LAVA CAVES IN SUBURBAN AUCKLAND NEW ZEALAND.

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Abstract

Auckland, New Zealand is a city of 1.8 million people, built on 53 recent (250 ky to 500y BP) but hopefully extinct volcanoes.
These volcanoes have produced many small lava caves, but these are hidden under suburban houses and roads. The problems of finding more caves in this environment are explored, along with the associated problems of ownership, engineering, health and safety, and indigenous rights.

Introduction

Fig.1. Location map for Auckland.

Although New Zealand is a very techtonically mobile and volcanic set of islands, only the Auckland isthmus has the right type of basalt to form caves. The volcanoes are small, monogenetic and range in age from 250 ky to 500 y old. The base of the hills and craters vary from sea level to about 100 metres. The heights are up to 200metres. There are 53 volcanic centres, some are explosion craters, while others have extensive lava flows topped with a scoria cone. Most of the volcanoes with lava flows have produced normal lava tubes about one to two metres below the surface. 250 entrances have been located. The longest is 280metres in length.

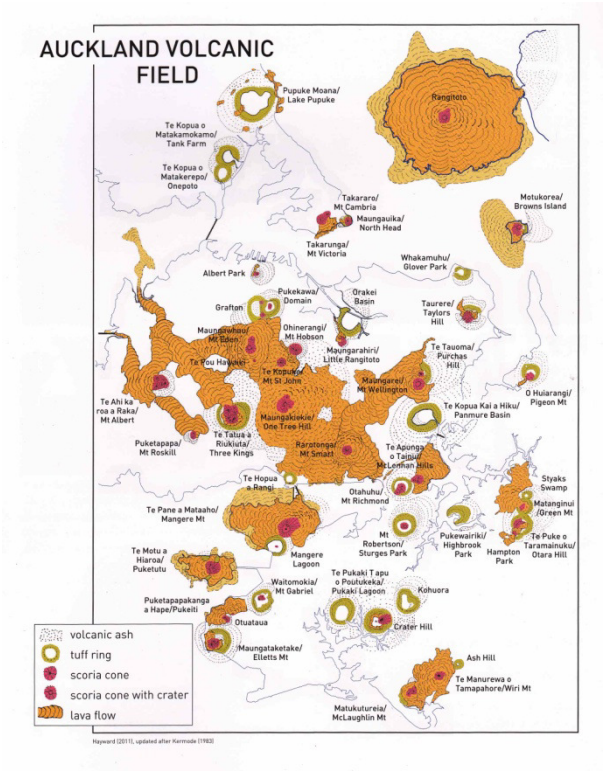

Fig. 2. Volcanic centres of Auckland.

Colonisation

There have been two major migration events, Maori about 800 years ago and Europeans about 200 years.

Maori came from Polynesia and were mainly a stone age culture and did not build permanent structures. Although they built extensive fortifications around the scoria cones; the lava fields were left relatively undisturbed apart from cultivation. They did however use the cave entrances as burial grounds or urupa. Some were very large but none remain open. Those that did

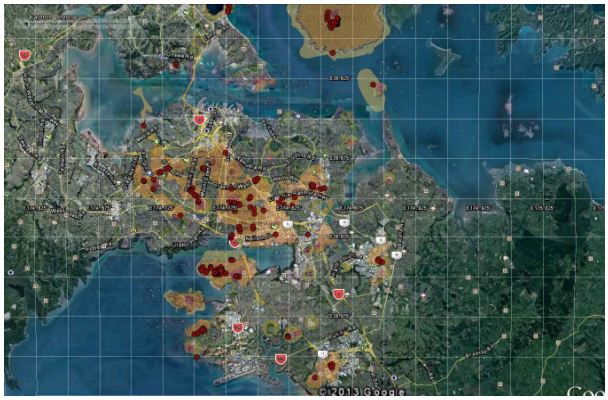

Fig. 3. Location of lava caves. (Red dots).

remain open have been pillaged for souvenirs or fertilizer. However, there is a resurgence of maori values and the heritage values are beginning to be recognized.

Fig. 4. Fortification and storage pits around one of the scoria cones.

The first European to visit New Zealand was Abel Tasman in 1642, but it was not until the late 19th century that Auckland became a European style colony. After 1900 roads became more than cart tracks and houses were built alongside them. Caves were used as tourist attractions or filled in if they got in the way.

Fig. 5. Several volcanic cones with lava fields between them covered with houses.

There are now 1.8 million people living in Auckland and there is little land now left uncovered by tar seal or housing lots. Almost all the caves are in private ownership. Some caves are part of the landscaping

Fig. 6. A delightfull entrance to an 80metre private cave.

But others have had manholes put in to protect them, either in the street or in school grounds.

Fig.7. A manhole entrance into a cave complex under the road.

The Wiri cave, which has been made into a scientific reserve, because of its value has a more substantial gate. This gets breached regularly as permission is rarely given.

Fig. 8. A vandalized entrance to a scientific cave reserve.

Because these caves can be quite extensive they can go under several properties. So far this has not been a problem as only the entrance owners usually know where the cave goes, but it can have serious consequences if there is a cave under a property if the owner wants to do some building work. As the caves are only 1 -2 metres below the surface then only light buildings can be erected, and no digging.

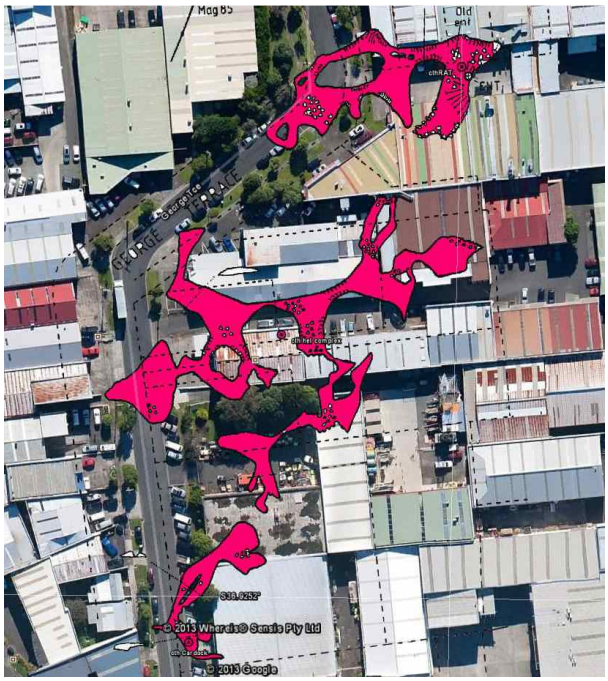

Fig.9 A complex cave in a light industrial area. The cave extends under several properties. The foundations are reinforced concrete slabs.

In the past , and in limestone areas, protection of the caves from vandals has been achieved by keeping entrances secret. In a city it is protection from developers and builders with bulldozers and diggers making foundations that is the worst problem. Thus we have to work with the council to publish the caves as scheduled and heritage sites on the property information maps.

Finding caves in the present day.

Incongruously it is the very agents of destruction, the bulldozers and diggers of construction sites that find the new caves now. Theoretically if a cave is found, then council should be informed so the inspectors, archeologists, Iwi and cavers can inspect the site to see if it needs to be preserved. This can be expensive if there are human remains as they have to be carefully removed and recorded and perhaps reburied. If the cave is large there may need to be extensive engineering modifications required.

Often, developers hide the caves as they know that it will increase their costs and of course decrease their profit. I often hear of caves that have been covered up.

One a private developer doing infill housing, found a cave in a trench and let the council know. I was rung up as no one was willing to enter and I am known for being able to explore and survey. So I did a survey both with tape, compass and camera.

Fig. 10. The cave is at the near end of the trench. The developer was stopped from filling in the trench which hampered deliveries to the building sites. The cave extends to left and right of the picture.

The cave in fact was quite extensive going under three properties and one of the proposed houses. The council was horrified at the thought of hoses collapsing and them being sued for wrong permits. So the owner was stung for getting all sort of engineers reports and

designs and persuading them that the house next door would not fall down even if it had already been there a hundred years. The owner estimated it cost him 80k in delayed time and permits.

Fig. 11. The ceiling of this fine cave is only 80cm below ground causing concerns about the danger of collapse.

Fig. 12. The extent of the cave under the building site and surrounding houses.

The other , In December 2015 was part of a big 35km water pipe line extension construction, a multi million dollar project. It was known that it was likely to cut into caves and GPR, percussion and boreholes were done in advance and then an exploratory dig. A cave was found. The council was told. Iwi came and blessed it. The archaeologist walked by. Nobody could go in. It was a construction site. I was called in. I was allowed to go in briefly after inductions for the site with all PPEs (hard hat, boots, long trousers long sleeves, gas meter and signing off. A very quick survey on the back of a hand was enough to determine it was worth keeping. To do the proper survey, which also included a 3d laser survey, we had to spend a morning getting more inductions, drug tested, and two days to get a 'confined spaces certificate'. At the site we were signed in, the cave was gas tested , we also wore gas meters and we had observer safety officers inside and out of the cave. Whew! Seriously the risk of gas was important, as this was a suburban area with gas mains which can leak and two workers had been killed by an explosion in a pipe trench only recently, 1km away. It sharpens the thinking. The probable cost of the cave, tens of thousands plus the cost of a manhole to access the cave later.

Fig. 13. The large pipe trench traversing lava cave country.

Fig. 14. Machines to make a cave digger weep!

Fig. 15. Is it safe? The caver was lucky to get on site. He is wearing a helmet but no PPEs (personal protection equipment) ie fluoro vest, long trousers, long

sleeves, gloves, induction or confined space certificates. Next time he did have everything or else he would not have been let in.

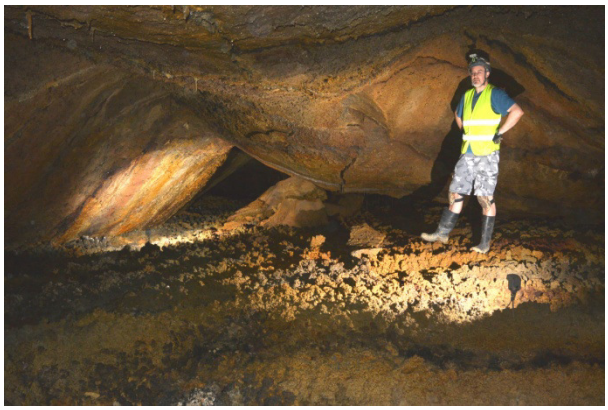

Fig. 16. A worthwhile cave but needs a engineers design to span it with a water pipe.

Fig. 17. Caving is a spectator sport.

Fig. 18. The mapped extent of the cave. The water pipe will go up the right hand side of the road. There was a break in at the right hand lobe of the cave that had not been reported.

Fig. 19. The old and the new. On the left is the compass and tape survey. On the right is a $50,000 3D laser scanner. The white spheres are the control points.

Interestingly, at the end of the cave I found some recent fill that a just completed house builder had put into a hole he had created. No notification. No extra cost except a bit more concrete.

Conclusion

The result of these two recent cave discoveries is that the council has sharpened up its reponse to cave discoveries in construction sites so that the protocols are, or should be in place.

Council must be notified.

The Council will notify the archeologists, Iwi and cavers to access the cave.

Reports, and maps are supplied.

Hopefully a permanent entry is installed so that foundations can be checked or for scientific purposes.

We. As cavers now have the appropriate certification to go underground in an industrial site.

References

Crossley P C. 2014. Auckland Lava Caves. New Zealand Speleological Bulletin. Vol. 11. No.208 p190-247.