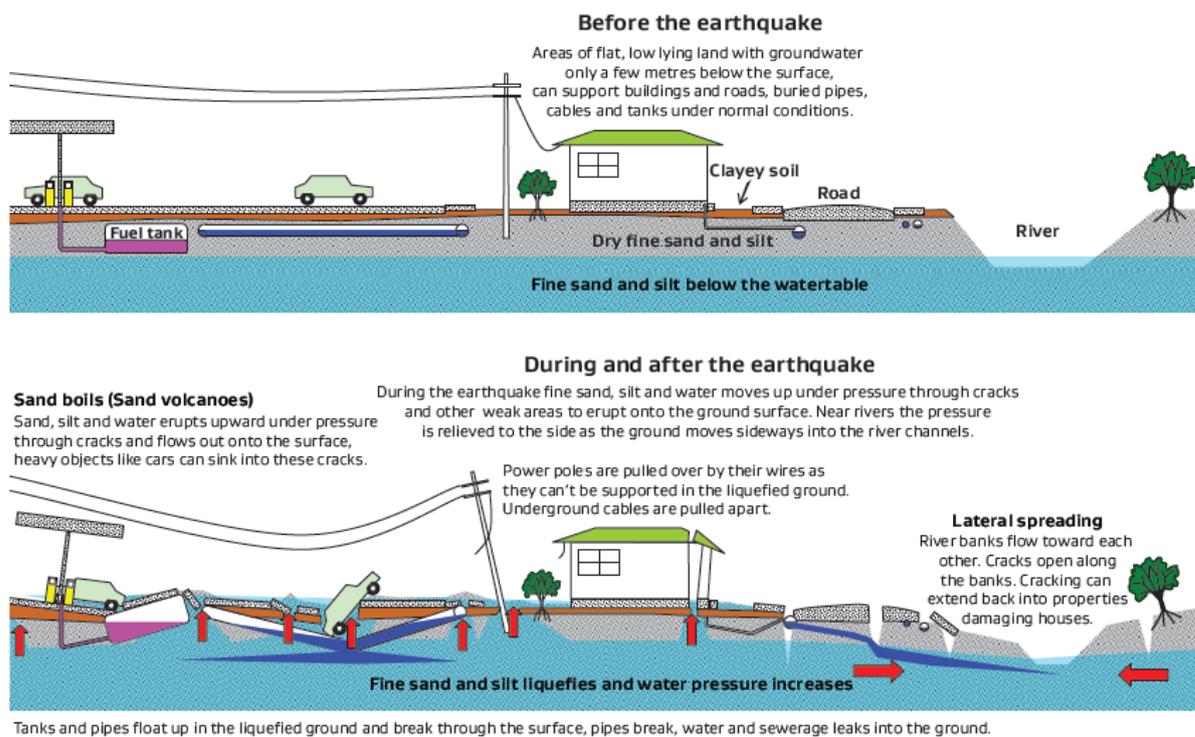


## Hawke's Bay Liquefaction Hazard Report - Frequently Asked Questions

What is liquefaction?

Liquefaction occurs when an earthquake shakes up water-logged sediments. As a result, the soil behaves like a liquid and can flow down very gentle slopes. This condition is usually temporary, but buildings can sink and underground pipes may float to the surface. When the shaking stops, groundwater is squeezed out of the ground causing flooding, which can leave areas covered in mud.

Figure 2.6: Liquefaction and its effects (Source: IPENZ)



What are the risks?

There is a liquefaction hazard present in several areas of Hawke's Bay. Three factors must be present for sediments to be prone to liquefaction. The sediment must be

- 1) saturated with ground water,
- 2) composed of sand or silt-sized particles, and
- 3) compacted fairly loose.

The occurrence and severity of damage is dependent on several variables including extent of shaking, the depth at which the liquefaction occurs, and the thickness and lateral extent of liquefaction. Low-lying areas in the region, especially near the coast, and reclaimed land are particularly susceptible.

## Liquefaction in Hawke's Bay

Has Hawke's Bay experienced liquefaction in the past?

Since 1840, at least seven earthquakes have produced strong shaking in Hawke's Bay. Liquefaction effects were reported for four of these events including 1931. However, the extent of liquefaction ground damage may actually be greater than has been reported because of the low population over much of the region, especially prior to 1900.

Could liquefaction in Hawke's Bay be similar to that experienced during the 2011 Christchurch earthquake?

There are areas of Hawke's Bay underlain by potentially liquefiable soils, and there are several earthquake faults within or near the Bay capable of generating earthquakes strong enough to cause liquefaction. Based on historical evidence, it does not appear that the region has experienced as widespread liquefaction as Christchurch in 2011. However, the future occurrence and consequences of liquefaction in Hawke's Bay will depend on several factors including the size and location of the earthquake, whether the liquefiable areas contain development and the density and type of development.

### Liquefaction Maps Information

Why was an update of the existing hazard maps commissioned?

The previous liquefaction hazard maps for Hawke's Bay were developed by GNS in 1999. The 2010-2011 Canterbury earthquakes resulted in a significant increase in our understanding of liquefaction; both of triggering and consequences. In addition, more detailed geologic mapping of the Central Hawke's Bay region has been completed since 1999, and this mapping allowed the liquefaction susceptibility of Central Hawke's Bay to be refined considerably compared to what was possible previously. This combined enhancement of knowledge has provided an opportunity to better characterise the liquefaction hazard in Hawke's Bay; particularly Central Hawke's Bay and the Heretaunga Plains. The improved understanding of the hazard allows us to better understand the risks to existing development and ideally reduce the potential for liquefaction-induced damage to future development.

What new maps are available?

There are five (5) new maps available on the Hazard Portal ([www.hbhazards.co.nz](http://www.hbhazards.co.nz)). One shows the Liquefaction Hazard Vulnerability Map for Heretaunga Plains. The four (4) other maps show the liquefaction severity expected for three levels of probability on the Heretaunga Plains, namely the 25, 100 and 500-year return period and one map showing the wider region being the Central Hawke's Bay, Hastings & Wairoa District.

What is the difference between the old maps and the new ones?

The new maps are based on more detailed information being available in many areas. The scales of vulnerability in new maps can not be compared with the old maps. This is because the new categories are created using a different way of measuring vulnerability.

Also included is the introduction of a new colour system (yellow to brown), which aligns with new national guidance. There is little change in Wairoa and for the Napier and Hastings major urban areas. Havelock North remains consistent with low liquefaction hazard. While in Central Hawke's Bay and some parts of Taradale the liquefaction hazard has been reduced.

What do the different colours mean?

The study areas have been divided into 3 coloured zones for liquefaction vulnerability; cream (low), orange (medium) and brown (high). Low (cream) means there might be 'none to minor' liquefaction for 500 year earthquake shaking (typically larger than magnitude 6), medium (orange) means there might be 'minor' to moderate damage, and 'high' (brown) might be moderate to severe damage.

What are the buffer zones in Wairoa and Central Hawke's Bay?

Buffer zones have been added to all the zones identified in Wairoa District, Central Hawke's Bay District and Hastings District (outside the Heretaunga Plains) as there is uncertainty about the level of liquefaction hazard in these areas. The width of this buffer zone is 500 m (+/- 250 m)

If a buffer zone boundary line falls across a property it should initially be treated as being part of the higher hazard class. Site-specific assessments (ranging from visual inspection through to ground investigations) will be needed to determine the actual level of liquefaction hazard.

Does the research allow for future sea level rise?

No, looking at how sea-level rise might affect liquefaction was outside the scope of this project. As other projects are investigating sea level rise, once more geotechnical data is collected a follow-on project can be considered.

Will the information change in the future?

It is intended that these maps will be periodically updated as more subsurface data (geotechnical and groundwater information) is collected and liquefaction prediction methodologies are improved as the science advances.

What happens now?

The updated liquefaction hazard report and maps will be supplied to local city and districts councils so the information can then be used to help manage the liquefaction risk in the future.

Where can I find information about liquefaction risk in Hawke's Bay?

You can find a simple summary about our earthquake and liquefaction risk on the Hawke's Bay CDEM website [www.hbemergency.govt.nz/hazards/earthquake](http://www.hbemergency.govt.nz/hazards/earthquake) . If you want to read the science report underpinning the mapping visit the HBRC report search, [www.hbrc.govt.nz/our-council/publications/reports-search/](http://www.hbrc.govt.nz/our-council/publications/reports-search/), key word 'liquefaction' to find 'Assessment of liquefaction risk in the Hawke's Bay: Volume 1: The liquefaction hazard model & Appendices' GNS Science Report 2015/186 October 2017.

## Property Information

Will this affect property values?

Liquefaction mapping has been in place in Hawke's Bay since 1999 and has been completed for a number of areas of New Zealand already, and property values do not appear to have been affected by this information to date.

What do I do if I am building a home with a high-liquefaction hazard?

The Ministry of Business, Innovation & Employment (MBIE) and the Ministry for the Environment have published draft Planning and Engineering Guidance for Potentially Liquefaction-Prone Land. You should discuss the implications of this with your designer and builder. We also recommended owners/developers obtain expert advice from a qualified and experienced geotechnical engineer before developing plans.

What are the local councils doing about this?

The councils have only just received this information, and are reviewing how this information will be incorporated into current building and resource consent applications and what changes may need to be made to District Plans.

How do I know if my property will be affected by liquefaction after an earthquake?

Check out the liquefaction hazard planning map in the Hawke's Bay Hazard Portal and type in your address. [www.hbhazards.co.nz](http://www.hbhazards.co.nz)

How do I know how bad the liquefaction will be?

There is no way to know since possible liquefaction is driven by many variables including:

- the depth to groundwater;
- the density and composition of the subsurface soils and the depth to the liquefiable layers; and,
- the intensity and duration of ground shaking (related to the size and distance of the earthquake).

Therefore, apart from being able to identify specific site conditions where liquefaction is unlikely to occur (gravels not containing large amounts of sand or silt and hilly or bedrock terrain), all other sites may experience liquefaction to a greater or lesser extent when shaken severely enough and for long enough.

How accurate are the zones, and should I do more testing on my land before building?

It is important that people understand that having their land included in a particular zone does not unequivocally mean that the land is "good", "medium" or "bad." The maps indicate what is a strong possibility across those areas. The best areas (yellow) have a very low probability of having a liquefaction problem, but there may still be some localised places where the hazard exists.

The only sure way of showing whether a specific site has low, medium, or high liquefaction potential is a site specific geotechnical investigation. At the moment there are no national requirements in the building code but in conjunction with the MBIE draft Planning and Engineering Guidance for Potentially Liquefaction-Prone Land, landowners in some of these areas can consider the following:

Residential dwellings in the Orange Zone.

The decision for a landowner in the orange zone is whether to invest in a deep geotechnical investigation or include an "enhanced foundation" as part of their building anyway.

Residential dwellings in the Brown Zone.

For landowners in the Brown Zone it is recommended that a geotechnical engineer should provide input into the design of a building. This should include a site-specific assessment of liquefaction issues as recommended by the draft MBIE Planning and Engineering Guidance for Potentially Liquefaction-Prone Land.

### Commercial and Industrial Buildings in the Orange and Brown Zones.

Under the draft Guidelines a site specific geotechnical investigation should be carried out to address liquefaction potential. This is because commercial structures are often larger and heavier than houses and may have different performance expectations after earthquakes. Currently there is no "one size fits all foundation" for commercial structures (noting that there may also be other geotechnical issues to be addressed).

Hawke's Bay local councils are currently working through the new hazard information in consideration of the draft MBIE Planning and Engineering Guidance for Potentially Liquefaction-Prone Land to assess information that will need to be provided in a Building Consent for land in the identified zones.

Is there anything I can do to protect my existing property?

There are options to mitigate the risk of liquefaction on developed properties, but typically, these can be expensive. If your house is located on land with a high liquefaction potential you are best to ensure your home is insured sufficiently to rebuild with more robust foundations in the event of total loss (noting this could be fire or flood - not just an earthquake).

How can I mitigate the risk of liquefaction on my land?

Options for homeowners can be found here: <https://www.eqc.govt.nz/canterbury/ground-improvement-programme>

It is essential that where needed the owner/developer obtain expert advice from a qualified and experienced geotechnical engineer.