8 March 2023

Community newsletter
Muriwai Beach cyclone recovery

Rates information for affected properties

While the council doesn't currently offer a remission of rates for red stickered properties, we want to reassure owners that no penalties will be imposed on them for late rates payments, regardless of whether we have managed to contact them or not.

Currently, our preferred approach is to provide support through grants as this enables us to target financial support to those who have been impacted the most and who are most in need. A grant can also target support to tenants, not just property owners.

If you are experiencing financial difficulties and are unable to pay your rates, we encourage them to call us on 09 301 0101 to talk through the support, payment and postponement options available to you.

Information for tenants

If you're a tenant and the property you live in has been damaged by a severe weather event, you should contact your landlord – they are responsible for the remediation of the property. Tenants are not responsible for any damage to the property or clean up incurred following a natural disaster.

However, tenants are responsible for the costs related to any damage sustained to their own possessions, like furniture, during a natural disaster. If the property you live in has been damaged or is currently uninhabitable, we would recommend that you speak with your landlord or letting agency in the first instance to discuss your options. You don't have to end the tenancy. Whether you stay or not may depend on a range of factors including how long the property is going to remain uninhabitable. However, if you do wish to end a tenancy due to the damage caused by a natural disaster, landlords are required to give seven days' notice, and tenants are required to give two days' notice.

If a property is partially damaged, or so seriously damaged that it can't be lived in, landlords should reduce the rent accordingly. More information is available on the Tenancy Services website - *What to do after a natural disaster* » Tenancy Services.

Pages 2-9 | In this edition geotech and natural hazards specialist **Ross Roberts** describes the geotechnical situation in Muriwai and introduces some of the concepts being considered to inform the next steps.

Background on Muriwai geology

Much of Muriwai, like other parts of Auckland's west coast, is underlain by Kaihu Group sands. These geologically young sediments were created from sand dunes, and form the high land around Muriwai (Figure 1). Underneath these sands are highly weathered, much older marine tuffs (consolidated volcanic ash deposited under the sea). The boundary between the two (known as an unconformity) is believed to lie about halfway up the slope near the central portion of Domain Crescent. This boundary is particularly important for the stability of the slope and is described in more detail below.

Figure 1: Lightly cemented sands on the Edwin Mitchelson Track (track created in approximately 1900 as access to the Mitchelson home)

The sands are weak and are poorly cemented, or completely uncemented, meaning grains of sand are not well stuck together. During rainfall, water starts to fill the air spaces between grains. Initially, this has a suction effect where the water pulls the sand grains together, increasing strength. As water content increases, this suction drops and the sands fail and flow. A good analogy is sand on a beach. If a little water is added, a steep-sided sandcastle can be built. But if too much water is added, the castle collapses rapidly as a debris flow. In Muriwai we have experienced debris avalanches (which included rocks and trees) which turned into debris flows (mostly sand) as they travelled down the slope.

Debris flows are fast-moving landslides that are particularly dangerous to life and property because they move quickly, destroy objects in their paths, and often strike without warning. They occur in a wide variety of environments throughout the world. Unusually high rainfall is required to generate debris flows and if such an event follows an extended wet period, when the ground is already saturated, the likelihood of a debris flow increases. Debris flows can travel at speeds exceeding 50 kph and can carry large items such as boulders, trees and cars.

Water is a critical factor. After a previous landslide in 1965, an Auckland University geography lecturer (Laurie Wright) observed groundwater on the slope and the description is quite useful:

> *"He observed that for days after the events, water seeped out of the Kaihu Group sands about midway up the landslide paths. This water had flowed down through the permeable Kaihu Group sands until it reached the sub-horizontal boundary over the less permeable Waitakere Group. At this boundary the water flowed laterally through the sands and would, in normal circumstances, seep out along the cliffs. After heavy rain the amount of groundwater rapidly increased and made the sand more susceptible to failure. This same unconformity is clearly visible at the top of vertical cliffs all the way down the coast from Muriwai to Te Henga and is often marked by a rich growth of vegetation where the groundwater seeps out."* (from Bruce Haywards paper "The tragic 1965 Muriwai Landslide" published in Geocene 28: 2-5 (https://gsnz.org.nz/assets/Uploads/branches/Geocene-28_Feb-2022.pdf)

History of instability

In August 1965, following heavy rainfall, landslides occurred on consecutive days at the south-east end of Domain Crescent, completely destroying two houses and killing two people. The landslide extent is denoted in yellow in the figure below. The debris avalanche flowed right across the road and deposited sediment up to 1.5 m thick over parts of 34 and 36 Domain Crescent. The destroyed batches were on the uphill side of the road. One was demolished while the second was swept off its foundations and carried across the road.

Figure 2: Figure 2: Map of the 1965 landslide extent overlain on the 2006 aerial photograph (from Bruce Haywards paper "The tragic 1965 Muriwai Landslide" published in Geocene 28: 2-5 (https://gsnz.org.nz/assets/Uploads/branches/Geocene-28_Feb-2022.pdf)

A 1966 New Zealand Geographer article recorded that witnesses said the landslide moved at 90 kilometres per hour. At the time of the 1965 landslides, Rodney County engineers declared that no houses would ever again be allowed to be built in the path of these landslides. In 1981 the Local Government Amendment Act (section 641A) allowed councils to issue building permits for houses on unstable land prone to erosion, subsidence, slippage or inundation. Councils were also absolved of any civil liability. This opened up the ability for landowners to overturn the previous council decisions, and house building re-commenced on the site of the 1965 landslide.

This isn't the only evidence we have of past landslides in Muriwai. A prominent feature of Muriwai is the escarpment that forms the crenulated ridgeline immediately west of Oaia Road. These crenulations, or "embayments", represent the headscarps (or source areas) of landslides, and were described recently in a news article by Associate Professor Martin Brook https://thespinoff.co.nz/science/22-02-2023/landslides-and-law-the-questions-cyclone-gabrielle-raises-about-where-we-build.

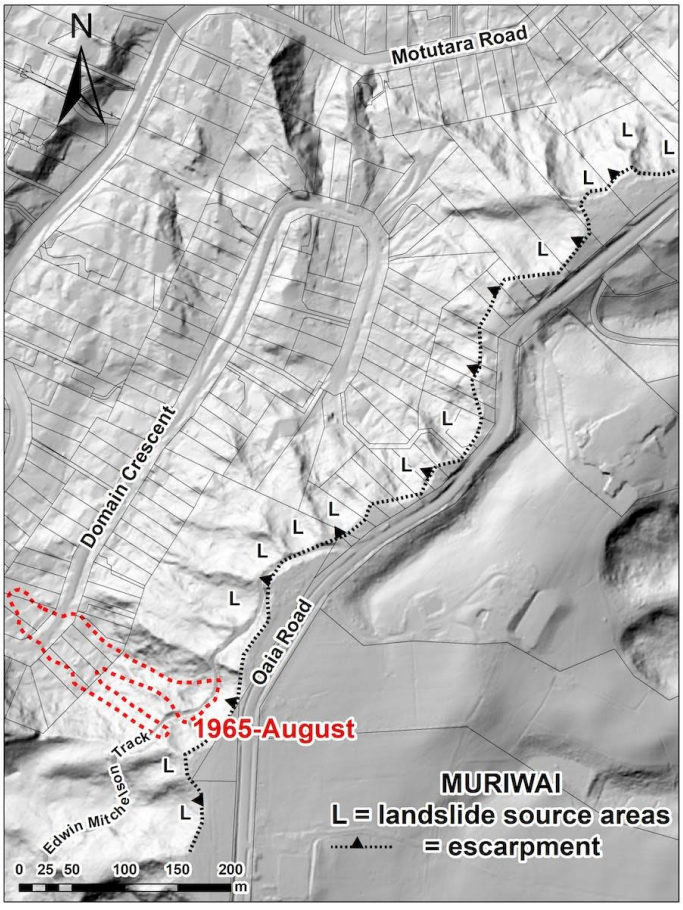

Figure 3: History of instability visible in the landscape, with each letter L representing an old (likely pre-human occupation) landslide. From Martin Brooks https://thespinoff.co.nz/science/22-02-2023/landslides-and-law-the-questions-cyclone-gabrielle-raises-ab

Domain Crescent and Motutara Road are bult on a talus (debris) slope at the base of the escarpment. The presence of this debris illustrates that over the years a significant quantity of material has fallen from the escarpment in the form of landslides.

What our monitoring shows

Our LiDAR surveys show that the landslides are still moving, but that, based on early evidence, the movements appear to be getting smaller. We have surveys undertaken on:

- 18 February
- 26 February
- 4 March
- And will have another one undertaken on 11 March.

Preliminary data became available on 6 March showing the relative change in the first week (18 February to 26 February) and the second week (26 February to 4 March). There is still some review and quality assurance required on this data to make it appropriate for sharing. However, we can share the overall findings.

In general, there was a relatively large amount of movement in the first week around the scarps of the existing landslides. This was expected; the scarps had been destabilised by the loss of material below, and there was a heavy rain event on Friday 24 February which would have triggered movement. Much of this movement was in small, but in some steeper areas was in the order of 1-2 metres of vertical change. Much less change was measured lower down the slopes, which suggests that the material lost from the top spread out within the existing landslide body or was washed out into the roads and land below as loose sediment.

In the second week, the amount of change was much smaller. The exact difference is still being quantified. This reduction in movement is part of the expected reduction in total slope movement, as well as reflecting the significantly drier and more settled weather.

If this pattern continues in the next weekly round of monitoring, we will revise our approach and investigate less frequent monitoring, as well as other monitoring methods.

Because the landslide movement is slowing, we are now able to undertake more reliable assessments of the zones at risk. Our initial phase of assessment uses a methodology known as the Fahrboeschung model (F-angle) which roughly estimates the maximum likely distance that a landslide will travel. This works by measuring the existing landslides and then extrapolating them to other equivalent locations around the area. Our results have indicated F-angles generally fall in a consistent range of 22 to 25 degrees, but that site-specific features may require changes in some locations.

Figure 4: An example of development of F-angle measurements.

Initial results from this will be used to inform both managed temporary access and permanent access (see end of this newsletter for more details of these).

An example of the output from F-angle assessments is shown in Figure 5. This is a draft produced today, and so may change in the coming days and weeks.

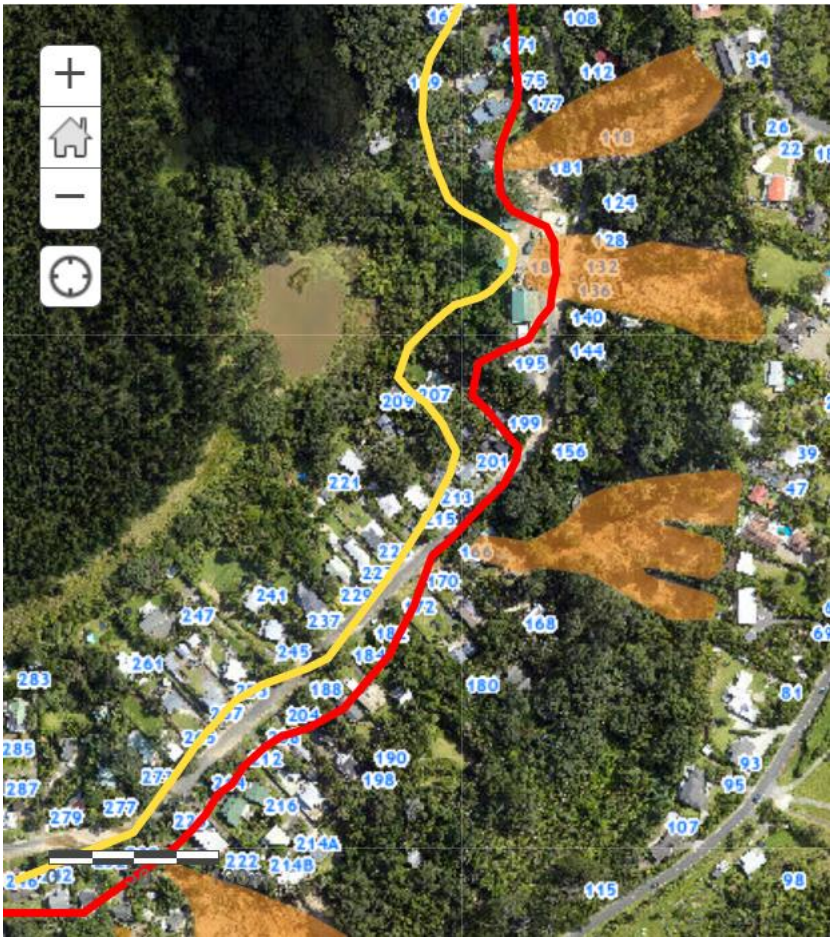

Figure 5: Part of the draft F-angle assessment showing zone in red which reflects the shortest likely landslide travel, and yellow which represents the longest likely landslide travel. Note that this is an early draft created on 8 March and is likely to change as it goes through a peer review process. Some landslide material could move beyond the green line in specific cases, so site-specific assessment will always supersede what is shown here.

An introduction to risk

What is risk?

To explain the next steps for Muriwai, it's important to understand a little about risk. One of the biggest problems in dealing with risk is that the term is used to mean many different things by different people in different contexts. In this briefing risk means the likelihood of loss – usually of life or property. This is commonly presented as a probability per year. For example, the average New Zealander's chance of dying on the roads each year from 2002 to 2011 was about 1 in 10,000.

Risk assessments are based on both the hazard (likelihood) and the consequence of an event. That means that even if a hazard is not considered to be highly likely, if the consequences of it occurring are life-threatening, the risk to people exposed to the hazard is likely to be unacceptably high.

What risk is acceptable?

Everyone has a different tolerance of risk. For example, it's commonly accepted that people in their early 20s are, on average, happier to take risks than those in their 40s. Because of this variability it's not easy to say what level of risk is acceptable.

New Zealand does not have a formal system for analysing landslide risk and there are no established criteria for determining risk tolerability and acceptance. Making decisions about risk involves a wide range of value judgments and should involve all those interested in or affected by risk (whether affected directly by the risk itself or by the measures adopted for its reduction), or their appropriate representatives.

Although the phrase "safe as houses" implies that buildings are very safe, nothing is perfect. Our building code sets a standard for new buildings of 1 in 1,000,000 (the bottom line on the graph in Figure 6). In New Zealand this is generally considered "safe".

Best practice for landslide risk assessment in New Zealand generally follows the Australian Geomechanics Society (AGS) methodology which defines an 'intolerable' loss of life risk to be any natural hazard risk with an annual probability greater than one-in-10,000. The difference between these two values shows how

variable risk tolerance can be. The one-in-10,000 risk from the AGS guidelines is of 100 times greater risk than the one-in-1,000,000 NZ Building Code.

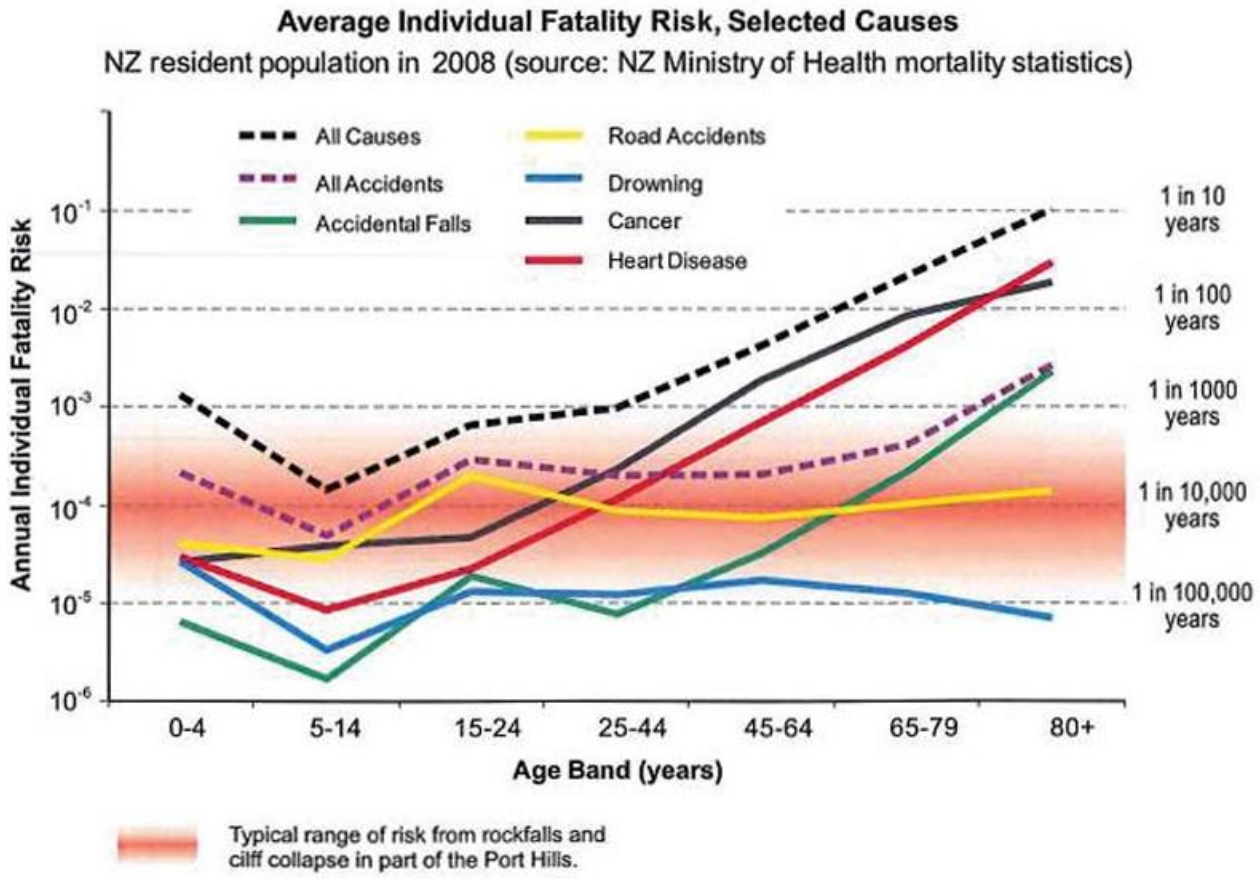

Figure 6: Average individual fatality risk New Zealand residents are exposed to from a range of hazards and other causes, with the risk of cliff collapse in the Port Hills after the Canterbury Earthquake Sequence highlighted in orange as an example of a similar

Another important factor to consider is the time people are exposed to a hazard. People often spend a significant amount of time in their homes – typically 10 to 16 hours a day – which means the exposure is high, and the risk is therefore higher as a result. For lightly used roads the amount of time each person spends in a hazard zone is much smaller, and so the risk can be lower even when the hazard is more severe.

What is the risk in Muriwai?

The risk varies from property to property. At a crude level, we can say that with four fatalities[1] in the last century, and a population exposed to the hazard of about 500 people (based on 205 red placarded properties), the risk is in the order of 1 in 12,500 – very close to the generally accepted "intolerable" level. However, the recent landslides have destabilised the slopes and increased the risk relative to the historical average.

[1] **Please note:** this reference is made in the context of explaining the industry-accepted concept of risk. The language used is consistent with how experts approach risk, and is not intended to offend readers or be dismissive of the tragic loss of life at Muriwai during Cyclone Gabrielle.

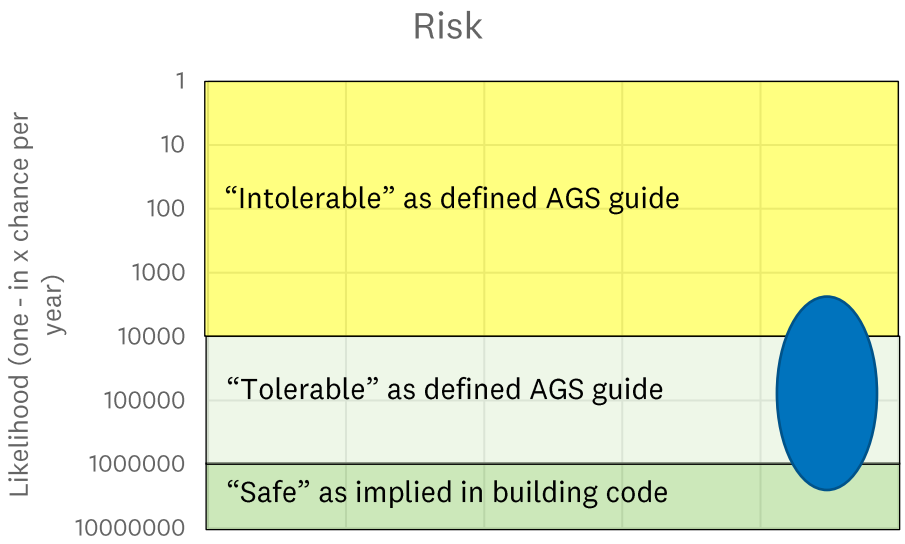

Figure 7: Where the current assessment of risk at Muriwai (blue oval) fits relative to normal guidelines. The blue ‘blob’ represents the range of risk for all properties in the Muriwai community.

In Figure 7, the blue oval representing the risk in Muriwai covers a large range of numbers. This is because of two factors:

1. Each property has a different risk profile. Some are higher risk, others lower. The oval is intended to encompass them all. We do not yet have enough information to present the risk at individual properties. We anticipate that, in time, detailed modelling will allow this property-level assessment, but it may take several months. Some lower-risk properties may be able to be identified earlier.
2. There is a lot of uncertainty in the information, and so the blue oval is large to represent this. Once we have more robust information, which will be collected over the coming three to six months, the blue oval should shrink in size.

How can houses be identified as safe?

There are a range of ways that a house can be identified as “safe”, including:

1. Wait for the hazard to reduce
2. Better understand the hazard
3. Reduce the exposure to the hazard

In such cases, when we say “safe” we mean “not dangerous” in the sense used by the Building Act 2004, section 121. This is a lower level of safety than the level required for new buildings in the Building Code.

1. Wait for the hazard to reduce

Over time most landslides will increase in stability. Immediately after the main event there are often secondary landslides, typically at the crest of the existing slide or around the edges. These most commonly occur in areas which were supported by the land which has now failed. These are commonly smaller than the main event and taper off over time.

In Figure 7, this is equivalent to the blue oval moving down the graph into the ‘safer’ areas.

We are seeing this occur in Muriwai, although the monitoring timeframes are still very short – we would also expect to see seasonal changes as we move into winter.

How long it takes for the hazard to reduce will depend on the geology and topography, and will be heavily influenced by the weather (additional rainfall can trigger further landslides). For some landslide types it can be accelerated by human interventions, for example by removing loose debris from slopes. This is less

likely to be effective for debris flows, especially where they have a potentially very large source area as is the case in Muriwai, as they're not driven by easily identifiable loose debris on the slope.

2. Better understand the hazard

By getting more information about the existing landslides (for example, how far they have moved, and modelling how far future landslides might move) we can fine-tune which properties we think might be affected by future landslides. This may allow us to change the placard on some buildings.

In Figure 7, this is equivalent to the blue oval getting smaller because we have more confidence in our information.

3. Reduce the exposure to the hazard

In some cases, exposure can be reduced by, for example, putting earth bunds uphill of properties that might be affected by a debris flow. However, these can be very challenging to construct and maintain in relatively densely populated areas.

Next steps for entry to your house

There are two types of access we are working on:

1. Managed temporary access
2. Permanent access

Details of how these will work will be issued soon by the Auckland Council Rapid Building Assessment team.

1. Managed temporary access

This is when people are allowed back in their homes for a short period (usually around 15 minutes) to get the small things they need or value the most, such as passports, to pick up pets, and to turn off gas and other appliances which might cause a fire risk.

To make sure it's safe, we need geotechnical assessments of slip movement to be completed and analysed. We will allow managed temporary access as soon as it is safe to do so.

2. Permanent access

This is when a red placard is downgraded to a yellow, when a yellow is downgraded to a white, or in some cases where the restrictions imposed on a yellow change (for example, from "daylight hours only" to "part of the building at any time").

This will occur when it's safe. We can't put a date on it because we can't reassess houses until it's safe for us to do so, and we can only let people back to live in their homes if it is completely safe for them. We will only know it's safe by monitoring the area and carrying out geotechnical assessments, and that will take time. How much time depends on factors outside our control, for example if slips keep moving or if we get more bad weather.

In some cases, work may be needed to stabilise a slip or remove material before we can let people back, and this work can only begin when it's safe.

Longer term actions

We will soon be commencing more detailed geotechnical investigation, analysis and modelling of the slopes at Muriwai. This can now start to commence as the risks are slowly reducing, making access for investigations feasible in the near future.

This work is likely to take in the order of three to six months and will be used to inform our plans for those houses which have not been able to have their placard downgraded based on the information we are collecting at the moment. We anticipate that this may apply to those properties uphill from the F-angle lines shown on our recent modelling, but the decisions will be made on a property-by-property basis to ensure that all the site-specific factors are taken into account.

Vehicle access to Muriwai Beach

Tomorrow evening (Thursday 9 March), those who hold a permit to drive on Te Oneone Rangatira / Muriwai Beach will receive an update via email. This will inform permit-holders that on Friday 10 March, vehicle access from the Wilson Road access will re-open. However, there remains no access on or off the beach at the southern end of Muriwai Beach.

We are also asking permit-holders to take into consideration the impacts on Muriwai residents as the community recovers if they are planning on driving on Muriwai Beach from this access point.

Have we got your details?

If you've received this newsletter via email, then we're all good – we have your correct contact details.

If it has been passed on to you by someone else or you're reading it via a website or social media channel, we'd like you to share your contact details with us. Please email us at muriwai@aucklandcouncil.govt.nz.

There are lots of reasons we might not have your details – you might be a tenant (and we've been dealing directly with the property owner); you might not have provided an email address (just a phone number) to our inspections team; or sometimes, despite our best efforts, handwritten forms lead to mistakes.