard Overlay (HCH) represents inundation potential from a large and rare (1% annual exceedance probability, or AEP) coastal storm-tide at present-day mean sea level. It tends to be restricted to locations close to, and somewhat inland of, the existing high-tide mark. The Medium Coastal Hazard Overlay (MCH) represents inundation potential from the same 1% AEP coastal storm-tide, plus an additional approximately 1.59 m of relative sea-level rise (RSLR) relative to the existing land surface, which might occur over approximately the next 100 years according to the scenario modelled.

### **THEME 2 – NO HISTORY OF COASTAL INUNDATION (025, 125, 288, 393, 397, 412)**

- 21 Few properties lie within the HCH, and it is possible that properties within the HCH have experienced coastal hazards historically. However, we would not expect any historical coastal hazards within the majority of the MCH, because it represents a scenario approximately 100 years into the future for planning purposes. The absence of historical inundation at a property therefore does not indicate that the overlay is in error.

**THEME 3 – SUFFICIENCY OF EVIDENCE, MODELLING AND TRANSPARENCY (383, 433, 476, 480, F03, 369, 380, 427, F07)**

- 22 The derivation of the overlays is described in Andrews et al. (2023). The modelling uses high-resolution digital land-elevation models, robust extreme sea-level analysis based on sea-level and wave measurements and calibrated models, and numerical modelling of inundation. It follows the latest guidance on relative sea-level rise from MfE (2022<sup>2</sup>), which was adopted in MfE (2024<sup>3</sup>). The modelled RSLR is consistent with Category C – Land-use planning controls for existing coastal uses and assets (building additions) as specified in Table 8 of MfE (2024). In my opinion the assessment is based on robust, current and appropriately documented methodology.

**THEME 4 – CONSISTENCY BETWEEN NEIGHBOURING PROPERTIES (288, 380, 479)**

- 23 The mapped hazard categories are based on the modelled inundation extent associated with each scenario, and not on distance from the current shoreline. Properties at different distances from the coast may therefore fall within the same hazard category if they are predicted to be inundated under the same modelled scenario.
- 24 The two main controlling factors are the height of the sea and the height of the land surface relative to the height of the sea. The land surface elevation is based on an accurate digital elevation model derived from LiDAR. Properties may appear similar, but only those of relatively low land-surface elevation, where the modelling showed that seawater could flow, are identified. For a property to appear within the mapped inundation extent, the modelled water depth must be at least 10 cm relative to the local land surface; areas with shallower depths were deliberately filtered out.

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<sup>2</sup> MfE (2022) Interim guidance on the use of new sea-level rise projections: Guidance for local government. Ministry for the Environment Publication ME1667. Wellington, Ministry for the Environment. 35 p. <https://environment.govt.nz/publications/interim-guidance-on-the-use-of-new-sea-level-rise-projections>

<sup>3</sup> MfE (2024) Ngā pūmate takutai me te ārahitanga huringa āhuarangi. Coastal hazards and climate change: Guidance for local government. Ministry for the Environment Publication ME1805. Wellington, Ministry for the Environment. 144 p. + Appendices <https://environment.govt.nz/publications/coastal-hazards-and-climate-change-guidance>

## **THEME 5 – “HIGH/MEDIUM” LABELLING (380, 514)**

- 25 I interpret the submitters’ argument to be that the labels can be misinterpreted as current risk categories. The High and Medium Coastal Hazard Overlays do not represent different probabilities of occurrence; rather, they represent inundation extents associated with different hazard scenarios. Consequently, while the terminology could potentially be misunderstood, the underlying hazard assessment remains scientifically valid. The MCH in particular is sensitive to the selected relative sea-level-rise scenario and planning timeframe, which I discuss further below.

## **THEME 6 – PROPERTY-SCALE RISK ASSESSMENT (237, 327, 514, F15, 427, F07, F09)**

- 26 The submitters generally advocate a risk-based approach in which site-specific assessments may override the mapped overlays. I agree that the management of coastal hazards should be risk-based. However, the mapped overlays and the question of how risk should be implemented through the District Plan are distinct. The overlays provide a consistent basis for identifying areas potentially exposed to coastal hazards across the district. Whether a predominantly site-specific assessment framework should be adopted in place of mapped overlays raises planning and implementation matters – including consistency of decision-making, cumulative effects, long-term monitoring and administrative burden – that are a policy judgement rather than a question of hazard science. From a coastal hazard science perspective, the choice of future climate-change scenario is a key component of any risk-based approach, because future risk is strongly influenced by relative sea-level rise; I discuss this further below.

## **THEMES ADDRESSING COASTAL PROTECTION WORKS OR LOCAL ADAPTATIONS (TABLE 3)**

### **THEME 7 – EXISTING COASTAL PROTECTION WORKS, INCLUDING THE TUPUA HORO NUKU / EASTERN BAYS SHARED PATH (025, 268, 279, 280, 288, 397, 480, 501)**

- 27 Coastal erosion and coastal inundation are distinct hazards. The Coastal Hazard Overlays considered here are based on coastal inundation modelling, not coastal erosion modelling. The key technical question is therefore not whether the Tupua Horo Nuku / Eastern Bays shared path provides coastal protection in a general sense, but whether the constructed

landform would materially alter the modelled flow paths, water levels, or inland extent of the inundation scenarios used to define the overlays.

- 28 The shared path was built after the modelling was completed and is not factored into the overlay maps. It is a present-day modification to the coastal edge and can reasonably be regarded as a form of coastal adaptation. I understand from Council that the shared path is approximately level with the existing roadway, which is typically about 2 m NZVD2016 based on Hutt City Council GIS data. I note the precise as-built crest levels and the lateral continuity of the works are not known to me in detail, and this is an uncertainty factor in the following assessment.
- 29 The MCH is based on a 1% AEP coastal storm-tide event plus approximately 1.59 m of relative sea-level rise. Based on the sea levels used in Andrews et al. (2023), the relevant modelled sea levels for the MCH are approximately 4.41 m NZVD2016 or higher. A shared-path crest of about 2 m NZVD2016 is well below those levels. For the shared path to materially reduce the inland extent of the MCH it would need to form a continuous hydraulic barrier along the relevant waterfronts with crest levels above the modelled water levels and no lower flow paths; at approximately 2 m NZVD2016 it plainly does not. Furthermore, the MCH is a future-facing planning scenario: if sea level were to approach the levels included in the MCH scenario, the effects would almost certainly be noticed, and further adaptation decisions required, well before 1.59 m of relative sea-level rise was reached. In my opinion the presence of the shared path does not justify removing or reducing the MCH.
- 30 The situation is different for the HCH, which represents present-day inundation from a 1% AEP storm-tide event at present-day mean sea level (relevant sea levels of approximately 2.78–3.00 m NZVD2016; Table 3-1, Andrews et al. 2023). Present-day coastal edge works are more directly relevant to the HCH. A shared-path crest of about 2 m NZVD2016 is, however, also below the HCH modelled water levels, and so would not on its own be expected to exclude HCH inundation. A robust assessment would require the as-built levels of the shared path and associated coastal edge works to be incorporated into the digital elevation model, followed by a targeted hydraulic-connectivity review or, preferably, re-running the present-day inundation scenario. In my opinion this could

potentially refine the HCH in localised areas, but it would not alter the technical basis for the MCH. In practice this is not a high priority to resolve, because I understand that the only private property affected by the HCH overlay in the relevant area is located seaward of the shared path in any event.

**THEME 8 – HOMEOWNER MITIGATION AND ADAPTATION ACTIONS (268, 277, 278, 279, 280, 281, 369, 380, 501, F07)**

32. The submitters contend that existing adaptation actions – for example elevated floor levels, stormwater improvements, soak pits and retention infrastructure – should result in reduced hazard ratings or a reduced overlay extent. I acknowledge that such measures can reduce the consequences of natural hazard events for individual properties. However, the purpose of the overlays is to identify areas potentially exposed to coastal hazards over the planning timeframe, not to represent the effectiveness of site-specific mitigation. There is an important distinction between hazard and risk: adaptation measures may reduce risk for a particular property without altering the underlying hazard exposure the overlays are intended to identify, and their continued effectiveness depends on ongoing maintenance, ownership and performance during future events. In my opinion the submissions have not demonstrated that existing adaptation actions should be reflected through reductions in hazard ratings or overlay extent; site-specific measures are more appropriately considered through subsequent planning, engineering and consent processes.

**THEME 9 – NATURAL COASTAL PROCESSES (268, 277, 278, 279, 280, 281, 380, 501, F03)**

- 31 The modelling is based on a digital elevation model from LiDAR collected in 2021 for Hutt City through to Muritai, with 2013–2014 LINZ LiDAR used south of Muritai and along the open coast. While historical gravel accretion and shoreline growth may have reduced coastal hazard exposure at certain locations over recent decades, the assessment was intentionally based on contemporary topography and future sea-level-rise scenarios. It did not attempt to predict whether current accretion trends would continue, reverse or stabilise, and it does not consider past or future natural geomorphological change or coastal protection works (vertical land motion was allowed for through the relative sea-level-rise rate, not by deforming the DEM). Coastal erosion and coastal inundation are

distinct hazards; whether or not sediments have been accumulating historically, there is no guarantee that accumulation will continue after 1.59 m of relative sea-level rise, and it is plausible – even likely – that such rise would drive coastal recession.

#### **THEMES ADDRESSING RULES OR DOWNSTREAM IMPLICATIONS (TABLE 4)**

- 32 Most of the themes in Table 4 (themes 10, 11, 13, 16 and 17 – relating to insurance, property values and property rights; restrictions on development; industrial and commercial carve-outs and economic matters; communication and consultation; and urban-growth opportunities) raise planning, legal, economic and policy matters that are outside my area of expertise. Consistent with the scope of my evidence set out above, I do not comment on them. I address below only the technical elements of the remaining themes.

#### **THEME 12 – FLEXIBILITY WHERE RISK CAN BE MANAGED (237, 315, 514, 427, F09)**

- 33 From a coastal hazard science perspective, I agree that risk can often be reduced through site-specific design, mitigation and adaptation measures. However, the effectiveness of those measures depends on their design assumptions, maintenance, longevity and performance over time. Whether the District Plan should rely primarily on site-specific mitigation rather than a district-wide overlay framework is a planning and policy matter on which I do not express an opinion.

#### **THEME 14 – MITIGATION INFRASTRUCTURE VERSUS REGULATORY OVERLAYS (095, 268, 277–281, 369, 380, 501, F07, F09)**

- 34 Coastal hazard overlays and mitigation infrastructure serve different functions and are not direct alternatives. Overlays identify areas potentially exposed to hazards, whereas mitigation infrastructure seeks to reduce the consequences of those hazards. The existence of mitigation infrastructure does not necessarily eliminate hazard exposure, and its long-term performance may depend on future sea-level rise, maintenance, design standards and exceedance events. The appropriate balance between hazard identification, mitigation works and regulatory controls is a planning and governance matter.

**THEME 15 – STORMWATER AND DRAINAGE CONTRIBUTIONS TO FLOODING (268, 277–281, 369, 380, 433, F07, F09)**

35 Some submitters contend that observed flooding is primarily attributable to stormwater or drainage issues rather than coastal hazards. The assessment underpinning the overlays was not intended to evaluate the adequacy or performance of local drainage infrastructure. However, coastal hazard assessments identify areas potentially exposed to coastal hazard processes irrespective of the cause of any observed local flooding. Whether infrastructure upgrades are required to manage existing drainage problems is a separate matter from identifying areas potentially exposed to coastal inundation.

**SUBMISSIONS IN SUPPORT OF THE OVERLAYS (TABLE 5)**

36 The submissions in Table 5 generally support the retention of the overlays, a precautionary and risk-based approach, the consideration of climate change and sea-level rise, the management of residual risk, long-term resilience planning, and the use of evacuation, adaptation and hazard-mitigation measures. These matters are generally consistent with the coastal hazard assessment and mapping methodology underpinning the overlays. The submissions do not identify any issues with the technical hazard assessment that would require amendment to the mapping, and I do not recommend any changes to the overlays in response to them.

**SEA-LEVEL RISE SCENARIOS**

37 The coastal inundation assessment (Andrews et al. 2023) uses sea-level rise as a policy-framed planning scenario, linked to MfE guidance, NZCPS requirements and a 100-year planning horizon to 2130 (Minister of Conservation 2010<sup>4</sup>; MfE 2024). By contrast, the tsunami assessment (Burbidge et al. 2021<sup>5</sup>) uses sea-level rise as a modelling scenario

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<sup>4</sup> Minister of Conservation (2010) New Zealand Coastal Policy Statement 2010, as amended in 2025: 30. <file:///C:/Users/stephens/OneDrive%20-%20ESNZ/Papers/Reports/nz-coastal-policy-statement-2010-amended-2025.pdf>

<sup>5</sup> Burbidge, D.R., Power, W.L.G., A. R., X., W. (2021) Hutt City Probabilistic Tsunami Hazard Maps, GNS Science Consultancy Report 2021/115, November 2021.

requested by Council to evaluate how tsunami inundation changes under higher sea levels. The coastal inundation sea-level-rise assumptions are therefore directly integrated into the planning framework, whereas the tsunami report largely treats sea-level rise as an external modelling input.

## **COASTAL INUNDATION ASSESSMENT**

- 38 The coastal inundation assessment was explicitly developed within the coastal hazard planning framework set out in national policy and guidance. It adopts a 100-year planning timeframe to the year 2130 and applies relative sea-level-rise projections that incorporate both climate-driven sea-level rise and vertical land movement, using the SSP2-4.5, SSP5-8.5 and SSP5-8.5 H+ scenarios together with NZSeaRise vertical land movement estimates.
- 39 In particular, the MCH is based on approximately 1.59 m of relative sea-level rise, which corresponds to the SSP5-8.5 median projection plus vertical land movement for the Lower Hutt shoreline at approximately the year 2130. This is consistent with the framework set out in MfE guidance for planning decisions involving land-use change and development over a 100-year planning horizon (MfE 2024), and with the New Zealand Coastal Policy Statement, which requires coastal hazards to be identified, and increasing risk to be avoided, over at least 100 years (Minister of Conservation 2010). The adopted sea-level-rise assumptions are therefore not arbitrary assumptions created for the hazard modelling; they are directly linked to the planning framework within which the assessment was undertaken. In my opinion the adopted coastal inundation scenarios are consistent with the policy framework and current national guidance that informed the assessment.

## **TSUNAMI ASSESSMENT**

- 40 By contrast, the tsunami modelling report uses 1.0 m of sea-level rise as a modelled sensitivity input (present-day Mean High Water Springs, and present-day MHWS plus 1.0 m of sea-level rise) rather than as a policy-derived planning outcome. In my view this does not invalidate the modelling; it demonstrates that tsunami inundation extent increases materially when 1.0 m of sea-level rise is applied. However, the tsunami report does not provide a specific policy justification for selecting 1.0 m, nor explicitly link the scenario to a particular planning horizon, climate pathway or relative sea-level-rise projection. From a

coastal hazards science perspective, a 1.0 m sea-level-rise tsunami scenario is technically reasonable as a sensitivity assessment. Whether it remains the most appropriate planning scenario for District Plan purposes is a policy and planning judgement. I note that, if the tsunami modelling were framed using the same 100-year planning horizon and relative sea-level-rise assumptions applied within the coastal inundation assessment, the resulting future sea-level-rise allowance would likely be greater than 1.0 m rather than lower.

## **SENSITIVITY TO CLIMATE-CHANGE ASSUMPTIONS AND SEA-LEVEL-RISE SCENARIOS**

- 41 A number of submissions question the validity of the overlays on the basis that the future inundation scenarios are overly conservative, based on inappropriate sea-level-rise assumptions, or do not adequately account for future adaptation. In my opinion it is important to distinguish between the coastal hazard modelling itself and the policy decisions regarding the selection of future climate-change scenarios and planning timeframes.
- 42 The inundation modelling by Andrews et al. (2023) did not directly model future changes in storms, rainfall or wave climate. The principal climate-change factor incorporated was relative sea-level rise (RSLR), which includes both projected climate-driven sea-level rise and vertical land movement, and which directly influences the extent of mapped future inundation.
- 43 For the MCH, the District Plan adopts the SSP5-8.5 median scenario including vertical land movement to the year 2130, corresponding to a RSLR of approximately 1.6 m across the Hutt City coastal margin. Andrews et al. (2023) also evaluated the SSP2-4.5 median scenario (RSLR of about 1.18 m) and the SSP5-8.5 H+ scenario (median RSLR of about 2.04 m by 2130). The adopted scenario therefore sits between lower and higher plausible pathways that were explicitly evaluated. Relative to the adopted scenario, the SSP2-4.5 scenario is approximately 0.42 m lower and the SSP5-8.5 H+ scenario is approximately 0.44 m higher. Across the low-gradient coastal margins of much of Petone, Alicetown, Seaview, Eastbourne and parts of the Lower Hutt foreshore, differences of this magnitude would be expected to alter the inland extent of future inundation appreciably. The mapped extent of the MCH is therefore inherently sensitive to the selected RSLR scenario.

This is not a limitation of the modelling; it reflects the physical reality that coastal inundation exposure increases progressively as sea level rises.

- 44 In my opinion the selected SSP5-8.5 median scenario should not be interpreted as a scientific prediction of the most likely future sea level. Rather, it is a planning scenario selected from a range of plausible futures. The technical modelling demonstrates how inundation extent changes under that scenario; which scenario should be used for planning purposes is fundamentally a policy matter.
- 45 The second key factor is the chosen planning timeframe. The year 2130 was adopted because it provides a planning horizon of at least 100 years, consistent with Policies 24 and 25 of the NZCPS, and the MfE guidance recommends the use of RSLR projections to 2130 for most planning categories associated with long-lived development. Shorter horizons apply to some categories (for example, MfE planning category D, for short-lived, readily adaptable, low-consequence assets, for which a horizon to approximately 2075 may be appropriate). A substantially shorter timeframe would imply a lower RSLR allowance and a reduced future inundation extent, but that would represent a different planning approach rather than a change to the underlying hazard science.
- 46 The HCH differs fundamentally. It is based on present-day 1% AEP coastal inundation conditions and does not include future relative sea-level rise. It is therefore largely insensitive to the choice of SSP scenario, climate pathway or planning timeframe; the principal influences on the HCH are present-day coastal water levels, topography and any present-day modifications to the coastal edge.

#### **RELATION TO THE NATIONAL POLICY STATEMENT ON NATURAL HAZARDS**

- 47 A related question is how the modelled hazard events sit within the risk framework of the National Policy Statement on Natural Hazards (NPS-NH), for each of damage to property and potential for injury or fatalities, and whether this is consistent across the mapped hazard areas or varies within a given area.
- 48 The HCH and MCH are both based on coastal inundation from a storm-tide with 1% AEP, which Table 1 of the NPS-NH classifies as “Possible”. The likelihood of a 1% AEP event

occurring over a 100-year timeframe (104 years between 2026 and 2130) is 63%, which is “almost certain” (Table 1, NPS-NH). Under the Risk Matrix (Figure 1, NPS-NH), over a 100-year period a Possible event with Moderate consequences shifts to an almost-certain event with High consequences.

## **HIGH COASTAL HAZARD OVERLAY**

49 For the HCH (1% AEP storm-tide at present-day mean sea level), and drawing on experience from recent very high storm-tide sea levels at Thames and Tauranga (5 January 2018) and Nelson / Tasman during ex-Tropical Cyclone Fehi (1 February 2018), the consequence level could be described as:

- Consequence: Moderate.
- Damage to property: some damage to land and non-structural damage to building(s); limited loss of use, repairs required.
- Potential for injury or fatalities: unsafe for people, with potential for injuries, although expected to be minor.

## **MEDIUM COASTAL HAZARD OVERLAY**

### ***In the year 2026 (no sea-level rise)***

50 The MCH builds in 1.59 m of future relative sea-level rise and therefore extends inland far beyond the HCH. At present-day mean sea level, the consequence for areas of the MCH that lie outside the HCH could be described as:

- Consequence: Negligible.
- Damage to property: no loss of use, no building repairs required.
- Potential for injury or fatalities: no injuries.

### ***In the future, after 1.59 m of relative sea-level rise***

51 In the modelled scenario, the most inland extent of the MCH could be expected to have moderate consequences, similar to the present-day HCH, but there will be a gradient of consequence: the built environment at relatively low land elevations and closer to the present-day shoreline will have much worse consequences if no adaptation measures are taken. These relative consequences have not been quantified, but could be quantified using (for example) RiskScape software. I would hypothesise that, in the lowest-lying areas near the sea, on a stormy day and after 1.59 m of relative sea-level rise, the consequence would be at least:

- Consequence: Major.
- Damage to property: major damage to land and building(s), including structural damage; loss of use and substantial repair required.
- Potential for injury or fatalities: unsafe for people, with potential for many injuries, or critical injuries and/or fatalities.

52 I would also expect that the effects of sea-level rise will be felt at many properties well before 1.59 m of relative sea-level rise is reached, prompting adaptive action that would likely mitigate the consequences. That is, of course, the logic underlying the District Plan policies and rules within this overlay.

Signed:



Date: 20 July 2026

# **Appendix B3: Tsunami evidence of Dr David Burbidge and Ms Edith Bretherton**

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**Before the Hearings Panel  
At Hutt City Council**

|                         |                                                |
|-------------------------|------------------------------------------------|
| <b>Under</b>            | Schedule 1 of the Resource Management Act 1991 |
| <b>In the matter of</b> | the Proposed Lower Hutt District Plan          |
| <b>Between</b>          | <b>Various</b>                                 |
|                         | <b>Submitters</b>                              |
| <b>And</b>              | <b>Hutt City Council</b>                       |
|                         | <b>Respondent</b>                              |

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**Joint statement of evidence of Dr David Ross Burbidge and Ms Edith  
Bretherton on behalf of Hutt City Council**

**Date: 20 July 2026**

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## **INTRODUCTION**

- 1 Our full names are Dr David Ross Burbidge and Ms Edith Victoria Bretherton. Dr Burbidge is employed as a geophysicist specialising in earthquake and tsunami hazard and risk assessments and tsunami forecasting at the New Zealand Institute for Earth Sciences (ESNZ), Lower Hutt, New Zealand. Ms Bretherton is employed as a senior natural hazards specialist at ESNZ, Lower Hutt, New Zealand.

ESNZ was formerly known as the Institute of Geological and Nuclear Sciences Limited (GNS Science).

- 2 We have prepared this statement of evidence on behalf of Hutt City Council in respect of technical related matters arising from the submissions and further submissions on the Lower Hutt Proposed District Plan (PDP).

- 3 Specifically, this statement of evidence relates to the matters in Chapter NH - Natural Hazards and CE - Coastal Environment where it relates to tsunami hazards.

- 4 We are authorised to provide this evidence on behalf of the Council.

## **QUALIFICATIONS AND EXPERIENCE**

- 5 Dr Burbidge's academic qualifications comprise of a Doctor of Philosophy (Earth Sciences – 2000) from the Australian National University (ANU) and a Bachelor of Science (First Class Honours in Physics - 1996) also from the ANU.

- 6 He holds the position of Tsunami Team Leader at the ESNZ. He has worked at GNS Science (now ESNZ) since 2014, including four years as

the Head of Department for Tectonophysics (which included the Tsunami Team) before moving into his current role.

- 7 His previous work experience prior to coming the GNS Science comprises of one year working as a Research Scientist at the Defence Science and Technology Organisation (DSTO) in Australia and then 12 years working at Geoscience Australia (GA). At GA he was the Earthquake Hazard Section Leader for four years and for the rest of that a period he was a Research Geophysicist within that Section. During that time, he worked on a range of projects covering the fields of earthquake and tsunami hazard and risk assessment and tsunami monitoring and forecasting.
- 8 During his time at GNS Science (now ESNZ), he has been involved, or is currently involved, with the following relevant projects:
  - 8.1 He has led or contributed to, a range of tsunami inundation hazard modelling projects including projects for Hutt City Council, Wellington City Council, Hawkes Bay Regional Council, West Coast Regional Council, Bay of Plenty Regional Council and Environment Canterbury. In most cases these modelling hazard assessments were used to inform tsunami evacuation maps, but some, such as the one for the Hutt City Council, were designed primarily to inform land-use planning.
  - 8.2 He contributed to the 2021 update to the National Tsunami Hazard Model (NTHM). The NTHM estimates the maximum tsunami height off the coast which has a particular probability of being exceeded each year. The NTHM underpins the tsunami inundation hazard assessments listed above. He was second author on the final report for the 2021

update and is part of the team working on the current update planned for completion this year.

- 8.3 He is currently a member and is the current chair of the Tsunami Expert Panel for New Zealand and sit on the DART (Deep-Ocean Assessment and Reporting of Tsunamis) Technical Advisory and Steering Groups. He also leads the Tsunami Science Advisory and Monitoring project in the GeoNet Programme. He has provided tsunami advice through to emergency managers in these capacities during numerous tsunami responses during his time at ESNZ.
- 8.4 He currently one of the co-leaders of the National Tsunami Model (NTM) project funded by the Natural Hazard Commission (NHC). This project aims to extend the NTHM onshore and to use this onshore inundation to estimate the potential impact of a tsunami on the community, in particular on residential buildings.
- 8.5 He is also currently the project leader for the recently formed Strategic Science and Investment Fund (SSIF) Tsunami, Coastal Hazards and Coastal Change Project. The project conducts fundamental and applied research into these topic areas with the long-term aim to help reduce their potential impact on the New Zealand Community.
- 8.6 He is a member of American Geophysical Union and the Geoscience Society of New Zealand.

- 9 Ms Bretherton's academic qualifications comprise of a Master of Science (Physical Geography 2016), Bachelor of Science (Earth Science and Physical Geography), Graduate Diploma in Arts (2007) and Bachelor of Business (2005), all from Massey University.

- 9.1 She holds the position of Senior Natural Hazards Planner at ESNZ. She leads the Planning and Policy Research project under the Strategic Science Investment Fund (SSIF) in the Multi-Hazard and Risk programme (previously Improved Risk Governance), and the Science to Practice project in the “It’s our Fault” programme.
- 9.2 She has led multi-disciplinary teams researching policy levers to reduce risk from natural hazards and climate change. She has also been a member of the technical advisory group for Auckland Councils’ plan change 78 (now 120), Environment Southland Technical Advisory Group. She has coordinated expert witnesses for Wellington City District Council, Wairarapa District Councils and Hutt City District Council. She led multi-disciplinary peer reviews of tsunami risk assessments for Wellington City District Council.
- 9.3 Prior to joining GNS Science in 2022 she worked for the West Coast Regional Council as a Senior Planner from February 2018. She developed provisions including Natural Hazards for Te Tai o Poutini Plan (combined) District Plan for the West Coast. She also progressed the Coastal Plan review and was a support planner for the Regional Policy Statement and Land and Water Plan Change hearings.
- 9.4 Previous to this she was programme coordinator for the Auckland Unitary Plan March 2013 – November 2016. She moved into resource consent processing as the plan became operative at the West Auckland Planning Office.
- 9.5 She gained her accreditation as an RMA commissioner in 2022 and has acted as a Commissioner on the West Coast for the District Councils for hearings, commissioner only

decisions, commissioner led mediation, and s.357 commissioner referrals.

9.6 She is a full member of the New Zealand Planning Institute and has convened a special interest group for natural hazards, of which she is the establishment chair.

9.7 She is currently seconded on a part time basis to the Ministry for Cities, Environment, Regions and Transport (MCERT) formerly the Ministry for the Environment as a Senior Advisor in the Natural Hazards Policy Team.

#### **CODE OF CONDUCT**

10 We have read the Code of Conduct for Expert Witnesses set out in the Environment Court's Practice Note 2023. We have complied with the Code of Conduct in preparing my evidence and will continue to comply with it while giving oral evidence before the Hearings Panel. Our qualifications as an expert are set out above. Except where we state we rely on the evidence of another person, we confirm that the issues addressed in this statement of evidence are within our areas of expertise, and we have not omitted to consider material facts known to us that might alter or detract from my expressed opinions.

#### **INVOLVEMENT WITH THE PROPOSED DISTRICT PLAN**

11 Dr Burbidge was lead author of the study by Burbidge et al. (2021) - hereafter referred to as "the 2021 study" - which was commissioned as part of the PDP update process. The mapping in the 2021 study is the underlying data used to define the tsunami hazard areas in the PDP.

12 Dr Burbidge provided tsunami expert witness evidence for Plan Change 56.

## SUMMARY

- 13        Our names are Dr David Burbidge and Ms Edith Bretherton
- 14        We have been asked by Hutt City Council to provide evidence in relation to submissions on tsunami in the PDP.
- 15        Our statement of evidence addresses multiple submissions and is in two formats:
- 15.1      Overview and Grouped Comments in the following sections.
- 15.2      Detailed responses to individual submissions in Table 1.

### 21.1 OVERVIEW AND GROUPED COMMENTS

**Modelled hazard events alignment with the consequence table (table 2) from the National Policy Statement on Natural Hazards (NPS NH)<sup>1</sup>.**

The NPS NH outlines a risk assessment methodology that has a matrix of consequence and likelihood. It is noted that the method and purpose of the 2021 report was to understand inundation hazard, not life and property risk.

Using figure 1 in NPS NH, the annual exceedance probabilities (AEP) and annual recurrence intervals (ARI) likelihoods for are:

- 1% AEP / 50-100 year ARI “possible”,
- 1% - 0.2% AEP / 100-500 year ARI “unlikely”, and
- 0.2% to 0.02% AEP / 500-5000 year ARI “rare”.

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<sup>1</sup> [07-07-20 - FINAL-NPS template.dotx](#)

Considering that there is an ensemble of tsunamis could occur within each of the timeframes, there would be a spectrum of effects for life safety and for property damage. This is because the modelling for each overlay is not simply a single event from a single earthquake but a probability-based assemblage.

Single events could be extracted from the model, and likely consequences from that event assessed.

#### **Sea level rise (SLR) addition, and sensitivity of the underlying modelling to climate assumptions.**

The modelled outputs in the 2021 report differentiate between current and future hazard by the addition of 1m of SLR. Both sets of outputs were produced in that study. The results from the model are highly sensitive to this addition of SLR; this is discussed in some detail in section 4 of the 2021 report and is illustrated in figures taken from the report in Appendix A.

Turning to the New Zealand Coastal Policy Statement (NZCPS), the use of the recurrences selected in the PDP is supported. The NZCPS requires that natural hazards in the coastal environment be considered over at least the next 100-year timeframe. Therefore, a SLR increment is appropriate to be added to the tsunami overlays. A 1m SLR addition has been applied for consistency with neighbouring jurisdictions, and some projections for the Hutt Valley show this to be a medium range projection.

The alignment with the NPS NH is discussed earlier in this report specific to the tsunami overlays.

#### **Impact of Tupua Horo Nuku / the Eastern Bays cycleway on the underlying modelling.**

The 2021 report and modelling were undertaken prior to the construction of the cycleway. The modelling for the district plan predates the cycleway construction and was provided to the T&T engineers who designed the structure. The degree to which mitigation of a tsunami has been incorporated in the engineering design

is unknown to ESNZ. Interactions between coastal processes, and structures in the coastal environment are complex, and are likely to vary along the length of the structure, and in part dependent on materials used.

The interaction between the cycleway and the medium coastal hazard area is discussed in the responses to the coastal inundation submissions expert response.

## DETAILED RESPONSES – TABLE 1

16 We have reviewed the general, site and area-specific critiques made by submitters, and provided response and recommendation as to whether the underlying modelling requires reassessment and reapplication at a district and site level.

| Submitter                  | Submitter Number<br>FS<br>Submitter Number | Specific sites or areas                                                                                                                                                                                       | Relief Sought                                                                                    | Expert Witness Response                                                   | Expert Witness Recommendation                    |
|----------------------------|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|--------------------------------------------------|
| Adrian Palmer Family Trust | 315                                        | 9 Toop St, Gracefield<br>2-10 Wareham Place, Seaview<br>2 Jackson St, Petone<br>10, 29 Udy St, Petone<br>6 Regent St, Petone<br>411-413 Cuba St, Alicetown<br>21 Meachen St, Seaview<br>140 Hutt Road, Petone | The submission seeks removal of the tsunami hazard overlay on 9 Toop Street and 6 Wareham Place. | No detail provided in submission as to why the overlay should be removed. | Retain overlay as notified on properties listed. |

|                                                |     |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                  |
|------------------------------------------------|-----|------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| Antony and Penelope Orbell                     | 281 | 3 Ngaio St Eastbourne                          | Not specific but inferred reduction or removal of identified hazard area.                                                                                                                                                                                                                                                                                                                                                                                          | Detail provided in submission does not question the assumptions and process of the hazard modelling.                                                                                                                                                                                                                                                                                                                                                        | Retain as notified.                              |
| Argosy Property No. 1 Ltd                      | 237 | 39 Randwick Road Moera<br>19 Barnes St Seaview | Retain as notified tsunami overlay objectives and policies                                                                                                                                                                                                                                                                                                                                                                                                         | The support is noted.                                                                                                                                                                                                                                                                                                                                                                                                                                       | Retain overlay as notified on properties listed. |
| Christopher John McHaffie and Mary Anne Malone | 278 | 9 Ngaio St Eastbourne                          | Not specific but inferred reduction or removal of identified hazard area.                                                                                                                                                                                                                                                                                                                                                                                          | Detail provided in submission does not question the assumptions and process of the hazard modelling.                                                                                                                                                                                                                                                                                                                                                        | Retain as notified.                              |
| Dave and Michaela O'Donovan                    | 37  | No                                             | Hazard Identification on Maps<br><br>The hazard map with the District Plan shows a large area of Petone as tsunami high risk. This is a relative high risk when considering the rest of the Hutt Valley. This area however is not high risk though when compared to other parts of NZ. This is because the likelihood of a tsunami being exactly oriented to enter through the Wellington harbour heads and reach Petone is very low. Areas of the north island on | The submitters attention is drawn to the underlying modelling from which the tsunami overlays have been developed.<br><br>The modelling in the 2021 report has already taken into consideration both the probability of the earthquake and its location and orientation. The modelling also took into consideration any effects of the Wellington Harbour's heads may have on the tsunami.<br><br>Tables 2.1, 2.2 and 2.3 in the 2021 report detail out the | Retain overlay as notified.                      |

|  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |
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|  |  |  | <p>both the east and west coasts (Wairarapa, Hawkes Bay, Kāpiti and the Wellington south coast) have similar earthquake probability that could result in a tsunami but much higher “high risk” as their coasts are exposed.</p> <p>Classify tsunami risk based on both earthquake probability and also orientation/ location of earthquake. This would see all of the Hutt Valley Tsunami Risk except Eastbourne being lowered.</p> <p>Definition of high or medium risk should be on the NZ wide scale. (I believe this could be easily done).</p> | <p>specific sources (local and distant) that have been used to develop the 1:100, 1:500 and 1:1000 overlays respectively. The grids used to model the tsunami are discussed in Section 3 of the report and they include the whole harbour, include the heads.</p> <p>We therefore feel that the evidence presented by the submitter does not mean that the Hutt Valley needs to be remodelled, and that the hazard or risk needs to be lowered accordingly.</p> <p>The NPS NH requires territorial authorities to undertake a risk-based approach within their jurisdiction, it does not require the territorial authority to assess their district against a national high or medium risk scale. No evidence is presented by the submitter as to why they “believe it could be easily done”.</p> |  |
|--|--|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

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|------------------------|----------|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Grant and Kristin Gunn | 369, F07 | 95 Oroua St Eastbourne      | Not specific but inferred reduction or removal of identified hazard area.                                                                                                                                                                                                                                                                                                                                                                  | Detail provided in submission does not question the assumptions and process of the hazard modelling.                                                                                                                                                                                                                                                                                                                      | Retain as notified.                                                                                                           |
| Ian and Raylene Caddis | 433      | 618 Marine Drive Days Bay   | Not specific but inferred reduction or removal of identified hazard area.                                                                                                                                                                                                                                                                                                                                                                  | Detail provided in submission does not question the assumptions and process of the hazard modelling.                                                                                                                                                                                                                                                                                                                      | Retain as notified.                                                                                                           |
| Jennifer Gray          | 277      | 272 Muritai Road Eastbourne | Not specific but inferred reduction or removal of identified hazard area.                                                                                                                                                                                                                                                                                                                                                                  | Detail provided in submission does not question the assumptions and process of the hazard modelling.                                                                                                                                                                                                                                                                                                                      | Retain as notified.                                                                                                           |
| Joe Jeffries           | 514      | No                          | <p><i>I oppose applying a “high” hazard ranking to tsunami areas based on a 1% AEP scenario inundation extent with 1m Sea Level Rise as this does not accurately reflect “high” hazard risk and is unnecessary to manage the specific hazard identified.</i></p> <p><i>Delete the High, Medium and Low categorisations for overlays and instead rename the tsunami and coastal inundation overlays around the information they are</i></p> | <p>The modelled outputs differentiate between current 1% AEP and future risk by the addition of 1m SLR. Both sets outputs were produced for the modelling.</p> <p>The NPS NH and the NZCPS support the use of 1% AEP plus 1m SLR.</p> <p>The NZCPS requires that natural hazards in the coastal environment and considered over at least the next 100-year timeframe. Therefore, a SLR increment is appropriate to be</p> | <p>Retain overlay as notified.</p> <p>Consider amending policy to clarify what is required to meet the evacuation clause.</p> |

|                  |    |                    |                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                            |
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|                  |    |                    | <p><i>based on. Alternatively amend the Tsunami Hazard Overlay so that it applies to a 1% AEP scenario at today's sea level consistent with the approach to coastal inundation.</i></p> <p><i>It is also unclear how access to evacuation routes is specifically related to an addition to an existing building.</i></p> | <p>added to the tsunami overlays. A 1m SLR addition has been applied for consistency with neighbouring jurisdictions, and some projections for the Hutt Valley show this to be a medium range projection.</p> <p>We note the request to change the names of the overlays. However, that is a communication matter not a technical matter.</p> <p>We agree it is unclear it is unclear how access to evacuation routes specifically relates to additions to existing buildings.</p> |                            |
| Kelvin Sanderson | 95 | 129 Cuba St Petone | <p>The submitter queries which hazard overlays apply to their property and what mitigations are possible. Referring to the proposed maps, the site is in the tsunami low and tsunami medium overlays.</p> <p>The site is also in several other natural hazard overlays.</p>                                              | <p>Mitigation of hazards at a community level would need to be included in a long term plan process, to secure funding to do so.</p> <p>Community / district wide protection from tsunami is not common place in New Zealand, and while is undertaken in Japan for instance, the is substantial cost and construction involved.</p>                                                                                                                                                | Retain overlay as proposed |

|              |     |                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |
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|              |     |                            | The submitter request that the hazard overlays are removed, and that the Council, and other public bodies mitigate the risk instead.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |
| Lars Schmidt | 480 | 227 Marine Drive Lowry Bay | <p><i>I have assessed the tsunami hazard and flood plan and have found significant flaws. Please provide evidence that this mapping was reviewed by independent expert reviewers of the relevant disciplines.</i></p> <p><i>There are significant changes in the understanding of seismic hazard and these have been ignored. The research behind this plan is long outdated and cannot be considered. The plan change is therefore based on flawed data. I request the council to stop any flooding and tsunami risk, and seismic overlay risk plan changes until either a fair timeframe and budget is provided to challenge the current assumptions (estimate is 5-10 years), or the correctness of the</i></p> | <p>The independent peer reviews of the tsunami risk assessment are contained within the acknowledgement section of the report. It is not clear which parts of the tsunami modelling the submitter finds to be flawed, and in need of revision. The underlying data was developed through the national tsunami hazard model programme (2021) and is subject to extensive scientific rigour.</p> <p>The Resource Management Act which considers subdivision, use and development (broader than the building itself), can and does take a longer timeframe. Specifically, the NZCPS stipulates that within the coastal environment, a timeframe of at least 100 years is used.</p> |  |

|               |     |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                       |                                                                                                  |
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|               |     |                             | background research and information is confirmed by an independent peer review panel of subject matter experts.                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                       |                                                                                                  |
| Laura Skilton | 314 | Petone                      | <p>There are pockets in the tsunami overlays on the same parcel and the submitter queries have they been applied, based on actual ground level, and is the low and medium under the high?</p> <p>The submitter states that they have not read the detailed reports to create the rules and maps but does put forward some relief for the mapped overlays, and states that they find it difficult to believe that the mapping is accurate enough to have pockets of overlays, and a straight line would be simpler.</p> | <p>The mapping is based on actual ground levels, so is as accurate as possible, and does create pockets.</p> <p>The overlays are intended to work that the low and medium sit under the high, so the perceived wave “jumping” is in fact the lesser risk overlay peeping through.</p> | <p>Retain overlays as notified.</p> <p>Consider clarifying explanation of overlays stacking.</p> |
| Lisa Bowker   | 17  | 438 Muritai Road Eastbourne | Purchased in 1978, no hazards identified, no indication of potential hazards, no hazards since. Seeks references to hazards be removed from property                                                                                                                                                                                                                                                                                                                                                                   | The preparation of the district plan has resulted in hazards being identified. A tsunami not being experienced in the property owners experience                                                                                                                                      | Retain overlay as proposed.                                                                      |

|                                      |          |                             |                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                          |
|--------------------------------------|----------|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                      |          |                             |                                                                                                                                                                                                                                                                            | does not preclude the potential for it to occur.                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                          |
| Louise Kay Cameron                   | 279      | 13 Karamu Street Eastbourne | Not specific but inferred reduction or removal of identified hazard area.                                                                                                                                                                                                  | Detail provided in submission does not question the assumptions and process of the hazard modelling.                                                                                                                                                                                                   | Retain as notified.                                                                                                                                                                                                                                                      |
| Lynn Kelleher                        | 280      | 5 Karamu Street Eastbourne  | Not specific but inferred reduction or removal of identified hazard area.                                                                                                                                                                                                  | Detail provided in submission does not question the assumptions and process of the hazard modelling.                                                                                                                                                                                                   | Retain as notified.                                                                                                                                                                                                                                                      |
| Mary Lynskey and Christopher Lynskey | 213      | 2 Cheviot Road Lowry Bay    | No specific relief sought for tsunami.                                                                                                                                                                                                                                     | No relief sought or response to queries required                                                                                                                                                                                                                                                       | Retain as proposed                                                                                                                                                                                                                                                       |
| Michael Kerlake                      | 501      | 12 Ngaio St Eastbourne      | Not specific but inferred reduction or removal of identified hazard area.                                                                                                                                                                                                  | Detail provided in submission does not question the assumptions and process of the hazard modelling.                                                                                                                                                                                                   | Retain as notified.                                                                                                                                                                                                                                                      |
| Natural Hazards Commission           | 327, F15 | No                          | Evacuation modelling by GNS Science shows that those in the eastern part of Petone, by the Hutt River mouth, may take more than 40 minutes to evacuate (see Appendix 5). This is more than the 30-minute requirement in CE-P14 and CE-P15. More residential development in | The differences between the arrival times for local faults detailed in from <i>Wang, X.; Mueller, C.; Power, W.L.; Lukovic, B. 2016. Arrival time estimates for local source tsunami for Wellington suburbs, GNS Science Report 2016/03. 53 p.; doi: 10.21420/G25C73</i> and simplified in Table 1 and | Consider amending policy clause relating to evacuation time to clarify if it is access to the evacuation route or being clear of the evacuation zone that is required. If specifying time to exit the evacuation zone consider more nuanced approach for neighbours with |

|  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                             |
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|  |  |  | <p>this area will likely increase the number of people in this area, which in turn will likely extend evacuation time beyond 40 minutes and increase casualties. There will be no time for official warnings to be made for these local events and the reliance will be on natural warnings for people to evacuate. Based on this information, we recommend that the policies relating to evacuation in CE-14 and CE-15 are deleted, and the cumulative hazards and risks for Petone are considered further in our suggested 'Petone Natural Hazards Precinct'.</p> | <p>those used to develop the Plan Change are highlighted. The purposes of these layers are different, and have different hazard parameters such as recurrence and certainty, and different faults. It is also noted that the evacuation time modelling was updated in <i>Lukovic B, Heron DW, Wang X, Power WL. 2017. Evacuation time estimates for local source tsunami for Wellington suburbs. Lower Hutt (NZ): GNS Science. 159 p. (GNS Science Report; 2017/05). doi:10.21420/G2FW2V</i></p> <p>The underlying concern as to whether the evacuation time contained in the policies are appropriate and sufficient remains.</p> <p>It is possible that waves from some sources could arrive at different times across the community, which makes selecting one time challenging.</p> <p>One option could be to assign times for different neighbours</p> | <p>more specific minimum arrival times.</p> |
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|                               |     |                       |                                                             | <p>within the District. Alternately, not specifying time, and referring assessments on appropriate evacuation time to evolving research may be more accurate and nuanced, but does provide greater uncertainty for plan users.</p> <p>We note that the policy current requires seeks the ability to access safe pedestrian evacuation routes, assuming the tsunami arrives within 30mins of fault rupture, not that the occupants can safely evacuate within 30 minutes.</p> <p>Clarifying the policy intent as to whether it is the access to an evacuation route which is critical, or safely evacuating may resolve the issue of timing between fault rupture, and access to an evacuation route.</p> |                             |
| Nicola Stent and Stuart Stent | 393 | 6A Oriental St Petone | Remove high hazard tsunami overlay, has never been impacted | The preparation of the district plan has resulted in hazards being identified. A tsunami not being experienced in the property owners experience                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Retain overlay as proposed. |

|                    |     |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                            |                    |
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|                    |     |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | does not preclude the potential for it to occur.                                                           |                    |
| Patricia Cleland   | 367 | 8 Cheviot Road Lowry Bay | All overlays must include interrogated for justification, transparency, and evidence. Any restriction, regardless of its intent must be clearly defined, justified and fairly applied, or else it risk setting a dangerous precedent that undermines public trust and confidence.                                                                                                                                                                                                   | No specific relief sought.<br><br>Justification, transparency and evidence can be found in the s.32 report | Retain as notified |
| PBJ Properties Ltd | 476 | 23 Fitzherbert St Petone | The submission refers to Sites of Significance to Māori (SASM) and hazards, but the queries raised by the submitter only relate to SASM. It is inferred the same queries are also raised in relation to hazards.<br><br><i>How were the SASM's arrived at? What is the documented evidence for this decision? Why are these specific areas targeted? What does this mean for us as the property owners? Will this ruling impact on the value of our property? What is the extra</i> | No specific relief sought.<br><br>Justification, transparency and evidence can be found in the s.32 report | Retain as notified |

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|             |     |                            | <i>cost of all of this to the landowner? Will there be time delays?</i>                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                             |
| Philip King | 125 | 238 Marine Drive Lowry Bay | Property purchased in the 1960's no known hazards, not experienced any, remove.                                                                                                                                                                  | The preparation of the district plan has resulted in hazards being identified. A tsunami not being experienced in the property owners experience does not preclude the potential for it to occur.                                                                                                                                                                                                                                                                                                                                                                       | Retain overlay as proposed. |
| PTL Trust   | 397 | 212 Marine Drive Lowry Bay | <p>Owned for 31 years, haven't experienced hazards, brick wall on top of concrete base. Protection structure.</p> <p>No specific relief evidence or statements about tsunami. Is the structure, and sea wall designed to mitigation tsunami?</p> | <p>The preparation of the district plan has resulted in hazards being identified. A tsunami not being experienced in the property owners experience does not preclude the potential for it to occur.</p> <p>The submitter notes they have a sea inundation protection structure in the form of a brick wall on a concrete base, it is not clear if the wall was designed to withstanding tsunami impacts.</p> <p>The 2021 report and modelling were undertaken prior to the construction of the cycleway. The modelling for the district plan predates the cycleway</p> | Retain overlay as proposed. |

|                             |    |                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                             |
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|                             |    |                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | construction and was provided to the T&T engineers who designed the structure. The degree to which mitigation of a tsunami has been incorporated in the engineering design is unknown to ESNZ.                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                             |
| Richard Kemp and Honor Kemp | 25 | 226 Marine Drive Lowry Bay | <p>Owned for 35 years, hasn't experienced hazards, 2m brick wall.</p> <p>The owner also notes <i>"Furthermore, the very extensive sea wall and walking and cycle shared path currently being constructed in Lowry Bay and other Eastern Bays has been designed to "improve the resilience of Marine Drive by providing protection against storms and waves, along with coastal erosion" [Sourced from HCC Tupua Horo Nuku Council website]. This project should alleviate concerns about natural hazards, not only for our Property but for all coastal properties in Lowry Bay".</i></p> | <p>The preparation of the district plan has resulted in hazards being identified. A tsunami not being experienced in the property owners experience does not preclude the potential for it to occur.</p> <p>The submitter notes they have a 2m brick protection structure. It is not clear if the wall was designed to withstanding tsunami impacts.</p> <p>The 2021 report and modelling were undertaken prior to the construction of the cycleway. The modelling for the district plan predates the cycleway construction and was provided to the T&amp;T engineers who designed the structure. The degree to which mitigation of a tsunami has been incorporated</p> | Retain overlay as proposed. |

|                                   |     |                                                                                                                                                                                              |                                                                                            |                                                                                                                                                                                                   |                             |
|-----------------------------------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
|                                   |     |                                                                                                                                                                                              |                                                                                            | in the engineering design is unknown to ESNZ.                                                                                                                                                     |                             |
| Ron Beernink and Glenda McCallum  | 303 | 42 Fitzherbert St Petone                                                                                                                                                                     | No relief sought for tsunami                                                               | No relief sought or response to queries required                                                                                                                                                  | Retain as proposed          |
| Sensible Solutions for Eastbourne | 383 | 95 Oroua St Eastbourne<br>376, 1/376A, 2/376A Muritai Road<br>2 Pukatea St Eastbourne<br>15 Marine Parade Eastbourne<br>12 Puriri St Eastbourne<br>606, 607, 607A, 608 Marine Drive Days Bay | No specific relief sought for tsunami                                                      | No relief sought or response to queries required                                                                                                                                                  | Retain as proposed          |
| Tom Brodie                        | 11  | 438 Muritai Road Eastbourne                                                                                                                                                                  | Owned since 1978, never experienced hazards, remove.                                       | The preparation of the district plan has resulted in hazards being identified. A tsunami not being experienced in the property owners experience does not preclude the potential for it to occur. | Retain overlay as proposed. |
| Tom Hudig                         | 288 | 231 Marine Drive Lowry Bay<br>48 Victoria St Petone                                                                                                                                          | I have lived here for 55 years. Regarding sea inundation: you are building a sea wall that | The preparation of the district plan has resulted in hazards being identified. A tsunami not                                                                                                      | Retain overlay as proposed. |

|                   |     |                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                     |
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|                   |     | 11 Aurora St Petone | <p>includes walk and cycle path in Lowry Bay to stop this in your words “designed to improve the resilience of Marine Drive by providing protection against storms and waves, along with coastal erosion”.</p> <p>In the 55 years we have lived here we have never had sea inundation even during the most intensive southerly storms. Since we have lived here we have not had any subsidence and the house shows no evidence of being unstable despite large earthquakes and torrential rains.</p> | <p>being experienced in the property owners experience does not preclude the potential for it to occur.</p> <p>The submitter notes they have a protection sea inundation structure in the form of a brick wall on a concrete base, it is not clear if the wall was designed to withstanding tsunami impacts.</p> <p>The cycleway structure, and its impact on tsunami is also highlighted. The modelling for the district plan predates the cycleway construction and was provided to the T&amp;T engineers. The degree to which mitigation of a tsunami has been incorporated in the engineering design is unknown to ESNZ</p> |                     |
| Tony Brenton-Rule | 268 | 10 Ngaio Street     | Not specific, but inferred reduction or removal of identified hazard area                                                                                                                                                                                                                                                                                                                                                                                                                            | Detail provided in submission does not question the assumptions and process of the hazard modelling.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Retain as notified. |

## REFERENCES

Burbidge DR, Gusman AR, Power WL, Wang X. 2021 Hutt City Probabilistic Tsunami Hazard Maps. Lower Hutt (NZ): GNS Science. 26 p. Consultancy Report 2021/115.

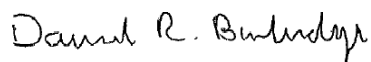
Lukovic B, Heron DW, Wang X, Power WL. 2017. Evacuation time estimates for local source tsunami for Wellington suburbs. Lower Hutt (NZ): GNS Science. 159 p. (GNS Science Report; 2017/05).  
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National Policy Statement for Natural Hazards, Ministry for the Environment 2025. [National Policy Statement for Natural Hazards 2025: December 2025 | Ministry for the Environment](#)

New Zealand Coastal Policy Statement, Ministry for the Environment 2010 (amended 2025). [New Zealand Coastal Policy Statement | Ministry for the Environment](#)

Wang, X.; Mueller, C.; Power, W.L.; Lukovic, B. 2016. Arrival time estimates for local source tsunami for Wellington suburbs, GNS Science Report 2016/03. 53 p.; doi: 10.21420/G25C73

**Signed:**



**David Ross Burbidge**



**Edith Victoria Bretherton**

**Date: 20/07/2026**

**Appendix A: Figures from the 2021 Report with and without sea level rise.**

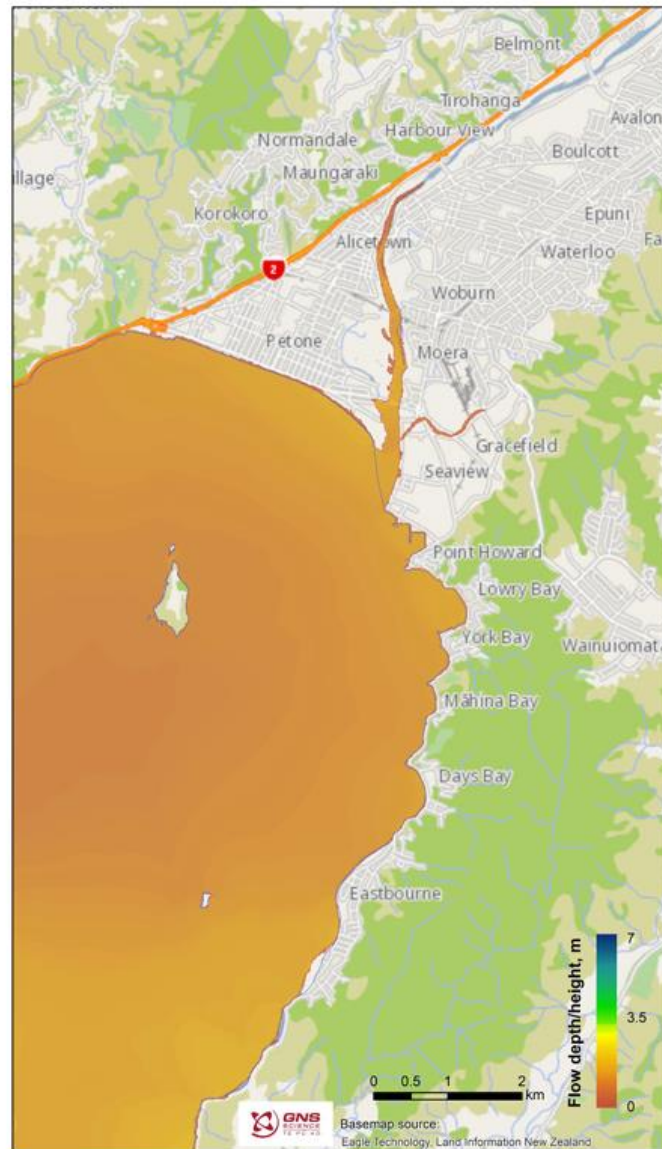


Figure 4.1 Probabilistic tsunami inundation map for Lower Hutt showing the median flow depths onshore and offshore tsunami heights with a 1-in-100-years chance of being exceeded per annum at current MHWS. Onshore values refer to flow depths, while offshore values refer to maximum tsunami heights.

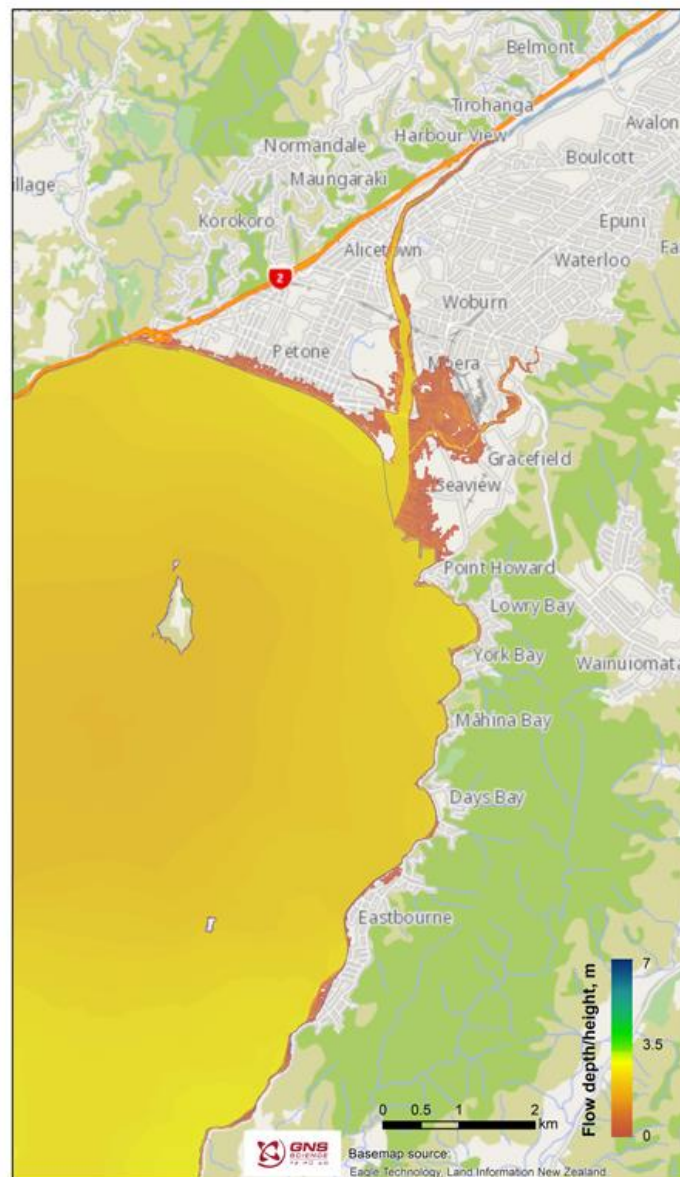


Figure 4.2 Probabilistic tsunami inundation map for Lower Hutt showing the median flow depths onshore and offshore tsunami heights with a 1-in-100-years chance of being exceeded per annum at current MHWS plus 1.0 m of sea-level rise. Onshore values refer to flow depths, while offshore values refer to maximum tsunami heights.

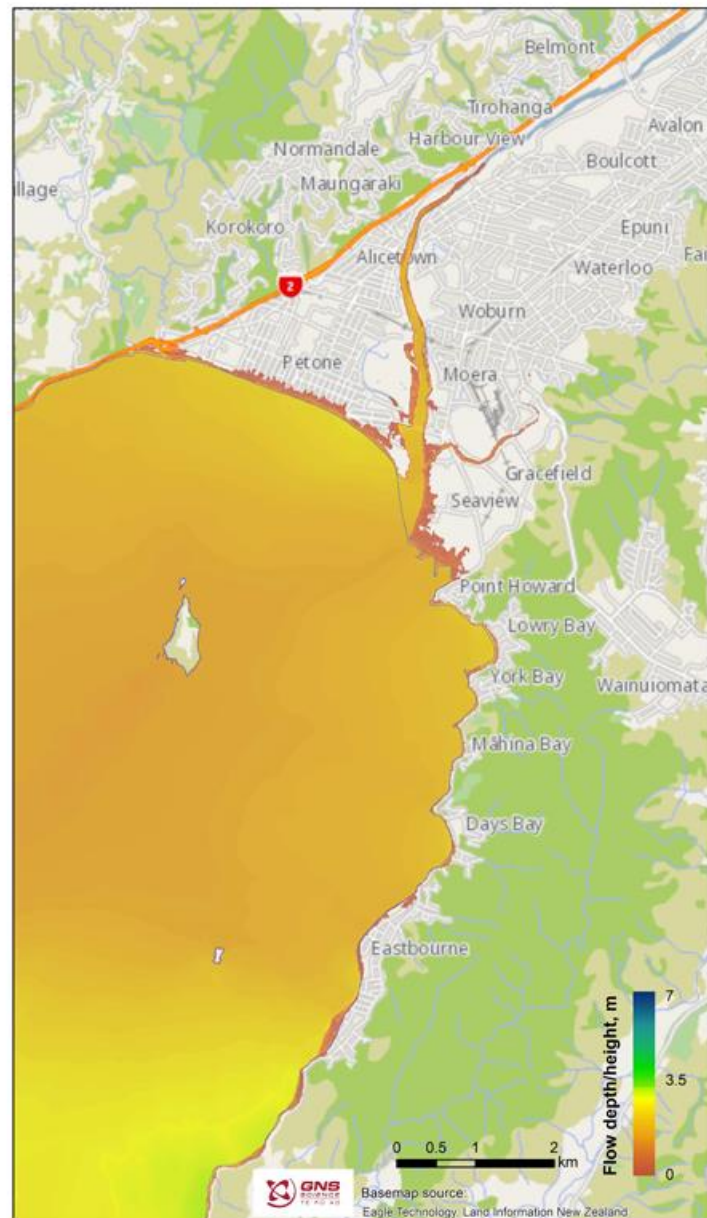


Figure 4.3 Probabilistic tsunami inundation map for Lower Hutt showing the median flow depths onshore and offshore tsunami heights with a 1-in-500-years chance of being exceeded per annum at current MHWS. Onshore values refer to flow depths, while offshore values refer to maximum tsunami heights.

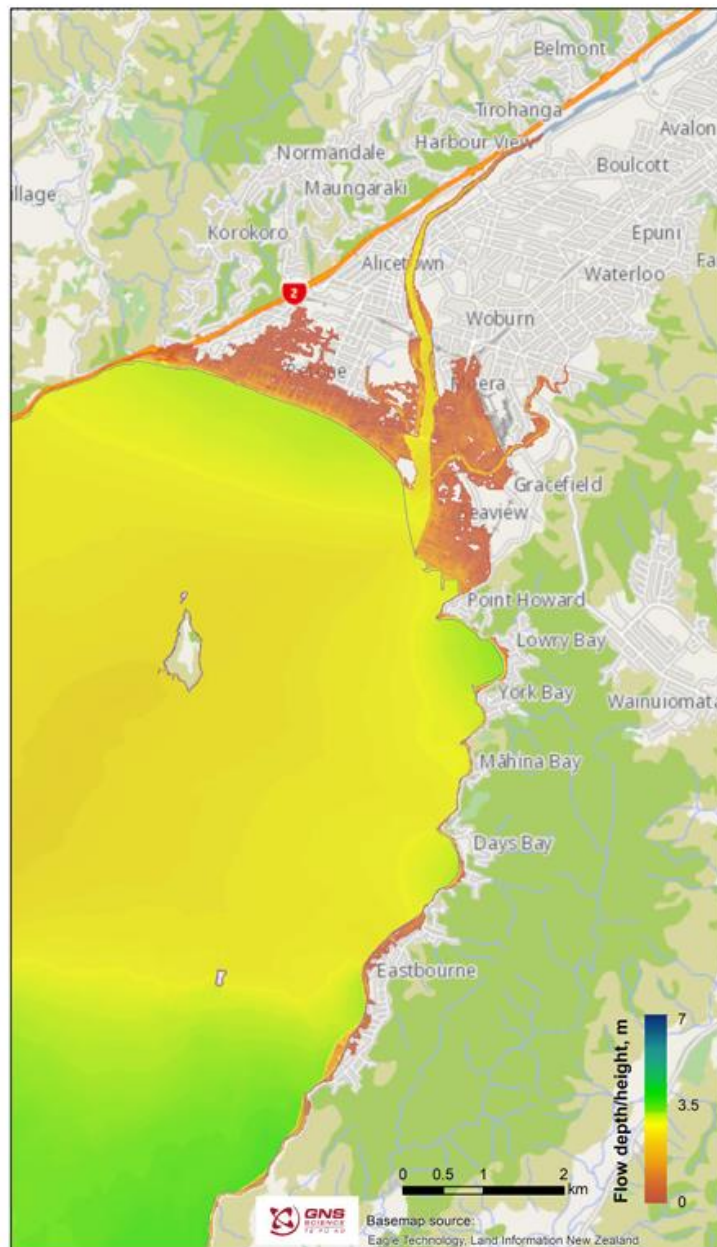


Figure 4.4 Probabilistic tsunami inundation map for Lower Hutt showing the median flow depths onshore and offshore tsunami heights with a 1-in-500-years chance of being exceeded per annum at current MHWS **plus 1.0 m of sea-level rise**. Onshore values refer to flow depths, while offshore values refer to maximum tsunami heights.

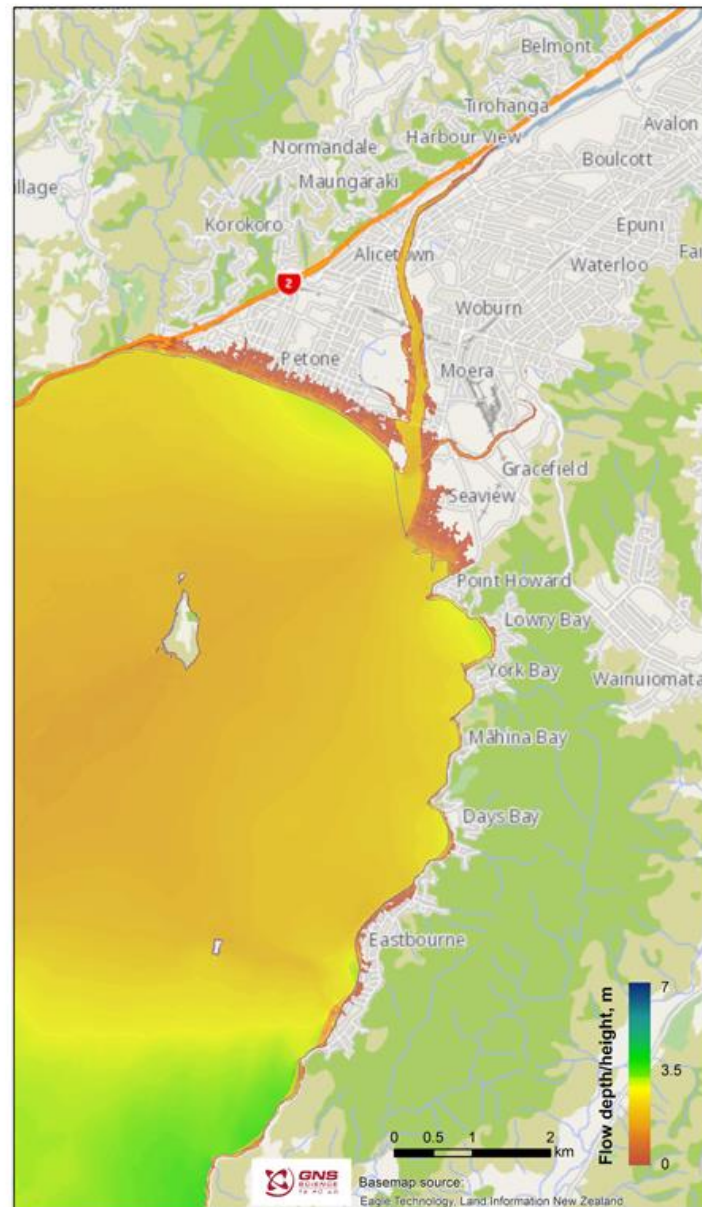


Figure 4.5 Probabilistic tsunami inundation map for Lower Hutt showing the median flow depths onshore and offshore tsunami heights with a 1-in-1000 years chance of being exceeded per annum at current MHWS. Onshore values refer to flow depths, while offshore values refer to maximum tsunami heights.

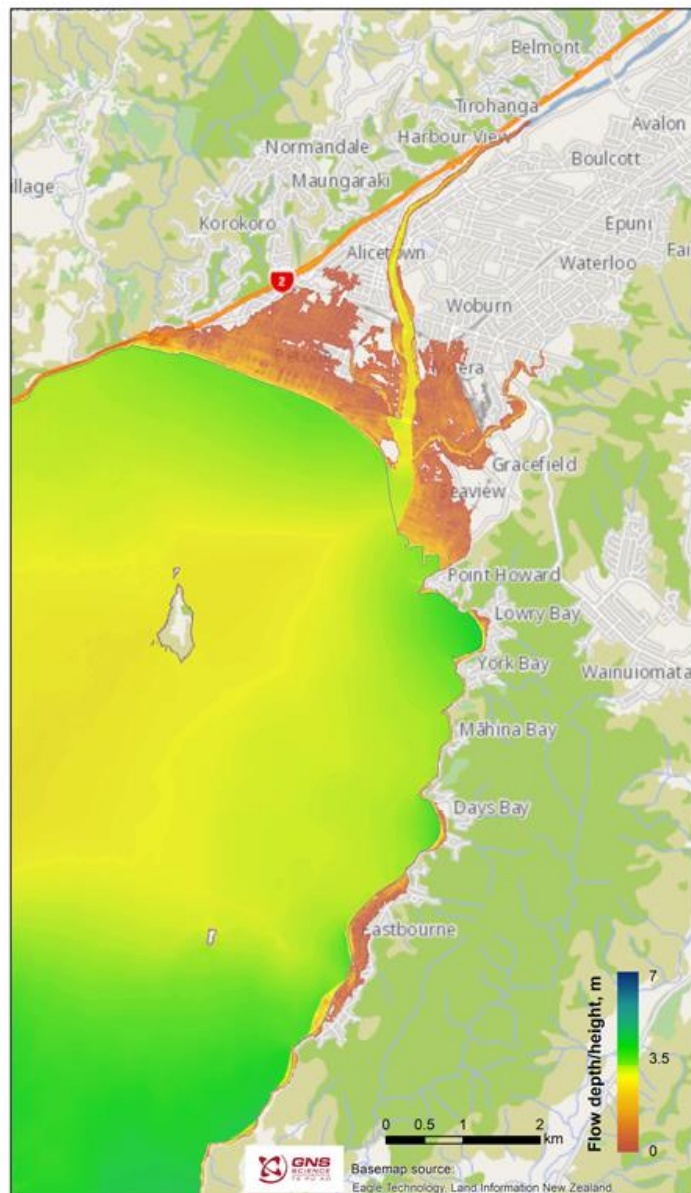


Figure 4.6 Probabilistic tsunami inundation map for Lower Hutt showing the median flow depths onshore and offshore tsunami heights with a 1-in-1000 years chance of being exceeded per annum at current MHWS plus 1.0 m of sea-level rise. Onshore values refer to flow depths, while offshore values refer to maximum tsunami heights.

# **Appendix B4: Fault rupture evidence of Dr Nicola Litchfield and Ms Edith Bretherton**

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**Before the Hearings Panel  
At Hutt City Council**

|                         |                                                |
|-------------------------|------------------------------------------------|
| <b>Under</b>            | Schedule 1 of the Resource Management Act 1991 |
| <b>In the matter of</b> | the Proposed Lower Hutt District Plan          |
| <b>Between</b>          | <b>Various</b>                                 |
|                         | <b>Submitters</b>                              |
| <b>And</b>              | <b>Hutt City Council</b>                       |
|                         | <b>Respondent</b>                              |

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**Joint statement of evidence of Dr Nicola Jane Litchfield and Ms Edith  
Bretherton on behalf of Hutt City Council**

**Date: 17 July 2026**

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## INTRODUCTION

- 1 Our full names are Dr Nicola Jane Litchfield and Ms Edith Victoria Bretherton. Dr Litchfield is employed as a Principal Tectonic Geomorphologist / Earthquake and Ms Bretherton is employed as a senior natural hazards specialist, both at the New Zealand Institute for Earth Sciences (ESNZ), Lower Hutt, New Zealand.

ESNZ was formerly known as the Institute of Geological and Nuclear Sciences Limited (GNS Science).

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

- 3 Specifically, this statement of evidence relates to the matters in Chapter NH - Natural Hazards where it relates to active fault hazards.

- 4 We authorised to provide this evidence on behalf of the Council.

## QUALIFICATIONS AND EXPERIENCE

- 5 Dr Litchfield holds the qualifications of Doctor of Philosophy (Geology – 2000) from the University of Otago, a Master of Science with First Class Honours (Geology – 1996) from the University of Canterbury, and a Bachelor of Science (Geology – 1993) from the University of Canterbury. She has worked for ESNZ, and predecessor organisations for 25 years including 4 years as a New Zealand Science and Technology Post-doctoral fellow (2001-2004) and currently hold the role of Principal Tectonic Geomorphologist / Earthquake Geologist. Since 1995 I have been involved in multiple active fault mapping, paleoseismology

and fault characterisation studies, seismic hazard assessments and providing active fault expert evidence.

- 6 She led active fault mapping studies for District Plans for Whakatāne, Upper Hutt City, Porirua, Kaikōura, Taupō, Wairarapa Councils, and Tairāwhiti / Gisborne Districts, and have reviewed studies for other regions (Hawke's Bay, Horizons, West Coast, Marlborough, Canterbury, Otago).

Her paleoseismology studies have included trenching studies of active faults around New Zealand (e.g., Wellington, Ohāriu, Masterton, Papawai, Alpine, Dunstan, Akatore, Titri, Mohaka Faults and several in the Taupō Rift).

Dr Litchfield was one of the leaders of the active fault earthquake source model for the 2010 NZ National Seismic Hazard Model (NSHM) and the NZ Community Fault Model version 1.0, which was a key input into the 2022 NSHM. I led development of the NZ Paleoseismic Site Database version 1.0 which also contributed to the 2022 NSHM.

She has provided active fault expert evidence for the Porirua City Council Proposed District Plan and Appeals, the Wellington City Proposed District Plan and the Wairarapa Combined District Plan.

She is member of the Geoscience Society of New Zealand, Seismological Society of America, American Geophysical Union, and New Zealand Archaeological Association.

She was a member of the team that received a New Zealand Society for Earthquake Engineering Commendation for the science response to the Christchurch Earthquakes in the Port Hills.

She leads the award-winning It's Our Fault: Nō Mātou Te Hapa programme aimed at improving resilience to earthquakes and associated hazards throughout the Wellington Region.

- 7 Ms Brethertons' academic qualifications comprise of a Master of Science (Physical Geography 2016), Bachelor of Science (Earth Science and Physical Geography), Graduate Diploma in Arts (2007) and Bachelor of Business (2005), all from Massey University.
- 8 She holds the position of Senior Natural Hazards Planner at ESNZ. She leads the Planning and Policy Research project under the Strategic Science Investment Fund (SSIF) in the Multi-Hazard and Risk programme (previously Improved Risk Governance), and the Science to Practice project in the "It's our Fault" programme.
- 9 She has led multi-disciplinary teams researching policy levers to reduce risk from natural hazards and climate change. She has also been a member of the technical advisory group for Auckland Councils' plan change 78 (now 120), Environment Southland Technical Advisory Group. She has coordinated expert witnesses for Wellington City District Council, Wairarapa District Councils and Hutt City District Council. She led multi-disciplinary peer reviews of tsunami risk assessments for Wellington City District Council.
- 10 Prior to joining GNS Science in 2022 she worked for the West Coast Regional Council as a Senior Planner from February 2018. She developed provisions including Natural Hazards for Te Tai o Poutini Plan (combined) District Plan for the West Coast. She also progressed the Coastal Plan review and was a support planner for the Regional Policy Statement and Land and Water Plan Change hearings.
- 11 Previous to this she was programme coordinator for the Auckland Unitary Plan March 2013 – November 2016. She moved into resource

consent processing as the plan became operative at the West Auckland Planning Office.

- 12 She gained her accreditation as an RMA commissioner in 2022 and has acted as a Commissioner on the West Coast for the District Councils for hearings, commissioner only decisions, commissioner led mediation, and s.357 commissioner referrals.
- 13 She is a full member of the New Zealand Planning Institute and has convened a special interest group for natural hazards, of which she is the establishment chair.
- 14 She is currently seconded on a part time basis to the Ministry for Cities, Environment, Regions and Transport (MCERT) formerly the Ministry for the Environment as a Senior Advisor in the Natural Hazards Policy Team.

#### **CODE OF CONDUCT**

- 15 We have read the Code of Conduct for Expert Witnesses set out in the Environment Court's Practice Note 2023. We have complied with the Code of Conduct in preparing my evidence and will continue to comply with it while giving oral evidence before the Hearings Panel. Our qualifications as an expert are set out above. Except where we state we rely on the evidence of another person, we 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**

- 16 Our names are Dr Nicola Litchfield and Ms Edith Bretherton
- 17 We have been asked by Hutt City Council to provide evidence in relation to submissions on active fault hazard in the PDP.

18 Our responses to the individual submissions follow on Table 1.

## DETAILED RESPONSES – TABLE 1

19 We have reviewed the critiques made by submitters and provided response and recommendation.

| Submitter                               | Submitter Number<br>FS Submitter Number | Specific sites or areas           | Relief Sought                                              | Expert Witness Response                  | Expert Witness Recommendation |
|-----------------------------------------|-----------------------------------------|-----------------------------------|------------------------------------------------------------|------------------------------------------|-------------------------------|
| Anish Punjabi                           | 141                                     | Ford Road, Manor Park             | There is no relief sought specific to active fault hazard. | No evidence or commentary to respond to. | Retain as notified            |
| Bhuvi Punjabi                           | 144                                     | Ford Road, Manor Park             | There is no relief sought specific to active fault hazard. | No evidence or commentary to respond to. | Retain as notified            |
| Neha Punjabi                            | 140                                     | No                                | There is no relief sought specific to active fault hazard. | No evidence or commentary to respond to. | Retain as notified            |
| Pamodh Panagoda                         | 154                                     | 14 Martha Turnell Cres Manor Park | There is no relief sought specific to active fault hazard. | No evidence or commentary to respond to. | Retain as notified            |
| Te Kārearea Ltd and Rosco Ice Cream Ltd | 447                                     | 30 Benmore Crescent Manor Park    | There is no relief sought specific to active fault hazard. | No evidence or commentary to respond to. | Retain as notified            |

**Signed:**

A handwritten signature in blue ink, appearing to read 'N Litchfield', written on a light-colored background.

**Nicola Litchfield**

A handwritten signature in blue ink, appearing to read 'Edith Bretherton', written on a light-colored background.

**Edith Bretherton**

**Date:** 17 July 2026

# **Appendix B5: Slope stability evidence of Mr Pathmanathan Brabhaharan and Dr Dougal Mason**

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# Hutt City Council **Slope Assessment Overlay**

Proposed District Plan Support

21 July 2026



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# Document distribution

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## Hutt City Council

## Slope Assessment Overlay

## Proposed District Plan Support

Report No. GER 2026 – 11

21 July 2026

## Prepared for

Hutt City Council

Laings Road, Lower Hutt

## Prepared by

WSP New Zealand Limited  
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| Quality control | Name                                      | Date         |  |
|-----------------|-------------------------------------------|--------------|--|
| Prepared by:    | Danielle Barnhill<br>Tegan Stoneman-Wills | 16 July 2026 |  |
| Reviewed by:    | P Brabhakaran   Doug Mason                | 20 July 2026 |  |
| Approved by:    | P Brabhakaran                             | 21 July 2026 |  |

## Revisions

| Rev | Date         | Details |
|-----|--------------|---------|
| 0   | 20 July 2026 | Issue 1 |
| 1   | 21 July 2026 | Issue 2 |

## Disclaimer:

This report ('Report') has been prepared by WSP New Zealand Limited ('WSP') exclusively for Hutt City Council ('Client') in relation to support for the Slope Assessment Overlay in the Proposed District Plan ('Purpose') and in accordance with the Short Form Agreement with the Client dated 2 July 2026 ('Agreement').

This Report is based on information available to WSP at the time of preparation, including the Slope Failure Susceptibility Assessment (WSP, 2021), Slope Runout Assessment (WSP, 2025), and submissions provided by Hutt City Council for review. The Report has been prepared to provide technical commentary on matters relating to the methodology, interpretation, and intended application of the Slope Assessment Overlay.

This Report does not constitute a site-specific geotechnical assessment, landslide hazard assessment, or engineering evaluation of any individual property. No site inspections, site-specific investigations, or verification of property-specific conditions have been undertaken as part of this work unless explicitly stated.

The findings, opinions, and conclusions contained in this Report are subject to the assumptions and limitations identified herein and in the underlying assessments. WSP accepts no liability whatsoever for any use of, or reliance on, this Report for any purpose other than the Purpose, or by any person or organisation other than the Client.

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## Appendix A – Technical Commentary on Submissions

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# 1. Introduction

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## 1.1 Qualifications, experience, and code of conduct

This report has been prepared with the direction and overview of *Pathmanathan Brabhaharan* and *Dougal Mason* of WSP. Their qualifications and experience are summarised below.

### 1.1.1 Pathmanathan Brabhaharan

Name: Pathmanathan Brabhaharan

Qualifications: BSc Engineering (Honours) | MSc Engineering, Master of Business Administration | Chartered Professional Engineer in New Zealand

Affiliations: Fellow, Engineering New Zealand | Fellow, NZ Society for Earthquake Engineering | Member, NZ Geotechnical Society, and by affiliation International Society for Soil Mechanics and Geotechnical Engineering | International Society for Rock Mechanics | Member, Structural Engineering Society.

Immediate Past President, NZ Society for Earthquake Engineering

Experience: Experience 43 years, including 37 years in New Zealand, specialising in Geotechnical, Earthquake and Civil Engineering, based in Wellington.

Natural hazard and associated risk assessment | Resilience of the built environment and infrastructure and risk.

Assessment of landslide hazards and risk, and provision of advice on the management of risk to the built environment through planning measures, landuse planning and District Plan regulations for a variety of districts – Wellington region, Tauranga and Bay of Plenty region, Auckland region, Whanganui, Blenheim, Queenstown-Lakes, Dunedin etc.

Research into landslide hazards following earthquakes and storms in New Zealand (Kaikoura | Christchurch) and overseas (China | Japan), and development of guidance on seismic design of slopes, slope guidelines for NZGS and training to practicing geo professionals.

Led the assessment of the slope susceptibility and runout and the slope assessment overlay for Hutt District, and previously earthquake induced landslide hazards for the Wellington region including Hutt City. Led the preparation of this report based on the review of submissions.

### 1.1.2 Dougal Mason

Name: Dougal Mason

Qualifications: PhD Engineering Geology | MSc Geology (Honours) | BSc Geology | BA History

**Affiliations:** Member, Engineering New Zealand | Member, NZ Geotechnical Society, and by affiliation International Association for Engineering Geology and International Society for Rock Mechanics | Member, NZ Society for Earthquake Engineering.

**Experience:** 22 years specialising in engineering geology and geohazards, of which 19 years based in Wellington. Assessment of landslide hazards and risk, and provision of advice on the management of risk to the built environment through planning measures, land use planning and District Plan regulations for a variety of districts – Hutt City, Tauranga City, Bay of Plenty Region, Auckland Region, Whanganui District, Blenheim.

Research into landslide hazards and performance of slopes following earthquakes and storms in New Zealand, and development of guidance on seismic design of slopes, and contribution to NZ Geotechnical Society slope stability guidance units for practitioners.

Delivered the assessment of slope failure susceptibility and runout and the slope assessment overlay for Hutt City. Contributed to the preparation of this report based on the review of submissions.

### **1.1.3 Code of conduct**

We have read the Code of Conduct for Expert Witnesses set out in the Environment Court's Practice Note 2023. We have complied with the Code of Conduct in preparing our evidence and will continue to comply with it while giving oral evidence before the Hearings Panel. Our qualifications as experts are set out above. Except where we state we rely on the evidence of another person, we confirm that the issues addressed in this statement of evidence are within our areas of expertise, and we have not omitted to consider material facts known to me that might alter or detract from my expressed opinions.

## **1.2 Background**

Hutt City Council (HCC) is undertaking a review of the District Plan (DP), including the introduction of a Slope Assessment Overlay, supporting the identification and management of slope instability hazards. The overlay has been developed to provide a district-scale planning tool that identifies where slope instability hazards may be present and where further geotechnical assessment is recommended as part of future development and subdivision activities. The Slope Assessment Overlay is intended to support hazard-informed land use planning and is not designed to determine hazard or risk at an individual property level.

The Slope Assessment Overlay is underpinned by two assessments – a Slope Failure Susceptibility Assessment (WSP, 2021) and a Slope Runout Assessment (WSP, 2025). The Slope Failure Assessment provides a district-wide appraisal of slope failure susceptibility by evaluating factors that are known to influence slope instability. This includes topography, soil / rock and geographic characteristics, lithology, land cover and proximity to faults and streams (WSP, 2021). The assessment classified land into five categories of slope susceptibility ranging from Very Low to Very High susceptibility. Information from the Slope Failure Assessment was used as an input dataset to develop a Slope Runout Assessment for Focus Activity Areas including the Hill Residential Activity Area, Landscape Protection Activity Area, General Residential Activity Area (in hill suburbs) and Rural Residential Activity Area. This identified areas that could be potentially affected by material originating from upslope failures (WSP, 2025).

Runout zones were derived from areas classified as Moderate, High and Very High susceptibility using empirically derived runout travel angles.

The landslide susceptibility and runout datasets were combined and reviewed in the context of the geomorphology of the Hutt City area from a 1:2,000 scale to produce the Slope Assessment Overlay. The resulting overlay represents areas potentially affected by slope instability and associated runout and has been developed as a screening tool to inform planning decisions and identify where site-specific geotechnical investigations may be required. The overlay replaces the existing approach whereby geotechnical assessments are generally required across all hill areas, thereby providing a more targeted and evidence-based mechanism for identifying where further assessment is warranted.

## **1.3 Purpose of the Slope Assessment Overlay**

The Slope Assessment Overlay has been developed as a district-scale planning tool to support the identification and management of slope instability hazards within the Hutt City District Plan. The overlay is intended to assist HCC by identifying areas where slope instability processes may occur and where further geotechnical assessment may be required as part of future subdivision, development or land-use change. The overlay is based on district-wide landslide susceptibility and runout assessments, and is designed to provide a consistent, evidence-based screening tool for potential land instability hazard across Hutt City.

The Slope Assessment Overlay is not intended to determine hazard, risk or development suitability at an individual property scale. It instead is to function as a screening tool to identify areas where slope instability hazards may be present, and where more detailed site-specific investigations may be warranted. Site-specific geotechnical assessments can incorporate local ground conditions, engineering works, retaining structures, earthworks, drainage systems and other factors that cannot be reliably represented within a district-scale assessment, and provide a more site-specific understanding of hazard and risk at a site.

The inclusion of a property within the Slope Assessment Overlay does not indicate that slope failure is occurring, has occurred in the past, will occur in the future or that future development is inappropriate. It instead highlights to property owners that there is the potential for slope hazards, and additional geotechnical investigation and consideration is required to better understand site-specific conditions to inform future planning and development.

## **1.4 Interpretation and intended use of the overlay**

The Slope Assessment Overlay is derived from district-scale landslide susceptibility and runout assessments that identify where slope instability processes may be present based on factors that are known to influence landsliding such as topography, soil characteristics, geology and land cover. The assessments are intended to identify the relative spatial distribution of slope instability hazards across Hutt City and provide a basis for hazard screening and land-use planning.

The assessment has been carried out as part of a district-wide study using 2013 and 2016 LiDAR data and 1:50,000 geology maps and other district and regional scale information. No site-specific data or analysis has been incorporated into the mapping.

The Overlay is suitable for the intended use to determine areas where slope instability processes may occur and where further geotechnical assessment may be required as part of future subdivision, development or land-use change.

However, the landslide susceptibility and runout assessments do not predict the likelihood or frequency of landslides occurring at a particular location and do not provide annual exceedance probabilities or recurrence intervals. Similarly, the assessments do not quantify the magnitude or severity of potential landslide events. The assessments instead identify areas that may be more susceptible to slope failure or could be affected by landslide runout and are intended to be used as a screening tool rather than a quantitative hazard or risk assessment.

The Slope Assessment Overlay is not a risk map and does not classify areas according to potential damage, consequence or overall risk level. The consequences associated with a future landslide event are likely to vary considerably across the mapped overlay area depending on the characteristics of any failure, local topography, location and type of development, and other site-specific factors. Assessment of consequences and/or risk requires site-specific investigation and cannot be reliably inferred from the overlay alone.

## **1.5 Climate Change Considerations**

The landslide susceptibility and runout assessments which underpin the Slope Assessment Overlay have been developed using the best available information (for terrain, geology, and environmental conditions) at the time of assessment. The assessments do not explicitly model future climate change scenarios associated with increases in rainfall intensity or other climate-related drivers.

Climate change, however, may influence factors that are known to contribute to slope instability, including frequency and intensity of extreme rainfall events. As a result, climate change and associated changes in the intensity and frequency of rainfall may increase the likelihood of landslide occurrence in some locations in the future. This does not invalidate the overlay, as the mapping identifies areas where slope instability processes may occur based on the underlying terrain and geological conditions. The Slope Assessment Overlay highlights the importance of adopting a precautionary approach and undertaking site-specific assessment, including potential climate change effects, where development is proposed within the overlay.

## **1.6 Risk mitigation**

Slope movements or failures could cause severe damage to the built environment and potentially cause fatalities. The risks to people and development from landslide hazards could be mitigated by a variety of measures. These could include avoiding developing areas of high landslide susceptibility; carrying out earthworks, stabilisation measures, structural measures; or development that is able to resist, tolerate or accommodate slope displacements. At a high level it would be prudent to avoid or use higher slope hazard areas for low intensity land use and use lower hazard areas for more intensive or sensitive land use. This will facilitate development with lower risk and lower cost, and which uses resources and land in a more sustainable manner.

Where developments are in areas susceptible to run-out from slope failures (rather than in areas susceptible to slope movement or failure), measures could potentially be considered to protect downstream developments by the construction of bunds or barriers to deflect the runout away from



development or create space for detention of the runoff debris from potential slope failures, or alternatively avoiding areas susceptible to inundation from runoff.

## **1.7 Report Purpose**

This report has been prepared to support HCC's consideration of submissions related to the Slope Assessment Overlay. We have reviewed the submissions identified by HCC that relate to the overlay, its technical basis and methodology. The purpose of this report is to provide technical commentary on submissions relevant to the district-scale assessment methodology that underpins the Slope Assessment Overlay and to assist HCC in understanding how specific submission matters relate to the overlay's intended purpose and use.

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## 2. Submission Responses

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We have reviewed 56 submissions that have been highlighted by HCC to be potentially relevant to the Slope Assessment Overlay. Appendix A presents the response submissions with WSP's responses, focused only on the technical aspects of the overlay.

Key themes and trends within the submissions relating to the Slope Assessment Overlay include:

- The overlay being based on a district-scale desktop assessment and not informed by site-specific investigations, geotechnical assessments or property-level data.
- The absence of known historical landslide events or instability affecting individual properties.
- The perceived influence of vegetation on slope stability and landslide susceptibility.
- Requests for removal of properties from the overlay due to local site conditions and existing geotechnical structures, retaining walls, engineered building platforms and previous geotechnical assessments for individual properties.
- Concerns around the application of the overlay to individual properties, and the distinction between district-scale hazard screening and site-specific hazard assessment.
- Queries regarding the use of a binary overlay extent rather than displaying the underlying landslide susceptibility classifications (e.g. Very Low to Very High susceptibility).

General responses to some of the issues raised in the submissions are summarised in Section 3.

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## 3. Conclusions

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This report presents a review of the submissions identified by Hutt City Council that relate to the proposed Slope Assessment Overlay and provides technical commentary on the matters raised. The submissions reflect a range of perspectives regarding the interpretation and application of the overlay, particularly in relation to individual properties and site-specific conditions.

The Slope Assessment Overlay has been developed as a district-scale planning tool to support the identification and management of slope instability hazards across Hutt City. As such, the overlay is intended to be used as a hazard screening and planning mechanism, with site-specific investigations remaining the appropriate means of assessing local ground conditions, hazard, and risk where required.

We consider that the Slope Assessment Overlay will be a useful tool to manage potential effects from land instability.

We summarise below our responses to the general issues raised in the submissions.

- 1) The assessment has been developed using recognised landslide susceptibility and runout assessment methodologies, regionally consistent datasets, and established industry approaches commonly applied in New Zealand and internationally for district-scale natural slope hazard assessments. The assessment methodology, datasets, assumptions and limitations used to develop the landslide susceptibility, runout and geomorphological assessments are documented within the supporting technical reports. These reports set out the information sources, analytical approaches and assessment criteria used to identify areas potentially affected by slope instability processes across the district.
- 2) Some submissions query whether the reports have been peer reviewed. The reports have also been reviewed internally within WSP. Although the reports were not required to be externally peer reviewed, the approach adopted and used is consistent with approaches used for similar landslides susceptibility studies and land use planning approaches that have been peer reviewed and used across New Zealand, presented at conferences and published as technical papers.
- 3) The methodology for the overlay relies on regionally consistent datasets and broad-scale assessment techniques and is not intended to replicate site-specific geotechnical investigations. Rather, the purpose of the assessment is to provide a consistent and evidence-based planning framework for identifying areas where slope instability hazards may warrant consideration through the District Plan.
- 4) The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment. The overlay is not intended to determine hazard or risk at a property scale, but is a screening tool designed to identify where site-specific geotechnical assessment may be required.
- 5) The proposed Slope Assessment Overlay itself does not adversely constrain land development and use but provides a high-level screening tool so that site specific geotechnical investigations could be carried out to assess the hazards and how the land may be developed in a way that takes into consideration the risk from slope instability and runout. Such site-specific

assessments will determine whether the land could be developed and what mitigation measures may be required for the specific development proposed.

- 6) The Slope Assessment Overlay provides a tool for the Council to require site specific geotechnical assessments as part of any future development. The overlay also highlights to property owners the presence of potential slope hazards, and enable them to proactively consider the siting, investigation, mitigation and design of any proposed development.
- 7) The development of the landslide susceptibility and runout zones are based on regional and district level datasets and LiDAR data, and no site investigations have been carried out in specific areas. Therefore, the susceptibility has been presented as district scale overlays and therefore should not be used to consider hazards at property specific level, except as a screening tool to consider slope potential hazards in the areas. The overlay considers the level of landslide susceptibility as well as the potential for runout and the geomorphological context of the area.
- 8) There may be earthworks, retaining walls and structures formed as part of existing developments or as part of current or proposed developments. Since the landslide susceptibility has been assessed at a district wide scale, it is not possible to assess such formed structures, the level of engineering carried out and therefore their landslide susceptibility at a property level. However, evidence of such engineering and associated reports or drawings can be used when site specific geotechnical assessments are carried out for any future development.
- 9) There is a misconception that there is a slope hazard only if there is evidence of past landslides at the property. The absence of recorded landslides or known instability on a property does not necessarily indicate that the land is free from slope instability hazards, as the assessment is based on factors known to influence slope failure, including topography, geology and land cover, rather than solely on historical events. Many slope failures are observed to occur on slopes not previously affected by slope instability, both in earthquake as well as storm events. Accordingly, the overlay identifies areas that may be susceptible to future slope instability and landslide runout, rather than only areas where landslides have occurred in the past.
- 10) Some submissions query why vegetated areas with trees are included in the Slope Assessment Overlay. While the presence of vegetation and trees generally enhances slope stability due to the root system and evapotranspiration removing water from the slope, this generally only enhances stability against shallow slope failures in rainfall conditions, but not deeper-seated failures in storm events, or earthquake induced failures. Also, the presence of trees could also add to the weight and reduce stability of slopes. Therefore, the presence of trees and vegetation does not necessarily remove the susceptibility to landslides.
- 11) There have been queries as to why the underlying landslide susceptibility maps have been prepared with Very Low to Very High susceptibility, whereas the Slope Assessment Overlay is binary, and thought to be areas of landslide hazard or no hazards. The purpose of the overlay is to cover areas where there are sufficiently significant landslide and runout susceptibility, to require site specific geotechnical investigations. The susceptibility and runout maps (with the varying degrees of susceptibility) and associated technical reports are available to inform site specific consideration of the slope hazards and the risk to the development proposed. The Slope Assessment Overlay does not mean that there are no slope hazards outside the area covered by the overlay.

- 12) Some have queried whether there is a relationship between the flood hazards and the Slope Assessment Overlay. The flood maps and slope maps have been developed independently, with generally flooding affecting flatter areas and slope susceptibility in sloping hillside areas, except where there could be runout from slope failures onto the flat areas adjacent to hillsides.

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## 4. References

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WSP, 2021. *Slope Failure Susceptibility Assessment: Hutt City District Plan Review*, s.l.: Hutt City Council.

WSP, 2025. *Slope Failure Runout Assessment - Hutt City District Plan Review*, s.l.: Hutt City Council.

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# **Appendix A   Technical Commentary on Submissions**

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Appendix A – Technical Commentary of Submissions

[also refer to general comments in Sections 2 and 3 of the Report]

| Submission Number | Submitter                         | Site/Area                             | Submission Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------|-----------------------------------|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3                 | Rohan Kulkarni                    | 1/48, 2/48, and 52N Stanley St Wainui | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment. The overlay is not intended to determine hazard or risk at a property scale, but is a screening tool designed to identify where site-specific geotechnical assessment may be required.</p> <p>The proposed Slope Assessment Overlay itself does not adversely constrain land development and use but provides a high-level screening tool so that site specific geotechnical investigations could be carried out to assess the hazards and how the land may be developed in a way that takes into consideration the risk from slope instability and runout. Such site-specific assessments will determine whether the land could be developed and what mitigation measures may be required for the specific development proposed.</p> <p>The inclusion of the three properties within the overlay reflects a combination of the broader geomorphological area identified through the district-wide assessment and the presence of local terrain characteristics identified through the susceptibility and runout assessments. The district-wide methodology utilises regionally consistent datasets and LiDAR-derived topographic information, which can identify localised slopes, cut batters, earthworks and other terrain features represented within the landscape.</p> <p>The overlay reflects the combined consideration of landslide susceptibility, potential runout and geomorphological characteristics across the wider area. As such, the property's inclusion within the overlay is not based solely on the presence of steep slopes at a particular location, but on the broader assessment of slope instability processes undertaken at a district scale.</p> |
| 5                 | Seyedomid Zoie                    | 20 Thomson Grove Stokes Valley        | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment. The overlay is not intended to determine hazard or risk at a property scale, but is a screening tool designed to identify where site-specific geotechnical assessment may be required.</p> <p>The absence of recorded landslides or known instability on the property does not necessarily indicate that the property is free from future slope instability hazards. The overlay is based on a district-scale assessment of factors that influence slope stability, including topography, geology, soil characteristics and land cover, and is intended to identify areas that may be susceptible to future slope instability or runout rather than only areas affected by past events.</p> <p>A review of the assessment outputs in the area where this property is located indicates that inclusion of this area within the overlay is consistent with the district-wide methodology used to identify areas that may be affected by slope instability processes, including both susceptibility and potential runout areas.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 6                 | Jarred Gustafson and Paula Gentle | No                                    | <p>The Slope Assessment Overlay identifies areas that may be susceptible to slope instability based on a district-wide assessment. No property-specific hazard or risk assessments were undertaken during its development, and the overlay is not intended to be used to determine hazard or risk at an individual property level. It is intended as a broad-scale planning tool to support land-use decision-making by identifying locations where site-specific geotechnical assessment may be required for future subdivision or development.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 7                 | Mark Gunkel and Evangeline Gunkel | No                                    | <p>The Slope Assessment Overlay identifies areas that may be susceptible to slope instability based on a district-wide assessment. It is intentionally a broad-scale, generalised planning tool designed to support land-use planning by identifying locations where site-specific geotechnical assessment may be required as part of future subdivision or development.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

Appendix A – Technical Commentary of Submissions

[also refer to general comments in Sections 2 and 3 of the Report]

| Submission Number | Submitter     | Site/Area                        | Submission Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------|---------------|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                   |               |                                  | <p>The overlay is underpinned by a Landslide Susceptibility Layer, which classifies land from Very Low to Very High susceptibility based on factors known to influence landsliding, together with areas potentially affected by landslide runout. These datasets have been combined into a single binary planning overlay that identifies areas where slope instability hazards may be present and further investigation may be warranted.</p> <p>No property-specific hazard or risk assessment has been undertaken as part of the development of the overlay, and it is not intended to confirm hazard or risk at an individual property level or replace site-specific geotechnical investigations. Instead, it provides a consistent, evidence-based screening tool to identify where more detailed assessment may be required. The underlying landslide susceptibility and runout layers are available to inform such assessment.</p>                                                                                                                                                                                                                         |
| 8                 | Jay Daley     | 10A Moana Road Days Bay          | <p>The Slope Assessment Overlay identifies areas with potential slope instability based on a district-wide assessment. It is not intended to determine hazard or risk at a property scale, but to identify where site-specific assessment may be required.</p> <p>The absence of recorded landslides or known instability on the property does not necessarily indicate that the property is free from slope instability hazards. The overlay is based on a district-scale assessment of factors that influence slope stability and runout, including topography, geology, soil characteristics and land cover, and is intended to identify areas that may be susceptible to future slope instability rather than only areas affected by past events.</p> <p>A review of the assessment outputs in the area where this property is located indicates that inclusion of this area within the overlay is consistent with the district-wide methodology used to identify areas that may be affected by slope instability processes, including both susceptibility and potential runout areas.</p>                                                                     |
| 9                 | Teh Meng Hing | 14 Main Road Wainuiomata         | <p>The Slope Assessment Overlay is intentionally a broad-scale, district-wide planning tool developed to identify areas where slope instability hazards may be present and where further investigation may be warranted. It is derived from district-scale landslide susceptibility and runout assessments using established methodologies and regionally consistent datasets that represent factors known to influence slope stability. The overlay is not intended to provide site-specific hazard determinations or replace detailed geotechnical investigations. Accordingly, it is not based on geotechnical assessments of individual properties but instead provides a consistent and evidence-based screening tool to support land-use planning and identify locations where site-specific geotechnical assessment may be required as part of future subdivision or development. This approach reflects standard natural hazard planning practice, whereby district-scale assessments are used to identify potential hazard areas and inform where more detailed investigations should subsequently be undertaken.</p>                                     |
| 10                | Judy Ryan     | 19A & 19B Mulberry St Maungaraki | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment. The overlay is not intended to determine hazard or risk at a property scale, but is a screening tool designed to identify where site-specific geotechnical assessment may be required.</p> <p>The Slope Assessment Overlay is applied at a district scale and considers the broader topographic, geological and geomorphological setting of a site, including both potential landslide source areas and areas that may be affected by landslide runout. A review of the assessment outputs indicates that the overlay primarily affects the rear portion of the property where susceptibility and/or runout have been identified. While the front unit is located on relatively flat land and outside the principal hazard area, the property is held within a single land parcel, and the overlay reflects the mapped hazard extent affecting part of the site. The information reviewed indicates that the mapped overlay extent is consistent with the assessment methodology adopted for the district-wide assessment.</p> |

Appendix A – Technical Commentary of Submissions

[also refer to general comments in Sections 2 and 3 of the Report]

| Submission Number | Submitter                               | Site/Area                         | Submission Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------|-----------------------------------------|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 13                | Julia Neuhof                            | 60 Pokohiwi Rd<br>Normandale      | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment. The overlay is not intended to determine hazard or risk at a property scale, but is a screening tool designed to identify where site-specific geotechnical assessment may be required.</p> <p>While the dwelling may be located on relatively flat land, the assessment identified areas of susceptibility and potential runout in the area where the property is located. Some of these modelled areas may include small-scale topographic features, earthworks or local slopes represented within the underlying elevation data. Given the district-wide scale of the assessment, individual terrain features of this nature were not assessed on a property-by-property basis. The overlay therefore reflects the broader assessment of slope instability processes given the geomorphological setting of the area, rather than the conditions at the footprint of dwellings alone.</p>                                                                                                                                                                                      |
| 19                | Terry Strickland and<br>Mary Strickland | 18 Thomson Grove Stokes<br>Valley | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment. The overlay is not intended to determine hazard or risk at a property scale, but is a screening tool designed to identify where site-specific geotechnical assessment may be required.</p> <p>The absence of recorded landslides or known instability on the property does not necessarily indicate that the property is free from future slope instability hazards. The overlay is based on a district-scale assessment of factors that influence slope stability, including topography, geology, soil characteristics and land cover, and is intended to identify areas that may be susceptible to future slope instability rather than only areas affected by past events.</p> <p>A review of the assessment outputs in the area where this property is located indicates that the inclusion of the area within the overlay is consistent with the district-wide methodology used to identify areas that may be affected by slope instability processes, including both susceptibility and potential runout areas.</p>                                                       |
| 21                | Dean Tredrea and<br>Rennie Tredrea      | 2 Bledisloe Cres<br>Wainuiomata   | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment. The overlay is not intended to determine hazard or risk at a property scale, but is a screening tool designed to identify where site-specific geotechnical assessment may be required.</p> <p>The landslide susceptibility and runout assessments were developed using district-wide topographic and geomorphological datasets. As a result, the modelling process can identify small-scale slopes, local changes in topography, earthworks, cut batters, retaining features and other terrain expressions represented within the underlying spatial elevation data. Given the scale of the assessment and the extent of the study area, it is not practical to individually review localised features at property level that may influence the model outputs. Consequently, the overlay reflects both the underlying modelling results given the broader geomorphological context of the area, rather than a site-specific assessment of individual properties. Site specific geotechnical assessments would be able to consider features and hazards at a property level.</p> |
| 22                | Eli Gilfedder                           | 114 Cheviot Road Lowry<br>Bay     | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment. The overlay is not intended to determine hazard or risk at a property scale, but is a screening tool designed to identify where site-specific geotechnical assessment may be required.</p> <p>The landslide susceptibility and runout assessments were developed using district-wide topographic and geomorphological datasets. As a result, the modelling process can identify small-scale slopes, local changes in topography, earthworks, cut batters, retaining features and other terrain expressions represented within the underlying spatial elevation data. Given the scale of the assessment and the extent of the study area, it is not practical to individually review localised features at property level that may influence the model outputs. Consequently, the overlay reflects both the underlying modelling results and the broader geomorphological context of the area, rather than a site-specific assessment of individual properties. Site specific geotechnical assessments would be able to consider features and hazards at a property level.</p>   |

Appendix A – Technical Commentary of Submissions

[also refer to general comments in Sections 2 and 3 of the Report]

| Submission Number | Submitter      | Site/Area             | Submission Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
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| 23                | Ron Muir       | 133 Park Road Belmont | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment. The overlay is not intended to determine hazard or risk at a property scale, but is a screening tool designed to identify where site-specific geotechnical assessment may be required.</p> <p>The Slope Assessment Overlay has been developed from district-scale landslide susceptibility and runout modelling and incorporates geomorphological mapping to produce a consistent and practical planning layer. While portions of the property may appear relatively flat or gently sloping, the inclusion of the area in which the property is located within the overlay is consistent with the district-wide assessment methodology given the broader geomorphological setting of the area. The overlay should not be interpreted as indicating that all parts of a property are susceptible to slope instability, but rather that the property is located within an area identified through the district-scale assessment as potentially affected by slope instability processes.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 24                | Barry Godfrey  | 29 Walters St Avalon  | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment. The overlay is not intended to determine hazard or risk at a property scale, but is a screening tool designed to identify where site-specific geotechnical assessment may be required.</p> <p>Geotechnical investigations for the site provide valuable information regarding local ground conditions and a more detailed understanding of site-specific stability than is possible through a district-scale assessment such as the Slope Assessment Overlay.</p> <p>The Slope Assessment Overlay serves a different purpose to a geotechnical assessment which has been prepared for a specific development proposal. The overlay has been developed using a consistent district-wide methodology that considered landslide susceptibility, runout, and geomorphological characteristics across the wider area. The inclusion of the area in which the property is located within the overlay reflects its location within the wider geomorphological area identified through the district-wide assessment, rather than determination or suitability for development. Where geotechnical investigations and reports have been prepared, these are valuable to inform future development.</p>                                                                                                                                                                                                                                                                                                                                                                    |
| 33                | Neil Blackie   | No                    | <p>The Slope Assessment Overlay identifies areas that may be susceptible to slope instability based on a district-wide assessment. It is a broad-scale planning tool intended to support land-use decision-making by highlighting locations where site-specific geotechnical investigations may be warranted as part of future subdivision or development.</p> <p>The overlay is informed by a Landslide Susceptibility Layer, which categorises land from Very Low to Very High susceptibility according to factors that influence landslide occurrence, together with areas potentially affected by landslide runout. These datasets have been integrated into a single planning overlay that represents district-wide patterns of slope instability and associated geomorphological processes, rather than site-specific conditions, to inform where future geotechnical investigations would be appropriate. The underlying landslide susceptibility and runout layers are available to assist with such site-specific assessment.</p> <p>No property-specific hazard or risk assessment has been undertaken as part of the development of the overlay, and it is not intended to confirm hazard or risk at an individual property level or replace site-specific geotechnical investigations. Inclusion of areas within the overlay reflects the broader geomorphological setting and slope instability processes identified through the district-wide assessment and should not be interpreted as a site-specific assessment of existing instability. Rather, the overlay provides a consistent, evidence-based screening tool to identify where more detailed assessment may be required.</p> |
| 91                | Jo-Ella Sarich | No                    | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment. The overlay does not represent a property-specific slope stability assessment, nor does it assign a hazard or risk rating to individual properties. Rather, it has been developed using a combination of landslide susceptibility modelling, runout modelling and geomorphological assessment undertaken at a district scale. It is a screening tool designed to identify where site-specific geotechnical assessment may be required.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

Appendix A – Technical Commentary of Submissions

[also refer to general comments in Sections 2 and 3 of the Report]

| Submission Number | Submitter      | Site/Area                   | Submission Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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|                   |                |                             | <p>The landslide susceptibility assessment which underpins the overlay has considered a range of factors in addition to slope angle, including geology, geomorphology and land cover. As a result, the slope angle ranges described in the technical report should not be interpreted as the sole basis for inclusion within the Slope Assessment Overlay. The overlay reflects the combined consideration of susceptibility, runout potential and geomorphological characteristics, rather than any single factor in isolation. However, the district-wide study did not assess individual features, such as cut slopes, at a property level.</p> <p>The overlay is underpinned by a Landslide Susceptibility Layer, which classifies land from Very Low to Very High susceptibility based on factors known to influence landsliding, together with areas potentially affected by landslide runout. These datasets have been combined into a single binary planning overlay that identifies areas where slope instability hazards may be present and further investigation may be warranted.</p> <p>No property-specific hazard or risk assessment has been undertaken as part of the development of the overlay, and it is not intended to confirm hazard or risk at an individual property level or replace site-specific geotechnical investigations. Instead, it provides a consistent, evidence-based screening tool to identify where more detailed assessment may be required. The underlying landslide susceptibility and runout layers are available to inform such assessment.</p> |
| 97                | Brent McKenzie | 56 Miromiro Road Normandale | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment. The overlay is not intended to determine hazard or risk at a property scale, but is a screening tool designed to identify where site-specific geotechnical assessment may be required.</p> <p>The site-specific topographic survey provides a more detailed representation of topographic conditions at the property than is available through the datasets used for the district-wide assessment. While the survey provides additional local detail, the property remains associated with areas of mapped susceptibility and potential runout and is located within a broader geomorphological setting identified through the district-wide assessment. The property's inclusion within the overlay reflects consideration of these factors at a district scale.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 101               | Susan Ellis    | 12 Bull Avenue Wainuiomata  | <p>The Slope Assessment Overlay identifies areas that may be susceptible to slope instability based on a district-wide assessment. It was developed using a range of factors known to influence slope instability, including topography, geology, geomorphology, land cover, and potential landslide runout. As a result, the overlay reflects the broader pattern of slope instability processes across the district rather than a property-by-property delineation of individual slopes or landforms.</p> <p>No property-specific hazard or risk assessments were undertaken as part of the overlay's development, and it is not intended to determine hazard or risk at an individual property level. Instead, the overlay serves as a screening tool to identify where more detailed, site-specific geotechnical assessment may be required to support future development.</p> <p>While portions of the property may not be on a steep slope, the inclusion within the overlay of the area within which the property is located reflects the outcomes of the district-wide assessment methodology and the broader geomorphological setting of the area. The overlay should not be interpreted as indicating that specific part of a property is located within or outside the overlay but is in an area where slope hazards should be considered.</p>                                                                                                                                                                                                                                     |
| 110               | Joerg Bruemmer | 94 Pomare Rd Tirohanga      | <p>The Slope Assessment Overlay is not linked to the flood modelling.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

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[also refer to general comments in Sections 2 and 3 of the Report]

| Submission Number | Submitter                         | Site/Area                      | Submission Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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| 119               | James Sunderland and Jocelyn Qian | 11 Gribble Grove Stokes Valley | <p>The Slope Assessment Overlay identifies areas that may be susceptible to slope instability based on a district-wide assessment. It is intended as a broad-scale planning tool and was not developed using site-specific investigations. As such, the overlay is not designed to determine hazard or risk for individual properties, but rather to indicate where further geotechnical assessment may be appropriate to support future development.</p> <p>The absence of recorded landslides or known instability on a property does not necessarily indicate that the land is free from slope instability hazards, as the assessment is based on factors known to influence slope failure, including topography, geology and land cover, rather than solely on historical events. Many slope failures are observed to occur on slopes not previously affected by slope instability, both in earthquake as well as storm events. Accordingly, the overlay identifies areas that may be susceptible to future slope instability and landslide runout, rather than only areas where landslides have occurred.</p> <p>The inclusion within the overlay of the area where this property is located is consistent with the district-wide methodology used to identify areas that may be affected by slope instability processes, including both susceptibility and potential runout areas.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 122               | John Wadham                       | 23 Pomare Road Tirohanga       | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment based on landslide susceptibility, runout potential and geomorphological characteristics. The overlay is not intended to determine hazard or risk at a property scale, nor does it provide site-specific geotechnical assessment. The overlay is instead a screening tool designed to identify where site-specific geotechnical assessment may be required.</p> <p>The assessment has been developed using recognised landslide susceptibility and runout assessment methodologies, regionally consistent datasets, and established industry approaches commonly applied in New Zealand and internationally for district-scale slope hazard assessments. While the assessment is not intended to replace site-specific investigations, it is considered appropriate for identifying areas that may be affected by slope instability processes and informing district-scale planning decisions.</p> <p>Inclusion within the overlay is not dependent on the presence of flooding or inundation hazards. The assessment considers a range of factors that influence slope instability, including topography, geomorphology, geology and land cover, together with potential landslide runout processes.</p> <p>The absence of recorded landslide activity or known instability at a property does not necessarily indicate that the land is free from slope instability hazards. Many slope failures are observed to occur on slopes not previously affected by slope instability, both in earthquake as well as storm events. The underlying assessment identifies areas that may be susceptible to future slope instability based on factors such as topography, geology, geomorphology and land cover, rather than solely on the occurrence of previously recorded events.</p> <p>The property's inclusion within the overlay reflects the outcomes of the district-wide landslide susceptibility, runout and geomorphological assessment methodology. The overlay should not be interpreted as a site-specific determination of hazard or risk, but rather as a screening tool identifying areas where slope instability processes may warrant consideration through the District Plan.</p> |
| 123               | Rakesh Mehta                      | 115 Main Road Wainuiomata      | <p>The Slope Assessment Overlay identifies areas of potential slope instability from a district-wide assessment. It is intended for screening purposes only and is not a measure of hazard or risk at the property scale.</p> <p>The absence of recorded landslides or known instability on the property does not necessarily indicate that the property is free from slope instability hazards. Many slope failures are observed to occur on slopes not previously affected by slope instability, both in earthquake as well as storm events. The Slope Assessment Overlay is based on a district-scale assessment of factors that influence slope stability, including topography, geology, soil characteristics and land cover, and is intended to identify areas that may be susceptible to future slope instability rather than only areas affected in the past.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

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[also refer to general comments in Sections 2 and 3 of the Report]

| Submission Number | Submitter    | Site/Area                       | Submission Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
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|                   |              |                                 | A review of the assessment outputs for this property indicates that its inclusion within the overlay is consistent with the district-wide methodology used to identify areas that may be affected by slope instability processes, including both susceptibility and potential runout areas.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 125               | Philip King  | 238 Marine Drive Lowry Bay      | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment. The overlay is not intended to determine hazard or risk at a property scale, but is a screening tool designed to identify where site-specific geotechnical assessment may be required.</p> <p>The absence of recorded landslides or known instability on the property does not necessarily indicate that the property is free from slope instability hazards. Many slope failures are observed to occur on slopes not previously affected by slope instability, both in earthquake as well as storm events. The Slope Assessment Overlay is based on a district-scale assessment of factors that influence slope stability, including topography, geology, soil characteristics and land cover, and is intended to identify areas that may be susceptible to future slope instability rather than only areas affected by past events. The property's inclusion within the overlay reflects consideration of these factors at a district scale.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 183               | Eujin Au     | 32 Cypress Dr Maungaraki        | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment. The overlay is not intended to determine hazard or risk at a property scale but is a screening tool to identify where site-specific geotechnical assessment may be required.</p> <p>The purpose of the overlay is not to assess the performance of existing buildings or development. Instead, it identifies areas of land that have the potential for slope instability based on a district-wide assessment of susceptibility, runout potential and geomorphological characteristics.</p> <p>The presence of development or site-specific geotechnical investigations does not necessarily indicate an absence of slope instability processes. While geotechnical reports may provide a more detailed understanding of local ground conditions and site stability, the district-wide study was not intended to evaluate individual properties or buildings at a site-specific basis.</p> <p>The inclusion of the property within the overlay reflects the broader assessment of slope instability process undertaken at a district scale.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 194               | Steve Hobman | 6 & 7 Catherine Grove Tirohanga | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment. The overlay is not intended to determine hazard or risk at a property scale but is a screening tool to identify where site-specific geotechnical assessment may be required.</p> <p>The absence of known landslide events or evidence of instability does not necessarily indicate that land is free from slope instability hazards, as the overlay is intended to identify areas that may be susceptible to future slope instability processes rather than only areas affected by past events. Many slope failures are observed to occur on slopes not previously affected by slope instability, both in earthquake as well as storm events.</p> <p>The inclusion within the overlay of the area in which the property is located, reflects the outcomes of the district-wide susceptibility, runout and geomorphological assessment. While portions of the site may appear relatively flat, stable, or developed, the overlay reflects the broader assessment of slope instability processes within the surrounding area and should not be interpreted as indicating that all parts of the property are susceptible to slope instability. Given the district-wide scale of the assessment, it is not practical to review and refine every localised feature, earthwork, retaining structure or terrain variation on a property-by-property basis.</p> <p>The district-wide assessment did not evaluate individual cut slopes, retaining structures, earthworks, building platforms or site-specific development history. While these features may influence local site conditions, the property's inclusion within the overlay reflects the broader district-scale assessment methodology and the surrounding geomorphological setting. The overlay should not be interpreted as indicating that all parts of the property are susceptible to slope instability or that instability is currently occurring at the site.</p> |

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| Submission Number | Submitter             | Site/Area                  | Submission Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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| 206               | Lesley and Peter Glen | 6 Sheehy Grove Wainuiomata | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment of landslide susceptibility, runout potential and geomorphological characteristics. The overlay is not intended to determine hazard or risk at a property scale, nor does it provide a site-specific geotechnical assessment. Rather, it is a screening tool designed to identify where further geotechnical assessment may be required.</p> <p>The absence of recorded instability does not necessarily indicate that a property is free from slope instability hazards. Many slope failures are observed to occur on slopes not previously affected by slope instability, both in earthquake as well as storm events. The assessment identifies areas that may be susceptible to future slope instability based on factors such as topography, geology, geomorphology and land cover, rather than solely on the occurrence of previously recorded landslide events.</p> <p>In this instance, the inclusion within the overlay of the area in which the property is located reflects its location within a broader geomorphological area identified through the district-wide assessment methodology. The overlay should not be interpreted as indicating that instability is currently occurring at the property. Rather, it reflects the wider pattern of slope instability processes identified through the district-wide assessment.</p>                                                                                                                                                                      |
| 211               | Lyn and Keith Bromley | No                         | <p>The Slope Assessment Overlay identifies areas that may be susceptible to slope instability based on a district-wide assessment. It is intentionally a broad-scale, generalised planning tool designed to support land-use planning by identifying locations where site-specific geotechnical assessment may be required as part of future subdivision or development proposals. The underlying landslide susceptibility and runout layers are available to assist with such site-specific assessment.</p> <p>The overlay is underpinned by a Landslide Susceptibility Layer, which classifies land from Very Low to Very High susceptibility based on factors known to influence landsliding, together with areas potentially affected by landslide runout. These datasets have been combined into a planning overlay that reflects the broader pattern of susceptibility, runout and geomorphological characteristics across the district, rather than conditions at an individual property.</p> <p>No property-specific hazard or risk assessment has been undertaken as part of the development of the overlay, and it is not intended to confirm hazard or risk at an individual property level or replace site-specific geotechnical investigations. Inclusion within the overlay reflects the broader geomorphological setting and slope instability processes identified through the district-wide assessment and should not be interpreted as a site-specific assessment of existing instability. Rather, the overlay provides a consistent, evidence-based screening tool to identify where more detailed assessment may be required.</p> |
| 229               | Roger McMillan et al  | 385 Hebden Cres Kelson     | <p>The Slope Assessment Overlay is intentionally a broad-scale, district-wide planning tool developed to identify areas where slope instability hazards may be present and where further investigation may be warranted. It is derived from district-scale landslide susceptibility and runout assessments using established methodologies and regionally consistent datasets that represent factors known to influence slope stability.</p> <p>While the presence of established vegetation may contribute to slope stability, this does not demonstrate that a property is free from future slope instability hazards. Slope failures do occur in vegetated areas, particularly during significant rainfall or earthquake events.</p> <p>The overlay is not intended to provide site-specific hazard determinations or replace detailed geotechnical investigations. Accordingly, it is not based on geotechnical assessments of individual properties but instead provides a consistent and evidence-based screening tool to support land-use planning and identify locations where site-specific geotechnical assessment may be required as part of future subdivision or development.</p> <p>The inclusion within the overlay of the area in which the property is located is consistent with the district-wide methodology used to identify areas that may be affected by slope instability processes, including both susceptibility and potential runout areas.</p>                                                                                                                                                                            |

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[also refer to general comments in Sections 2 and 3 of the Report]

| Submission Number | Submitter              | Site/Area                      | Submission Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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| 230               | Claudia and John Riley | Moores Valley Rd & Crowther Rd | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment. The overlay is not intended to determine hazard or risk at a property scale, but is a screening tool to identify where site-specific geotechnical assessment may be required.</p> <p>The absence of recorded landslides or known instability on the property does not necessarily indicate that the property is free from slope instability hazards. Many slope failures are observed to occur on slopes not previously affected by slope instability, both in earthquake as well as storm events. The Slope Assessment Overlay is based on a district-scale assessment of factors that influence slope stability, including topography, geology, soil characteristics and land cover, and is intended to identify areas that may be susceptible to future slope instability rather than only areas affected by past events. While the presence of established vegetation may contribute to slope stability, this does not demonstrate that a property is free from future slope instability hazards. Slope failures do occur in vegetated areas, particularly during significant rainfall or earthquake events.</p> <p>A review of the assessment outputs indicates that inclusion of the area within the overlay is consistent with the district-wide methodology used to identify areas that may be affected by slope instability processes, including both susceptibility and potential runout areas.</p>                |
| 252               | Lisa Caddis            | 297 Muritai Road Eastbourne    | <p>The Slope Assessment Overlay is a broad-scale planning tool developed from landslide susceptibility and runout assessments to identify areas where slope instability hazards may be present and where further assessment may be warranted. The purpose of the overlay is not to confirm hazard or risk at an individual property, but to provide a consistent and evidence-based screening tool to support future subdivision and development decisions.</p> <p>The absence of recorded landslides or known instability on a property does not necessarily indicate that the land is free from slope instability hazards, as the assessment is based on factors known to influence slope failure, including topography, geology and land cover, rather than solely on historical events. Many slope failures are observed to occur on slopes not previously affected by slope instability, both in earthquake as well as storm events. Accordingly, the overlay identifies areas that may be susceptible to future slope instability and landslide runout, rather than only areas where landslides have occurred in the past. Therefore, the overlay is intended to inform the need for geotechnical assessments in areas with slope instability susceptibility.</p>                                                                                                                                                                                                                                                                                          |
| 282               | Monique McDonald       | 21 Thomson Grove Stokes Valley | <p>The Slope Assessment Overlay identifies areas with potential slope instability based on a district-wide assessment. The overlay is a broad-scale planning tool developed from landslide susceptibility and runout assessments to identify areas where slope instability hazards may be present and where further assessment may be warranted. The purpose of the overlay is not to confirm hazard or risk at an individual property, but to provide a consistent and evidence-based screening tool to support future subdivision and development decisions.</p> <p>The absence of recorded landslides or known instability on a property does not necessarily indicate that the land is free from slope instability hazards, as the assessment is based on factors known to influence slope failure, including topography, geology and land cover, rather than solely on historical events. Many slope failures are observed to occur on slopes not previously affected by slope instability, both in earthquake as well as storm events. Accordingly, the overlay identifies areas that may be susceptible to future slope instability and landslide runout, rather than only areas where landslides have occurred.</p> <p>A review of the assessment outputs for the area in which the property is located indicates that its inclusion of the area within the overlay is consistent with the district-wide methodology used to identify areas that may be affected by slope instability processes, including both susceptibility and potential runout.</p> |
| 285               | Graham Mark            | 5 Tarras Grove Kelson          | <p>The Slope Assessment Overlay is a district-scale, evidence-based planning tool developed to identify areas that may have potential for slope instability across the district. The overlay has been derived from landslide susceptibility modelling, runout modelling and geomorphological assessment using regionally consistent datasets and established assessment methodologies. It is not intended to provide a site-specific geotechnical assessment, determine hazard or risk at an individual property, or assign a property-specific hazard classification. Rather, it is a screening tool used to identify where further site-specific geotechnical assessment may be warranted. The underlying landslide susceptibility and runout layers are available to assist with such site-specific assessment.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

Appendix A – Technical Commentary of Submissions

[also refer to general comments in Sections 2 and 3 of the Report]

| Submission Number | Submitter                     | Site/Area                   | Submission Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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|                   |                               |                             | <p>The absence of recorded landslides or known instability on the property does not necessarily indicate that the property is free from slope instability hazards. Many slope failures are observed to occur on slopes not previously affected by slope instability, both in earthquake as well as storm events. The overlay is based on a district-scale assessment of factors that influence slope stability, including topography, geology, soil characteristics and land cover, and is intended to identify areas that may be susceptible to future slope instability rather than only areas affected by past events.</p> <p>A review of the assessment outputs for the area in which this property is located indicates that the inclusion of the area within the overlay is consistent with the district-wide methodology used to identify areas that may be affected by slope instability processes, including both susceptibility and potential runout areas.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 288               | Tom Hudig                     | 231 Marine Drive, Lowry Bay | <p>The Slope Assessment Overlay identifies areas of potential slope instability from a district-wide assessment. It is intended for screening purposes only and is not a measure of hazard or risk at the property scale.</p> <p>The absence of recorded landslides or known instability on the property does not necessarily indicate that the property is free from slope instability hazards. Many slope failures are observed to occur on slopes not previously affected by slope instability, both in earthquake as well as storm events. The Slope Assessment Overlay is based on a district-scale assessment of factors that influence slope stability, including topography, geology, soil characteristics and land cover. It is intended to identify areas that may be susceptible to future slope instability rather than only areas affected by past events.</p> <p>A review indicates that inclusion within the overlay of the area in which the property is located is consistent with the district-wide methodology used to identify areas potentially affected by slope instability, including both susceptibility and landslide runout processes.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 317               | Rowan Swain & Kim Weber-Swain | 273 Muritai Road Eastbourne | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment. The overlay is not intended to determine hazard or risk at a property scale, but is a screening tool designed to identify where slope instability hazards may warrant site-specific geotechnical assessment.</p> <p>The landslide susceptibility and runout assessments were developed as district-scale planning tools and are not intended to provide site-specific geotechnical assessments of individual properties. Rather, they are used to identify areas where slope instability processes may be present and where further site-specific investigation may be warranted. This approach is consistent with standard natural hazard planning practice, whereby broad-scale assessments are used to inform land-use planning and identify circumstances where more detailed investigations may be required. The underlying landslide susceptibility and runout layers are available to assist with such site-specific assessment.</p> <p>The Slope Assessment Overlay is intentionally presented as a planning layer rather than a property-specific hazard or risk classification. The overlay is underpinned by landslide susceptibility mapping, runout modelling, and geomorphological assessment, and reflects the combined consideration of these factors.</p> <p>The overlay has been developed as a district scale planning tool and is not based on slope angle alone. The assessment considers a range of factors that influence slope instability, including topography, geology, geomorphology, land cover and potential landslide runout. The overlay therefore reflects the broader pattern of slope instability processes identified through the assessment rather than a property-by-property delineation of individual slopes or landforms.</p> <p>The landslide susceptibility and runout assessments were undertaken using recognised industry methodologies, regionally consistent datasets, and established assessment approaches commonly applied in New Zealand and internationally for district-scale hazard assessments. These methodologies are considered appropriate for identifying areas potentially affected by slope instability processes at a planning scale.</p> |

## Appendix A – Technical Commentary of Submissions

[also refer to general comments in Sections 2 and 3 of the Report]

| Submission Number | Submitter                                            | Site/Area                     | Submission Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
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| 347               | Terry Pinfold and Ruth Gilbert                       | 20 Taungata Road York Bay     | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment. The overlay is not intended to determine hazard or risk at a property scale, but is a screening tool designed to identify where site-specific geotechnical assessment may be required.</p> <p>The overlay is not derived solely from slope angle or the visible surface topography. It instead reflects the combined consideration of landslide susceptibility, runout and geomorphological characteristics that have been identified and assessed through the district-wide assessment.</p> <p>While parts of the property may be flat or gently sloping, the properties inclusion within the overlay reflects the outcomes of the district-wide assessment methodology and the geomorphological setting of the area. The overlay has been developed to represent the wider pattern of susceptibility, runout and geomorphological characteristics across the district and is therefore not intended to replicate individual topographic features or local variations in ground conditions.</p> <p>A review of the assessment outputs indicates that the area in which the property is located remains associated with mapped susceptibility and potential runout areas and forms part of the wider landform identified through the district-wide assessment. Accordingly, the mapped overlay extent reflects the combined assessment of slope instability processes undertaken at a district scale rather than the conditions at any single location within the property.</p>                                                                                                                                                                                                                                                                                                                                                                                      |
| 363               | Sandra Michel-Shanks                                 | 39 Dalton Grove Stokes Valley | <p>The Slope Assessment Overlay is a district-scale, evidence-based planning tool developed to identify areas that may have potential for slope instability across the district. Developed from landslide susceptibility modelling, runout modelling and geomorphological assessment, the overlay is not intended to provide a site-specific geotechnical assessment or determine hazard or risk at an individual property. It does not assess the design, condition, performance or effectiveness of retaining walls or earthworks within a property. Rather, the overlay is a screening tool used to identify where further site-specific geotechnical assessment may be warranted.</p> <p>Features within the property, such as being flat and terraced, and retaining walls on site, influence site conditions and stability. However, the district-wide assessment for susceptibility, runout and the overlay itself do not evaluate individual features or engineering work at a property level.</p> <p>The absence of recorded instability does not necessarily indicate that the property is free from slope instability hazards. Many slope failures are observed to occur on slopes not previously affected by slope instability, both in earthquake as well as storm events. The assessment identifies areas that may be susceptible to future slope instability based on factors such as topography, geology, geomorphology and land cover, rather than solely on the occurrence of past landslide events.</p> <p>While the dwelling may be located on a modified and relatively flat portion of the site, the inclusion within the overlay of the area in which the property is located reflects the broader slope instability processes and geomorphological setting identified within the wider area. The overlay should not be interpreted as indicating that all parts of the property are susceptible to slope instability or that instability is currently occurring at the site.</p> |
| 364               | Wainuiomata Rural Community Association Incorporated | Moores Valley                 | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment. The overlay is not intended to determine hazard or risk at a property scale, but is a screening tool designed to identify where site-specific geotechnical assessment may be required.</p> <p>The inclusion of the area within the Slope Assessment Overlay reflects the outcomes of the district-wide hazard assessment methodology. Consideration of whether the overlay should apply to particular zoning classifications or development contexts is a planning matter for Council rather than a technical assessment matter.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

Appendix A – Technical Commentary of Submissions

[also refer to general comments in Sections 2 and 3 of the Report]

| Submission Number | Submitter              | Site/Area                       | Submission Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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| 367               | Patricia Cleland       | 8 Cheviot Road Lowry Bay        | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment. The overlay is not intended to determine hazard or risk at a property scale, but is a screening tool designed to identify where site-specific geotechnical assessment may be required. There is no restriction implied in the overlay, but identified the need for site specific consideration of potential slope hazards.</p> <p>The assessment has been developed using recognised landslide susceptibility and runout assessment methodologies, regionally consistent datasets, and established industry approaches commonly applied in New Zealand and internationally for district-scale natural slope hazard assessments. The assessment methodology, datasets, assumptions and limitations used to develop the landslide susceptibility, runout and geomorphological assessments are documented within the supporting technical reports. These reports set out the information sources, analytical approaches and assessment criteria used to identify areas potentially affected by slope instability processes across the district. The methodology for the overlay relies on regionally consistent datasets and broad-scale assessment techniques and is not intended to replicate site-specific geotechnical investigations. Rather, the purpose of the assessment is to provide a consistent and evidence-based planning framework for identifying areas where slope instability hazards may warrant consideration through the District Plan.</p> <p>The overlay therefore represents the outcomes of a documented and evidence-based district-wide assessment and provides a framework for subsequent site-specific investigation where required. While site-specific information may provide a more detailed understanding of conditions at an individual property, this does not diminish the role of the overlay as a district-wide planning and hazard screening tool.</p> |
| 373               | Kelson Heights Limited | 64 Waipounamu Drive             | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment. The overlay is not intended to determine hazard or risk at a property scale, but is a screening tool designed to identify where site-specific geotechnical assessment may be required.</p> <p>Geotechnical investigations and certifications for earthworks provide valuable site-specific information regarding the performance and suitability of engineered landforms. However, as this is a district-wide assessment, it is not intended to review individual earthworks, geotechnical reports, engineered slopes or certification documents at a property-specific level.</p> <p>The inclusion of the site within the overlay reflects the outcomes of a district-wide assessment of landslide susceptibility, runout and geomorphology, rather than an assessment of completed earthworks or engineered site conditions. The overlay identifies areas where slope instability processes may warrant consideration at a planning level, whereas the geotechnical investigations relate to the design, construction and certification of the development. Such site-specific geotechnical investigations will be expected to take into consideration the earthworks and associated design that has been carried out.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 375               | Fiona Christeller      | 18 & 18A Taungata Road York Bay | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment. The Slope Assessment Overlay reflects the combined consideration of susceptibility, runout and geomorphological characteristics rather than any single hazard mechanism in isolation. The overlay is not intended to provide a site-specific geotechnical assessment or determine hazard or risk at an individual property. Rather, it is a screening tool used to identify where further site-specific geotechnical assessment may be warranted.</p> <p>The district-wide assessment was not intended to evaluate individual retaining walls, earthworks, building platforms, site development, or property-specific engineering measures. Such features may influence local site conditions but have not been assessed at a property-by-property basis as part of this district-wide study.</p> <p>The landslide susceptibility assessment considered a range of factors that influence slope instability, including topography, geology, geomorphology and land cover, rather than slope angle alone. As a result, inclusion within the overlay is not determined solely by the steepness of the land at a particular location. The final overlay reflects the combined consideration of landslide susceptibility, potential runout and geomorphological characteristics identified through the district-wide assessment.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

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[also refer to general comments in Sections 2 and 3 of the Report]

| Submission Number | Submitter                          | Site/Area                 | Submission Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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|                   |                                    |                           | <p>The absence of recorded instability does not necessarily indicate that a property is free from slope instability hazards. The underlying susceptibility assessment identifies areas that may be prone to future slope instability based on factors such as topography, geology, geomorphology and land cover, rather than solely on the occurrence of historical landslide events.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 380, F09          | Andrew Robinson and Robyn Robinson | 269 Muritai Rd Eastbourne | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment. The overlay is not intended to determine hazard or risk at a property scale, but is a screening tool designed to identify where slope instability hazards may warrant site-specific geotechnical assessment.</p> <p>The landslide susceptibility and runout assessments were developed as district-scale planning tools and are not intended to provide site-specific geotechnical assessments of individual properties. Rather, they are used to identify areas where slope instability processes may be present and where further site-specific investigation may be warranted. This approach is consistent with standard natural hazard planning practice, whereby broad-scale assessments are used to inform land-use planning and identify circumstances where more detailed investigations may be required. The underlying landslide susceptibility and runout layers are available to assist with such site-specific assessment.</p> <p>The Slope Assessment Overlay is intentionally presented as a planning layer rather than a property-specific hazard or risk classification. The overlay is underpinned by landslide susceptibility mapping, runout modelling, and geomorphological assessment, and reflects the combined consideration of these factors.</p> <p>The overlay has been developed as a district scale planning tool and is not based on slope angle alone. The assessment considers a range of factors that influence slope instability, including topography, geology, geomorphology, land cover and potential landslide runout. The overlay therefore reflects the broader pattern of slope instability processes identified through the assessment rather than a property-by-property delineation of individual slopes or landforms.</p> <p>The landslide susceptibility and runout assessments were undertaken using recognised industry methodologies, regionally consistent datasets, and established assessment approaches commonly applied in New Zealand and internationally for district-scale hazard assessments. These methodologies are considered appropriate for identifying areas potentially affected by slope instability processes at a planning scale.</p> |
| 383               | Sensible Solutions for Eastbourne  | 19 Ferry Road, Days Bay   | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment. The overlay is not intended to determine hazard or risk at a property scale, but is a screening tool designed to identify where slope instability hazards may warrant site-specific geotechnical assessment. There is no restriction implied in the overlay but identifies the need for site specific consideration of potential slope hazards.</p> <p>The landslide susceptibility and runout assessments were developed as district-scale planning tools and are not intended to provide site-specific geotechnical assessments of individual properties. Rather, they are used to identify areas where slope instability processes may be present and where further site-specific investigation may be warranted. This approach is consistent with standard natural hazard planning practice, whereby broad-scale assessments are used to inform land-use planning and identify circumstances where more detailed investigations may be required.</p> <p>The Slope Assessment Overlay is intentionally presented as a planning layer rather than a property-specific hazard or risk classification. The overlay is underpinned by landslide susceptibility mapping, runout modelling, and geomorphological assessment, and reflects the combined consideration of these factors.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

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[also refer to general comments in Sections 2 and 3 of the Report]

| Submission Number | Submitter               | Site/Area              | Submission Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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|                   |                         |                        | <p>The overlay has been developed as a district scale planning tool and is not based on slope angle alone. The assessment considers a range of factors that influence slope instability, including topography, geology, geomorphology, land cover and potential landslide runout. The overlay therefore reflects the broader pattern of slope instability processes identified through the assessment rather than a property-by-property delineation of individual slopes or landforms.</p> <p>The landslide susceptibility and runout assessments were undertaken using recognised industry methodologies, regionally consistent datasets, and established assessment approaches commonly applied in New Zealand and internationally for district-scale hazard assessments. These methodologies are considered appropriate for identifying areas potentially affected by slope instability processes at a planning scale.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 387               | Craig & Margaret Barker | 18 Otira Grove Kelson  | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment. The overlay is not intended to determine hazard or risk at a property scale, but is a screening tool designed to identify where slope instability hazards may warrant site-specific geotechnical assessment.</p> <p>The topographical model used for the slope susceptibility assessments and runout predate the ongoing subdivision development and hence do not necessarily arise from recent development upstream of the property. Earthworks formation as part of subdivision development may change the slope runout from upstream developments, and this will depend on the nature and stability of slopes formed and modifications to runout pathways for debris from slope failures. These have not been considered as part of the development of the overlay or the review of submissions.</p> <p>This submission is not relevant to the methodology or inputs used to develop the Slope Assessment Overlay so has not been commented on. Any site-specific issues would need to be raised with the parties involved as an operational matter.</p>                                                                                                                                                                                                                                                                                                                                        |
| 398               | Katrina Jacobsen        | 7 Wyndrum Ave Waterloo | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment. The overlay is not intended to determine hazard or risk at a property scale, but is a screening tool designed to identify where site-specific geotechnical assessment may be required.</p> <p>The absence of recorded instability does not necessarily indicate that the property is free from slope instability hazards. Many slope failures are observed to occur on slopes not previously affected by slope instability, both in earthquake as well as storm events. The assessment identifies areas that may be susceptible to future slope instability based on factors such as topography, geology, geomorphology and land cover, rather than solely on the occurrence of past landslide events.</p> <p>A review of the assessment outputs indicates that the inclusion within the overlay of the area in which the property is located reflects the broader geomorphological setting identified through the district-wide assessment, together with the outcomes of the landslide susceptibility and runout modelling. The overlay is therefore not solely reliant on the presence of steep slopes or visible instability at a particular location.</p> <p>The district-wide assessment was undertaken using regional datasets and desktop-based assessment methods and did not include site inspections or the evaluation of individual property features (including retaining walls).</p> |
| 416               | David & Pauline Innes   | 353 Moores Valley Road | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment. The overlay is not intended to determine hazard or risk at a property scale, but is a screening tool designed to identify where site-specific geotechnical assessment may be required.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

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| Submission Number | Submitter                  | Site/Area               | Submission Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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|                   |                            |                         | <p>The inclusion within the Slope Assessment Overlay of the area in which the property is located reflects the outcomes of the district-wide hazard assessment methodology which does not consider land ownership and does not consider whether it is publicly or privately owned. Consideration of whether the overlay should apply to particular zoning classifications or development contexts is a planning matter for the Council rather than a technical assessment matter.</p> <p>Riverbank erosion has not been considered as part of the slope susceptibility assessment.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 423               | Susan Ewart                | 4 Kaitawa Road York Bay | Submission relates to flood risk – not relevant for Slope Assessment Overlay.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 427               | David Surrey               | No                      | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment. The overlay is not intended to determine hazard or risk at a property scale, but is a screening tool designed to identify where site-specific geotechnical assessment may be required.</p> <p>The overlay is not based solely on slope angle and does not seek to identify only steep slopes. It considers a range of factors that influence slope instability, including topography, geology, geomorphology, land cover, and potential landslide runout.</p> <p>The Slope Assessment Overlay reflects the combined consideration of these factors across the wider landscape. As a result, portions of land that may appear relatively gentle or exhibit lower susceptibility in isolation may still be included within the overlay where they form part of the broader geomorphological setting or are associated with identified slope instability processes.</p> <p>Accordingly, the overlay is intended to represent the broader pattern of susceptibility, runout and geomorphological characteristics identified through the assessment, rather than refine individual areas of lower slope gradient at a property scale.</p>                                                                                                                                                               |
| 438               | Sanna and Mark McGavin     | 46 Major Drive Kelson   | <p>The Slope Assessment Overlay is intentionally a broad-scale, district-wide planning tool developed to identify areas where slope instability hazards may be present and where further investigation may be warranted. It is derived from district-scale landslide susceptibility and runout assessments using established methodologies and regionally consistent datasets that represent factors known to influence slope stability.</p> <p>The overlay is not intended to provide site-specific hazard determinations or replace detailed geotechnical investigations. Accordingly, it is not based on geotechnical assessments of individual properties but instead provides a consistent and evidence-based screening tool to support land-use planning and identify locations where site-specific geotechnical assessment may be required as part of future subdivision or development. This approach reflects standard natural hazard planning practice, whereby district-scale assessments are used to identify potential hazard areas and inform where more detailed investigations should subsequently be undertaken.</p> <p>A review of the underlying assessment outputs indicates that the property's inclusion within the overlay is consistent with the district-wide methodology used to identify areas potentially affected by slope instability, including both susceptibility and landslide runout processes.</p> |
| 459               | Orlando & Franziska Ravera |                         | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment. The overlay is not intended to determine hazard or risk at a property scale, but is a screening tool designed to identify where site-specific geotechnical assessment may be required. The overlay should not be interpreted as a site-specific assessment of hazard or risk, nor an assessment of the adequacy of existing engineering measures.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

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| Submission Number | Submitter                                | Site/Area                          | Submission Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
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|                   |                                          |                                    | <p>Engineered features such as retaining structures and foundations designed to engineering standards can influence local site conditions. However, this district-scale assessment was not intended to evaluate individual properties, buildings, retaining structures, engineering design or site-specific geotechnical information at a property level.</p> <p>The overlay has been developed from landslide susceptibility modelling, runout modelling and a geomorphological assessment undertaken at a district scale. As a result, inclusion within the overlay reflects the broader assessment of slope instability processes and the surrounding geomorphological setting, rather than the specific design or performance of existing structures on an individual property. Accordingly, the presence of existing development or site-specific engineering measures does not necessarily preclude land from being included within the overlay, which reflects the outcomes of the district-wide assessment methodology.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 465               | Steven Penn & Nicola Cooper              | 46 Moores Valley Road Wainuiomata  | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment. The overlay is not intended to determine hazard or risk at a property scale but is a screening tool to identify where site-specific geotechnical assessment may be required.</p> <p>Retaining walls, earthworks, building platforms and other site-specific engineering measures may influence local site conditions; however, the district-wide assessment was not intended to evaluate individual properties or site-specific engineering works on a property-by-property basis.</p> <p>The overlay does not require an assessment of existing development and should not be interpreted as indicating that instability is currently occurring at the site. Rather, it provides a planning framework for considering slope instability hazards where future subdivision, development or earthworks are proposed. The overlay in the area therefore reflects the outcomes of the district-wide assessment methodology, including consideration of susceptibility, runout and geomorphological characteristics within the wider area.</p>                                                                                                                                                                                                                                                                                                  |
| 469               | The Brookfield Board and Scouts Aotearoa | 562 Moores Valley Road Wainuiomata | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment. The overlay is not intended to determine hazard or risk at a property scale, but is a screening tool designed to identify where site-specific geotechnical assessment may be required.</p> <p>The inclusion of the property within the Slope Assessment Overlay reflects the outcomes of the district-wide hazard assessment methodology. The vulnerability of the area to potential slope hazards is independent of the actual land use. Consideration of whether the overlay should apply to particular zoning classifications or development contexts is a planning matter for Council rather than a technical assessment matter.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 473               | Luke Scullion                            | No                                 | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment. The overlay has been developed from district-scale landslide susceptibility and runout assessments and is intended for land-use planning purposes. It does not replace site specific assessments.</p> <p>The underlying assessments are not being relied upon as site-specific assessments of individual properties. Instead, the overlay is used as a screening tool to identify areas where there may be greater potential for slope instability and where site-specific geotechnical investigation should be undertaken to confirm local conditions. The overlay therefore acts as a trigger for further assessment, rather than a definitive assessment of any individual property.</p> <p>Localised slope instability hazards may occur outside of the mapped overlay extent. This reflects the district-wide scale and intended purpose of the assessment. The overlay identifies land where slope instability processes are considered more likely to be present or warrant consideration based on the combined assessment of landslide susceptibility, runout and geomorphic characteristics.</p> <p>The presence of the overlay in an area where a property is located, should not be interpreted as indicating that a site-specific assessment has been undertaken or that hazard or risk has been confirmed for a property.</p> |

Appendix A – Technical Commentary of Submissions

[also refer to general comments in Sections 2 and 3 of the Report]

| Submission Number | Submitter                    | Site/Area                        | Submission Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------|------------------------------|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 479               | Mary Spiers and Samuel Spink | 267 Muritai Road Eastbourne      | <p>The Slope Assessment Overlay is intentionally a broad-scale, district-wide planning tool developed to identify areas where slope instability hazards may be present and where further investigation may be warranted. It is derived from district-scale landslide susceptibility and runout assessments using established methodologies and regionally consistent datasets that represent factors known to influence slope stability.</p> <p>The overlay is not intended to provide site-specific hazard determinations or replace detailed geotechnical investigations. Accordingly, it is not based on geotechnical assessments of individual properties but instead provides a consistent and evidence-based screening tool to support land-use planning and identify locations where site-specific geotechnical assessment may be required as part of future subdivision or development. This approach reflects standard natural hazard planning practice, whereby district-scale assessments are used to identify potential hazard areas and inform where more detailed investigations should subsequently be undertaken.</p> <p>A review of the assessment outputs indicates that the area in which the property is located is within an area potentially affected by landslide runout from upslope land identified as susceptible to slope failure. The inclusion of the area within the Slope Assessment Overlay is therefore consistent with the methodology used to identify areas that may be affected by slope instability processes.</p>                                                                                                                                                                      |
| 493               | Lynne Birch                  | No                               | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment. The overlay is not intended to determine hazard or risk at a property scale, but is a screening tool designed to identify where site specific geotechnical assessment may be required.</p> <p>The Slope Assessment Overlay is underpinned by a Landslide Susceptibility Layer which classifies land from Very Low to Very High susceptibility to failure and is based on factors known to influence instability. This information, combined with the runout modelling, has been used to develop a single planning overlay that identifies land potentially affected by slope instability, where site specific geotechnical consideration may be required to support any development. The underlying landslide susceptibility and runout layers are available to assist with such site-specific assessment.</p> <p>Climate change, however, may influence factors that are known to contribute to slope instability, including frequency and intensity of extreme rainfall events. As a result, climate change and associated changes in the intensity and frequency of rainfall may increase the likelihood of landslide occurrence in some locations in the future. This does not invalidate the overlay, as the mapping identifies areas where slope instability processes may occur based on the underlying terrain and geological conditions. The Slope Assessment Overlay highlights the importance of adopting a precautionary approach and undertaking site-specific assessment, including potential climate change effects, where development is proposed within the overlay.</p> |
| 495               | Peter Fahy                   | 15 Sweetacres Drive Belmont      | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment. The overlay is not intended to determine hazard or risk at a property scale, but is a screening tool designed to identify where site specific geotechnical assessment may be required.</p> <p>A review of the assessment outputs for the area in which this property is located indicates that inclusion of the area within the overlay is consistent with the district-wide methodology used to identify areas that may be affected by slope instability processes, including both susceptibility and potential runout areas.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 506               | Rinu Abraham                 | 131 Wainuiomata Road Wainuiomata | <p>The Slope Assessment Overlay identifies areas of potential slope instability from a district-wide assessment. It is intended for screening purposes only and is not a measure of hazard or risk at the property scale.</p> <p>A review of the assessment outputs for this property indicates that its inclusion within the overlay is consistent with the district-wide methodology used to identify areas that may be affected by slope instability processes, particularly potential runout areas.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

Appendix A – Technical Commentary of Submissions

[also refer to general comments in Sections 2 and 3 of the Report]

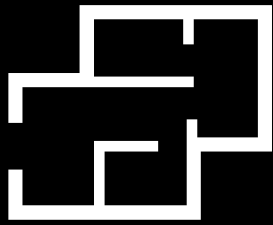
| Submission Number | Submitter           | Site/Area                 | Submission Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------|---------------------|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                   |                     |                           | <p>The inclusion within the Slope Assessment Overlay of the area in which the property is located reflects the outcomes of the underlying district-wide susceptibility, runout and geomorphological assessment methodology and is not based solely on aerial imagery. The overlay is intended to identify both potential landslide source areas, and land that may be affected by slope instability processes originating from surrounding areas. As such, inclusion within the overlay is not limited to properties containing steep slopes and is agnostic to land ownership.</p> <p>The overlay should not be interpreted as indicating that instability is currently occurring on the property, nor as a site-specific assessment of hazard or risk. Rather it identifies where slope instability processes may warrant further consideration and where site-specific geotechnical assessment may be required.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| F03               | Kris Philip Connell | 269 Muritai Rd Eastbourne | <p>The Slope Assessment Overlay identifies areas that may have potential for slope instability based on a district-wide assessment. The overlay is not intended to determine hazard or risk at a property scale, but is a screening tool designed to identify where slope instability hazards may warrant site-specific geotechnical assessment.</p> <p>The landslide susceptibility and runout assessments were developed as district-scale planning tools and are not intended to provide site-specific geotechnical assessments of individual properties. Rather, they are used to identify areas where slope instability processes may be present and where further site-specific investigation may be warranted. This approach is consistent with standard natural hazard planning practice, whereby broad-scale assessments are used to inform land-use planning and identify circumstances where more detailed investigations may be required.</p> <p>The Slope Assessment Overlay is intentionally presented as a planning layer rather than a property-specific hazard or risk classification. The overlay is underpinned by landslide susceptibility mapping, runout modelling, and geomorphological assessment, and reflects the combined consideration of these factors.</p> <p>The overlay has been developed as a district scale planning tool and is not based on slope angle alone. The assessment considers a range of factors that influence slope instability, including topography, geology, geomorphology, land cover and potential landslide runout. The overlay therefore reflects the broader pattern of slope instability processes identified through the assessment rather than a property-by-property delineation of individual slopes or landforms.</p> <p>The landslide susceptibility and runout assessments were undertaken using recognised industry methodologies, regionally consistent datasets, and established assessment approaches commonly applied in New Zealand and internationally for district-scale hazard assessments. These methodologies are considered appropriate for identifying areas potentially affected by slope instability processes at a planning scale.</p> |

wsp



# **Appendix B6: Regional comparison of natural hazard modelling and policy approaches**

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**URBANEDGE**  
P L A N N I N G L T D

## **Regional Comparison of District Plan Provisions – Wellington**

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PO Box 39071  
Wellington Mail Centre  
Lower Hutt 5045

## QUALITY CONTROL

|                    |                                                      |
|--------------------|------------------------------------------------------|
| <b>Document</b>    | Regional Comparison of District Plans - Wellington   |
| <b>Issue Date</b>  | July 2026                                            |
| <b>Prepared by</b> | James Beban – Director<br>Anna Kidd – Senior Planner |
| <b>Reviewed by</b> | Stephen Davis                                        |
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## EXECUTIVE SUMMARY

Lower Hutt City Council is undertaking a district plan review, including a review of the natural hazards chapter. This report was prepared to assist Lower Hutt City Council in preparing evidence for the hearing stream on this chapter. The purpose of this report is to compare the natural hazard mapping and rule frameworks used in district plans across the Wellington Region, with a particular focus on how the Proposed Lower Hutt District Plan aligns with, or differs from, those approaches. The report is a desktop analysis of district plan provisions and focuses on provisions within plans that apply a hazard-sensitive approach to the management of natural hazard risk.

The key findings of the review are:

- The Proposed Lower Hutt District Plan is broadly consistent with the regional approach to natural hazard mapping. Fault hazard and tsunami modelling align with the wider Wellington Region, while the slope stability mapping is similar to the approach used by Upper Hutt City Council. Coastal inundation modelling in the Proposed Lower Hutt District Plan is more conservative than the approach used by Wellington City Council and Porirua City Council. Flood modelling varies more significantly across the region, reflecting differences in when modelling was undertaken, the climate change assumptions applied, local rainfall variability, and whether modelling was prepared by Wellington Water or Greater Wellington Regional Council.
- The rule framework in the Proposed Lower Hutt District Plan is generally consistent with the regional approach, although it includes some refinements and localised differences. Flood hazards are the main area of difference, with the Proposed Lower Hutt District Plan providing for some hazard sensitive activities as permitted activities, which differs from the approach taken in other parts of the region.
- Overall, the regional approach is that as hazard risk increases, and as the sensitivity of an activity to that hazard increases, the activity status also becomes more restrictive, although there is some variability in the use of Restricted Discretionary and Discretionary activity statuses.

# 1 INTRODUCTION

## 1.1 Purpose and scope

This report outlines how the councils within the Wellington Region plan for natural hazards. Specifically, this report considers the mapping used to inform natural hazards as well as the rule activity statuses for different activities and how the rules are applied. This report reviews the following natural hazards:

- Slope stability
- Fault Hazard Overlay
- Flood hazard Overlay
- Liquefaction
- Mangaroa Peat Overlay (Upper Hutt only)
- Coastal Inundation
- Tsunami

## 1.2 Limitations and caveats

This report is a desktop analysis of the District Plan provisions in the region. This analysis has largely concentrated on the District Plan frameworks that used a hazard sensitive approach for the following reasons:

- They represent the most recent plan reviews in the region; and
- It allows for easier comparison of the provisions.

## 1.3 Structure of this report

Section 1: *Introduction* – providing the context, purpose and scope of the research

Section 2: *Results and findings of the District Plan analysis*

Section 3: *Summary of the findings*

## 2 Introduction

Within the Wellington context, many of the district councils have recently reviewed, or partially reviewed, the natural hazard provisions within their respective district plan. The exception is Kāpiti Coast District Council.

The vast majority of the district plans take a risk-based approach to the management of natural hazard risk. This is where the hazards are ranked as low, medium or high, and the activity status is determined by the sensitivity of the activity to the hazard. The more sensitive the activity is to a hazard, and the greater the hazard presented by the natural hazard, the more restrictive the provisions.

Within the Wellington context, all councils have slightly varying approaches to the natural hazards. The reasons for this include:

- Evolution of the Hazard Sensitivity approach to the management of natural hazard risk. This includes developing more nuanced approach to hazard risk management as a result of lessons learnt on previous versions of the approach;
- Differing local contexts that have resulted in some changes to the provisions;
- Changing legislative environment; and
- Differing decisions made by commissioners.

South Wairarapa District Council, Carterton District Council and Masterton District Council share a district plan: the Combined Wairarapa District Plan.

### 3 FINDINGS

The results of the analysis have been presented in tables, where the colours align with the resource consent activity status as follows:

|  |                          |
|--|--------------------------|
|  | Permitted                |
|  | Controlled               |
|  | Restricted Discretionary |
|  | Discretionary            |
|  | Non-Complying            |

#### 3.1 Slope Stability

Wellington City Council, Kāpiti Coast District Council, and Porirua City Council manage slope stability through their general earthworks rules.

The Combined Wairarapa District Plan has an earthworks rule for works within flood hazard areas, but no slope stability rules.

Upper Hutt City Council has a Slope Susceptibility Overlay in their District Plan (based on slope angle of more than 26 degrees and including runout areas). While Upper Hutt City Council does not manage activities within the Slope Susceptibility Overlay, it does manage earthworks for building platforms for certain activities; this does not include runout areas.

The Proposed Lower Hutt District Plan includes a Slope Susceptibility Overlay in their District Plan (based on slope angle of more than 25 degrees). While the Proposed District Plan does not manage activities within the Slope Susceptibility Overlay, it does manage earthworks for building platforms for certain activities.

#### Rules

| UPPER HUTT DISTRICT PLAN              |                              |
|---------------------------------------|------------------------------|
|                                       | Slope Susceptibility Overlay |
| Hazard Sensitive Activity             |                              |
| Potentially Hazard Sensitive Activity |                              |
| Least Hazard Sensitive Activity       |                              |

| PROPOSED LOWER HUTT CITY DISTRICT PLAN              |                              |
|-----------------------------------------------------|------------------------------|
|                                                     | Slope Susceptibility Overlay |
| Activities most sensitive to natural hazards        |                              |
| Activities potentially sensitive to natural hazards |                              |

|                                               |  |
|-----------------------------------------------|--|
| Activities least sensitive to natural hazards |  |
|-----------------------------------------------|--|

## APPLICATION OF RULES

|                                          | New Buildings  | New Structures | Additions | Activities |
|------------------------------------------|----------------|----------------|-----------|------------|
| <b>Upper Hutt District Plan</b>          | ✓ <sup>1</sup> | ✗              | ✗         | ✓          |
| <b>Proposed Lower Hutt District Plan</b> | ✓ <sup>2</sup> | ✗              | ✗         | ✓          |

## SUMMARY OF APPROACH

There is no difference in the approach for managing the risks from slope instability between the Upper Hutt District Plan and the Proposed Lower Hutt City District Plan. This applies to both the rule frameworks and the application of rules.

### 3.2 Fault Hazard Overlay

All councils within the Wellington Region map fault hazards within their district plan. The Combined Wairarapa Councils, Wellington City Council, Upper Hutt City Council, Porirua City Council and Proposed Lower Hutt District Plan map fault hazards based on the certainty of the known location of the fault hazard and the expected return period of the fault rupture. These maps were all undertaken using a consistent methodology of identifying fault hazards from LiDAR data as and fault studies.

Kāpiti Coast District Council maps faults that have ruptured within the last 125,000 years and that have a history indicating that they are likely to rupture again. There are different rules within the District Plan based on fault complexity (ie. how defined the fault trace is), together with the Building Importance Category.

### Rules

| WELLINGTON CITY DISTRICT PLAN                         |                    |                       |                     |
|-------------------------------------------------------|--------------------|-----------------------|---------------------|
|                                                       | Low Hazard Overlay | Medium Hazard Overlay | High Hazard Overlay |
| Additions for Potentially Hazard Sensitive Activities |                    | N/A                   |                     |
| Additions for Hazard Sensitive Activities             |                    | N/A                   |                     |
| Less Hazard Sensitive Activities                      |                    | N/A                   |                     |
|                                                       |                    | N/A                   |                     |

<sup>1</sup> Insofar as it applies to earthworks for a building platform

<sup>2</sup> Insofar as it applies to earthworks for a building platform

|                                                                                         |  |     |  |
|-----------------------------------------------------------------------------------------|--|-----|--|
| Construction or conversion buildings to contain Potentially Hazard Sensitive Activities |  | N/A |  |
| Construction or conversion buildings to contain Hazard Sensitive Activities             |  | N/A |  |
|                                                                                         |  | N/A |  |

| UPPER HUTT DISTRICT PLAN                              |                    |                       |                     |
|-------------------------------------------------------|--------------------|-----------------------|---------------------|
|                                                       | Low Hazard Overlay | Medium Hazard Overlay | High Hazard Overlay |
| Additions for Less Hazard Sensitive Activities        | N/A                |                       |                     |
| Additions for Potentially Hazard Sensitive Activities | N/A                |                       |                     |
| Additions for Hazard Sensitive Activities             | N/A<br>N/A         |                       |                     |
| Less Hazard Sensitive Activities                      |                    |                       |                     |
| Potentially Hazard Sensitive Activities               | N/A<br>N/A         |                       |                     |
| Hazard Sensitive Activities                           | N/A                |                       |                     |

| COMBINED WAIRARAPA DISTRICT PLAN                      |                    |                       |                     |
|-------------------------------------------------------|--------------------|-----------------------|---------------------|
|                                                       | Low Hazard Overlay | Medium Hazard Overlay | High Hazard Overlay |
| Additions for Less Hazard Sensitive Activities        |                    |                       |                     |
| Additions for Potentially Hazard Sensitive Activities |                    |                       |                     |
| Additions for Hazard Sensitive Activities             |                    |                       |                     |
| Less Hazard Sensitive Activities                      |                    |                       |                     |
| Potentially Hazard Sensitive Activities               |                    |                       |                     |
| Hazard Sensitive Activities                           |                    |                       |                     |

| PORIRUA DISTRICT PLAN |                    |                       |                     |
|-----------------------|--------------------|-----------------------|---------------------|
|                       | Low Hazard Overlay | Medium Hazard Overlay | High Hazard Overlay |

|                                                       |  |  |  |
|-------------------------------------------------------|--|--|--|
| Additions for Less Hazard Sensitive Activities        |  |  |  |
| Additions for Potentially Hazard Sensitive Activities |  |  |  |
| Additions for Hazard Sensitive Activities             |  |  |  |
| Less Hazard Sensitive Activities                      |  |  |  |
| Potentially Hazard Sensitive Activities               |  |  |  |
| Hazard Sensitive Activities                           |  |  |  |

| PROPOSED LOWER HUTT CITY DISTRICT PLAN                                                                             |                    |                       |                     |
|--------------------------------------------------------------------------------------------------------------------|--------------------|-----------------------|---------------------|
|                                                                                                                    | Low Hazard Overlay | Medium Hazard Overlay | High Hazard Overlay |
| Additions for Activities Least Sensitive to Natural Hazards                                                        | N/A                | N/A                   |                     |
| Additions for Activities Potentially Sensitive to Natural Hazards                                                  | N/A                | N/A                   |                     |
| Additions for Activities Most Sensitive to Natural Hazards                                                         | N/A                | N/A                   |                     |
| New buildings and conversions of existing buildings to contain Activities Least Sensitive to Natural Hazards       | N/A                | N/A                   |                     |
| New buildings and conversions of existing buildings to contain Activities Potentially Sensitive to Natural Hazards | N/A                | N/A                   |                     |
| New buildings and conversions of existing buildings to contain Activities Most Sensitive to Natural Hazards        | N/A                | N/A                   |                     |

#### APPLICATION OF RULES

|                                      | New Buildings | New Structures | Additions | Activities |
|--------------------------------------|---------------|----------------|-----------|------------|
| <b>Wellington City District Plan</b> | ✓             | x              | ✓         | ✓          |

|                                          |                |                |   |   |
|------------------------------------------|----------------|----------------|---|---|
| <b>Upper Hutt District Plan</b>          | ✓              | ✓ <sup>3</sup> | ✓ | ✓ |
| <b>Combined Wairarapa District Plan</b>  | ✓ <sup>4</sup> | ✗              | ✓ | ✓ |
| <b>Porirua District Plan</b>             | ✓ <sup>5</sup> | ✗              | ✓ | ✓ |
| <b>Proposed Lower Hutt District Plan</b> | ✓              | ✓              | ✓ | ✓ |

## SUMMARY OF APPROACH

All of the District Plans allow for Less Sensitive Activities (and associated additions) as a permitted activity in the fault hazard overlays.

Generally, the District Plans have new hazard sensitive activities in the high hazard area as a non-complying activity. Potentially Hazard Sensitive Activities are either a discretionary activity or a non-complying activity.

The approach to additions to Hazard Sensitive and Potentially Hazard Sensitive Activities is generally the same across Wellington City Council, Porirua City Council, Upper Hutt City Council and the Proposed Lower Hutt District Plan where additions are permitted up to a certain size and once this size is exceeded, they become a Restricted Discretionary Activity. The exception is the Combined Wairarapa District Plan which has additions for Hazard Sensitive and Potentially Hazard Sensitive Activities as either a Restricted Discretionary Activity or a Discretionary Activity depending on whether they are in a Medium or High Hazard Area.

Porirua City Council map different fault hazard overlays within their District Plan. There are different rules within the District Plan based on whether the subdivision, use or development is within 20m of the fault hazard or not.

While the Proposed Lower Hutt District Plan has a Controlled Activity status for the Wellington Fault Overlay, this only applies to very limited scenarios where there is an existing vacant site, as opposed to the general development of land in this area which requires consent as a Restricted Discretionary Activity.

The rule frameworks in each district plan apply to new buildings (including where they directly associated with an activity), additions, and activities (including conversions). The Upper Hutt District Plan applies rules to structures only in identified within the fault band, whereas the Proposed Lower Hutt District Plan applies rules to structures more generally.

## 3.3 Flooding

All councils in the Wellington Region map flooding based on a 1% AEP, or 1-in-100-year, flood event, but with different rainfall, climate change and sea level rise scenarios.

Wellington City Council mapping is based on a 1:100 year rainfall event assuming a 20% increase in rainfall under climate change and 1m sea level rise.

<sup>3</sup> Applies only to new structures erected within the fault band as a Discretionary Activity

<sup>4</sup> Insofar as it applies to buildings associated with the activity

<sup>5</sup> Insofar as it applies to buildings associated with the activity

Porirua City Council uses a 1:100 year rainfall event assuming a 15% increase in rainfall under climate change and 1m of sea level rise.

Kāpiti Coast uses 1% AEP flood modelling in its District Plan. However, we were unable to find what assumptions had been used in this modelling as the data is quite dated.

Upper Hutt City Council uses a 1 in 100 year flood incorporating climate change to 2090 and freeboard. The District Plan does not base flooding rules on hazard sensitivity.

The Proposed Lower Hutt District Plan maps a 1% AEP flood event assuming an increased rainfall (20% assumption) and 1.59m sea level rise.

The combined Wairarapa District Plan uses the RCP 8.5H+ scenario (which is the most conservative climate change scenario). However, the sea level rise and rainfall assumptions for this scenario were not available at the time of preparing this report.

The reasons for different flood modelling scenarios within the Wellington Region includes:

- The organisation that undertook the modelling. There are different modelling scenarios between Wellington Water and Greater Wellington Region Council.
- When the modelling was undertaken. Generally, more recent modelling has used more conservative climate change scenarios when compared to earlier models; and
- Local variability in respect to changes in rainfall levels across the region.

| WELLINGTON CITY DISTRICT PLAN                                                           |                    |                       |                     |
|-----------------------------------------------------------------------------------------|--------------------|-----------------------|---------------------|
|                                                                                         | Low Hazard Overlay | Medium Hazard Overlay | High Hazard Overlay |
| Additions for Potentially Hazard Sensitive Activities                                   |                    |                       |                     |
| Additions for Hazard Sensitive Activities                                               |                    |                       |                     |
| Less Hazard Sensitive Activities                                                        |                    |                       |                     |
| Construction or conversion buildings to contain Potentially Hazard Sensitive Activities |                    |                       |                     |
| Construction or conversion buildings to contain Hazard Sensitive Activities             |                    |                       |                     |

| COMBINED WAIRARAPA DISTRICT PLAN |                    |                       |                     |
|----------------------------------|--------------------|-----------------------|---------------------|
|                                  | Low Hazard Overlay | Medium Hazard Overlay | High Hazard Overlay |
|                                  |                    |                       |                     |

|                                                       |  |  |  |
|-------------------------------------------------------|--|--|--|
| Additions for Less Hazard Sensitive Activities        |  |  |  |
| Additions for Potentially Hazard Sensitive Activities |  |  |  |
| Additions for Hazard Sensitive Activities             |  |  |  |
| Less Hazard Sensitive Activities                      |  |  |  |
| Potentially Hazard Sensitive Activities               |  |  |  |
| Hazard Sensitive Activities                           |  |  |  |

| PORIRUA DISTRICT PLAN                                 |                    |                       |                     |
|-------------------------------------------------------|--------------------|-----------------------|---------------------|
|                                                       | Low Hazard Overlay | Medium Hazard Overlay | High Hazard Overlay |
| Additions for Less Hazard Sensitive Activities        |                    |                       |                     |
| Additions for Potentially Hazard Sensitive Activities |                    |                       |                     |
| Additions for Hazard Sensitive Activities             |                    |                       |                     |
| Less Hazard Sensitive Activities                      |                    |                       |                     |
| Potentially Hazard Sensitive Activities               |                    |                       |                     |
| Hazard Sensitive Activities                           |                    |                       |                     |

| PROPOSED LOWER HUTT DISTRICT PLAN                                 |                    |                       |                     |
|-------------------------------------------------------------------|--------------------|-----------------------|---------------------|
|                                                                   | Low Hazard Overlay | Medium Hazard Overlay | High Hazard Overlay |
| Additions for Activities Least Sensitive to Natural Hazards       |                    |                       |                     |
| Additions for Activities Potentially Sensitive to Natural Hazards |                    |                       |                     |
| Additions for Activities Most Sensitive to Natural Hazards        |                    |                       |                     |

|                                                                                                                               |  |  |  |
|-------------------------------------------------------------------------------------------------------------------------------|--|--|--|
| New buildings and structures and the Conversion of Existing Buildings for Activities Least Sensitive to Natural Hazards       |  |  |  |
| New buildings and structures and the Conversion of Existing Buildings for Activities Potentially Sensitive to Natural Hazards |  |  |  |
| New buildings and structures and the Conversion of Existing Buildings for Activities Most Sensitive to Natural Hazards        |  |  |  |

## APPLICATION OF RULES

|                                          | New Buildings  | New Structures | Additions | Activities |
|------------------------------------------|----------------|----------------|-----------|------------|
| <b>Wellington City District Plan</b>     | ✓              | ✗              | ✓         | ✓          |
| <b>Upper Hutt District Plan</b>          | ✓              | ✓ <sup>6</sup> | ✓         | ✓          |
| <b>Combined Wairarapa District Plan</b>  | ✓ <sup>7</sup> | ✗              | ✓         | ✓          |
| <b>Porirua District Plan</b>             | ✓ <sup>8</sup> | ✗              | ✓         | ✓          |
| <b>Proposed Lower Hutt District Plan</b> | ✓              | ✓              | ✓         | ✓          |

## SUMMARY OF APPROACH

The District Plans allow for Less Hazard Sensitive Activities as a permitted activity in the Low Hazard Area. In the Medium and High Hazard Areas, the District Plans vary from having the activity status as either Restricted Discretionary, Discretionary or Non-Complying. However, when looking at the rationale, the general approach is to ensure that the less hazard sensitive activities do not impede flood waters or flood flows.

In the Porirua District Plan and Wellington District Plan, the High Flood Hazard Area are reflective of stream corridors with a set buffer on either side. These are active water channels, so it is not desirable to construct within this area. In the Proposed Lower Hutt City District Plan, the identification of High Hazard Areas for flooding has used a different methodology, based on flood depth and velocity. This different approach to the management of Less Hazard Sensitive Activities in the Proposed Lower Hutt District Plan is reflected in the rule framework.

<sup>6</sup> Applies only to new structures erected within the 1% flood extent of the Te Awa Kairangi as a Discretionary Activity or structure within the stream corridor of the Pinehaven Flood Hazard Extent

<sup>7</sup> Insofar as it applies to buildings associated with the activity

<sup>8</sup> Insofar as it applies to buildings associated with the activity

The District Plans generally take a consistent approach where the construction of new Potentially Hazard Sensitive Activities and Hazard Sensitive Activities in the High Flood Hazard Area are a Non-Complying Activity.

The District Plans take differing and more nuanced approaches to the management of Potentially Hazard Sensitive Activities and Hazard Sensitive Activities in the Medium Hazard Area. Some of this difference is down to a nuancing of provisions. Both the Wellington City District Plan and the Proposed Lower Hutt District Plan have carveouts for significant commercial and industrial areas. This means the framework starts at a permitted activity standard for these carveout areas and then elevates. Outside of these carveout areas, the activity status is Discretionary (which is largely consistent across the district plans, with the exception that Wellington elevates to Non-Complying when a minimum floor level is not met).

The main area where the Proposed Lower Hutt District Plan is different to the Wellington and Porirua District Plans, but is aligned with the Combined Wairarapa District Plan, is that the construction of new residential units in the Low Hazard Area is a Permitted Activity as opposed to Restricted Discretionary Activity. This approach in the Proposed Lower Hutt District Plan reflects the existing practice in the City.

In summary, while there is some variation in the rule framework for the flood hazards across the District Plans, this has occurred for the following reasons:

- Changes in modelling which has resulted in changes to some of the rule frameworks;
- Nuancing of provisions involving areas which have been carved out due to their economic and social importance; and
- Evolution of the provisions over time in response to feedback and additional testing within applications.

The rule frameworks in each district plan apply to new buildings (including where they directly associated with an activity), additions, and activities (including conversions). The Upper Hutt District Plan applies rules to structures only in identified within the flood extent of Te Awa Kairangi, whereas the Proposed Lower Hutt District Plan applies rules to structures more generally.

### 3.4 Liquefaction

| WELLINGTON CITY DISTRICT PLAN           |                    |
|-----------------------------------------|--------------------|
|                                         | Low Hazard Overlay |
| Less Hazard Sensitive Activities        |                    |
| Potentially Hazard Sensitive Activities |                    |
| Hazard Sensitive Activities             |                    |

| COMBINED WAIRARAPA DISTRICT PLAN          |                    |
|-------------------------------------------|--------------------|
|                                           | Low Hazard Overlay |
| Additions in all hazard sensitivity areas |                    |

|                                         |  |
|-----------------------------------------|--|
| Less Hazard Sensitive Activities        |  |
| Potentially Hazard Sensitive Activities |  |
| Hazard Sensitive Activities             |  |
|                                         |  |

| PROPOSED LOWER HUTT DISTRICT PLAN                   |                    |
|-----------------------------------------------------|--------------------|
|                                                     | Low Hazard Overlay |
| Additions in all hazard sensitivity areas           |                    |
| Activities Least Sensitive to Natural Hazards       |                    |
| Activities Potentially Sensitive to Natural Hazards |                    |
| Activities Most Sensitive to Natural Hazards        |                    |
|                                                     |                    |

## APPLICATION OF RULES

|                                          | New Buildings  | New Structures | Additions | Activities |
|------------------------------------------|----------------|----------------|-----------|------------|
| <b>Wellington City District Plan</b>     | ✗              | ✗              | ✗         | ✓          |
| <b>Combined Wairarapa District Plan</b>  | ✓ <sup>9</sup> | ✗              | ✓         | ✓          |
| <b>Proposed Lower Hutt District Plan</b> | ✓              | ✓              | ✓         | ✓          |

## SUMMARY OF APPROACH

Wellington City Council and the Combined Wairarapa District Councils manage liquefaction through their district plans. The Proposed Lower Hutt District Plan proposes the same approach. Activities are generally permitted by both plans, except for some Hazard Sensitive Activities, which require consent as Restricted Discretionary Activities.

Kāpiti Coast District Council manages liquefaction risk where subdivision is to occur on peat or sand soils, by requiring supporting geotechnical information. This applies to all activities and zones and is not triggered by activity hazard sensitivity or level of risk.

<sup>9</sup> Insofar as it applies to buildings associated with the activity

The rule frameworks apply differently under each district plan. Wellington City Council only apply liquefaction rules to activities, with the Combined Wairarapa District Council's applying rules to new buildings (where directly associated with an activity), additions, and activities. The Proposed Lower Hutt District Plan applies rules new buildings and structures, additions, and activities (including conversions).

### 3.5 Soft soils

Upper Hutt District Plan manages soft soils in Mangaroa through the Mangaroa Peat Overlay. The District Plan rules allow for activities in Less Hazard Sensitive areas, and only elevates the activity status for subdivision where building platforms are being created for Hazard Sensitive or Potentially Hazard Sensitive activities.

| UPPER HUTT DISTRICT PLAN                                                                 |                    |
|------------------------------------------------------------------------------------------|--------------------|
|                                                                                          | Low Hazard Overlay |
| Less Hazard Sensitive Activities                                                         |                    |
| Subdivision that creates a building platform for Potentially Hazard Sensitive Activities |                    |
| Subdivision that creates a building platform for Hazard Sensitive Activities             |                    |

#### APPLICATION OF RULES

|                                 | New Buildings | New Structures | Additions | Activities |
|---------------------------------|---------------|----------------|-----------|------------|
| <b>Upper Hutt District Plan</b> | x             | x              | x         | ✓          |

This is a uniquely localised issue within Upper Hutt City and therefore this rule framework is not present in any other councils. The rule framework applies to all less hazard sensitive activities within the overlay area, and where building platforms are created through subdivision.

### 3.6 Coastal hazards

Wellington City Council, Porirua City Council and Lower Hutt City Council map coastal hazards within their district plans. Wellington City Council maps tsunamis for 1:100, 1:500 and 1:1000 year scenarios with 1m sea level rise, as well as existing coastal inundation with a 1:100 year storm and a 1:100 year storm with 1.43m sea level rise. Porirua City Council maps tsunamis for 1:100, 1:500 and 1:1000 year inundation extents with 1m of sea level rise, coastal hazards for current inundation risk and a 1:100 year storm surge with 1m sea level rise, and coastal erosion hazard for current risk and future risk with 1m sea level rise.

The Lower Hutt City Council maps tsunamis for the 1:100, 1:500 and 1:1000 year scenarios with 1m sea level rise, the existing coastal inundation extent with 1% AEP storm tide and wave setup, and the coastal inundation extent with 1.59m relative sea level rise and 1% AEP storm tide and wave set up.

The Combined Wairarapa District Plan states that a comprehensive coastal hazard assessment is yet to be undertaken for the Wairarapa and in the absence of such an assessment, a Foreshore Protection Area has been identified. This area incorporates the area 50 metres inland of the MHWS, with the exception of Riversdale where the Foreshore Protection Area has been mapped based on a local hazard assessment. Rules that apply in the Foreshore Protection Area are not determined based on hazard sensitivity or level of risk. Generally, non-habitable buildings and structures are permitted to a maximum floor area of 15m<sup>2</sup> and height of 3m, before the activity status elevates to Restricted Discretionary or Non-Complying. All new residential activities within the Foreshore Protection Area require consent as Non-Complying Activities.

The Kāpiti District Plan reviews in 2014 and 2017 did not include coastal hazard provisions and therefore coastal-hazard related provisions in the District Plan 1999 remain operative. There are no rules that apply to coastal hazards.

Upper Hutt City has no coastal boundaries and therefore does not have any coastal hazard mapping.

| <b>WELLINGTON CITY DISTRICT PLAN</b>                                                       |                    |                       |                     |
|--------------------------------------------------------------------------------------------|--------------------|-----------------------|---------------------|
|                                                                                            | Low Hazard Overlay | Medium Hazard Overlay | High Hazard Overlay |
| Additions for Less Hazard Sensitive Activities                                             |                    |                       |                     |
| Additions for Potentially Hazard Sensitive Activities                                      |                    |                       |                     |
| Additions for Hazard Sensitive Activities                                                  |                    |                       |                     |
| Less Hazard Sensitive Activities                                                           |                    |                       |                     |
| Construction or conversion of buildings to contain Potentially Hazard Sensitive Activities |                    |                       |                     |
| Construction or conversion of buildings to contain Hazard Sensitive Activities             |                    |                       |                     |

| <b>PORIRUA DISTRICT PLAN</b>                          |                    |                       |                     |
|-------------------------------------------------------|--------------------|-----------------------|---------------------|
|                                                       | Low Hazard Overlay | Medium Hazard Overlay | High Hazard Overlay |
| Additions for Less Hazard Sensitive Activities        |                    |                       |                     |
| Additions for Potentially Hazard Sensitive Activities |                    |                       |                     |
| Additions for Hazard Sensitive Activities             |                    |                       |                     |
| Less Hazard Sensitive Activities                      |                    |                       |                     |
|                                                       |                    |                       |                     |

|                                         |  |  |  |
|-----------------------------------------|--|--|--|
| Potentially Hazard Sensitive Activities |  |  |  |
| Hazard Sensitive Activities             |  |  |  |

| PROPOSED LOWER HUTT DISTRICT PLAN                                                                      |                    |                       |                     |
|--------------------------------------------------------------------------------------------------------|--------------------|-----------------------|---------------------|
|                                                                                                        | Low Hazard Overlay | Medium Hazard Overlay | High Hazard Overlay |
| Additions for Activities Least Sensitive to Natural Hazards                                            |                    |                       |                     |
| Additions for Activities Potentially Sensitive to Natural Hazards                                      |                    |                       |                     |
| Additions for Activities Most Sensitive to Natural Hazards                                             |                    |                       |                     |
| Construction or conversion of buildings to contain Activities Least Sensitive to Natural Hazards       |                    |                       |                     |
| Construction or conversion of buildings to contain Activities Potentially Sensitive to Natural Hazards |                    |                       |                     |
| Construction or conversion of buildings to contain Activities Most Sensitive to Natural Hazards        |                    |                       |                     |

#### APPLICATION OF RULES

|                                   | New Buildings | New Structures | Additions | Activities |
|-----------------------------------|---------------|----------------|-----------|------------|
| Wellington City District Plan     | ✓             | ✗              | ✓         | ✓          |
| Porirua District Plan             | ✓             | ✗              | ✓         | ✓          |
| Proposed Lower Hutt District Plan | ✓             | ✓              | ✓         | ✓          |

#### SUMMARY OF APPROACH

The District Plans allow for Less Hazard Sensitive Activities and associated additions as a permitted activity in the Low, Medium and High Hazard Areas.

In the Low Hazard Area of the Coastal Hazard Overlays, the Wellington and Proposed Hutt City District Plans have Potentially Hazard Sensitive Activities as permitted, whereas the Porirua District Plan has these as a Controlled Activity.

In the Low Hazard Area of the Coastal Hazard Overlays, Wellington City and the Proposed Lower Hutt District Plans, have the majority of Hazard Sensitive Activities as permitted, with several exceptions elevated to Restricted Discretionary Activity status. The same exceptions apply to both Wellington City and the Proposed Lower Hutt District Plan.

Porirua City has all Hazard Sensitive Activities as a Restricted Discretionary Activity, which elevates to Discretionary, when the 1:1000 year tsunami floor level is not met.

For Medium Hazard Area of the Coastal Hazard Overlays, the Wellington and Proposed Lower Hutt District Plans have Potentially Hazard Sensitive Activities as permitted, which elevate to a Restricted Discretionary Activity status where the permitted activity standards are not met. For both of these district plans, the permitted framework applies to their carveout areas, with Potentially Hazard Sensitive Activities outside of these carveouts being Restricted Discretionary Activities.

Porirua City has all Potentially Hazard Sensitive Activities as a Restricted Discretionary Activity, which elevates to Discretionary when the floor level requirements for tsunami and inundation are not met.

For Medium Hazard Area of the Coastal Hazard Overlays, the Wellington and Proposed Lower Hutt District Plans have Hazard Sensitive Activities as permitted, which elevate to a Restricted Discretionary Activity where the permitted activity standards are not met. For both District Plans, the permitted framework applies to their carveout areas, with Potentially Hazard Sensitive Activities outside of these carveouts being a Discretionary Activity.

Porirua City has all Hazard Sensitive Activities as a Discretionary Activity in the Medium Hazard Overlay.

For High Hazard Area of the Coastal Hazard Overlays, the Wellington and Proposed Lower Hutt District Plans have Hazard Sensitive Activities as permitted, which elevate to a Restricted Discretionary Activity where the permitted activity standards are not met. For both of these District Plans, the permitted framework applies to their carveout areas, with Hazard Sensitive Activities outside of these carveouts being a Non-Complying Activity.

Porirua City has all Hazard Sensitive Activities as a Non-Complying Activity in the High Hazard Area.

The Combined Wairarapa District Plan takes a blunt approach to the management of natural hazard risk in the coastal environment. Rules that apply in the Foreshore Protection Area are not determined based on hazard sensitivity or level of risk. Generally, non-habitable buildings and structures are permitted to a maximum floor area of 15m<sup>2</sup> and height of 3m, before the activity status elevates to Restricted Discretionary or Non-Complying. All new residential activities within the Foreshore Protection Area require consent as Non-Complying Activities. It is, however, recognised that the Wairarapa has very different natural hazard risk exposure to coastal hazards when compared to Wellington, Porirua and Lower Hutt, due to the largely undeveloped nature of its coastline.

In summary, while there is some variation in the framework for the coastal hazards across the District Plans, this has occurred for the following reasons:

- Evolution of the provisions over time in response to feedback and additional testing within applications;

- Nuancing of provisions involving areas which have been carved out due to their economic and social importance; and
- Difference in natural hazard risk exposure within the coastal environment.

The rule frameworks in each district plan apply to new buildings (including where they directly associated with an activity), additions, and activities (including conversions). The Proposed Lower Hutt District Plan also applies rules to structures more generally.

## 4 SUMMARY

The Proposed Lower Hutt District Plan is broadly consistent with the regional approach to natural hazard mapping. Fault hazard and tsunami modelling align with the wider Wellington Region, while slope stability mapping is similar to the approach used by Upper Hutt City Council. Coastal inundation modelling is more conservative in Hutt City, using the largest sea level rise assumption in the region; by comparison, Wellington City Council and Porirua City Council use a 1m sea level rise assumption. Flood modelling varies more significantly across the region, reflecting differences in when the modelling was undertaken, local climate change assumptions, and whether the modelling was prepared by Wellington Water or Greater Wellington Regional Council. The Wairarapa Councils use the most conservative flood modelling assumptions, followed by Lower Hutt, while Wellington City Council and Porirua City Council are largely aligned.

In terms of the rule frameworks, the Proposed Lower Hutt District Plan is generally consistent with the approach taken across the region, although it includes some refinements. The fault hazard framework is broadly consistent with other district plans, with the Proposed Lower Hutt District Plan taking a slightly more nuanced approach. The slope stability framework is effectively the same as the Upper Hutt City District Plan approach. For tsunami and coastal inundation hazards, the rule framework is largely consistent with that of the wider region, with most of the refinement occurring in identified carveout areas. Flood hazards are the main area of difference: the Proposed Lower Hutt District Plan provides for some Hazard Sensitive Activities as permitted activities, which differs from other parts of the region. While there is local variability, the regional approach is that as hazard risk increases, and as the sensitivity of an activity to that hazard increases, the activity status also becomes more restrictive, noting differences in the application of Restricted Discretionary and Discretionary activity statuses.