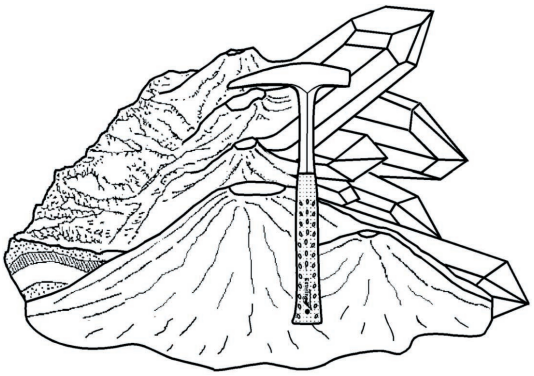


Geocene

Auckland GeoClub Magazine
Number 14, November 2016

Editor: Jill Kenny

CONTENTS

WOULD THE REAL BEACHLANDS FAULT PLEASE STAND UP	Bruce W. Hayward	2 – 3
MANGERE LAGOON PREDATED MANGERE MT	Bruce W. Hayward, Jenni Hopkins and Elaine Smid	4 – 5
Quizzes		6
A WALK ON A BEACH, MANGAWHAI HEADS, PART 1	Garry Carr	7 – 8
RAPID BUILD-UP OF WIND-BLOWN SAND IN KIKUYU GRASS AT MISSION BAY, AUCKLAND	Bruce W. Hayward	9 – 11
KARIOTAHI CAVES	Peter Crossley	11 – 12
NEWLY RECOGNISED MT EDEN LAVA FLOW LOBE	Bruce W. Hayward	13 – 14
Quiz answers		14

Geocene is a periodic publication of Auckland Geology Club, a section of the Geoscience Society of New Zealand's Auckland Branch.

Contributions about the geology of New Zealand (particularly northern New Zealand) from members are welcome. Articles are lightly edited but not refereed.

Please contact Jill Kenny <jill.kenny_at_xtra.co.nz> (substitute @ for _at_)

WOULD THE REAL BEACHLANDS FAULT PLEASE STAND UP

Bruce W. Hayward

For many years I have heard of the Beachlands Fault - supposedly the youngest potentially active fault near the centre of Auckland City. Before leading a Geoclub trip to Beachlands in June 2011, I spent some time looking through publicly accessible documents to try and locate exactly where it was. This is what I found:

The Beachlands Fault is too insignificant to appear on either Kermode's (1992) 1:50,000 map of Auckland City (R11) or Edbrooke's (2001) QMap of Auckland region. Firth (1930, fig. 18) appears to be the first to mention the fault and the only one I found to feature it in a photograph captioned "normal fault intersecting Waitemata and Pleistocene strata near Beachlands wharf". In the black and white photograph, the fault is near impossible to see and its exact location is not marked on his published maps. Two much later theses (Glading, 1987; Tejakusuma, 1998) have apparently described it, but these are not easily accessible.

Hull *et al*. (1995) summarised the literature on the Beachlands Fault, prior to Tejakusuma's thesis: "This fault has been described by Glading (1987) and Firth (1930) as striking at 320°, putting it on strike with the Kiripaka fault. Prebble (1991) mapped the Beachlands and Kiripaka fault as a continuous feature. The fault is seen as displacing the Waitemata Group and also the overlying Quaternary beds. The Beachlands fault offsets an erosion surface cut into the Waitemata rocks"… "and two discrete ash beds in the overlying Quaternary terrace. Glading (1987) stated that the upper ash bed pre-dated the 50,000 year ash recognised elsewhere in Auckland, but could not assign a precise age to the offset ash."



Fig. 1. View from near Beachlands wharf to the 15-m-high cliffs on its eastern side, showing the Beachlands Fault displacing Waitemata Group strata (lower part), a Pleistocene unconformity and a 2 m-thick, grey-white rhyolitic tephra (identified as pre-Ongatiti Tephra by Alloway *et al*., 2004).

Irwin (2009, p.72) included the Beachlands Fault in the category of active faults. GNS Science currently classifies active faults as being those that have evidence of movement in the last 100,000 years. Irwin (2009) states that Tejaksuma (in his unpublished 1998 thesis) deduced a vertical movement rate of 0.827mm/1000 years on the Beachlands Fault. Kenny *et al*. (2011) state "Limited evidence of faulting is found at Beachlands, where a small low-angle thrust fault less than 340,000 BP offsets Pleistocene tephra (Tejakusuma 1998)." This is likely referring to the Beachlands Fault which is a normal fault with a ~65° dip.

Kenny *et al*. (2011, fig. 20a) show the Beachlands Fault as a minor fault quite separate from the Waikopua Fault. They also show an offshore extension of the Beachlands Fault seismically imaged (Kenny *et al*., 2011, fig. 22). In 2011, the NZ Geopreservation Inventory placed the Beachlands Fault in Pohutukawa Bay (100 m+ east of Beachlands wharf) and the draft Auckland Unitary Plan available on-line 2013-2016 repeated this location.

After some difficulty, the 2011 Geoclub group found the elusive Beachlands Fault, about 20 m east of Beachlands wharf, which also gives the easiest and best view of it in the adjacent cliff. It is inaccessible without much cliff clambering at low tide from Pohutukawa Bay. Here I present a photograph of the cliff section, which shows the fault far more clearly than in Firth's (1930) photo. The lower half of the cliff on the right (west) of the fault is composed of gently dipping early Miocene Waitemata strata overlain, with a near-horizontal erosional unconformity of inferred Pleistocene age, by a ~2 m-thick tephra and more obscured, horizontally-bedded, tephric sediment extending to the top of the cliff. The 2 m-thick tephra bed and unconformity have been downthrown by ~2 m to the west and the underlying Waitemata Group strata have been displaced an indeterminate amount exceeding 2 m.

Alloway *et al*. (2004) used geochemistry to identify the 2 m-thick tephra as pre-Ongatiti Tephra (older than 1.2 myrs). Thus the Beachlands Fault has ruptured in one or more earthquakes in the last ~1.2 myrs, or slightly more, but how recently? There is no obvious displacement of the land where the fault reaches the top of the cliff on the edge of a terrace. The Auckland Council LIDAR map with 0.5 m contours shows no sign whatsoever of a linear displacement extending southeast along strike from the fault in the cliff.

I thus conclude that the last displacement pre-dated formation of the land surface, which might have been during the higher sea level of the warmest interglacial in the

last 1 myrs (MIS11,~400,000 years ago). Overall, it seems highly unlikely that the Beachlands Fault has ruptured in the last 100,000 years and it should therefore not be classed as an active fault, but it might still be one of the youngest to have ruptured near the heart of Auckland City.

References

Alloway, B., Westgate, J., Pillans, B., Pearce, N., Newnham, R., Byrami, M., Aarburg, S., 2004. Stratigraphy, age and correlation of middle Pleistocene silicic tephras in the Auckland region, New Zealand: a prolific distal record of Taupo Volcanic Zone volcanism. New Zealand Journal of Geology and Geophysics 47: 447–480.

Edbrooke, S.W., 2001. Geology of the Auckland Area. 1: 250 000 geological map 3. Institute of Geological and Nuclear Sciences.

Firth, C.W., 1930. The geology of the north-west portion of Manukau County, Auckland. Transactions of the New Zealand Institute 61: 85–137.

Glading, A.V., 1987. Aspects of the engineering and Quaternary geology, Whitford-Brookby-Beachlands, Auckland. Unpublished MSc thesis, Department of Geology, University of Auckland.

Hull, A.G., Mansergh, G.D., Townsend, T.D. Stagpoole, V., 1995. Earthquake hazards in the Auckland region. Client Report 33494D.10. Institute of Geological and Nuclear Sciences Limited. 37 pp.

Irwin, M., 2009. Synthesis of existing structural data for the Auckland Volcanic Field. University of Auckland, Institute of Earth Science and Engineering Report 1-2009.01, 207 pp.

Kenny, J.A., Lindsay, J.M., Howe, T.M., 2011. Large-scale faulting in the Auckland region. University of Auckland, Institute of Earth Science and Engineering Report 1-2011.4, 95 pp.

Kermode, L.O., 1992. Geology of the Auckland urban area.1: 50 000. Institute of Geological and Nuclear Sciences geological map 2.

Prebble, W.M., 1991. Report on the field investigations carried out to search for active fault at the proposed Manukau Sanitary Landfill site. In BCHF Water right application, Vol. 1.

Tejakusuma, I.G., 1998. Slope movement and faulting in Quaternary deposits and Miocene weak rock at Beachlands, Auckland, New Zealand. Unpublished MSc thesis, Geology Department, University of Auckland.

MANGERE LAGOON PREDATED MANGERE MT

Bruce W. Hayward[1], Jenni Hopkins[2] and Elaine Smid[3]
[1]19 Debron Ave, Remuera
[2]GNS Science, Lower Hutt
[3]University of Auckland

Mangere Mt and Mangere Lagoon are counted as two of Auckland's 53 volcanoes. They lie side by side on the edge of the Manukau Lowlands. Periodically the question of which is older has arisen, but no observations that might answer this question are recorded in the literature, as far as we can tell. Mangere Lagoon is an explosion crater with surrounding tuff ring and a small central scoria cone. Mangere Mt is built from voluminous scoria fountaining and is almost entirely surrounded by an extensive apron of lava flows that must have poured out from around the base of the scoria cone (Fig. 1). The gently-sloping surface of the lava flows on the southern side extends all the way to the top of the Mangere Lagoon crater slopes on its northern side. This topography suggests that either: a. Mangere Lagoon exploded through Mangere Mt flows, but did not build a tuff ring (unlikely); or b. that Mangere Lagoon crater and tuff ring already existed and Mangere flows built right up to the crest of the tuff ring but did not overflow it and partly or fully fill the crater with lava (as with Otara Hill flows into Hampton Park explosion crater) (also unlikely but more probable than a).

In April 2016, fifteen Geoclubbers made a special trip to Mangere Lagoon to see the exposures recently discovered by the authors that for the first time provide a definitive answer to the question of relative age of these two volcanic centres. Clearly, this evidence had not been seen by previous geologists who have documented these two volcanoes.

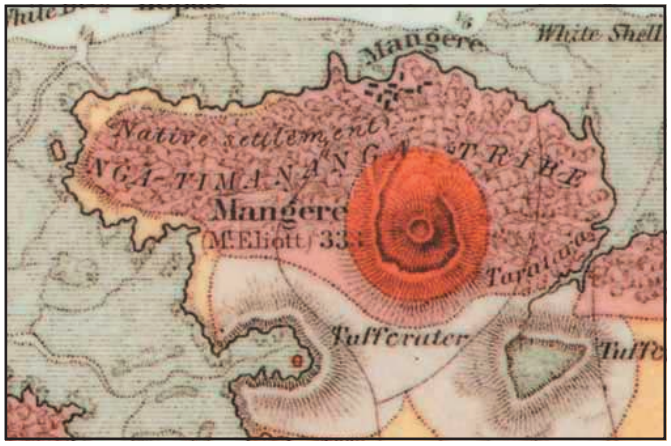


Fig. 1. A small part of Hochstetter's (1864) map showing Mangere Mt scoria cone (red) surrounded by lava flows (pink) and with Mangere Lagoon (labelled tuff crater with small red scoria cone blob in it) on its southwest margin.

In January 1859, Hochstetter (1864) undertook a one day trip from Onehunga across the Mangere arm of Manukau Harbour by boat and then walked up and over Mangere Mt and on out to Maungataketake via Waitomokia, and then returned to Onehunga. During this one day visit he mapped the extent of all the volcanic landforms he recognised, including some that we do not recognise today (Fig. 1) (Hayward, 2013). He would have noted from the top of Mangere Mt that he could not easily walk around the west side of Mangere Lagoon, as it would require crossing mud flats and a tidal channel (when the tide was out) – he would have walked both ways around the east side and therefore would not have had time to visit the northern slopes of Mangere Lagoon crater.

Cyril Firth (1930) and Ernie Searle (1959) were the next to map and describe these two volcanoes in any detail. Both provide brief descriptions of Mangere Lagoon and its central scoria cone, but make no mention of any evidence about whether it was older or younger than its near neighbour. Ernie visited the area when the Mangere sewage plant was being installed and may not have been allowed access near the works. A 1950s aerial photo (Fig. 2) shows scrub and a belt of trees obscuring the crater slopes of interest. Les Kermode undertook most of the more recent detailed documentation of Auckland volcanoes during the 1960s–1990s (Kermode, 1992). This period coincided precisely with the time when



Fig. 2. 1950s aerial photograph of Mangere Lagoon from the east, showing the belt of trees along the northern side (right) that would have obscured the view of lava spilling into the crater from the Mangere Mt flows above.



Fig. 3. 2009 aerial photograph of Mangere Lagoon and Mangere Mt from the southwest. The white line indicates the observed extent of lava spilling down the northern inner slopes of Mangere Lagoon crater from the Mangere Mt flow above. Red line shows approx location of new bulldozed walking track. Photo: Alastair Jamieson.



Fig. 4. Exposure on the recently bulldozed walking track up the northern slopes of Mangere Lagoon explosion crater showing a thin flow of vesicular basalt lava with its irregular scoriaceous base where it overlies the steeply sloping surface of tuff (hidden beneath the hammer and vegetation in this photograph).

Mangere Lagoon was used as sludge ponds and there was no public access. Like when Ernie was looking at the volcanoes, the northern crater slopes would still have been hidden under trees and the evidence we found was not visible unless Les had managed to get permission to investigate beneath the trees.

In the early 2000s, Mangere Lagoon was restored to its pre-sludge ponds state and a public walkway opened just above high tide level around the inside (Hayward, 2004). An additional short length of walking track was installed that linked with Mangere Mt via a newly bulldozed 2 m-wide section of track created diagonally down the northern crater slopes through the trees to the circum-lagoon track. Mangere Lagoon explosion crater has steep inner slopes around its eastern and northern sides, but the southern side is a low, partly modified bank and the western side was eroded out by the sea in the Holocene and is now bordered by a man-made causeway and pipeline (Fig. 3). Weathered tuff can be seen near the circum-crater track in a number of scattered localities on the steep eastern and northern slopes.

In the recently-created cuttings for the diagonal walking track up the northern slopes, there are several places where an irregular sheet of vesicular basalt lava (up to 0.6 m thick) can be seen to overlie weathered tuff. In one place the lava has a 10–20 cm thick scoriaceous base (Fig. 4). We found no evidence of a buried soil or any fossil vegetation between the base of the flow and steep tuff slopes beneath. The basalt flow could be traced back up the slope all the way to the top. Further west beneath the trees there are a number of places where more thin lava flow could be seen to have spilled down over the steep tuff slopes. At the top of the crater's northern slopes the lava flow surface rises gently to the foot of Mangere Mt scoria cone and clearly a lava flow has filled up any depression that might have been present between the crest of the tuff ring and the scoria cone. Small amounts of lava have slopped over the crest of the tuff ring and flowed partway, or in some places maybe all the way, down the steep slope into the crater.

Thus Mangere Mt lava flows are younger than Mangere Lagoon explosion crater. The lack of obvious soil or vegetation between the two suggests that maybe the mountain erupted quite soon (within decades) after the lagoon was formed, in a similar fashion to the twin volcanic centres of Purchas Hill and Mt Wellington (Hayward, 2006).

References

Firth, C.W., 1930. The geology of the north-west portion of Manukau County, Auckland. Transactions of the New Zealand Institute 61: 85–137.

Hayward, B.W., 2004. Restoration of Mangere Lagoon Explosion Crater, Auckland. Geological Society of New Zealand Newsletter 134: 28–31.

Hayward, B.W., 2006. The relationship between Purchas Hill and Mt Wellington. Geocene 1, 2-3.

Hayward, B.W., 2013. Volcanoes recognised by Hochstetter on the Mangere Lowlands. Geocene 9: 21–23.

Hochstetter, F. von, 1864. Geologie von Neu-Seeland. Beitrage zur Geologie der Provinzen Auckland und Nelson. Novara-Expedition, Geologie Thiel 1(1): 274 p.

Kermode, L.O., 1992. Geology of the Auckland urban area.1: 50 000. Institute of Geological and Nuclear Sciences geological map 2.

Searle, E.J., 1959. The Volcanoes of Ihumatao and Mangere, Auckland. New Zealand Journal of Geology and Geophysics 2: 870–888.

QUIZZES

Know your volcanoes. Match photos 1 – 5 with volcano names A – E.
(Answers on last page)

1.



2.



3.



4.



5.



Possibilities to choose from:-

A Auckland Domain
B Crater Hill
C Mt St John
D Tank Farm
E Te Hopua (Gloucester Park)

Where is this Waitemata Group cliff?
(Answer on last page)



Possibilities to choose from:-

a Emu Point, Motutapu Island
b Mission Bay / Bastion Point
c Long Bay, southern end
d Cape Horn, north coast Manukau Harbour
e Whangaparaoa Head

A WALK ON A BEACH, MANGAWHAI HEADS, PART 1

Garry Carr

Geoclub has visited Mangawhai Heads surf beach and coast on at least two occasions. This is a photo essay of the rocks along the coast line.



Fig. 1. Modern active dunes with Hen Island (eroded Miocene andesitic volcanics) in the distance.



Fig. 2. Looking northwest along the beach from the beach below the surf club.



Fig. 3. The rocks (and boulders) outcropping close to the Mangawhai surf club are dacite, dated at about 19 million years old. Here it is a remarkably uniform volcanic rock, light grey with some weathering. The breakwater here is an artificial structure built from rock quarried from the dacite right by the entrance to the harbour. In the far distance is Little Barrier Island.



Fig. 4. Cliffs formed by quarrying at the entrance to the Mangawhai Estuary.



Fig. 5. Honeycomb weathering creates interesting patterns. It is the result of alternating wetting and drying, with salt crystallising in pores in the rock, leading to enhanced erosion.



Fig. 6. As we move along the beach, dacite boulders that have fallen from the steep slope above cover the beach.



Fig. 7. The dacite has sand-sized phenocrysts of feldspar and often has a layered appearance that is called flow banding.



Fig. 8. Occasional xenocrysts can be found, this one is quartzose and possibly is a cumulate from the crystallising magma.



Fig. 9. The sand at Mangawhai Heads contains some dark-coloured heavy minerals that are concentrated above high tide mark, with the wind blowing lighter sand grains on to the dune. Wave action tends to mix them again.



Fig. 10. Another xenolith, this time of a rock type we meet further along the beach, greywacke.

RAPID BUILD-UP OF WIND-BLOWN SAND IN KIKUYU GRASS AT MISSION BAY, AUCKLAND

Bruce W. Hayward

In the early 1990s, much of the sand on Mission Bay beach had washed away. At high tide, the sea lapped at the base of the 2-m-high, stone retaining wall, threatening to erode beneath it. At this time the grass reserve area inland from the retaining wall and the 2 m-wide concrete path that ran along behind it, was perfectly flat and level with the path. There was little evidence of dry sand from above the high tide level being blown inland, as there was little or no sand on the beach when the tide was in.

In September–November 1995 and March–May 1996, the Auckland City Council paid to have 30,000 cubic metres of dredged sand from offshore of Pakiri dumped on Mission Bay beach in the first of a new round of beach replenishment around the city (Morley *et al*., 1996). This resulted in a completely new beach profile with a 15-m-wide strip of dry sand above spring high tide level sloping down over another 15–20 m to low tide level. Groins were constructed at each end of the beach to prevent long-shore drift and storm-water runoff carrying away the newly added sand, and after 20 years this has been remarkably successful.



Fig. 1. View west across the back of the eastern part of Mission Bay beach in 2015, showing the build-up of a low foredune in the grass on the landward side of the coastal path. Note the wide expanse of dry sand above high-tide level seaward of the retaining wall.

One unanticipated result of the beach replenishment has been the growth of a small fore-dune of wind-blown sand along the seaward edge of the grassed reserve (Figs 1, 2). This fore-dune is not composed of loose blowing sand however - it is always covered in grass. Indeed it would appear that the kikuyu grass and its roots has trapped the blown sand grains as they arrive and the grass has grown upwards keeping pace with sand accumulation.

In order to answer questions about the rate of dune accretion and whether its build-up was influenced by the presence or absence of a 50-cm-high wall separating the beach from the reserve, I undertook seven simple Heath-Robinson mini-transect surveys (A–G) across the grassed dune in June 2015 (Figs 3, 4), almost 20 years after the beach replenishment. The surveys showed that the grass-trapped foredune was 20–50 cm high and 5–7 m or more in width.

All transects had similar profiles (Fig. 5) with the highest build-up within 1 m of the seaward edge of the path and a steep front down to the path. Landward of the highest point the dune sloped away gently before flattening out. Beyond the landward end of transects C, F and G, the level of the grass reserve was 20–30 cm above that of the path (Fig. 5), suggesting that in some places wind-blown sand had dispersed more widely and had also built up the general level of the grass reserve for a much greater distance back from the sea. The two places with the highest background elevation of the grass (30 cm) beyond the foredune were transects F and G and both



Fig. 2. View east across the back of the central part of Mission Bay beach in 2015. Note the build-up of a fore-dune next to the path covered in kikuyu grass.



Fig. 3. Heath-Robinson levelling arrangement for surveying the height and width of the foredune along seven mini-transects behind Mission Bay beach (Fig. 4).

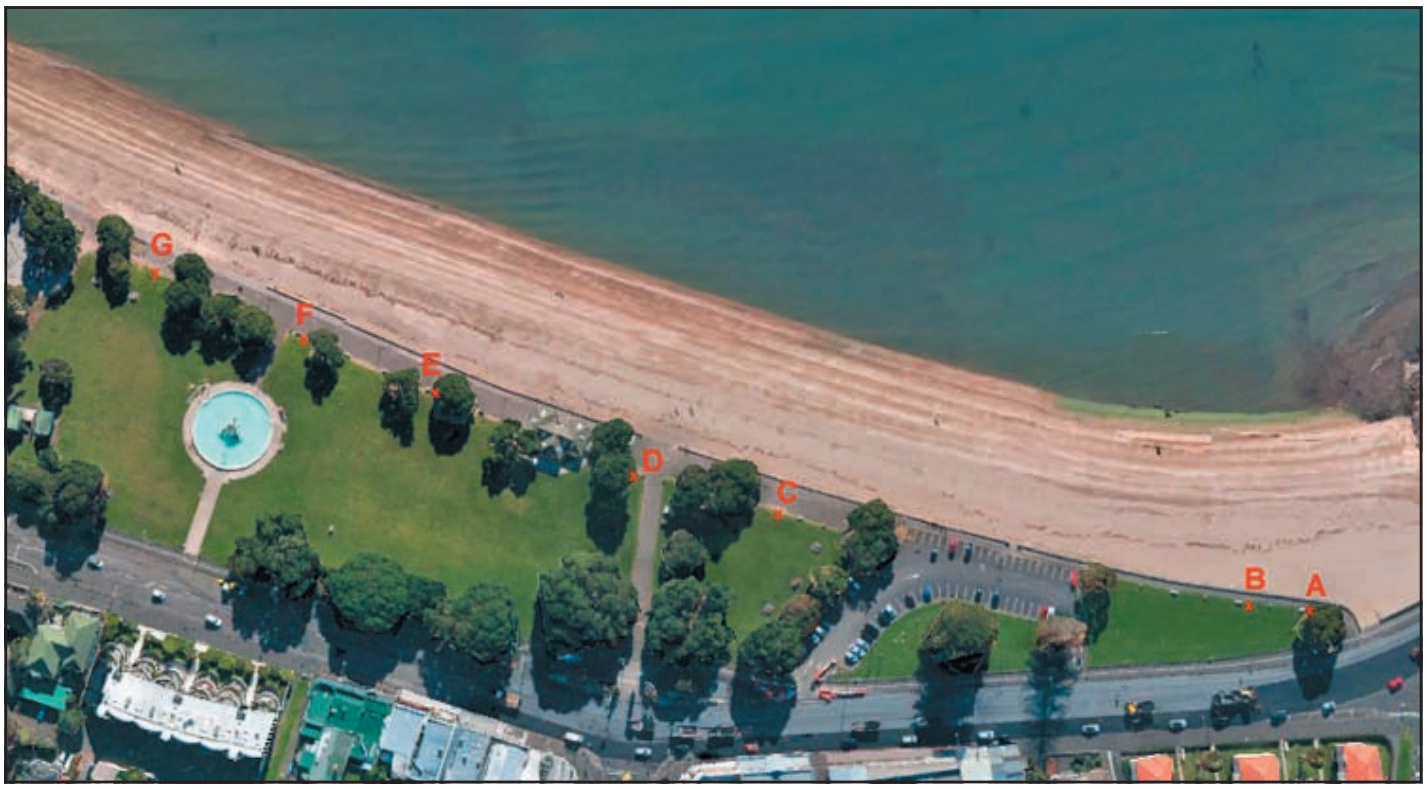


Fig. 4. Location of fore-dune mini-transects (A–G) behind the eastern half of Mission Bay, 2015.

are either directly behind or close to that portion of the beach where the seawall does not extend above the level of the path. Elsewhere (A–E) the seawall is ~0. 5 m high above the path (Figs 1–2) and presumably stops a lot of the wind-blown sand from leaving the back of the high-tide beach.

The foredune has the greatest volume in transects C, F and G. The reason for this is not completely clear. I have suggested that the lower seawall might explain the greater volume of wind-blown sand reaching F and G, but C has a seawall across the seaward side of the path. Perhaps the increased volume of sand in transect C might relate to the fact that it is in the middle of a gap between pohutukawa trees (Fig. 4) and the strong, sand-carrying winds might be funnelled more between the trees, but transect B is in a similar gap and has the smallest foredune. There does appear to be an increase in the volume and height of the foredune from the east end of the beach (A–B) towards the centre (F–G) (Fig. 5) that may relate to greater shelter from the coastal point at the east end of the beach from strong sand-carrying winds.

From observations over many years of frequent visits to Mission Bay (for walks and coffees) I suggest that the majority of the sand movement occurs during major on-shore storm events that might only occur a few times each year. Thus most of the foredune growth has probably occurred in no more than 50 storms in the last 20 years (mean 1 cm growth in elevation per storm).

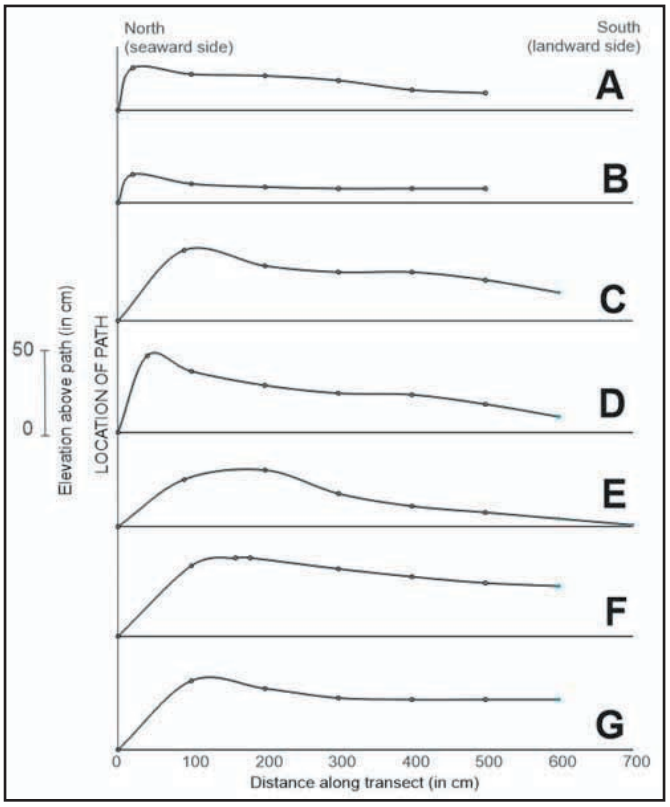


Fig. 5. Surveyed mini-transects from the path (left side) across the seaward edge of the grassed reserve lawn, showing the build of a low foredune since 1995 when the lawn was flat and level with the path.

Mean annual elevational build-up of sand has been 2 cm per year (range 1–2.5 cm per year).

Throughout this discussion I have assumed that all sand movement has been wind-blown. Clearly, this is not entirely true as hundreds of visitors swim and play on this beach every day in summer and bring sand, stuck to their wet feet, back onto the grass with them. Exactly what proportion of the sand build-up can be attributed to foot transport I am unable to calculate, but I would suspect it is no more than 10–20%.

I believe the shape of the foredune profiles, with most sand trapped right on the seaward front, is suggestive of a major wind-blown component. The majority of the people exiting this part of the beach after a swim would do so via the gaps in the higher part of the seawall in front of transects D, F and G. If foot transport of sand was a major factor, then the volume of the foredune at these places should be much greater than elsewhere. This is true for F and G and not so obvious at D when compared with C (Fig. 5).

I conclude that the design engineers seem to have done particularly well in keeping most of the added Pakiri sand from washing off Mission Bay beach, but they have not prevented a small amount from moving inland to build up a low foredune in the kikuyu grass of the reserve behind. I suspect it will not be too long before the Council decide that the steep face of the foredune is a hazard and undertake work to remove or flatten these unanticipated results of the beach nourishment programme 20 years ago.

Reference

Morley, M.S., Thompson, F., Smith, N., Stace, G.A., Hayward, B.W., 1996. Mission Bay sand replenishment from Pakiri dredging. Poirieria 18: 27–40.

KARIOTAHI BEACH CAVES

Peter Crossley

New Zealand is well endowed with sea caves. The 9 longest surveyed sea caves in the world are here. Matainaka in Otago, at 1540 m in length, is the longest. In the Auckland region, Erangi Point at Bethells is third at 1040 m and Mercer Bay, 470 m, is number 6.

At Tongaporutu on the Awakino coast, there are lots of beautiful big arches, but not of any great length - well worth a camera trip.

To achieve a good cave, one needs the cave process to be faster than the cutting back of the cliff face. The Waitakere coast is ideal because it has hard rock, joints, dikes and powerful waves. Tongaporutu has big waves and jointing, but softer rock. Thus the caves are shorter, but the thickness of the beds produces huge arches.

Kariotahi, on the Waiuku coast southwest of Auckland, has the wave power, but the sandstone rock would be expected to be too soft - but one never knows. An Auckland GeoClub field trip was too good an opportunity to miss.

Kariotahi is a popular west coast beach just south of the Manukau Harbour entrance. A road runs west from Waiuku to the sea via a gap in the Pleistocene sand dunes (Fig. 1). The old consolidated sand dunes form the cliffs at the back of the beach and are up to 50 m high, although being soft, are not very steep. The sand is very much a 'black sand' beach with lots of iron sand



Fig. 1. Location of the cave on Kariotahi Beach, west of Waiuku.

in it (and dead cars). This iron sand has leached and redeposited iron in layers in the sand forms lenses and perched water tables.

There is rapid erosion forming small overhangs that soon collapse, but in one case about 500 metres north of the parking area, a cave has managed to burrow in for about 40 metres without collapse. It is high and narrow at the entrance, possibly along a joint (Figs 2, 3), but inside it is a round tube (Figs 4, 5), hollowed out by the percussive waves that reach in that far - it is at the top of the tide level. The walls are a dull orange colour from the soft iron-rich sandstone (Fig. 6).

If Bruce had had a torch of his own, then he could have seen the iron limonite layers inside the cliff.



Fig. 2. The cave entrance is in the middle of the photo. The dark patch to the right is an overhang.



Fig. 3. The entrance in soft sandstone. It can be scratched with a fingernail. The dark patches on the floor are small mussels.



Fig. 4. This is about 15 m in looking out. The floor is clean-washed with small pools.



Fig. 5. A bit further in it becomes round in shape.



Fig. 6. The middle section of cave.



Fig. 7. At the end there is a pile of sandstone boulders that have probably helped to bash the way in.

NEWLY RECOGNISED MT EDEN LAVA FLOW LOBE

Bruce W. Hayward

Recent excavations for a new housing development in 3 Aberfoyle St, Epsom, exposed solid basalt lava where it is not shown on Kermode's (1992) 1:50,000 geological map of Auckland, nor on the recently published map of the lava flows of Mt Eden (Hayward *et al*., 2014). A walk around the nearby streets and examination of Auckland Council's LIDAR topographic map with 0.5 m contours (Fig. 1) clearly showed that the lava flow cannot be sourced from any other volcano than Mt Eden or its southern (?related) neighbour, Te Pouhawaiki. There are further exposures of solid basalt in the front garden of 5 Aberfoyle St and front fence of 13 Aberfoyle St.

Prior to this find, the author followed the opinion of the late Les Kermode in believing that the natural scarp running along the north side of King George Ave and Windmill Rd Park was the front and southern extent of Mt Eden's lava flows. The LIDAR contours, however, clearly show the route of this newly recognised lava flow lobe beneath Windmill Rd, across Pencarrow Ave, then dividing into three lobes. One lobe flowed east beneath present Pencarrow Rd and another bifurcating lobe flowed south into the block bordered on two sides by Aberfoyle St. The Aberfoyle area was clearly a valley head in pre-volcanic time bordered to the south and west by an arcuate Waitemata Sandstone ridge (now beneath Balmoral Rd and Penrhyn Rd).

Although the Aberfoyle lava flow is at a lower altitude to the flow front around Windmill Rd Park, it is not

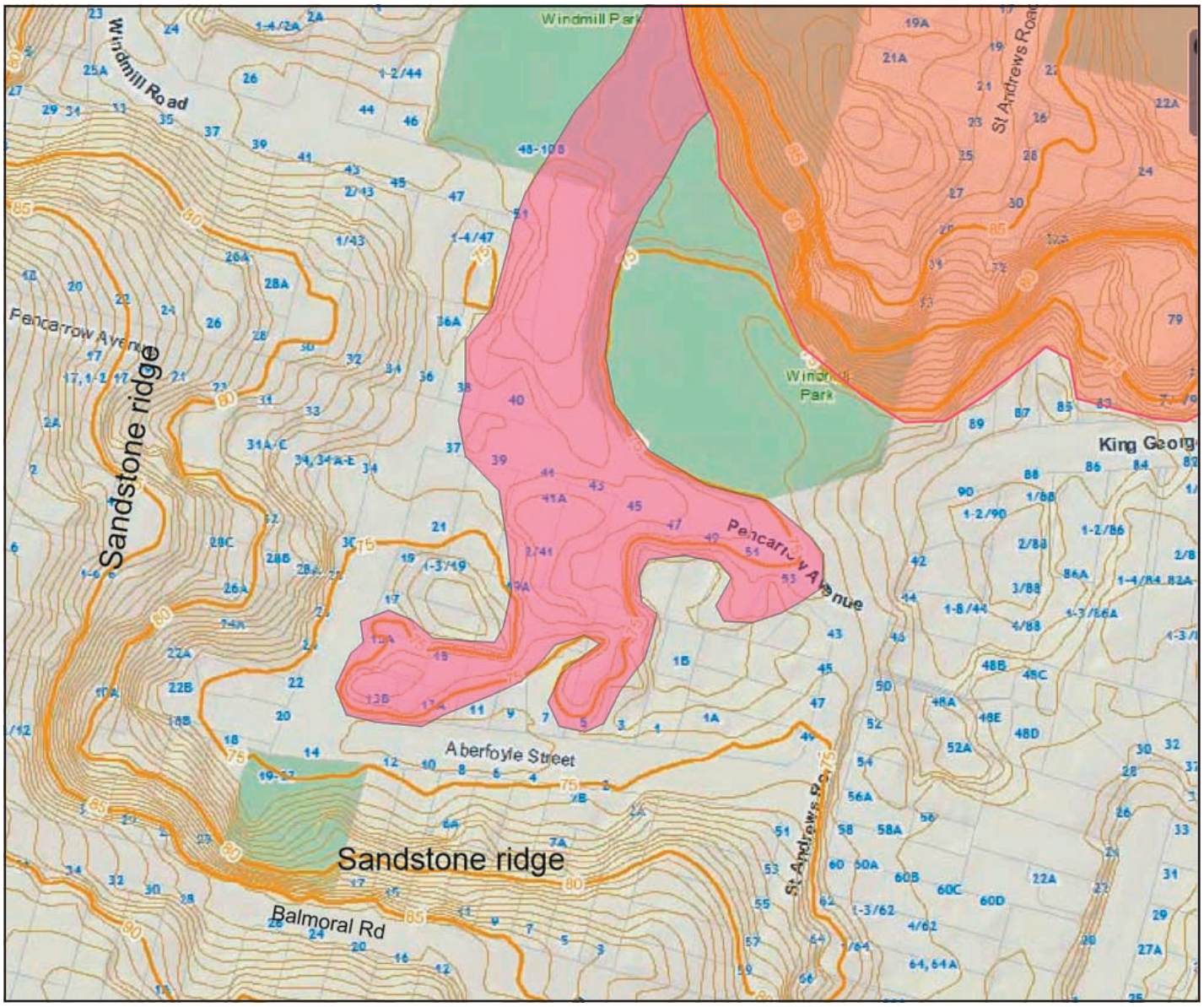


Fig. 1. LIDAR map of Windmill Rd Park and Aberfoyle St area, Epsom, showing location of recently recognised narrow dividing lava flow lobe (pink) beneath and south of the later Mt Eden lava flow that forms a 10 m high scarp to the north.

possible to know precisely which came first. The most likely is that the Aberfoyle flow was more fluid and predates the arrival of the obviously more viscous flow that forms the scarp in this area, as Mt Eden lava appears to have become progressively more viscous through time as the magma cooled.

References

Hayward, B.W., Kenny, J.A., Carr, G., Kermode, L.O., 2014. Revised map of Mt Eden Volcano. Geocene 11: 16.

Kermode, L.O. 1992: Geology of the Auckland urban area. 1:50 000. Institute of Geological and Nuclear Sciences geological map 2. 1 sheet + 63p. Institute of Geological and Nuclear Sciences Ltd. Lower Hutt, New Zealand.

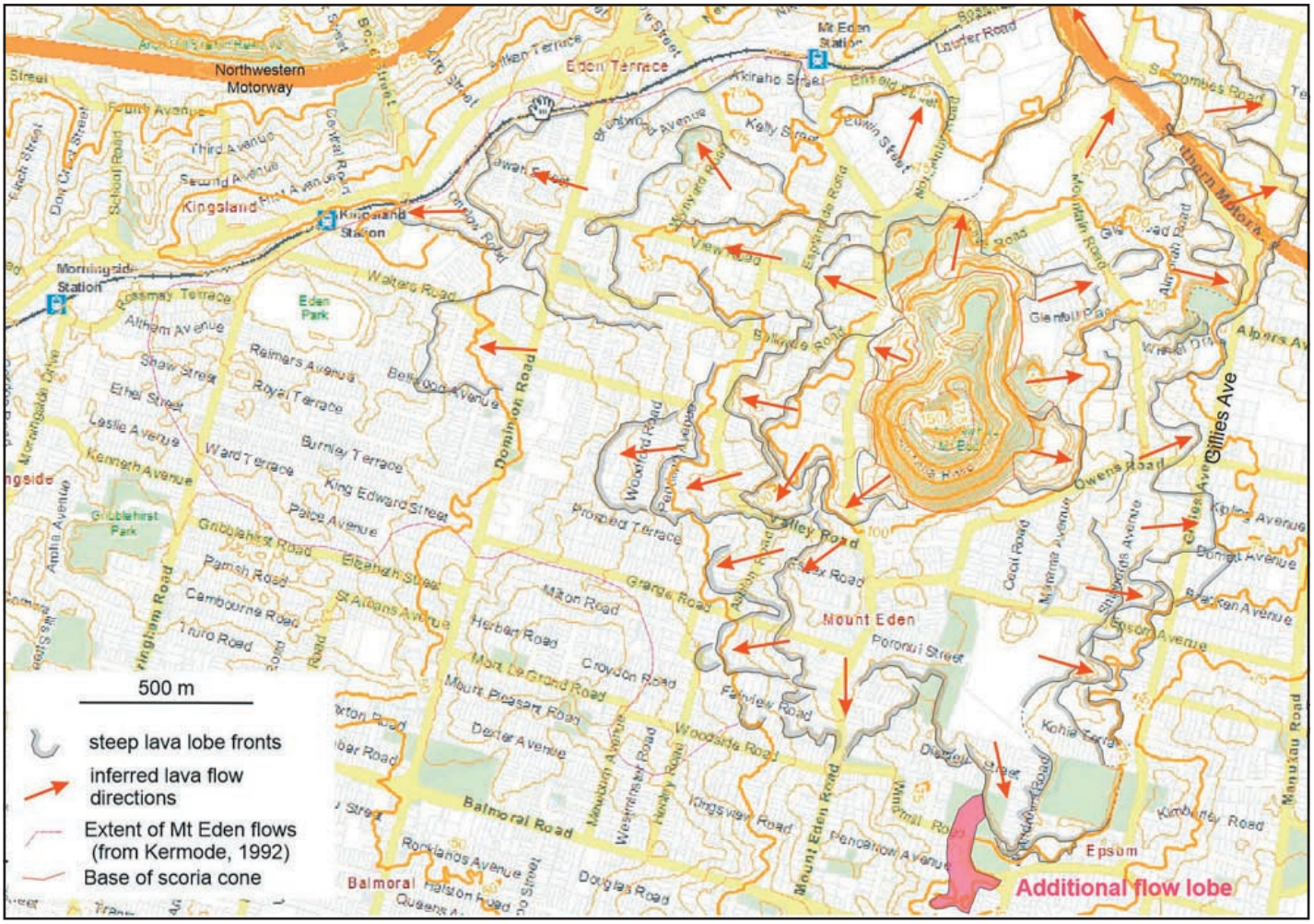


Fig. 2. Hayward *et al.*'s recent map of Mt Eden volcano and its lava flows with additional lava flow added in the south.

QUIZ ANSWERS

Know your volcanoes.

1 = E, Te Hopua, photographed during reclamation for the port of Onehunga

2 = C, Mt St John

3 = A, Auckland Domain, Duck Ponds - North Head and Mt Victoria in background

4 = D, Tank Farm. Lake Pupuke explosion crater top right of photo, Onepoto Basin explosion crater bottom left.

5 = B, Crater Hill. Familiar view when landing at Auckland International Airport.

Where is this Waitemata Group cliff?

e Whangaparaoa Head (eastern end of Whangaparaoa Peninsula - superb 3-dimensional example of steeply dipping strata)