



**EAST COAST LAB**  
LIFE AT THE BOUNDARY

# Napier Natural Hazards Resilience Workshop



**Initial Options Report**  
**October 2018**



## Ngā mihi

### Acknowledgement

This workshop report has been developed by East Coast LAB (Life at the Boundary) together with the Joint Centre for Disaster, Napier City Council and Hawke's Bay Civil Defence Emergency Management Group.


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## Purpose of the Report

This report has been commissioned by East Coast Life at the Boundary (ECLAB) to summarise the learnings from the Napier Natural Hazard Resilience Workshop, held at the National Aquarium of New Zealand in Napier on the 19th of September, 2018.

The workshop was organised by Paul Eady (Napier City Council) with the support of Lisa Pearce (HB Civil Defence Emergency Management), Dr. Graham Leonard (GNS Science), Dr. Liam Wotherspoon (Auckland University), Professor David Johnston (Massey University), Jenni Tipler (MBIE), Rick Wentz (Consultant) and Sarah-Jayne McCurrach (MCDEM).

The report provides initial options for how Napier City Council might improve the resilience of its asset and infrastructure management and city planning. While these options are designed for Napier City Council, it is intended that the information contained in this report is shared to support similar initiatives and programmes across New Zealand that aim to increase community resilience for natural hazards.



*Image 1 Participants in the Napier Natural Hazard Resilience Workshop*

## Introduction and Workshop Aim

Napier City is a coastal urban centre located within the Hawke's Bay region of New Zealand. It has an estimated resident population of about 63,900, and covers an area of 106 km<sup>2</sup>, much of it low-lying land, comprising of residential suburbs, commercial and industrial areas, and agricultural land including orchards and vineyards.


Napier City is at significant risk of destructive earthquakes along with distal and local-source tsunami.

The Hawke's Bay region is situated on, or close to, several active faults that can rupture and deform the ground surface. This includes the Napier-Hawke Bay Fault, which tracks through Napier City and the Hikurangi Subduction Margin, located offshore from Napier City. The city has a history of experiencing significant earthquakes, most notably the 1931, Hawke's Bay Earthquake and resultant fire. This earthquake caused significant damage and loss of life and there is a high risk that such a damaging earthquake could occur again. Since that earthquake, Napier has experienced eleven earthquakes of felt intensities of MM6 or greater and suffered millions of dollars of earthquake related damage.



*Image 2 Westshore Embankment Road after 1931 Earthquake*

While records of tsunami impacting on Napier are limited, the city has experienced distal-source tsunami in 1868, 1877 and 1960 generated by earthquakes in Peru and Chile. More recently it experienced a tsunami generated by the 2010 Chilean earthquake, which sent a wave measuring in excess of 1.4 metres into Ahuriri Harbour. Local-source tsunami are most likely to be generated by the Hikurangi Subduction Margin, located



approximately 150 kilometres east from Napier's coast. A tsunami caused by an earthquake on the Hikurangi Subduction Zone is thought to be a plausible candidate for the most destructive that New Zealand is likely to encounter with at-shore wave heights modelled to be in excess of 5 metres at Napier City. More recent tsunami risk modelling has predicted maximum wave heights of between 10-16 metres across the Hawke's Bay region, with 4895 deaths, 3752 injuries and \$5,211 million in economic losses<sup>1</sup>.

Considering this significant risk, Napier City Council organised the Napier Natural Hazard Resilience Workshop. The aim of the workshop was to communicate and better understand the consequences and resilience solutions for destructive earthquake and tsunami which could impact upon Napier City Council's assets and infrastructure. 46 participants attended the workshop representing central and local government, natural hazards research, first responders, infrastructure organisations and community groups. Participants and their organisation are detailed in Appendix 1.


The workshop followed an agenda (detailed in Appendix 4), which focussed on:

1. Considering a worst-case scenario for Napier City to identify earthquake and tsunami impacts
2. Identifying the resulting consequences for the social, built, natural and economic environments
3. Identifying what asset / infrastructure management and city planning activities and solutions could be undertaken to assist residents and visitors to survive and recover from future events
4. Assessing information / knowledge gaps and the best approach to fill these gaps.

This following four sections of this report present the workshop outputs in reference to these agenda items.

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<sup>1</sup> Horspool, N., Cousins, W. J., & Power, W. L. (2015). Review of tsunami risk facing New Zealand: a 2015 update. GNS science consultancy report, 38.



## 1. Exercise Scenario

Workshop participants were asked to consider a worst case scenario, as detailed below, for earthquake and tsunami impacting on the Napier coastline.

*At 15:25 hours on Tuesday, 18<sup>th</sup> of September a locked portion of the Hikurangi plate boundary moved causing a M9.0 earthquake. The epicentre was 30 km north-east of Castlepoint at a depth of 61 km. The first shake lasted 4.5 minutes with all buildings and infrastructure in Napier experiencing severe shaking – MM9-10. During the following 18 hours, four aftershocks of >M5.7 occurred, with landslides and river course changes and severe liquefaction in Napier, Hastings and Gisborne. The earthquake caused large cracks in the ground, and substantial damage to lifelines including bridges and roads, power, and the 'three-waters'. Cellular and data networks were damaged and overloaded. Nine people died in the initial earthquake, and there were 250-350 injuries, some serious.*

*The initial earthquake generated a local-source tsunami that impacted upon the entire New Zealand coastline, with a series of tsunami arriving after. Many residents tried to evacuate the tsunami causing significant road congestion and dangerous traffic behaviour. Multiple waves up to ten metres high inundated the city and extended far inland as shown in Figure 1 below/overleaf. An estimated 30% (19,000) of the Napier population was unable to evacuate before the first wave arrived resulting in considerable loss of life and injuries.*

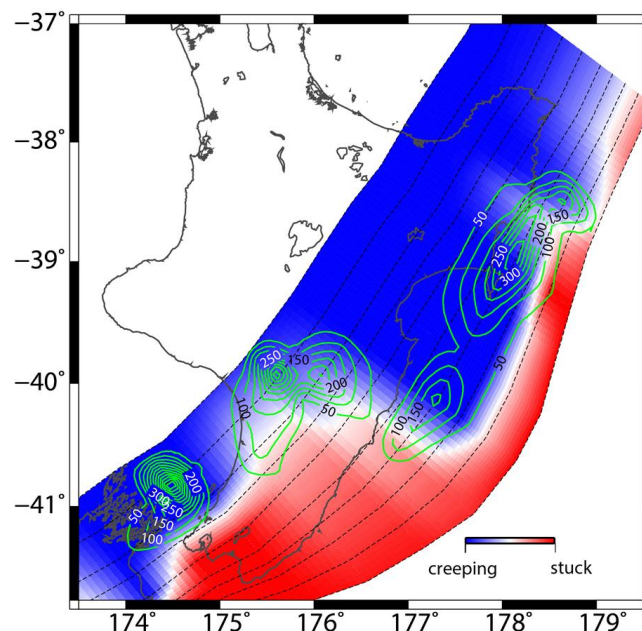


Figure 1 The red area in the image above shows where the fault boundary is locked (where plate coupling is occurring). The blue area shows the plates are creeping past each other, and the green contours show areas of past slow slip events. (GNS Science)

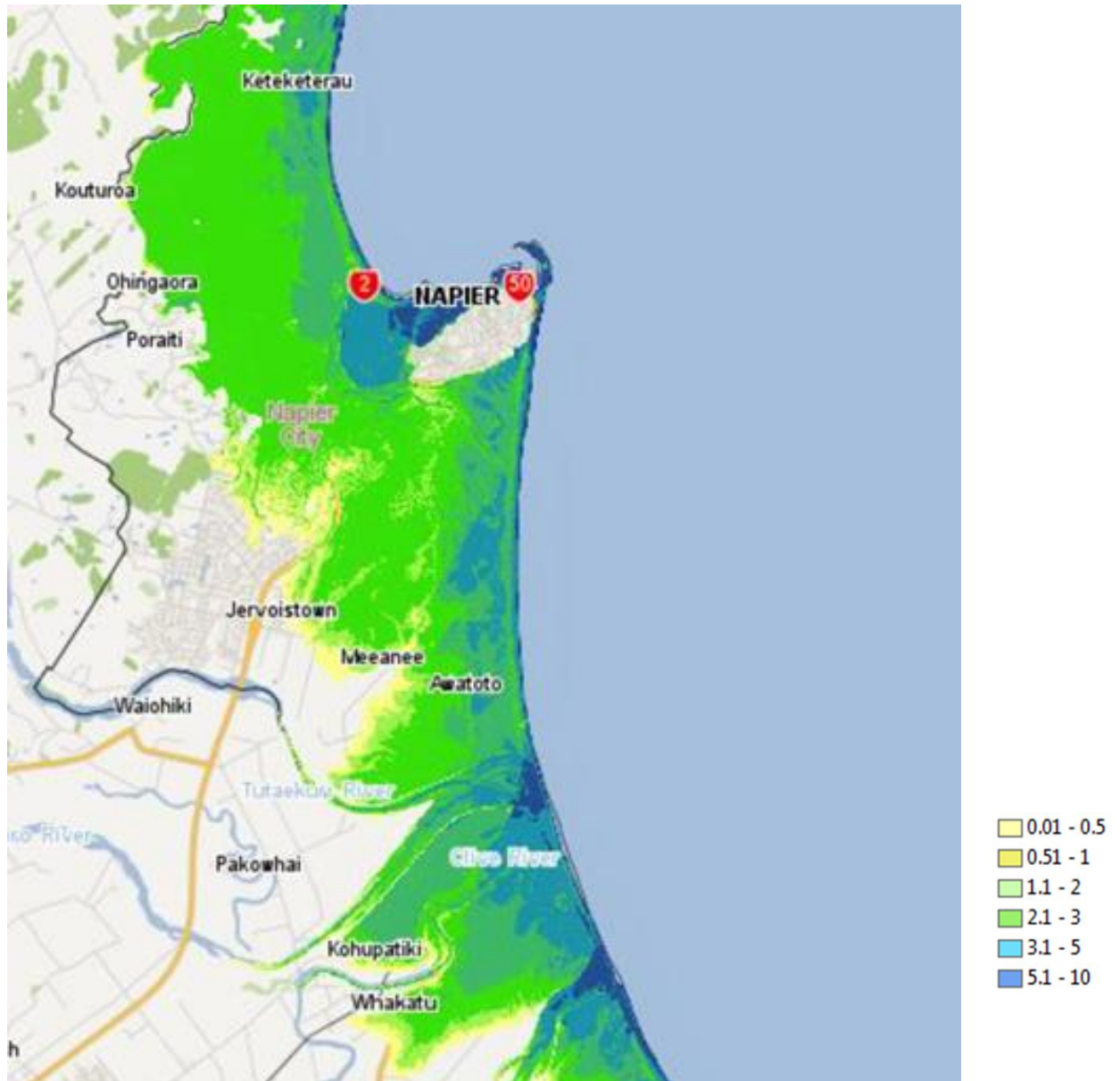


Figure 2 Tsunami inundation depths in metres (HBCDEM Hazard Mapping Portal [www.hbhazards.co.nz](http://www.hbhazards.co.nz))



## 2. Impacts and Consequences

Participants were asked to identify the impacts and consequences of the exercise scenario. Specific focus was given to the evacuation, refuge and response for the first ten days following the event and what effect that would have on the social, built, natural and economic environments. Participant answers are given in Table 1.



*Image 3 Workshop participants discussing the exercise scenario's impacts and consequences (HBCDEM).*

*Table 1 Impacts and consequences for earthquake and tsunami impacting on the Napier coastline*

Social	Built	Natural	Economic
Disruption of food, water, fuel supply	All EM services disrupted	Loss of endemic species	Impact in primary production
Emergency accommodation overload	Loss of infrastructure supporting response	Damage to estuary, wetlands	Business disruption – especially SMEs
Increased sickness	Impacted evacuation routes/infrastructure	Impact on fishery nurseries	Port and airport loss & disruption
Social vulnerability – evacuation and separation issues	Loss of communications and ability to operate	Contamination / pollution	Insurance uncertainty impact on rebuild and business confidence
Health – loss of care, A&E	Loss of fuel supply	Liquefaction	Recovery labour needs
Dealing with mass mortality – mass graves	Fire	Lateral spread leading to flooding	Loss of tourism
Anti-social behaviour - looting	Waste water treatment inundated/lost	Inundation - salinity impact on agriculture/aquifer	Inability to sustain recovery – very diverse & isolated
Mental health impacts	Port inundated/damaged	Land subsidence	Loss of business confidence
Disrupted pet care	Airport inundated/damaged	Debris	Loss of business to other areas (e.g. Kobe)
Limited capability to evacuate	Roads inundated/damaged	Landslides – loss of pasture/river siltation/impact on SH1	Impact for other areas -Wellington – Govt. distracted/disrupted
Essential service loss	Transformers/substations inundated/damaged		
Loss of culturally sensitive sites	Loss of most contractor yards (impacting response & recovery)		
Loss of heritage buildings	Debris		
Loss of housing	Infrastructure loss across wider area through EQ damage – electricity mains, rail, roading network		



### 3. Solutions Breakout Sessions

Following discussion of the impacts and consequences, participants were split into four breakout groups focussing on Welfare, Planning/City Development and Asset/Infrastructure management (split into two groups). The breakout groups were pre-allocated consisting of practitioners and researchers with knowledge of the group's focus area. Each group was tasked with discussing three key points by asking:

- What can be done in Napier?
- What are the solutions?; and
- What assets are needed?

The group responses are set out below.


#### Welfare Group


The three key points for the Welfare group were:

1. Evacuation
  - a. Clear messaging is required informing communities not to wait for an official warning before evacuating along with when vertical evacuation is appropriate.
  - b. There is a need to engage more with communities regarding evacuation routes and the need to practise evacuation.
  - c. Dot modelling could be used to determine the best evacuation routes.
2. Tsunami Investment
  - a. Investigation is needed into how tsunami investment can be used for other purposes, e.g. combining with already planned or future projects in the community/council.
3. Provision of Information
  - a. Community engagement is required to educate communities about the risk of tsunami and earthquake in Napier
  - b. a culture shift is needed to better enable engagement and education

#### Planning/City Development Group

The three key points for the Planning/City Development group were:

1. Key evacuation routes
    - a. Signage and education is needed to ensure people do not evacuate in the wrong direction.
- 

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- b. Evacuation routes need to be assessed to ensure they provide clear, easy access and egress from the inundation area.


- 2. Vertical evacuation

- a. Suitable locations for vertical evacuation structures need to be identified.
- b. Standards for tsunami resilient construction need to be defined which take into account that the vertical evacuation building/structure has already been impacted by an earthquake.
- c. Signage is required for the community to easily identify vertical evacuation buildings/structures from other buildings/structures.

- 3. Long term tsunami plan for Napier

- a. The plan is to move residents to the hills. By making the plan cover a 100-year timeframe it would be less political and therefore more workable.

NB: this allows for 10 district plan cycles and would fit around the depreciation period for long-life infrastructure assets.








*Image 4 Paulina Wilhelm (NCC) notes down the key points for Planning/City Development during workshop discussions*

## Asset/Infrastructure Management Group 1


The three key points for the Asset/Infrastructure Management (1) group were:

1. Resilience and redundancy of assets (in and out of inundation zone).
  - a. Identify assets that can be strengthened to withstand tsunami inundation or relocated out of the inundation zone.
  - b. Increase storage capacity so there are reserves after event – i.e. batteries, water reservoirs on Napier Hill, Taradale.

- 
- c. Develop 'super resilient suburbs', e.g. Napier Hill, Taradale, which will not be directly affected but could be designed to have higher capacity for evacuees.
  - 2. Heat map of city
    - a. Identify priority areas for asset management by overlapping datasets.
    - b. Prioritise actions to invest in available resources in the most effective way.
  - 3. Short life + long life assets
    - a. Think future city. Consider short and long life asset maintenance/replacement schedules in conjunction with long, long term planning (100-500-year plan).

#### Asset/Infrastructure Management Group 2

The three key points for the Asset/Infrastructure Management (2) group were:

- 1. Policy Development
    - a. Develop policy to build assets for greater resilience with reference to heat maps that overlay critical infrastructure points with inundation areas and evacuation points.
  - 2. Resilience Assessment
    - a. Assess the resilience of existing infrastructure.
    - b. Build new assets to be above code, designing for vertical evacuation.
  - 3. Network development
    - a. Invest in new technology.
    - b. Develop capability for the network to be more flexibly managed, e.g. community waste treatment that goes into storm water – one network servicing two things.
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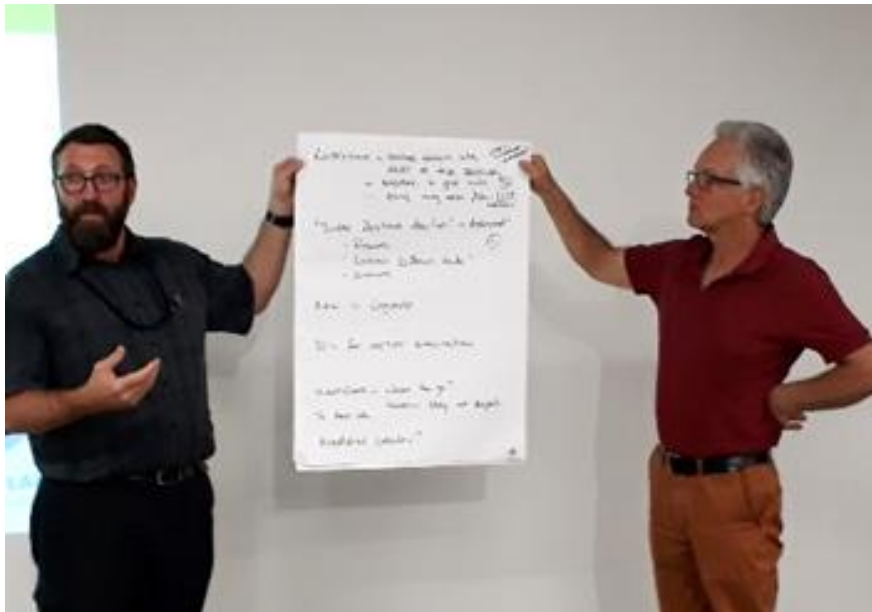
## 1. Recommendations

Recommendations have been developed after both a thematic analysis of the breakout group solutions (Appendix 2) and analysis of the cross group comparisons (Appendix 3). It is intended that the recommendations from the Napier Natural Hazard Resilience Workshop will contribute to Napier City Council's current Infrastructure Strategy.

The strategy recognises three phases of work:

- Phase 1            Data and information collection to deal with current issues that are known to exist across its services (over 3 – 6 years and beyond)
- Phase 2            Investigation of long-term hazards/issues (e.g. liquefaction, tsunami risk) which inform infrastructure investment planning (over 6 – 16 years)
- Phase 3            Infrastructure Investment and action (over 16 – 30 years)

The recommendations from the workshop inform Phase 1- Data and information collection, Phase 2 – Investigation and Phase 3 – Investment and Action.



*Image 5 Paul Eady (NCC) and Michael Adye (HBCDEM Recovery Manager) presenting key points for Infrastructure*

## **Recommendations for phases of work**


### **Phase 1- Data and information collection**

- 1) Continue to support the collection of data and information for on-going assessments, such as monitoring groundwater data, and sharing geotechnical data on the National Geotechnical Database.


### **Phase 2 - Investigation Recommendations**

- 2) Identify and assess the suitability of tsunami evacuation routes through the use of dot modelling and heat mapping. Consider routes that can also be developed for current every-day purposes.
- 3) Use recent research into tsunami resilient engineering (Japan and US) to assess the suitability of existing buildings and structures for vertical evacuation.
- 4) Identify tsunami vertical evacuation options that tie vertical evacuation building locations in with identified evacuation routes so people are able to evacuate the vertical evacuation buildings once the immediate tsunami danger has passed.
- 5) Consider future building developments for vertical evacuation, e.g. multi-level carpark/office block located at Hawke's Bay Airport.
- 6) Investigate soft and hard engineering options to reduce tsunami vulnerability. Soft engineering options include planting or sand dune replenishment. Hard engineering options include sea-walls and vertical evacuation mounds/banks.
- 7) Investigate engagement and collaboration pathways for Napier's different communities to participate in evacuation route and vertical evacuation identification. This can then progress to community driven evacuation exercises and education campaigns for increased awareness.
- 8) Identify which assets/infrastructure are critical. Consider setting a criteria for what 'critical' means for use in prioritising actions.
- 9) Identify vulnerable/exposed locations as well as strong/safe location to prioritise strengthening or removal of critical assets/infrastructure and community services (e.g. first responders) outside of the tsunami inundation zone.
- 10) Investigate the seismic/tsunami resilience of reservoirs and pump-stations and associated reticulated networks. Consider bottlenecks and vulnerable network pathways.
- 11) Investigate the feasibility of transfer/multi-use for different reticulated water networks (e.g. storm water to sewage).
- 12) Investigate the seismic/tsunami resilience of bridges, power and gas networks. Consider bottlenecks, vulnerable network pathways and issues with co-location of services.



- 
- 13) Investigate the feasibility of alternative power supplies for infrastructure (battery/solar) considering that fuel supply will be uncertain.

### Phase 3- Infrastructure Investment and Action Recommendations

- 14) Increase the profile for natural hazard resilience by communicating its importance. Develop science/research partnerships for added expert advice and embed risk-based resilience thinking into asset/infrastructure management. Lead the infrastructure resilience discussion with internal decision-makers and with community groups.
  - 15) Develop the Infrastructure policy/strategy to think 'future city'. Set the strategy over an extended timeframe (e.g. 100 years). Set criteria for whether investment in old infrastructure is discontinued, replaced with the same spec., up-graded or relocated. Set criteria for investment in old infrastructure versus new.
  - 16) Collaborate with Planning/City Development to use a combination of legislative and non-legislative instruments to support strategy for a natural hazard resilient city, e.g. land use planning/developer contributions (RMA), the CDEMA, the Building Act (S.106), insurance incentives, bank lending incentives.
  - 17) Develop an infrastructure emergency operations plan before the event to support recovery management.
  - 18) Invest in developing evacuation route and vertical evacuation infrastructure and assets
  - 19) Invest in the Napier City Council building to lead by example and become a vertical evacuation structure.
  - 20) Invest in moving critical or vital infrastructure and assets out of the tsunami inundation zone.
  - 21) Invest in strengthening assets and infrastructure ensuring service continuity, e.g. resilient reservoirs, pump-stations, bridges, networks, power sources for services.
  - 22) Invest in 'super resilient suburbs'. Develop infrastructure redundancy in these areas to be seismically resilient and capable of servicing increased evacuee populations.
  - 23) Incentivise community development in areas outside of the tsunami inundation zone through infrastructure development. Consider working with adjacent Territorial Authorities to achieve this.
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## Conclusion

The Napier Natural Hazard Resilience Workshop aimed to communicate and better understand the earthquake and tsunami consequences and improve the resilience of its asset/infrastructure management and city planning. It did this by:

1. Considering a worst-case scenario for Napier City to identify earthquake and tsunami impacts
2. Identifying the resulting consequences for the social, built, natural and economic environments
3. Identifying what asset / infrastructure management and city planning activities and solutions could be undertaken to assist residents and visitors to survive and recover from future events
4. Assessing information / knowledge gaps and the best approach to fill these gaps.

The four sections of this report set out how comprehensively this aim has been achieved. Section 1 presents the scenario, providing participants with a clear understanding of the impact of a damaging earthquake and tsunami, with Section 2 setting out almost 60 identified consequences. The solutions for these consequences, in Section 3, are just as comprehensive, with 12 key points identified across welfare, planning & city development, and asset management. Strong themes to emerge from this are for the identification of evacuation routes and vertical evacuation structures; strengthening, developing and/or relocating critical assets; developing 'super resilient suburbs' in the hills with increased infrastructure capabilities; and 'long, long-term planning' (100-500 year planning), encouraging development and residents away from the tsunami inundation zone. Another strong theme is for a communications and engagement strategy that enables the community to work with the Council in achieving these solutions. Section 4 provides 23 recommendations for how Napier City might achieve this, tying in with Napier City Council's current Infrastructure Strategy and focussing on investigation and infrastructure investment.

While we can't control the forces of earthquake and tsunami, initiatives such as the Napier Natural Hazard Resilience Workshop show how, through shared learning and proactive management, we can increase our capacity to withstand, respond and recover from their impacts. Furthermore, it is intended that the information compiled in this report be shared to support similar initiatives and programmes so that not only Napier City, but communities across New Zealand can work to increase their resilience to natural hazards.



## Appendix 1 - Attendance List

46 people attended the workshop and are sorted by which breakout session they were allocated to:

<b>Welfare Group</b> Natasha Carswell (NCC) David Johnston (MU) Alison Prins (HBCDEM) Jessica Wilson (NCC) Samantha Rodgers (NCC) Nigel Hall (Fire & Emergency) Debra Stewart (NCC) Lucy Carter (MU)	<b>Planning / City Development Group</b> Paulina Wilhelm (NCC) Graham Leonard (GNS) Sarah-Jayne McCurrach (MCDEM) Ian Macdonald (HBCDEM) Dean Moriarity (NCC) Georgina King (NCC) Fleur Lincoln (NCC) Miles Crawford (MU) Chris Dolley (HBRC) Murry Cave (GDC) Gavin Ide (HBRC) Erin O'Callaghan (HBRC)
<b>Asset Management Group 1</b> Paul Eady (NCC) Jenni Tipler (MBIE) Rick Wentz (Geotechnical) Michael Adye (HBRC Recovery Manager) Andrew Sloan (NZ Police) Oliver Postings (NZTA) Marieke Simons (KiwiRail) Robin Malley (NCC) Gareth Mentzer (NCC) Kevin Egger (NCC) Stephen King (NCC) Mandy Young (NCC) James Williams (UC)	<b>Asset Management Group 2</b> Jon Kingsford (NCC) Liam Wotherspoon (UA) John Scott (EQC) Kevin Egger (KiwiRail) Lance Titter (NCC) Graham Thorp (NCC) Bryan Faulknor (NCC) Michael Kilduff (NCC) Santha Agas (NCC) Deveraux Short-Henare (NCC) Belinda Storey Graham Eagle (NCC) Lisa Pearse (HBCDEM) Marcus Hayes-Jones (HBCDEM)


## Appendix 2 – Thematic Analysis of Breakout Group Solutions

Theme	Group	Solutions/Recommendations	Observations
Evacuation route investigation	Welfare	Dot modelling for best evacuation routes	A strong theme (5) spread across welfare, planning and asset management with stronger focus from the welfare and planning & city development teams.
	AM1	Where are our super evacuation resilient routes? Roads, laterals/different routes	
	P&CD	Identify key evacuation routes	
	P&CD	Clear access and assessment of evacuation routes	
	Welfare	Tie evac. routes in with existing uses – multi-use	
Vertical evacuation investigation	AM1	Westshore – where can it evacuate? Vertical evacuation platform at airport (multi-level carpark/office block)	The theme is spread across welfare, planning and asset management.  Evacuation (both routes and vertical) is a very strong theme with 9 solutions /recommendations made across all breakout groups.
	Welfare	Look for vertical evacuation options	
	P&CD	Identify suitable vertical evacuation locations with tsunami resilient construction	
	AM2	Investment signals for 'V.E.S.'	
Investigation for locating critical assets	AM2	How and where do we build assets?	A very strong theme (7) with even representation across both the asset management groups and the planning & city development.
	AM2	Heat map of city – overlap datasets to recognise priority areas	
	P&CD	Identification of critical assets	
	AM1	Where are the public assembly areas, super resilience for CD	
	AM1	Location of critical assets – medical centre, etc.	
	P&CD	Location of critical assets – fire stations/first responder orgs	
	AM1	Prioritisation – pick winners for asset development. How?	
National utilities Investigation	AM2	What national utilities will be lost?	





Engineering investigation	P&CD	What are the soft engineering options – planting/sand dunes	
Asset management	AM1	Aquifer – is it reliable? Geologically/biologically	
Asset dependency	AM2	Research into new systems – multiple use of same pipes (i.e. storm water to sewage) – alternative power supplies for infrastructure (battery/solar).	
	AM1	Heavy reliance on fuel, fibre, electricity. How do we manage this?	
Comms & engagement for evacuation	AM1	Communications for evacuation	A strong theme (5) spread across asset management, welfare and the planning & city development.
	P&CD	Prevent people from going the wrong way.	
	Welfare	Education – don't wait for an official warning, just go.	
	Welfare	Practice evacuation	
	AM1	District Council for vertical evacuation. Lead by example	
Comms & engagement for community participation	Welfare	Include community in evacuation route development	
	Welfare	Culture shift – joint project with T. Hikoi	
	P&CD	Community consultation/engagement	
Comms & engagement	Welfare	Celebrate/recognise good work	
Comms & engagement for Infrastructure development	Welfare	Develop 'Hill Hosties' and their capabilities/redundancies links with	Comms and engagement is a very strong theme with 12 solutions /recommendations made across all breakout groups. The main foci were comms/education for evacuation and engaging the community to participate in planning solutions
	AM1	Super resilient suburbs. Napier Hill, Taradale.	
	P&CD	How to manage the influx of residents evacuating into the hills – infrastructure redundancy in anticipation of this	
Infrastructure strengthening	AM2	Resilience and redundancy of assets in an out of the inundation zone	
	AM2	Strengthening and relocation of assets	

Policy development for infrastructure	P&CD	Planning for relocation of existing buildings and infrastructure	
	AM2	Strength standards (IR3 to IR4) for bridges carrying with critical infrastructure outside of tsunami inundation zone	
	AM2	Seismic design/standards for reservoirs	
Strategy	P&CD	Infrastructure management strategy	A strong theme (6) spread across the asset management groups and the planning & city development.
	AM1	Need to take resilience seriously	
	AM1	New vs upgrade for old infrastructure	
	AM1	What is the vision for a resilient Napier? Should be focussed on Napier City Council – lead by example	
	P&CD	Take a risk-based approach with risk assessment embedded into strategic documents.	
	AM2	Management of short + long life assets. Think future city. Discontinue investment in long life assets (if located in the inundation zone)	
Long term planning	P&CD	Long term plan to move to the hills	
	AM1	Long, long term plan for resilience	
	P&CD	Long term tsunami plan for Napier considering social, built natural and economic environments	
Operational planning	AM2	Emergency operations plan – water supply maybe compromised	
	AM2	Develop a recovery plan before the event (rather than during the event)	
Regulatory	P&CD	Regulatory framework that is supportive of the RMA and 4Rs of CDEM	
	P&CD	Use of Building Code for new buildings regulating height/flow paths.	
	P&CD	Land use planning – Industrial zoned land outside of hazard zone	





Community influencers	P&CD	Council partnering with insurance providers to lead change.	
	P&CD	Financial incentives for developing new tsunami resilient buildings	






## Appendix 3 – Analysis of cross group comparisons

1. There were strong correlations across all breakout groups for investigation of tsunami evacuation routes and vertical evacuation structures
  2. The Asset/Infrastructure Management breakout groups, with some input from Planning/City Development, gave more focus to investigating priority areas for (re)location of critical assets.
  3. Asset/Infrastructure Management (1) identified the need to investigate how the community can manage its heavy reliance on fuel. Asset/Infrastructure Management (2) took this further, calling for investigation into alternative power supplies for infrastructure (battery/solar), and for multiple use of same pipes (i.e. storm water to sewage).
  4. There was more of a focus from Welfare, with some input from Planning/City Development, on communication and engagement with the community for tsunami awareness, evacuation route planning and evacuation practice, with Napier City Council leading by example and including working with partners to support this 'culture shift'.
  5. There was strong focus from all breakout groups on developing super resilient suburbs (e.g. Napier Hill and Taradale), including the development of 'Hill Hosties' to receive evacuees and on building infrastructure redundancy to cope with the increased evacuee population.
  6. Developing asset/infrastructure resilience was a strong focus for both the Asset/Infrastructure Management groups. This included building infrastructure resilience and redundancy both in and out of the tsunami inundation zone, strengthening of critical infrastructure which is part of a network (bridges), and relocation of existing assets to outside the inundation zone.
  7. Both the Asset/Infrastructure Management groups and Planning/City Development called for policy development to support the development of asset/infrastructure resilience. This included setting seismic design standards for reservoirs and increasing strength standards for bridges (IR3 to IR4).
  8. Both the Asset/Infrastructure Management groups and Planning/City Development also identified the need for strategy development which gave clarity on how short and long life assets are managed by thinking 'future city'. This covered setting criteria for whether investment in old infrastructure was discontinued, replaced with the same spec., up-graded or relocated.
  9. Along the same lines as thinking 'future city', the Planning/City Development breakout group and Asset/Infrastructure Management (1) called for a long-long term plan and/or resilience investment fund for Napier to move to the hills. By making the planning/funding period stretch over hundreds of
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years (500), the plan and fund could be less political, more acceptable, and potentially more achievable.

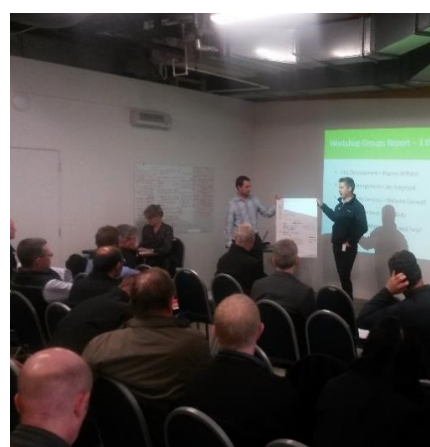
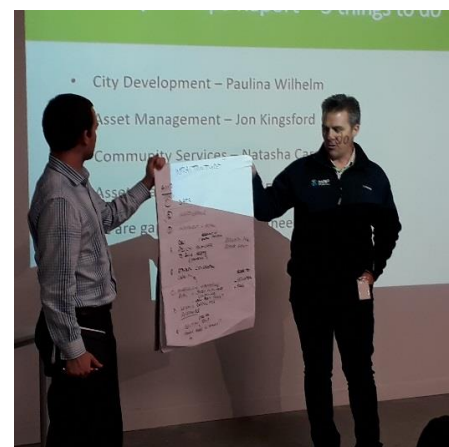
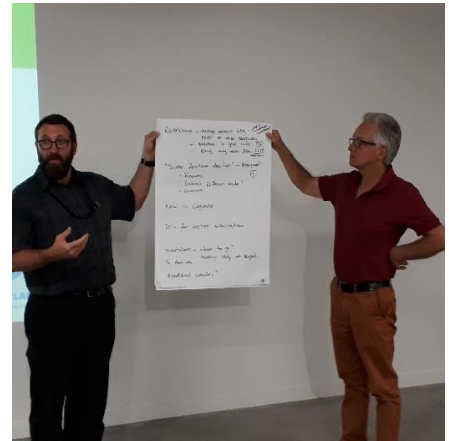
10. The Planning/City Development breakout group focussed strongly on the use of legislation/regulations to achieve a natural hazard resilient Napier. This included a strategic framework supported by land use planning through the RMA and the 4 Rs of the CDEMA, along with the building code, e.g., developer contributions into resilience investment.
  11. Both the Planning/City Development and Asset/Infrastructure Management (1) considered initiatives outside of legislation/regulations to inform community resilience. This covered the use of insurance data to inform decisions on prioritisation and making engagement with science/research and important issue for the city.
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## Appendix 4 – Workshop agenda

12-12.30	Welcome Background/Risk/Scenario	Ian Macdonald, Group Controller, HBCDEM Lisa Pearce – Chairman East Coast LAB Graham Leonard – Natural Hazard Scientist GNS
12.30-13.15	Understanding impacts & consequences – the event, evacuation, refuge and response over 0-10 days Collective group to impacts and consequences for: <ul style="list-style-type: none"> <li>• Social environment</li> <li>• Built environment</li> <li>• Natural environment</li> <li>• Economic environment</li> </ul>	Graham Leonard – Natural Hazard Scientist GNS
13.15-14.00	Quick-fire 5 minute presentations – options to be considered, including things that don't work and should be avoided	Graham Leonard (GNS) Liam Wotherspoon (UA) David Johnston (MU) Jenni Tipler (MBIE) Rick Wentz (Geotech) Sarah-Jayne McCuurach (MCDEM) John Scott (EQC)
14.00-14.20	Afternoon tea	
14.20-15.00	Breakout workshops (4) Groups to discuss with mentors; What can be done in Napier? What are the solutions? What assets are needed? City Development (Planning) Paulina Wilhelm Community Services (Welfare) Natasha Carswell Asset Management (Engineering) Jon Kingsford Asset Management (Engineering) Paul Eady	1) Planning – Graham L, Sarah-Jayne M 2) Welfare - David J, Kate B, Alison P 3) Engineering 1 – Jenni Tipler, Rick Wentz 4) Engineering 2 - Liam Wotherspoon, John Scott
15.00-15.30	Workshop Groups report back - first 3 things that can be done for inputs in 2019/20 AMP's. Including one quick win which can be included in the next Napier LTP	1) Paulina W 2) Natasha C 3) Jon K 4) Paul E
15.30-16.00	What are the gaps – where do we need help? Final discussion	Lisa Pearce
16.00	Ends	Paul Eady

## Appendix 5 – Workshop photos





## Appendix 6 – List of Acronyms

CDEMA	Civil Defence Emergency Management Act 2002
EQC	The Earthquake Commission
GDC	Gisborne District Council
GNS	GNS Science
HBCDEM	Hawkes Bay Civil Defence and Emergency Management
HBRC	Hawke's Bay Regional Council
LTP	Long Term Plan
MBIE	Ministry of Business Innovation and Employment
MCDEM	Ministry of Civil Defence and Emergency Management
MU	Massey University
NCC	Napier City Council
RMA	Resource management Act 1991
SME	Small to Medium Enterprise
UA	University of Auckland
UC	University of Canterbury









