RMA FORM 5

Submission on publicly notified proposed district plan change

Clause 6 of Schedule 1, Resource Management Act 1991

To: Chief Executive, Hutt City Council

1. This is a submission from:

Full name	*Last* Horrocks	*First* Jo
Company/organisation	Toka Tū Ake - EQC	
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2. This is a submission on the following proposed change to the City of Lower Hutt District Plan:

Proposed District Plan Change No:	**56**
Title of Proposed District Plan Change:	**Enabling Intensification in Residential and Commercial Areas**

3. I ☐ ■ **could not** gain an advantage in trade competition through this submission.

(Please tick one)

4. If you could gain an advantage in trade competition through this submission:

I ☐ ■ **am not** directly affected by an effect of the subject matter of that submission that–

(a) adversely affects the environment; and

(b) does not relate to trade competition or the effects of trade competition:

(Please tick one)

Note: if you are a person who could gain an advantage in trade competition through the submission, your right to make a submission may be limited by clause 6(4) of Part 1 of Schedule 1 of the Resource Management Act 1991.

5. The specific provisions of the proposal that my submission relates to are:

1. AMENDMENT 30 [Chapter 1 (*1.10.11 Lessening Natural Hazards*)]
2. AMENDMENT 49 [Chapter 4 Residential] - *(g) High Density Residential Activity Area*
3. AMENDMENT 404 [Chapter 14H Natural Hazards (Introduction)] - *Add Overlays section*
4. AMENDMENT 412 [Chapter 14H Natural Hazards (Issue, Objective and Policies)] – *Add new policy 14H 1.2*
5. AMENDMENT 427 [Chapter 14H Natural Hazards (Rules)] – *Add new Rule 14H 2.3 New residential units, commercial activities or retail activities in the Inundation Area of the Flood Hazard Overlay*
6. AMENDMENT 433 [Chapter 14H Natural Hazards (Rules)] - *Add new Rule 14H 2.9 New residential units in the High Coastal Hazard Area*

6. Our submission is:

- Amend chapter 1.10.11 Lessening Natural Hazards to include liquefaction and slope stability as qualifying matters and implement policies and rules to restrict intensification and development in areas where the risk of these hazards is greatest.
- Oppose Chapter 4 Residential - (g) High Density Residential Activity Area with regards to intensification in Petone and Eastbourne. Petone and Eastbourne are at risk from multiple natural hazards and high-density residential zones should be avoided in these areas.
- Amend Chapter 14H Natural Hazards (Introduction) - Add Overlays section and planning maps to include liquefaction and slope stability hazard overlays.
- Retain policy 14H 1.2 as written
- Specify the freeboard requirements of buildings within Flood Hazard Areas in line with National Planning Standard 4404:2010, and include flood hazard information within LIMs
- Remove Rule 14H 2.9 New residential units in the High Coastal Hazard Area. Intensification and further development within high hazard areas should be avoided. Replace with New Residential units in the High Coastal Hazard Area are prohibited.
- The High Coastal Hazard Zone is extended as shown in Figures 5 and 6 so that future development (intensification) of this area is avoided to reduce the future risks that climate change will bring.

<u>1 – (amendment 30) and 3 (amendment 404).</u> **Amend.**

The Hutt Valley is at high risk of earthquake shaking due to the proximity of the Wellington Fault and other active faults in the region. While the Hutt City proposed district plan change limits development close to the Wellington Fault to reduce risk to life and property close to the fault, the plan does not consider further-field effects of ground shaking. Liquefaction and earthquake induced landslides are of particular concern in Lower Hutt due to soft, liquefaction-prone soils in the southern part of the Hutt Valley, and the steep slopes at the edges of the Hutt Valley and in Wainuiomata.

<u>Liquefaction</u>:
Most of Petone, Alicetown, Moera, and Seaview, and parts of Melling, Woburn and Wainuiomata have soils which are classified as being at high risk of liquefaction in the Greater Wellington Regional Council liquefaction hazard map[1] (Figure 1). Several of these areas overlap with the high-density residential development zones in the proposed plan change.

[1] https://data-gwrc.opendata.arcgis.com/datasets/9d2074c4bc5b40e1b4352abd1f2e1ebf/explore

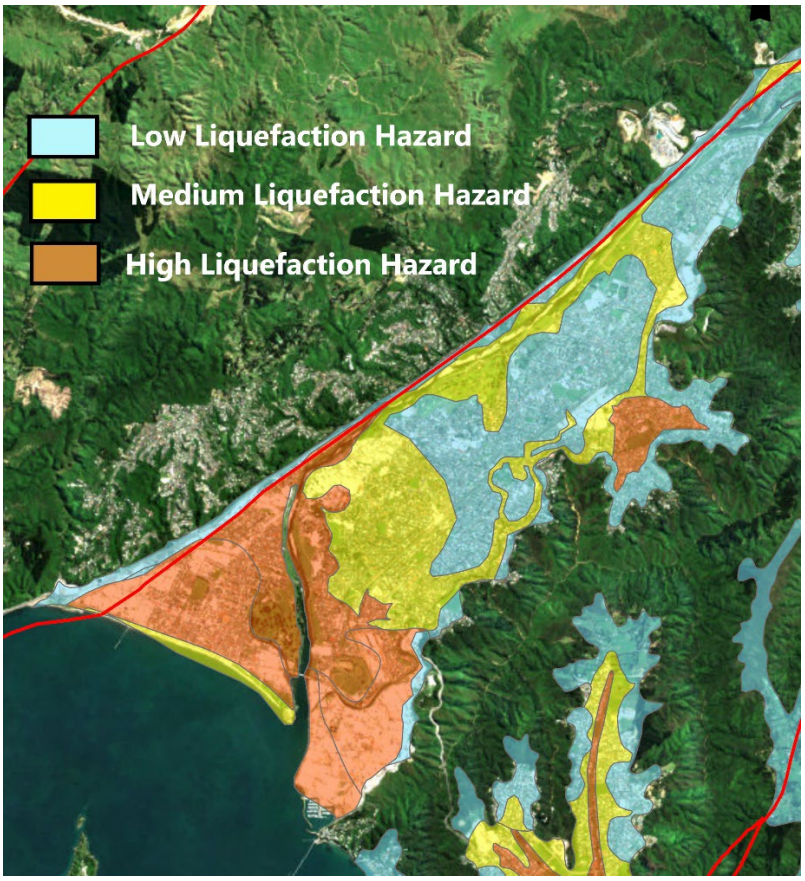


Figure 1: Liquefaction susceptibility map showing high (orange), medium (yellow) and low (blue) susceptibility to liquefaction in Lower Hutt. Data from Greater Wellington Regional Council

A provisional Tonkin & Taylor report on the impact of liquefaction in Lower has found that Petone and other southern suburbs of Lower Hutt are likely to have increased damage from liquefaction. A key finding from T&T is that certain building types are more susceptible to damage from liquefaction. Increased floor size (i.e. above 100m^2), height above one story and an irregular footprint increase the risk of liquefaction damage[2]. Severe liquefaction under the foundations of a building during an earthquake can cause it to sink, becoming uninhabitable and requiring complete rebuilding, even if the building does not suffer damage from shaking. As buildings of up to 22 m tall are permitted in the high-density residential zone, there will be an increased risk of damage and disruption from liquefaction. Damage could be reduced by limiting the floor area, requiring only single story and regular shape.

While foundation types as specified in the Building Act can reduce damage from liquefaction, it is important to also reduce risk by appropriate zoning. Property damage and associated disruption to life and wellbeing can be further reduced by avoiding intensification in areas at high risk of liquefaction.

On the 5th August 2022 a presentation by T&T was given to the Hutt City Council outlining the liquefaction hazard in Lower Hutt[3]. This presentation emphasized that targeted intensification in locations in the Hutt Valley with lower liquefaction hazard will result in lower building loss and lower rebuild costs in the wake of an earthquake, than if intensification is untargeted and spread across Lower Hutt[2]. T&T modelling of the current intensification areas shows that the resilience of Hutt City is greatly reduced, with a mean loss of $99,000 per property and 4,100 rebuilds. With more targeted intensification to the north of the CBD these losses are reduced to $87,000 per property and 3,000 rebuilds (refer to Appendix 1).

As such, a regulatory Liquefaction hazard overlay, such as that available from the Greater Wellington Regional Council should be included in the planning maps. Liquefaction risk should be included in the Natural Hazards section of the plan, with rules implemented to restrict development in high-risk areas. Guidance from MBIE/MFE[4] on planning and engineering for potentially liquefication-prone land should be used as a basis to develop policies and rules.

[2] See attached appendix a, containing results from upcoming Tonkin & Taylor liquefaction report
[3] Tonkin & Taylor "Earthquake Loss Modelling, Lower Hutt", Hutt City Council, 2022
[4] https://www.building.govt.nz/assets/Uploads/building-code-compliance/b-stability/b1-structure/planning-engineering-liquefaction.pdf

Slope Stability:
Lower Hutt is at risk of both earthquake and rain-induced landslides, due to the high rainfall, earthquake risk, and high density of slopes steeper than 20˚. As demonstrated by the numerous recent storm-induced landslides in the Wellington and Nelson regions, climate change is likely to increase the frequency and intensity of rainfall events likely to trigger landslides. A rupture of the Wellington Fault is also likely to trigger landslides on slopes close to the fault, including suburbs of Lower Hutt on the eastern and western hills of the Hutt Valley.

The proposed district plan currently only considers slope instability in rules for earthworks. We recommend a Landslide Hazard overlay is included in the Plan, with policies restricting development within high-hazard areas to preclude inconsistent application of earthworks rules and prevent subdivision and development on slopes prone to failure.

2 – (amendment 49). **Oppose in Part**

The proposed plan change has extensive areas zoned for High Density Residential development, including the majority of Petone and parts of Eastbourne, suburbs which are at risk from multiple natural hazards including flooding, coastal inundation, liquefaction, and tsunami.

Several of these hazards are likely to increase in risk with the impact of climate change. Sea level rise will increase the extent of coastal inundation during a storm, and there is likely to be an increase in the frequency and intensity of storms which cause coastal and river flooding. Increased sea levels may also raise the ground water level, increasing the liquefaction potential. Additionally, an earthquake on the Wellington Fault is expected to cause up to 1.9 m of subsidence in Petone[5] (Figure 2), leaving part of the suburb below current sea level and greatly increasing flooding risk.

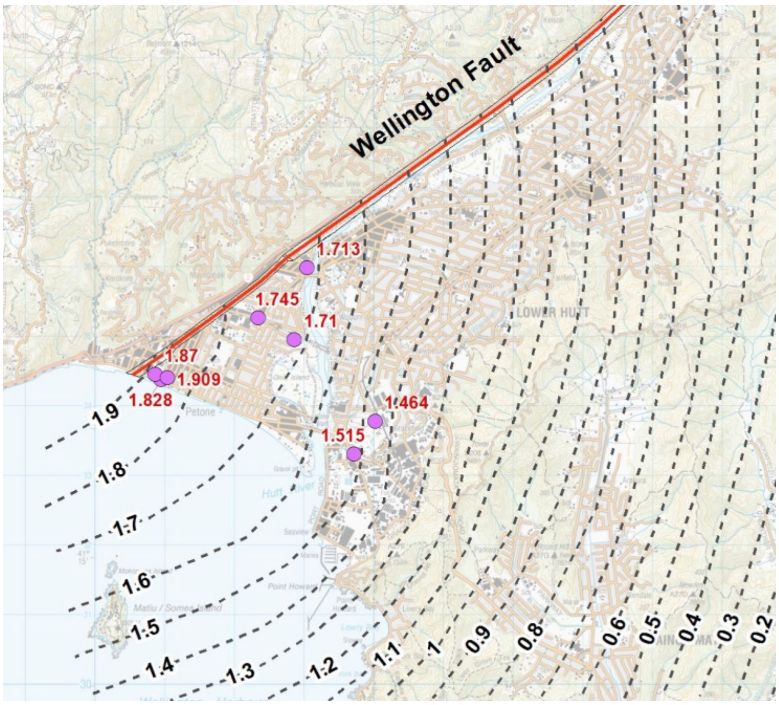


Figure 2: Contours of expected subsidence across lower Hutt in the wake of a Wellington Fault earthquake, including expected subsidence at specific points (pink dots). From Townsend et al (2015).

While the risks from flooding, coastal storm surges and liquefaction are largely to property and wellbeing, tsunami are a low probability, high impact hazard which relies on efficient evacuation of likely inundation areas to save lives. The suburb of Petone is almost entirely contained within Greater Wellington Regional Council's orange tsunami evacuation overlay, so evacuation of all residents will be

[5] Townsend, D.B.; Begg, J.G.; Van Dissen, R.J.; Rhoades, D.A.; Saunders, W.S.A.; Little, T.A. 2015. Estimating Co-Seismic Subsidence in the Hutt Valley associated with Rupture of the Wellington Fault, GNS Science Report 2015/02. 73 p.

necessary in the event of a tsunami.

Modelling by GNS Science of tsunami evacuation indicates that residents in eastern Petone may take up to 45 minutes to reach a safe zone because evacuation eastward is blocked by the Hutt River[6] (Figure 3), while a local source tsunami may take as little as five minutes to reach shore[4]. In addition, research into evacuation rates in Aotearoa New Zealand[7] found that in 2015 around one third of people did not intend to evacuate or evacuate fast enough, and a similar response occurred in Kaikoura in 2016. Increasing residential density in Petone will increase the number of people at risk from tsunami and potentially cause congestion and deaths in the event of an evacuation.

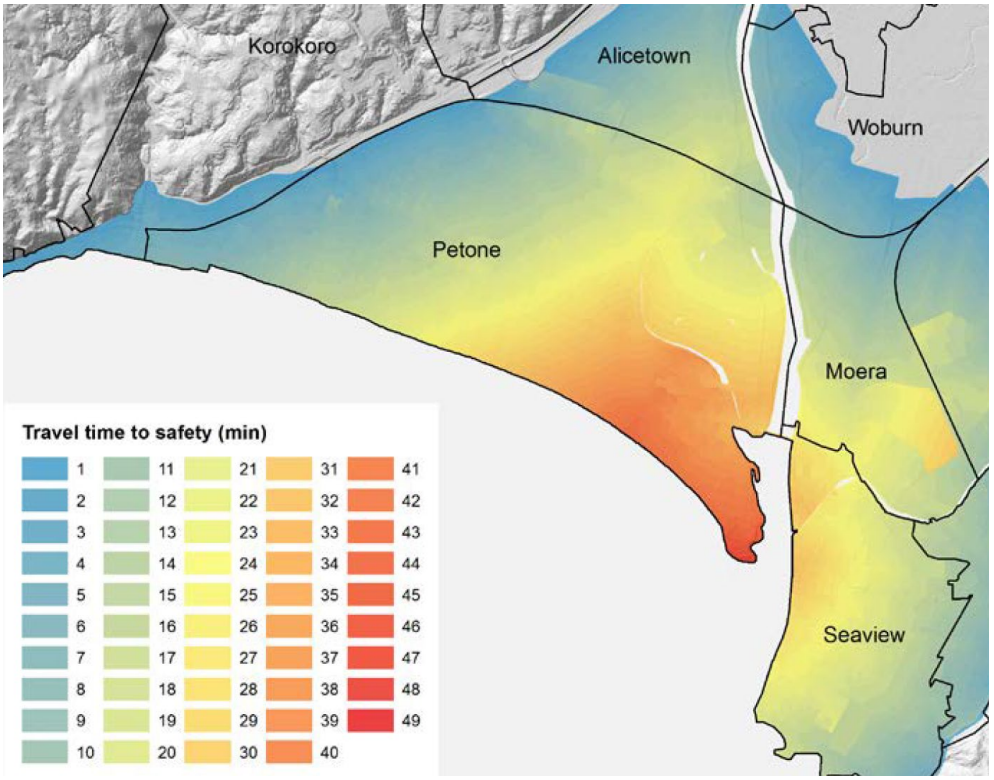


Figure 3: Modelled evacuation times for parts of Lower Hutt into tsunami safe zones. From Lucovic et al (2017).

Given the current level of risk from multiple natural hazards in Petone, and the likelihood that the risk will increase in the near future with climate change, Toka Tū Ake **opposes long term planning for high-density residential intensification in Petone**. It is understood that Petone offers convenient access to public transport networks and local commercial zones, but there are other areas of Lower Hutt which offer similar benefits for intensification, and do not put residents at the same level of risk to life and property.

We encourage the use of natural hazards as a qualifying matter to avoid intensification within areas subject to natural hazard risk.

4 – (amendment 412). **Support**

Toka Tū Ake EQC supports exclusion zones of 20m or more around the Wellington Fault, wherein development is restricted, and residential buildings are not permitted.

5 – (amendment 427). **Amend**

The proposed changes to the district plan specify that new residential units, commercial activities or retail activities are permitted activities within the inundation area of the Flood Hazard Overlay provided that the finished floor levels of the building are located above the 1% Flood Annual Exceedance

[6] 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

[7] Dhellemmes et al, 2021. Tsunami awareness and preparedness in Aotearoa New Zealand: The evolution of community understanding. International Journal of Disaster Risk Reduction 65.

Probability Level, including an allowance for freeboard.

Toka Tū Ake EQC supports the use of freeboard specifications to minimize property damage from flooding in at-risk areas. However, it is important to specify the amount of freeboard allowance required to minimize risk from flooding. New Zealand Planning Standard 4404:2010 requires that habitable buildings have 0.5 m of freeboard above the 1% AEP flood level, commercial and industrial buildings have 0.3 m freeboard, and uninhabited structures such as garages have 0.2 m freeboard. The Lower Hutt district plan should specify the level of freeboard required for different building types, to avoid confusion and inconsistent application of rules.

Flooding and coastal inundation events can have severe negative impacts on residents even when buildings are not structurally damaged. There may be damage to outdoor areas and residences may become inaccessible. Those properties within the Flood Hazard Overlay should have the flood risk included in Land Information Memorandums, rather than primarily relying on the District Plan to communicate this risk. Warning systems should also be in place for those living in the Flood Hazard Overlay, so they can understand the hazard, plan for evacuation, and know what to do when a warning is provided.

6 – (amendment 433). **Oppose**
Residential development should not be permitted within any hazard overly where the hazard is qualified as High in the District Plan (Figure 4).

The Hutt City Proposed Plan Change 56 contains some areas of proposed high density residential zone which overlap with the mapped High Coastal Hazard zone. Rule 14H 2.9 specifies that within the High Coastal Hazard Zone only two residential buildings are allowed instead of three, but this does not adequately reduce the risk to lives and property from coastal surges and tsunami.

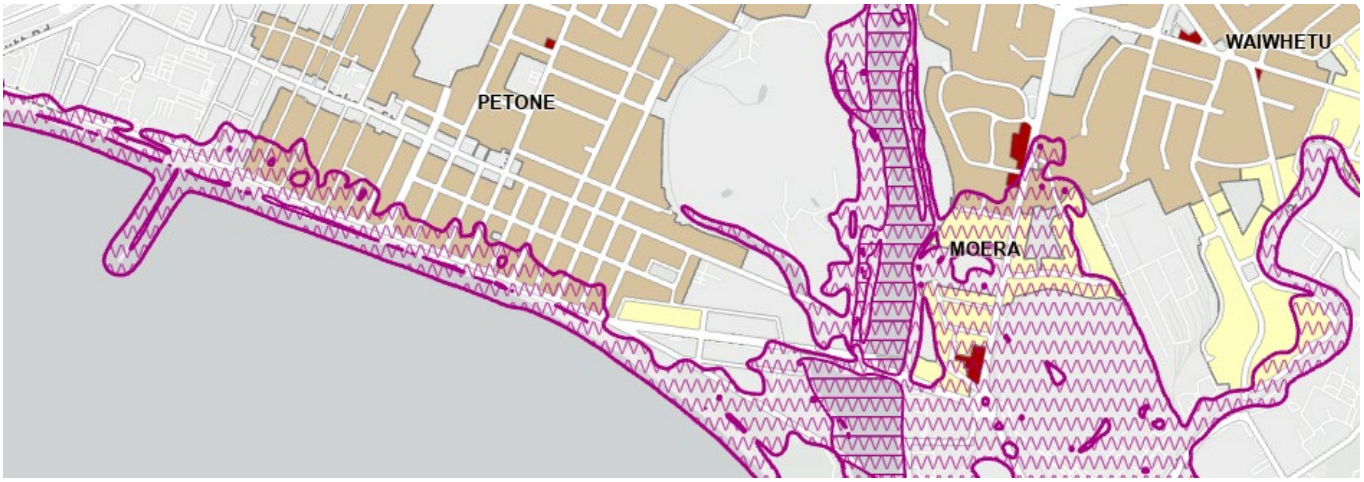


Figure 4: Hutt City Council plan change 56 maps, showing high density residential zones (brown), intersecting with High Coastal hazard zones (tsunami and storm inundation, purple overlay) in Petone and Moera.

Sea level rise and potential seismically induced subsidence[8] in these areas will increase the risk of coastal inundation from storm surges and tsunami. Intensification of these high-risk areas will put more peoples' lives, wellbeing, and property at risk from coastal hazards in the future.

Figure 5 from Greater Wellington's sea level rise modelling shows the extent of inundation that may be expected from 1.4m of sea level rise. This goes beyond the high coastal hazard zone shown in the plan change maps, into the area north of Jackson Street to Alicetown. Figure 5 shows that with the expected

[8] The NZ SeaRise project shows sea level rise and vertical land movement under potential climate change scenarios, available online at searise.nz/maps-2

1.4m in sea level rise, the consequences for Petone, Alicetown and Moera are considerable.

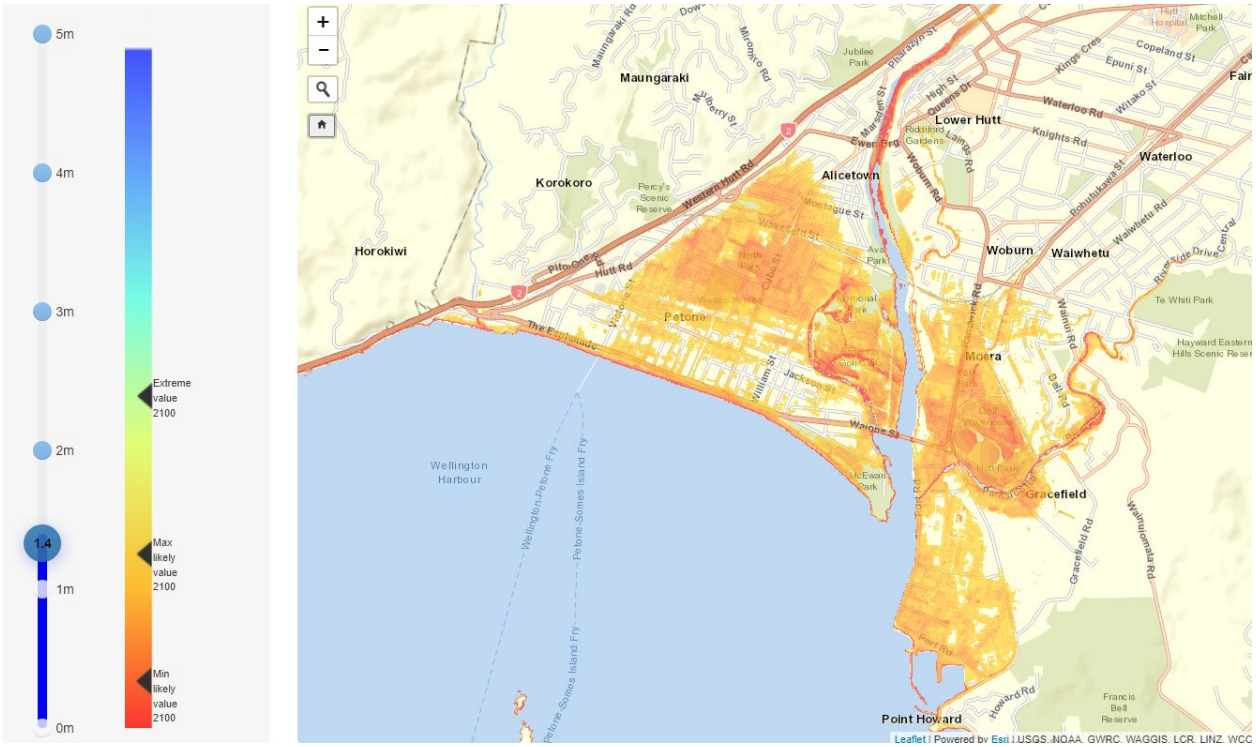


Figure 5: The area of Petone with modelled 1.4m sea level rise (based on sea level rise is very likely to rise up to ~1.3m by 2100). (Greater Wellington https://mapping1.gw.govt.nz/GW/SLR/)

Figure 6 from Greater Wellington's storm surge modelling shows the extent of inundation that may be expected from 1.5m of sea level rise. Similar to Figure 5, Figure 6 shows that the entire area of Petone, Moera and the southern part of Alicetown will be affected by inundation from storm surge. The consequences of this salt water inundation will be considerable for those living in these locations.

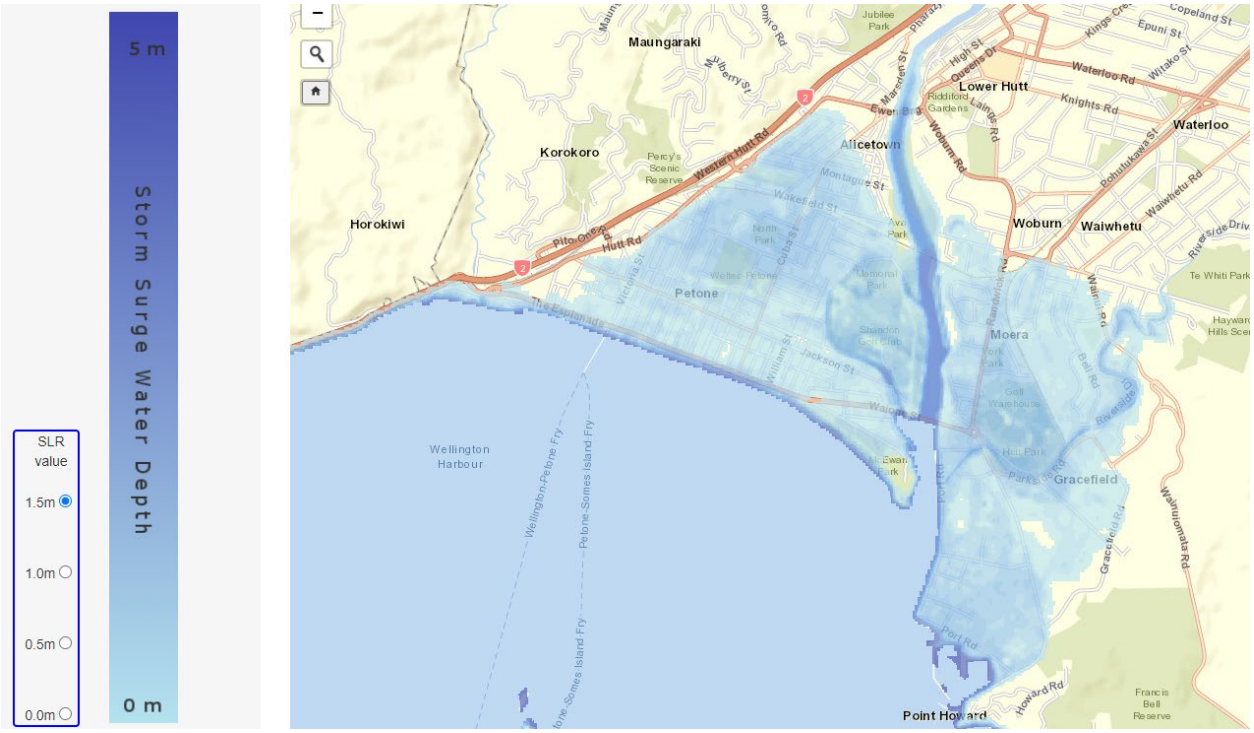


Figure 6: The area of Petone with modelled storm surge including1.5m sea level rise (Greater Wellington https://mapping1.gw.govt.nz/GW/SLR/)

While not shown in Figures 5 or 6, the road to Eastbourne is also regularly impacted by coastal inundation, and these disruptions will only increase with climate change. Due to the fragility of the road and lack of alternative access to Eastbourne and other bays, we recommend further development in this area is avoided to reduce future access issues.

Rather than allowing for further development in Petone and Eastbourne, any further development should be avoided (prohibited) in the High Coastal Hazard Zone, so the risk is not increasing, and legacy planning issues are avoided in the future. The High Coastal Hazard Zone should also be extended as shown in Figures 5 and 6 so that future development (intensification) of this area is avoided to reduce the future risks that climate change will bring.

7. I seek the following decision from Hutt City Council:

1. Amend chapter *1.10.11 Lessening Natural Hazards* to include liquefaction and slope stability as qualifying matters and implement policies and rules to restrict intensification and development in areas where the risk of these hazards is greatest.
2. Oppose *Chapter 4 Residential - (g) High Density Residential Activity Area* with regards to intensification in Petone and Eastbourne. Petone and Eastbourne are at risk from multiple natural hazards and high-density residential zones should be avoided in these areas.
3. Amend *Chapter 14H Natural Hazards (Introduction) - Add Overlays* section and *planning maps* to include liquefaction and slope stability hazard overlays.
4. Retain *policy 14H 1.2* as written
5. Specify the freeboard requirements of buildings within Flood Hazard Areas in line with National Planning Standard 4404:2010, and include flood hazard information within LIMs
6. Remove *Rule 14H 2.9 New residential units in the High Coastal Hazard Area.* Intensification and further development within high hazard areas should be avoided. Replace with *New Residential units in the High Coastal Hazard Area are prohibited.*
7. The High Coastal Hazard Zone is extended as shown in Figures 5 and 6 so that future development (intensification) of this area is avoided to reduce the future risks that climate change will bring.

8. I ☐ ■ **do not wish** to be heard in support of my submission.

(Please tick one)

9. If others make a similar submission,

I ☐ ■ **will not** consider presenting a joint case with them at the hearing.

(Please tick one)

Signature of submitter: *(or person authorised to sign on behalf of submitter)*		20/09/2022 *Date*

(a signature is not required if you make your submission by electronic means)

Privacy Statement

The information you provide in this submission, including your name and contact details, will be provided to other submitters and published on Hutt City Council's website. Hutt City Council is required to collect and publish this information under the Resource Management Act 1991. Your contact details will be removed from Council's website when the further submissions process has been completed, however your name will still appear in the hearing and decision reports.

You have the right to ask for a copy of any personal information we hold about you, and to ask for it to be corrected if you think it is wrong. If you'd like to ask for a copy of your information, or to have it corrected, please contact us at informationmanagementteam@huttcity.govt.nz or call 04-570-6666.

Where to send your submission

- **By email (preferred):** district.plan@huttcity.govt.nz
- **By post:** Hutt City Council, Private Bag 31912, Lower Hutt 5040
- **In person:** At the Hutt City Council Customer Service Centre, 30 Laings Road, Lower Hutt

Appenidx 1 – T&T poster on liquefaction losses in Lower Hutt

Earthquake Loss Modelling of Lower Hutt to Inform Future Growth Planning

Lacrosse, V., McDougall, N., van Ballegooy, S., Bird, E.

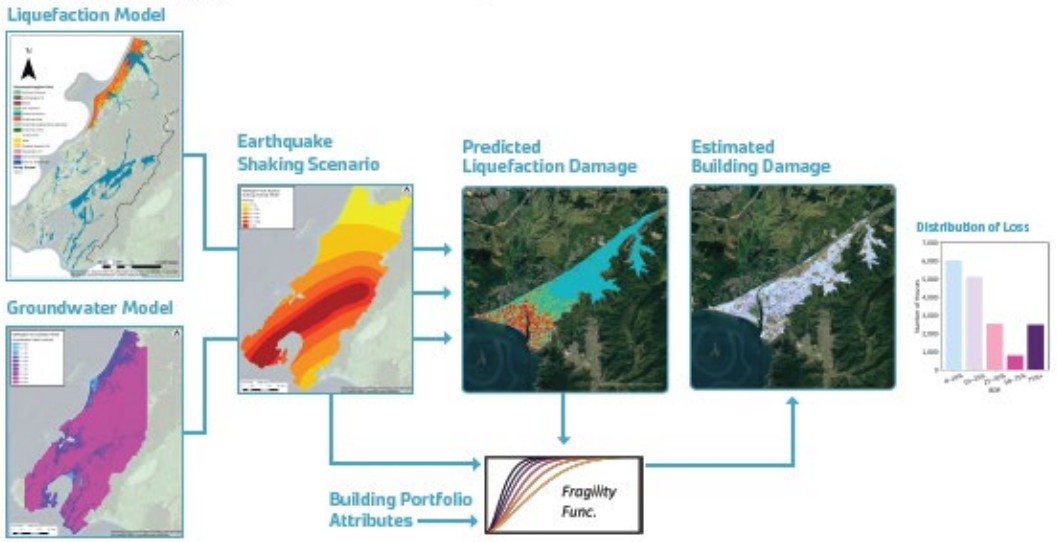
Overview

A series of earthquake loss modelling scenarios are being run to compare different options for growth in Lower Hutt. For different earthquake scenarios, the modelling gives estimates of the number of houses sustaining different severities of damage due to both shaking and liquefaction, the number of houses needing to be rebuilt, and hence the number of displaced individuals. The loss modelling scenarios are also used to compare:

- The performance of different building types, building shapes and foundation types
- The impact of sea level rise on future potential increased liquefaction damage to the housing stock
- The difference in expected building damage depending on where future intensification occurs and hence the benefit associated with avoiding intensification in certain areas.

Applying Damage Functions

In the last two years, new shaking and liquefaction building damage functions have been created. They are used to quantify earthquake damage to houses as a result of shaking and liquefaction for different sized earthquakes and are informed by data collated on the performance of residential properties throughout the Canterbury Earthquake Sequence 2010-2011. These damage functions can be broken down by foundation type, building size/shape and construction era.



Intensification of Lower Hutt

There is currently proposed intensification of Lower Hutt. For the purpose of this poster, the following scenarios, assuming a Wellington fault rupture event, are compared:

Current scenario: Earthquake event occurs today with existing residential portfolio

Scenario 1: Intensification occurs everywhere in Lower Hutt and new properties are built with NZS3604 concrete foundations (i.e. current approach)

Scenario 2: Intensification occurs in targeted areas of Lower Hutt and new properties are built using enhanced foundations and the building footprint is more regular

Mean loss: $94,000 per property
Number of rebuilds: 2,500

Mean loss: $99,000 per property
Number of rebuilds: 4,100

Non targeted intensification results in Lower Hutt becoming less resilient (i.e. the estimated mean average loss is now $99k instead of $94k). This is because new builds are typically two storeys or more, and those building types are more likely to sustain damage.

Mean loss: $87,000 per property
Number of rebuilds: 3,000

The expected decrease in resilience can be offset by targeting intensification in areas with better ground and by building smarter and using enhanced foundations.

Conclusion

Where we build and how we build has an impact on the expected building losses following an earthquake event. For example in Lower Hutt, if we intensify in targeted areas and build smarter with enhanced foundations, the estimated mean building losses per property following a Wellington fault rupture event would reduce by more than 10%. Coupled with the impact of sea level rise and the reductions would be greater.

The results from this work can directly inform land use planning and it allows the decisions to be quantified and justified.

This approach can be applied to areas outside of Lower Hutt.

Acknowledgements

This work was made possible and funded by Toka Tū Ake EQC. Special thanks go to Dr Jo Horrocks (Chief Resilience & Research Officer) and Dr Wendy Saunders (Principal Advisor Risk Reduction and Resilience).

Toka Tū Ake EQC

Tonkin+Taylor