



# IT'S OUR FAULT

## DEFINING EARTHQUAKE RISK IN WELLINGTON

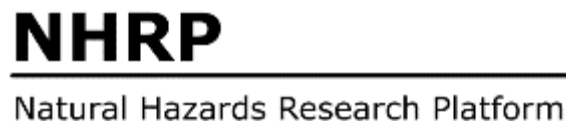
# Partnering for Impact

Derek Baxter – WCC (on behalf of the It's Our Fault & GNS teams)

# It's Our Fault – The Goal

To see Wellington positioned to become a more resilient region through a comprehensive study of the **likelihood** of large Wellington earthquakes, the **effects** of these earthquakes, and their **impacts** on humans and the built environment

[www.gns.cri.nz/ItsOurFault](http://www.gns.cri.nz/ItsOurFault)



# Wellington Fault

## Conditional Probability of Rupture

*(accounting for)*

- Elapsed time since most recent rupture  
Slightly younger than previously thought (~ 300 years ago)
- Timing of older ruptures  
Slightly less frequent than previously thought (~ every 800-1000 years)
- Single event displacement size  
Slightly larger than previously thought (~ 5 m per rupture)
- Slip rate  
Slightly slower than previously thought (~ 6 mm/year)
- Rupture statistics of the Wellington-Wairarapa fault pair in a synthetic earthquake catalogue derived from a physics-based numerical model  
Rupture of nearby Wairarapa Fault “unloads” Wellington Fault
- Various recurrence-time models  
Exponential, Lognormal, Weibull, inverse Gaussian



# Likelihood of rupture of *Wellington Fault* within next 100 years

Pre-It's Our Fault: ~ 30%

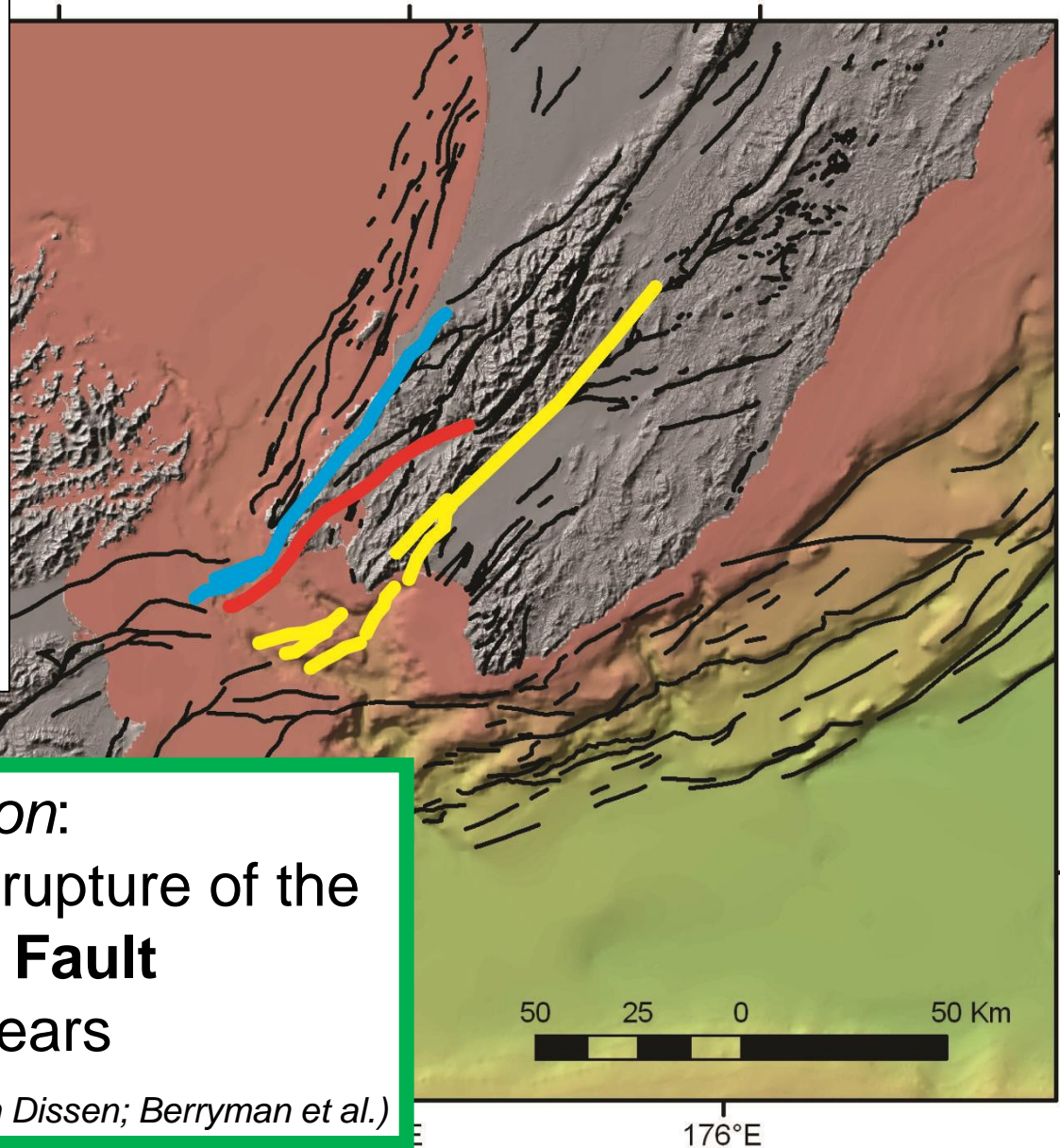
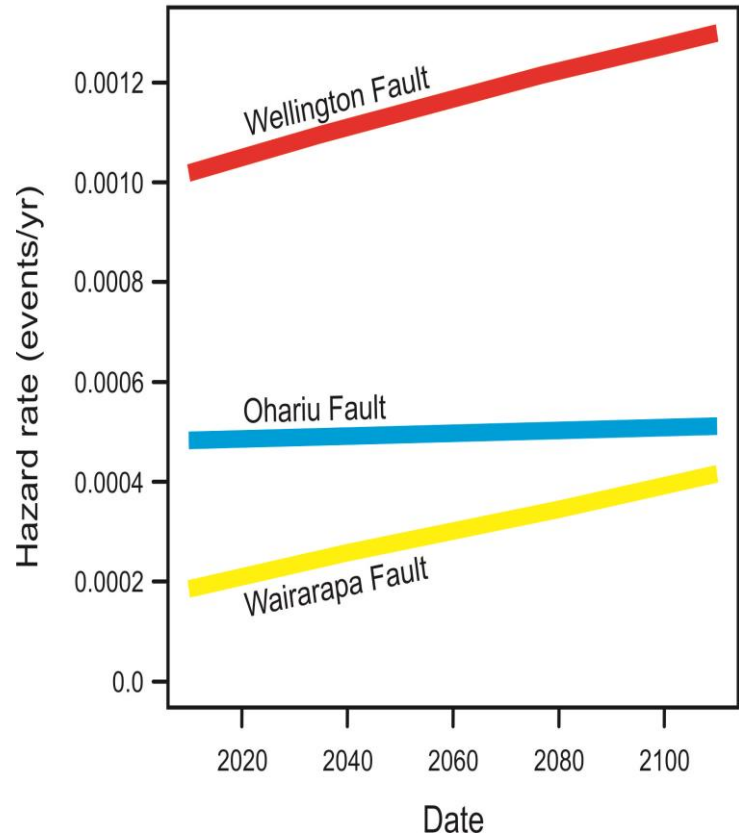


It's Our Fault Result: ~ 10%



# Active Faults of Central NZ

Conditional Probability of Rupture



*For Comparison:*  
conditional probability of rupture of the  
**southern Alpine Fault**  
is ~30% in 50 years

*(Rhoades & Van Dissen; Berryman et al.)*

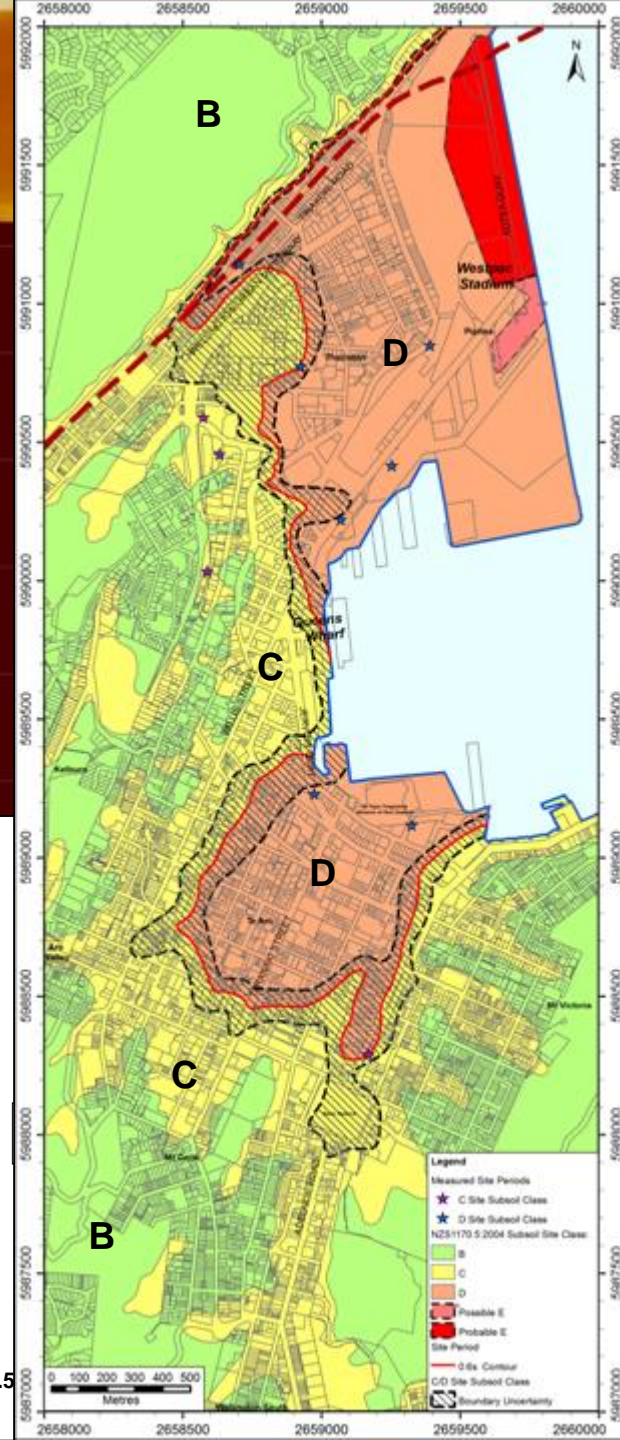
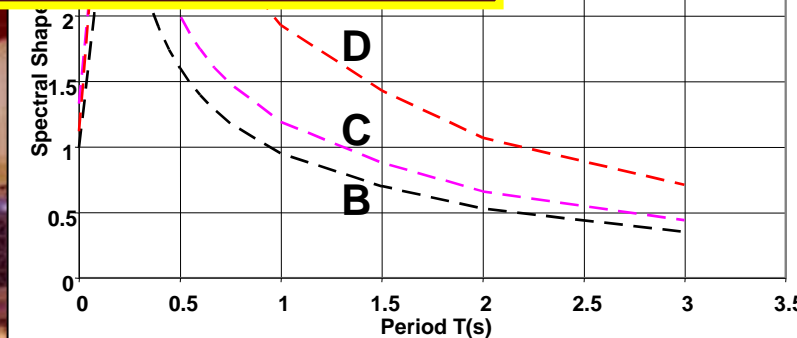


# Ground Shaking

Not all ground is created equal & how we deal with it

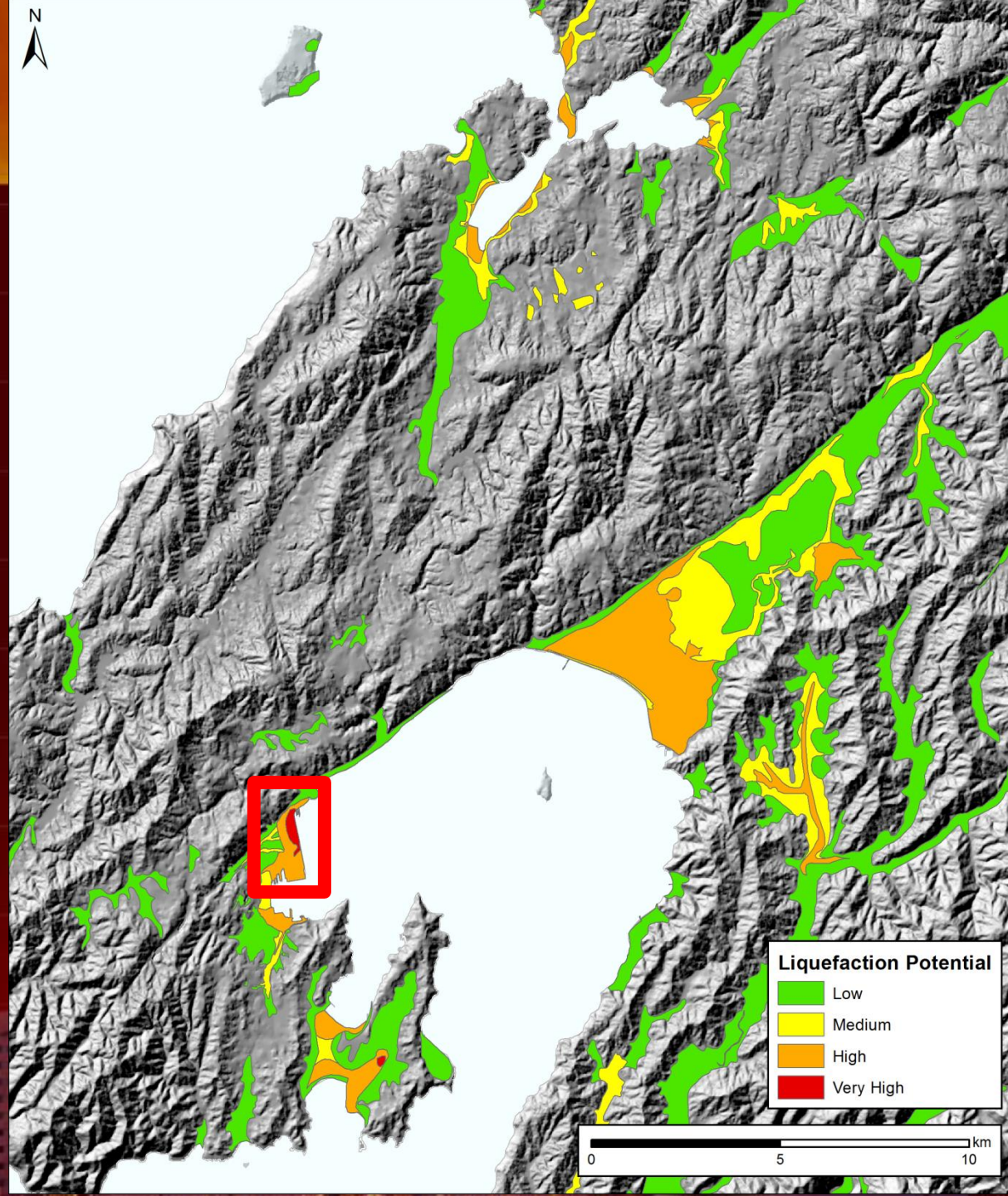
Provide results in a form that is usable for those that will most use the results

Spectral Shape Factors





# Liquefaction Susceptibility





# 1855 Landslides in Wellington City area

Past earthquakes have generated landslides in the Wellington region

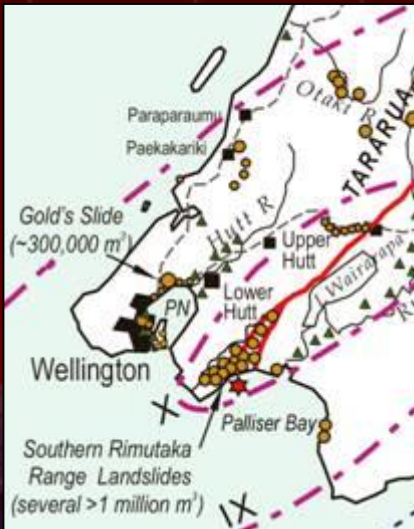
*This large (c.300,000 m<sup>3</sup>) landslide from the Wellington Fault scarp into Port Nicholson blocked the road to Petone. The head scarp (sc) and slide debris (sd) are still visible today north of the BP Station (see below).*



C E Gold's painting, 1855 – Alexander Turnbull Library.



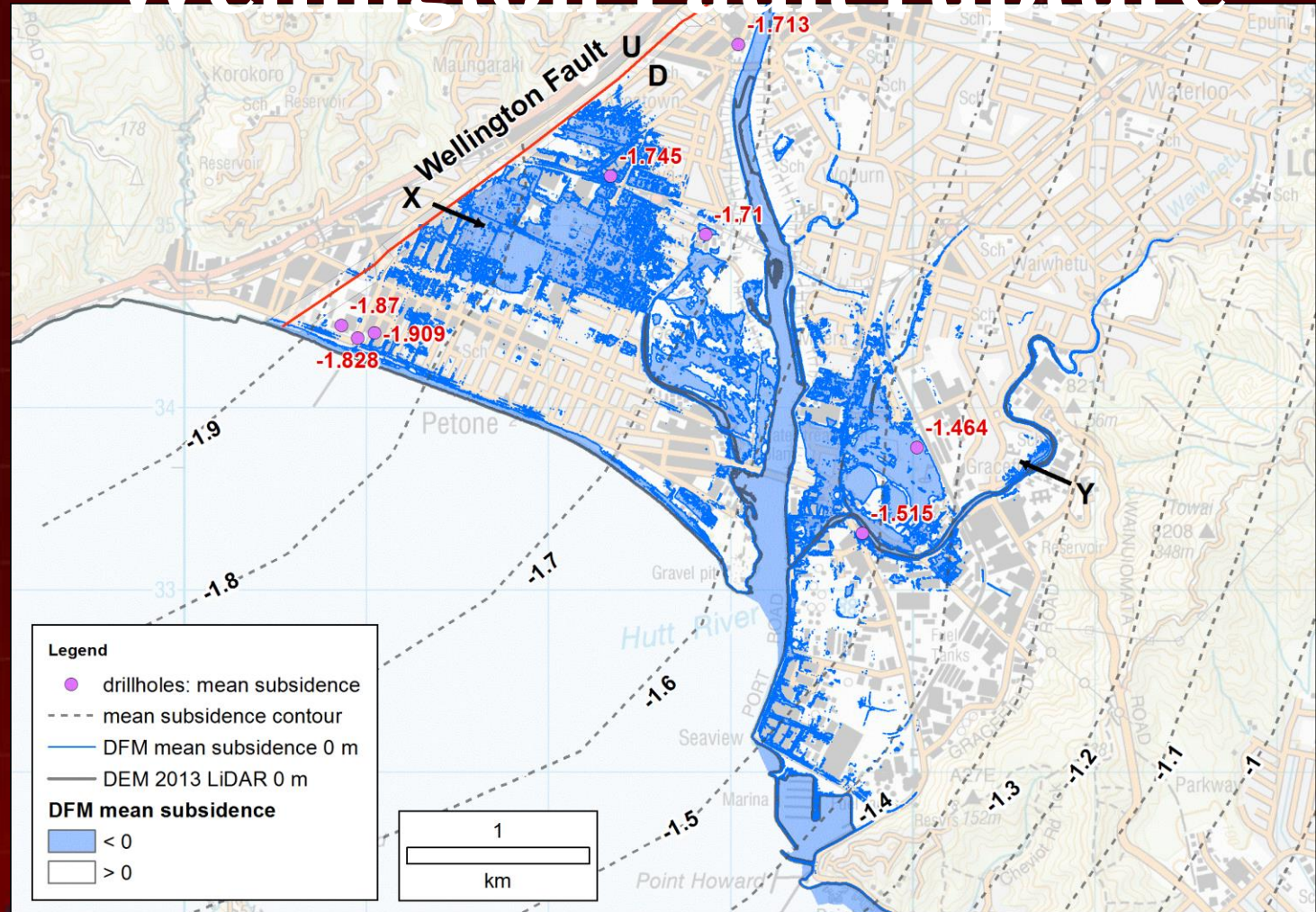
Recent photo



▶ 'Gold's slide' on the Hutt road – largest landslide Wellington area.



# Mean Hutt Valley subsidence resulting from Wellington Fault rupture



- Dark blue areas denote ground that has subsided below current sea-level



# Dire sea level rise predictions not scaring off home buyers in sought-after Lower Hutt suburb

Nicholas Boyack · 17:03, Mar 25 2019



ROBERT KITCHIN/STUFF

Petone could be insurance-less in the next 30 years if the effects of climate change worsen.

Home buyers aren't shying away from the Lower Hutt suburb of Petone, despite predictions that it could be under water in just 80 years and homes there could be uninsurable in as little as 30 years.

In November, *Stuff* reported on a Hutt City Council-commissioned study that estimated the sea would rise by at least one metre over the next 80 to 100 years – some estimates have it rising as much as 3.5m – leaving large swathes of the low-lying seaside area under water.

But sales figures from the Real Estate Institute of New Zealand (REINZ) show 21 houses sold in Petone between November 2018 and January 2019.



# Evacuation Time Estimates for Local Source Tsunami for Wellington Suburbs

D. Heron  
W. Power

B. Lukovic  
X. Wang  
GNS Science Report 2017/05  
April 2017

## Mega-retirement villages thrive, small providers struggling

Eleanor Wenman - 10:57, Aug 15 2017



MATTHEW TSO/STUFF

There are fears that recent pay equity settlement could force smaller facilities like Lower Hutt's Wesleyhaven to close.

Retiree Les Everson leads a busy life.

Stuff first caught him on his way out the door – off for a trip around Wellington's Island Bay.

That's the retiree's life these days, full of activities as a resident of the Bob Scott Retirement Village in Petone, Lower Hutt.

Everson is one of New Zealand's 711,200 people aged over 65. He's part of one of our fastest-growing demographics and is one of the tens of thousands of Kiwis living in aged residential care.

### READ MORE:

- Retirement village operator Ryman eyes up Karori campus in Wellington
- Impact of pay equity settlement passed on to rest home residents and their families
- \$25,000 a month loss puts future of Naenae resthome in doubt
- Long-term financial turmoil to blame for the closure of Britannia House rest home in Petone

"It's great. The other people in our building, we say 'how's your apartment?' and they say 'it's great' too."



# Integrating into district planning

- <https://www.youtube.com/watch?v=kDUBjq9P6Ro>





# How do we get better uptake

- **Begin with the end in mind**
- **What is the end use of my research**
- **How do I want it to be used**
- **Publication or Implementation**
- **Format of the reports/outputs**
- **Storytelling is a source and a conveyance.**