



Volcanoes of Auckland

A Field Guide

Bruce W. Hayward

Aerial photography by
Alastair Jamieson

Contents

Introduction	1
Auckland Volcanic Field	2
How the volcanoes work	4
Wet explosive eruptions	4
Fire-fountaining and fiery explosive eruptions	6
Lava flows	8
Volcanic bombs and projectile blocks	11
Volcanic ‘hailstones’	13
Lava caves	13
How old is each volcano?	16
Eruptions and sea level	24
Auckland’s next eruption?	26
The magma below Auckland	26
Time and place of Auckland’s next eruption	28
Monitoring for volcanic activity	30
The next eruption – what to expect	32
DEVORA	34
Auckland Lifelines Group	34
Human interaction with Auckland’s volcanoes	35
Māori occupation and use of Auckland’s volcanoes	35
Volcanoes as water sources	39
Volcanoes lost and damaged	42
Tūpuna Maunga Authority	44
Volcanoes of the Waitematā Harbour and North Shore	46
1. Rangitoto	48
2. Motukorea/Browns Island	62
3. Pupuke Moana/Pupuke Volcano	70
Northcote Road volcanic sequence	75
Takapuna Fossil Forest and Takapuna–Milford Coastal Walk	77
4. Te Kopua-o-Matakamokamo/Tank Farm/Tuff Crater	82
5. Te Kopua-o-Matakerepo/Onepoto Basin	86
6. Maungauika/North Head	90
7. Takarunga/Mt Victoria	96
8. Takararo/Mt Cambria	102

Volcanoes of central Auckland	104
9. Albert Park Volcano	106
10. Grafton Volcano	108
11. Pukekawa/Auckland Domain	112
12. Te Pou Hawaiki	116
13. Maungawhau/Mt Eden	118
14. Ōhinerangi/Mt Hobson/Ōhinerau	124
15. Te Kōpuke/Tītīkōpuke/Mt St John	128
Meola Reef Te Tokaroa	131
16. Maungakiekie/One Tree Hill	134
Hochstetter Pond and Puka Street Grotto	144
17. Te Tātua-a-Riukiuta/Three Kings	146
Liverpool Street tuff	151
18. Puketāpapa/Pukewīwī/Mt Roskill	152
19. Te Ahi-kā-a-Rakataura/Ōwairaka/Mt Albert	156
20. Te Hopua-a-Rangi/Gloucester Park	162
21. Rarotonga/Mt Smart	166
22. Ōrākei Basin	170
23. Maungarahiri/Little Rangitoto	176
 Volcanoes of eastern Auckland	 180
24. Whakamuhu/Glover Park/St Heliers	182
25. Taurere/Taylors Hill	186
26. Te Tauoma/Purchas Hill	190
27. Maungarei/Mt Wellington	194
Maungarei Stonefields Reserve and Heritage Trail	201
Waiatarua and Michaels Ave Reserve lava-flow-dammed lake and swamp	203
28. Te Kopua Kai-a-Hiku/Panmure Basin	204
29. Ōhūiarangi/Pigeon Mountain	208
East Tāmaki volcanoes	212
30. Styaks Swamp Crater	214
31. Matanginui/Green Mount	216
32. Te Puke-o-Taramainuku/Ōtara Hill	218
33. Hampton Park Volcano	220
34. Pukewairiki/Highbrook Park	224
35. Te Apunga-o-Tainui/McLennan Hills	228
36. Ōtāhuhu/Mt Richmond	232
37. Mt Robertson/Sturges Park	236

Volcanoes of southern Auckland	240
38. Boggust Park Crater	242
39. Te Pane-o-Mataaho/Māngere Mountain	244
Kiwi Esplanade pahoehoe flows	249
Ambury Regional Park lava flows	250
40. Māngere Lagoon	254
41. Te Motu-a-Hiaroa/Puketūtū	258
42. Moerangi/Waitomokia/Mt Gabriel	264
43. Puketapapakanga-a-Hape/Pukeiti	268
44. Ōtuataua	272
45. Maungataketake/Elletts Mountain	276
Ihumātao Fossil Forest	280
46. Te Pūkaki Tapu-o-Poutukeka/Pūkaki Lagoon	282
47. Crater Hill	286
48. Kohuora Crater	290
49. Cemetery Crater	294
50. Ash Hill Crater	296
51. Te Manurewa-o-Tamapahore/Matukutūruru/Wiri Mountain	298
Wiri Lava Cave	302
52. Matukutūreia/McLaughlins Mountain	304
53. Puhinui Craters	308
 Historic basalt buildings of Auckland	 310
 Glossary	 319
Select bibliography	322
Acknowledgements	326
Index	327



📍 Maungarei/Mt Wellington scoria cone from the southwest in 2018. *Photo by Alastair Jamieson*



Auckland Volcanic Field

Most people think of a volcano as a single large cone that has built up by a series of eruptions over a lifetime of thousands to hundreds of thousands of years. All the iconic cone volcanoes of the world are of this kind and include most of New Zealand's best-known volcanoes, such as Mts Taranaki, Ruapehu, Ngāuruhoe and Whakaari/White Island. Over time, this type of volcano erupts a considerable amount of lava and ash, often from a single vent at the centre of the cone. They all have a magma chamber at a relatively shallow depth (5–10 km) beneath them that periodically clears its throat and erupts part of its contents at the surface.

Another type of volcanism occurs where there is no magma chamber in the crust but, periodically, relatively small quantities of molten mantle rock rise from depths of 60–90 km and erupt at the surface. Each of these eruptions surface in

a different location and build a relatively small volcano that never erupts again. Volcanoes of this type erupt for a few days to several years and are separated by hundreds to thousands of years of inactivity. They tend to erupt within a discrete area that is called a volcanic field and the Auckland Volcanic Field is a classic example. In these volcanic fields the magma composition is consistently basalt. Volcanic fields with numerous small centres that each erupted once are called monogenetic. The exact number of volcanoes in the Auckland Volcanic Field depends on how they are counted, as some cones and craters are clustered close together and can be counted separately or in combination. This book recognises 53 individual volcanoes.

The Auckland Volcanic Field has erupted spasmodically over the last 200,000 years. While it is currently dormant, the last eruption,

☞ The best-known symbol or icon of Auckland City is Rangitoto Island – the youngest and largest volcano in the Auckland Volcanic Field.

☞ Motukorea/Browns Island is a combination of volcanic landforms (tuff ring, scoria cone, lava flows) produced by all three styles of eruption that characterise Auckland's volcanoes. *Photo by Alastair Jamieson*

Rangitoto, was only around 600 years ago and the field is considered to be still alive and likely to erupt again. All of Auckland's volcanoes, except Rangitoto, erupted on land. Sometimes the lava probably set the surrounding forest on fire but any evidence of this has disappeared. Each volcano would have killed the native forest in the immediate vicinity, and in several places the remains of these forests are buried and preserved by volcanic ash or lava flows. The two best and most easily viewed examples are at Takapuna Reef and at the end of Renton Rd, near Auckland Airport.



How the volcanoes work

The styles of eruption, types of rock produced and resulting landforms in Auckland's Volcanic Field

ERUPTION STYLE	SCIENTIFIC TERM	ROCK PRODUCED	LANDFORM
Wet explosive	Phreatomagmatic, Surtseyan & phreatic	Tuff (hardened volcanic ash), tuff breccia	Explosion crater (maar), tuff cone or tuff ring
Fire-fountaining & fiery explosive	Hawaiian & Strombolian	Scoria (lapilli, cinders), spatter, volcanic bombs	Scoria cone (cinder cone)
Lava outpouring	Strombolian & Hawaiian	Basaltic lava	Lava flow, lava field, or small lava shield

Wet explosive eruptions

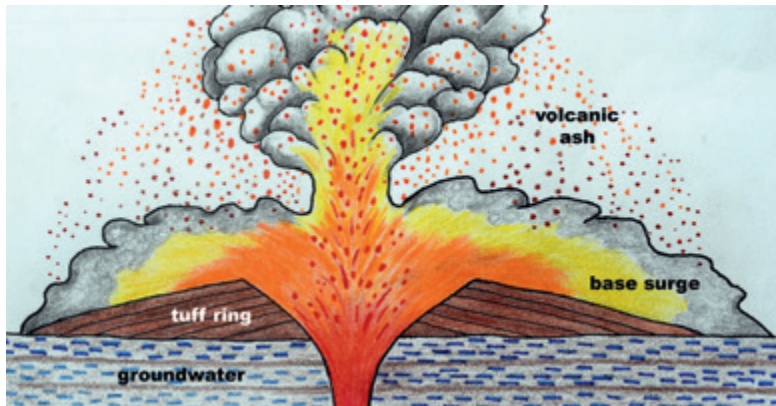
When many of Auckland's volcanoes first erupted, the rising magma came into contact with near-surface groundwater in aquifers or swampy ground. Initially, the heat from the extremely hot magma (about 1000–1200 °C) caused the water to flash to steam, resulting in a violent explosion, rather like what happens when cold water is splashed into a pan of extremely hot oil. These first explosive eruptions may have involved only steam and are referred to as phreatic or steam eruptions. The steam blasted up through the overlying ground, throwing out large and small fragments of rock and soil and creating a small crater. Deposits from these kinds of eruption are often structureless heaps of angular blocks in a matrix of finely comminuted soil and rock (known as tuff breccia).

Commonly, but not always, the steam blast eruptions were followed by those that also involved the rising magma, the surface of which was instantly chilled, solidified and explosively fragmented when it encountered the cold water.

These eruptions are called phreatomagmatic as they involve both steam and magma. They result in the upwards and outwards ejection of a rapidly expanding cloud of steam, magmatic gas, fragmented lava and other pieces of rock from the vent walls.

The solid particles that erupted into the air and were deposited over the ground are referred to by the general term tephra. Tephra is divided on the basis of particle size into ash (fragments smaller than 2 mm), lapilli (2–64 mm across), and blocks and bombs (greater than 64 mm). Wet explosive eruption columns rose to heights of a kilometre or more and the less dense volcanic ash and lapilli within them were dispersed by the wind.

Fallout tephra accumulated on the ground on the downwind side of the volcano. Blocks of solid rock were ejected from the vent on ballistic trajectories and landed nearby. Around the denser base of the eruption column, base surges of superheated steam, gas, ash and lapilli were blasted out sideways at speeds up to 200 km/h.



③ Cartoon of a wet explosive eruption from an Auckland volcano. This style of eruption typically forms an explosion crater surrounded by a tuff ring composed of hardened layers of volcanic ash. *Illustration by Margaret Morley*



④ Part of a sea cliff on Motukorea/Browns Island showing bedded tuff. Each layer represents an explosive pulse. Dark layers contain numerous grey basalt fragments derived from the rising magma and cream-coloured chunks of the underlying Waitematā Sandstone. Light-coloured laminated beds of fine ash were left behind by fast-moving base surges of searing gas, steam and ash. Height of photo 0.5 m. The black basalt fragment in the middle is a volcanic bomb in the impact crater where it landed in the soft ash.

These turbulent base surges devastated and partly buried areas within 3–5 km of the vent and were the most dangerous style of eruption produced by Auckland's volcanoes. As these surges passed they commonly left behind wavy beds of fine ash, sometimes with cross-bedded dune forms.

Wet explosive eruptions usually come in a series of pulsating episodes interspersed by short periods of inactivity. These eruptions typically produced a relatively shallow (50–100 m deep), wide (200–1000 m across), circular explosion crater surrounded by a low ring of bedded volcanic ash and lapilli. The ash and lapilli were erupted wet. As the layers dried out they hardened into a creamy-brown rock called tuff. The raised ring of tuff rock around the explosion crater is called a tuff ring, or, if it is a more substantial mound, it is sometimes called a tuff cone. A tuff ring, or cone, usually has its circular crest forming the rim of the crater with relatively steep slopes back into the crater and gentler slopes (c. 5–10 degrees) on the outside. The steeper inner slopes are often formed by a series of arcuate slump scarps as a result of sections of the tuff ring slipping back into the crater after being deposited.

If magma supply ceased before all the groundwater was used up, then the only land-form produced by the volcano was an explosion



crater surrounded by a tuff ring. There are 24 explosion craters with surrounding tuff rings in the Auckland Volcanic Field.

The rock fragments that were blasted out in these explosive eruptions include many pieces ripped from the walls of the volcano's throat. They range in size from small lapilli to large blocks more than a metre across. The composition of these ejected rocks provides information on the rock strata that underlie the volcano at depths of several hundred metres or more. In a way, these volcanoes were natural drilling rigs, bringing samples of rock to the surface for geologists to piece together and work out the underlying rock sequence.

After eruptions finished, the explosion craters gradually filled with rainwater, creating crater lakes. Many of these lakes have subsequently filled with sediment and are now tidal lagoons, swamps or reclaimed wetlands. Those that became tidal lagoons were formerly lakes that were breached by rising sea level about 8000 years ago as a result of the melting of the European and North American ice sheets after the end of the Last Ice Age.

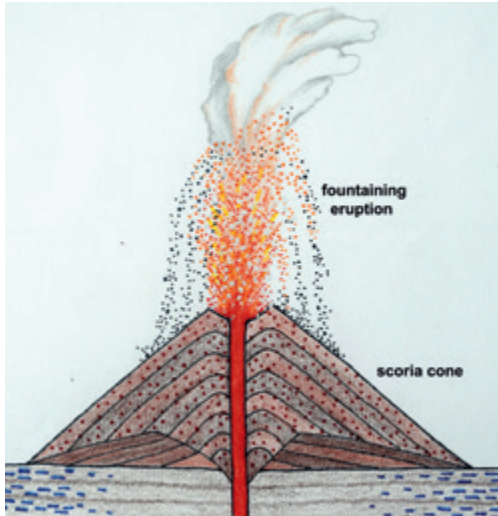
Fire-fountaining and fiery explosive eruptions

If the water in the vent was all used up (during the wet explosive eruptions) before the magma supply waned, then eruptions switched to a dry style and scoria cones were built. These partly or completely filled the explosion crater and maybe even buried all trace of the tuff ring.

The magma that erupted to form Auckland's volcanoes was molten rock containing dissolved gas (mostly water vapour and carbon dioxide) under pressure, rather like the dissolved gas in a bottle of fizzy drink. As the rising magma neared the surface, pressure reduced and the releasing gas drove a fountaining of frothy liquid from the vent, called fire-fountaining. Shake up a bottle of Coca-Cola, remove the lid, partly close the opening with your thumb and watch the fountaining powered by the escaping gas – so it is with natural fire-fountaining.

As the fountaining frothy lava flew through the air, it cooled and solidified, forming the frothy rock known as scoria (sometimes called cinders). This rock is initially black but oxidation of iron (reaction with oxygen in the air) during

📍 View from Māngere Mountain across Māngere Lagoon explosion crater and surrounding tuff ring with a small restored scoria cone in the middle.



🎨 Cartoon of a fire-fountaining eruption that produced a scoria cone with a steep-sided central crater. *Illustration by Margaret Morley*

📸 Time-elapse photo of a fiery explosive eruption (Strombolian) in Hawai'i at night. *Courtesy of US Geological Survey*



fountaining turned much of the hot scoria to its characteristic red colour. Scoria that remained black erupted on the margins of the fountain and cooled too quickly to react with the atmosphere.

The erupted scoria accumulated around the vent, building a steep-sided scoria cone with a deep crater. The slope of scoria cones is about 30 degrees, the angle at which scoria came to rest as it rolled downhill. A 30-metre-high scoria cone can be thrown up in less than a week and a 100-metre-high cone in several weeks. If a strong wind was blowing during fountaining, much of the scoria landed on the downwind side of the vent, building up a higher peak on one side of the scoria cone (e.g. One Tree Hill).

Scoria cones consist of layers of scoria of various sizes. Larger and denser fragments landed closer to the vent and the smallest lapilli and scoriaceous ash could be blown many kilometres away (e.g. Three Kings fountaining eruptions). Auckland's scoria cones were built mostly by steady fire-fountaining eruptions of rapidly rising, rather fluid magma containing multitudes of small gas bubbles. Sometimes this magma was still sufficiently liquid when it landed that it joined together to form a small lava flow that ran part-way down the cone slopes before cooling and solidifying. These small flows within a scoria cone are often called rootless lava flows because they differ from normal flows in that they have no obvious link to their source deep in the throat of the volcano.

Within some of the scoria cones there are layers of larger, ragged chunks of coarsely vesicular (holey) or more dense basalt that were expelled from the vent by discrete fiery explosive eruptions (called Strombolian style) of more pasty lava. These incandescent lumps often landed in a sticky molten form and tended to weld together into hard layers. The rate of magma ascent usually determines the style of eruption and the character of the ejected lava. The discrete fiery explosive outbursts occurred at fairly regular intervals seconds to minutes apart, and indicate more slowly rising, less fluid



④ A fire-fountaining (Hawaiian) eruption in Hawai'i. Notice how the wind has blown the column so that the scoria lands on one side of the vent. *Courtesy of US Geological Survey*

⑤ Well-sorted red scoria produced by fire-fountaining. The lumps of scoria are honeycombed with small holes (called vesicles) that were once bubbles in the erupting frothy lava.



magma. Some of the small gas bubbles coalesced and grew extremely large as they rose through the magma column, each bursting at the surface to produce a separate explosive blast ejecting lumps of fiery lava tens to hundreds of metres into the air.

These discrete fiery explosive eruptions often occurred towards the end of the dry fire-fountaining phase as the rate of magma ascent slowed and it became cooler, thicker and less gaseous. As a result, a number of Auckland's scoria cones are capped by partly welded deposits of large, ragged lumps of scoriaceous basalt and aerodynamically shaped volcanic bombs (e.g. McLaughlins Mountain, Mt Wellington, Big King and Little Rangitoto).

Over half of Auckland's volcanoes produced one or more scoria cones erupted by a combination of fire-fountaining and fiery explosive eruptions, although many have been damaged or removed by quarrying in recent times. Several of the smallest cones (e.g. Pukeiti, Te Pou Hawaiki and Hampton Park) are composed almost entirely of the more welded deposits thrown out by fiery explosive eruptions.

Lava flows

During the dry fire-fountaining and fiery explosive phase of eruption of Auckland's scoria cones, the partly degassed molten magma often rose up inside the throat of the volcano. If it reached the height of the base of the scoria cone, this magma could push its way through the loose scoria and emerge as a flow of lava from near the base of the cone. Sometimes the loose scoria collapsed and the side of the scoria cone was rafted away by the outflowing lava. Such action created a horseshoe-shaped or breached crater (e.g. on Mt Hobson and One Tree Hill). Any scoria that landed on the lava flowing through the breach was also rafted away.

The outpouring of lava flows was usually accompanied by fire-fountaining or fiery explosions. Gas in the fluid magma was released in the volcano's throat and powered the fiery eruptions



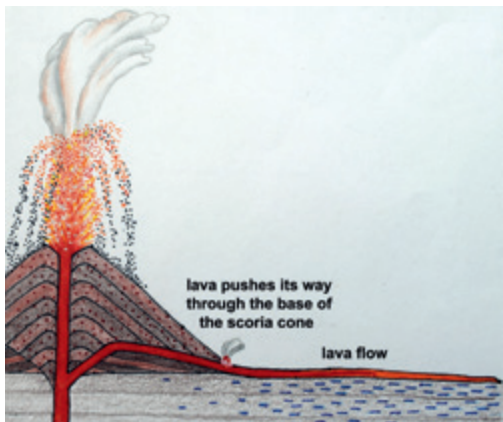
📍 Maungawhau/Mt Eden's steep-sided scoria cone was built by fire-fountaining and fiery explosive eruptions of bubbly lava (scoria) from two craters. The southern crater is the most obvious. *Photo by Alastair Jamieson, 2018*

from the vent directly above; whereas the lava that flowed out the side had lost most of its dissolved gas and, when it cooled and solidified, it became a relatively dense, dark grey basaltic rock. Some gas that was still trapped in the lava often rose towards the surface of the flow as it cooled. This sometimes resulted in a zone of more vesicular, or holey, basalt near the top of the flow.

As molten basaltic lava cools and solidifies, it contracts and cooling cracks form. These cracks often form fairly regular hexagonal-shaped columns (called columnar joints) that are vertical (or, more accurately, perpendicular to the cooling surfaces at the top and bottom of the flow). Sometimes, near-horizontal cooling joints also form near the top or bottom of a flow.

The size of the lava flow or field of coalescing lava flows depended on the supply of lava. Some

of Auckland's cones produced just one small flow (e.g. Little Rangitoto and North Head), whereas others produced sizeable lava-flow fields that completely surrounded them (e.g. Māngere Mountain and Mt Eden). The speed and distance travelled by individual flows was controlled by the eruption rate and temperature of the erupted lava and hence its viscosity. The hotter, more liquid lava flowed downhill at running pace. Its surface chilled quickly to a thin, elastic black crust but the fluid lava beneath continued to flow and deform the surface skin into curved, ropey rolls, rather like the skin on a pot of cooling jam. Flows with such a smooth surface texture are known by their Hawaiian name as pahoehoe flows. As the flows moved downhill they cooled and became stickier, eventually stopping and solidifying into basalt rock.



④ Cartoon cross-section of the plumbing and eruption style that resulted in the outpouring of lava flows from the base of an Auckland scoria cone. *Illustration by Margaret Morley*

④ A pahoehoe lava flow in Hawai'i showing the characteristic cooled, black crust with its ropery rolls on the surface of the still molten lava. *Courtesy of US Geological Survey*



④ Typical rubbly surface of an a'a lava flow on Rangitoto Island.

Towards the end of a volcano's eruptive history, the magma in the plumbing began to cool and the erupted lava flows were more viscous. They flowed more slowly and often came to a standstill not far from the vents from which they oozed (e.g. One Tree Hill and Mt Eden). These cooler, more viscous lava flows formed thicker, more solid surface crusts that behaved brittly and not elastically. This thick crust was broken up into sharp blocks of rotating basalt by the continued movement of the fluid lava interior of the flow. These flows, which look like a moving pile of rocky rubble, are known by their Hawaiian name as a'a flows.

The two Auckland volcanoes that erupted the largest volume of lava are One Tree Hill and Rangitoto. Over several years, numerous flows poured out from around the base of their growing scoria cones. These flows cooled and solidified on top of each other to build up roughly circular cones with gentle slopes of about 10 degrees. These gently sloping lava-flow cones are small shield volcanoes – Rangitoto's is the best developed, and One Tree Hill's is less so and best viewed from the south. McLennan Hills also built up a small shield volcano. All three were capped by several coalescing, steeper scoria cones at the centre.

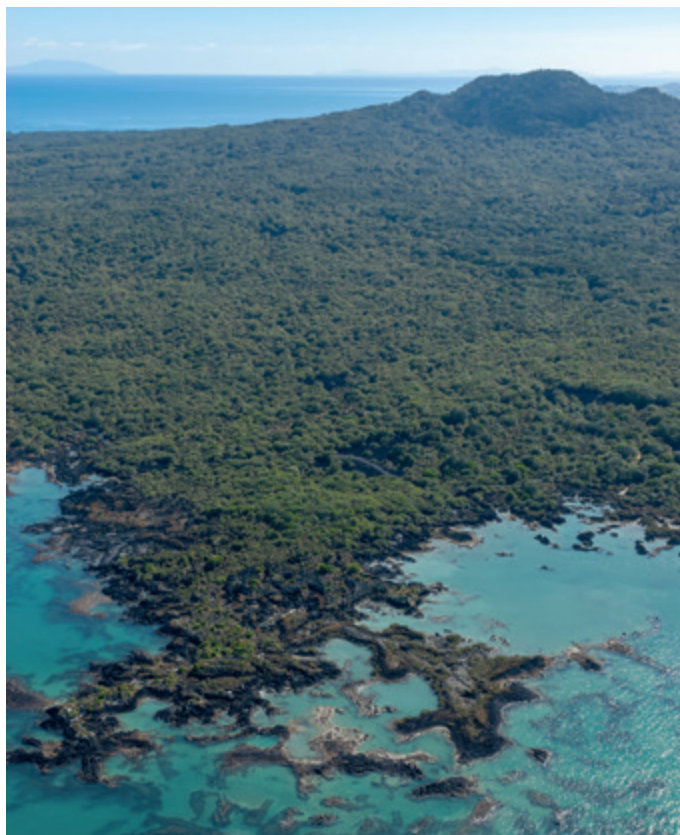
Where the volume of outpouring lava was less, the shape of the land over which it erupted influenced the resulting form of the lava-flow field. Flows that erupted onto the relatively flat Manukau lowlands generally spread out as a wide apron close to the central cone (e.g. Māngere Mountain and Ōtuataua). The Auckland Isthmus was more dissected with incised streams draining rolling sandstone hill country. In this area, outpouring lava flowed as viscous rivers down stream valleys and cooled to form solid ribbons of basalt filling the valley floors (e.g. the Three Kings and Mt Wellington flows). The streams were displaced and now flow along the side of the basaltic flows, eroding new courses into the softer sandstone banks (e.g. Oakley, Meola, Motions and Puhinui creeks).



Rangitoto



Visitors to iconic Rangitoto Island arrive by ferry at Rangitoto Wharf on the south side of the island (foreground) and usually walk the track to the summit for views over Auckland. *Photo by Alastair Jamieson*



📍 Aerial view of the southern slopes of Rangitoto Island showing the different vegetation (darker) growing on the main scoria cone compared with the pōhutukawa forest on the lava flows. In the foreground, branching lobes of some of the youngest lava flows formed as they entered the sea. *Photo by Alastair Jamieson, 2009*

Land status: Rangitoto Island is a Crown-owned scenic reserve, as is adjacent Motutapu Island Recreation Reserve. Both are managed by the Department of Conservation and fully open to the public.

How to get there: Catch a Fullers ferry from the ferry buildings in Quay St, downtown Auckland or from Devonport Wharf. They take passengers to and from Rangitoto Wharf several times a day. See www.fullers.co.nz/destinations/rangitoto-island/ for times and fares. Make sure you know the time of the last returning ferry because if you miss it you may have to hire an expensive water taxi to bring you back.

What to do: Spend a half or full day on Rangitoto Island. On a half-day trip there is time to walk to the summit for a panoramic view of Auckland and the Hauraki Gulf (2 hours return) and appreciate the rubbly lava flows and steeper scoria cone at the top. There may also be time for a quick visit



Some of the lava flows traversed by the track to the summit from Rangitoto Wharf have a surface of broken-up slabs of basalt (up to 1 m across) that probably cooled and solidified on the top of relatively fluid pahoehoe lava. As these flows cooled they became more viscous and slower, and this surface crust was ripped apart and rafted along as slabs.

to the lava caves. An alternative for less fit visitors is to pay for a road-train ride on the gravel road around the island with a stop near the summit for an opportunity to climb the wooden boardwalk and steps to the summit.

On a full-day visit (6 hours) there is time to walk to the summit, visit the lava caves and return to Rangitoto Wharf on the rocky road via Islington Bay (east side) or McKenzie Bay (west side). Both routes are 7 km. Around Islington Bay and Rangitoto wharves there are additional picturesque coastal walks past the sites of many of the former holiday baches that once lined the rocky shore. Just a few baches are still standing as historic reminders of a bygone era. For those interested in plants, examine the plant successions on the lava flows and the scoria cone using the main tracks or from side tracks, such as Kidney Fern and Wilson's Park tracks. On a hot summer's day, swim at the sandy beach at McKenzie Bay (1 hour's fast walk each way from Rangitoto Wharf) or, if the tide is in, there is a small artificial pool near Rangitoto Wharf. There is no shop on the island and the only toilets and fresh water are at Rangitoto Wharf, Islington Bay and McKenzie Bay.



This 2-metre-high, conical tower of basalt spatter near the track to the lava caves is called a hornito. Rangitoto is the only place in New Zealand where hornitos are preserved. Hornitos are small mounds of welded spatter built by the accumulation of incandescent lava ejected through holes in the roof of a lava tube within a lava flow.



📍 Profile of Rangitoto from Ōkahu Bay showing the gentle lower slopes of the lava-flow shield surmounted by the steeper main scoria cones. The two secondary scoria cones on either side of the main one are clearly visible from this part of Auckland City.

📍 Places of interest on Rangitoto Island:

1. Rangitoto Wharf. Shelter with information panels and water. If the tide is low, look over the sea wall adjacent to the shelter to see a well-exposed branching pahoehoe lava flow that was formed as molten lava reached the sea.
2. Second World War parade ground. This originally was an unfinished tennis court constructed by the prisoners who were housed in a camp close by.
3. A'a and slab pahoehoe lava flows and levees. Look for trenches margined by ridges of rubble (called levees) formed where molten lava drained out of the centre of the lava flow and the overlying rubble collapsed into the empty conduit, producing a trench.
4. Side track to the lava caves (10 minutes each way) leaves the Summit Track at the foot of the scoria cones. Track leads to a 100-metre-long cave with an unusual trench-like shape and near-vertical walls. This was the internal conduit for lava that flowed along within an a'a flow with an outer carapace of solidified clinker blocks of basalt. When the lava drained out it left this long lava tube. Entry and exit points are where the roof has collapsed. If you intend to explore these caves you should take a torch and wear a thick hat for protection in case you bump your head on the roof.
5. Depressed moat where the track to the caves branches from the Summit Track. It separates the top of the lava flows and the scoria cones. The track to the caves runs through this moat for some distance. It was probably formed by the slight subsidence of the scoria cones into the vent as lava withdrew back down the volcano's throat at the end of Rangitoto's eruptions.
6. Summit. Superb views into the crater and out over the Waitematā Harbour, Hauraki Gulf and Motutapu Island. The small concrete building was the fire command post used to co-ordinate Auckland's coastal defence gun batteries during the Second World War.
7. Islington Bay Wharf and historic baches.
8. Causeway to Motutapu Island constructed on top of a shell spit during the Second World War to link defensive posts on both islands.
9. Old Harbour Board quarry and site of controlled mine base during the Second World War.
10. Wreck Bay. Reached via a rough side track (1 hour each way) off the road between Islington Bay and the summit. The low cliffs on either side of the bay and the huge boulders thrown up above high tide attest to the power of major storms that have carved into the basaltic lava flows on the exposed north side of Rangitoto since they were erupted just 600 years ago. The sheltered south side of Rangitoto has had almost no erosion.
11. McKenzie Bay, along with adjacent Whites Beach, is the only sandy beach on Rangitoto. It was the site of a short-lived (1892–96) salt refinery where imported rock salt was dissolved in sea water and then refined salt crystals were produced from the brine by evaporation in a huge pan heated by four furnaces. Nearby on an offshore islet is Rangitoto Beacon (built in 1887) – one of the first structures built on the island and used for sea navigation. It was initially lit by gas but switched to electricity in 1929.
12. Flax Point. Site of Auckland's largest black-backed gull colony.