Natural Bridge (3H–10), Mount Eccles: a special type of lava tube.

Ken Grimes

Natural Bridge is a small but interesting cave found at the far end of a small lava channel (or canal) south of Mount Eccles. The lava channel originated as an overflow from a small crater—one in the line of craters that runs southeast from Mount Eccles. These craters may have erupted from a fissure, or may be "hornitos" fed through skylights in a lava tube that was running southeast from the main crater of Mount Eccles. The geologists are still undecided as to which story they believe.

In its final section the channel becomes more narrow and deeper and eventually is roofed over with lava to form the cave. Beyond the cave the channel widens out and disappears.

A walking track follows the channel from its source vent down to the cave, and this is the most interesting approach. Alternatively, you can drive along a dirt road and park 100m from the cave, just before the track drops down and crosses the lava channel. From the far side of the cave the walking track continues across stony rises to the South Canal and one can return to Mount Eccles by that route, possibly visiting other caves on the way (Figure 1).

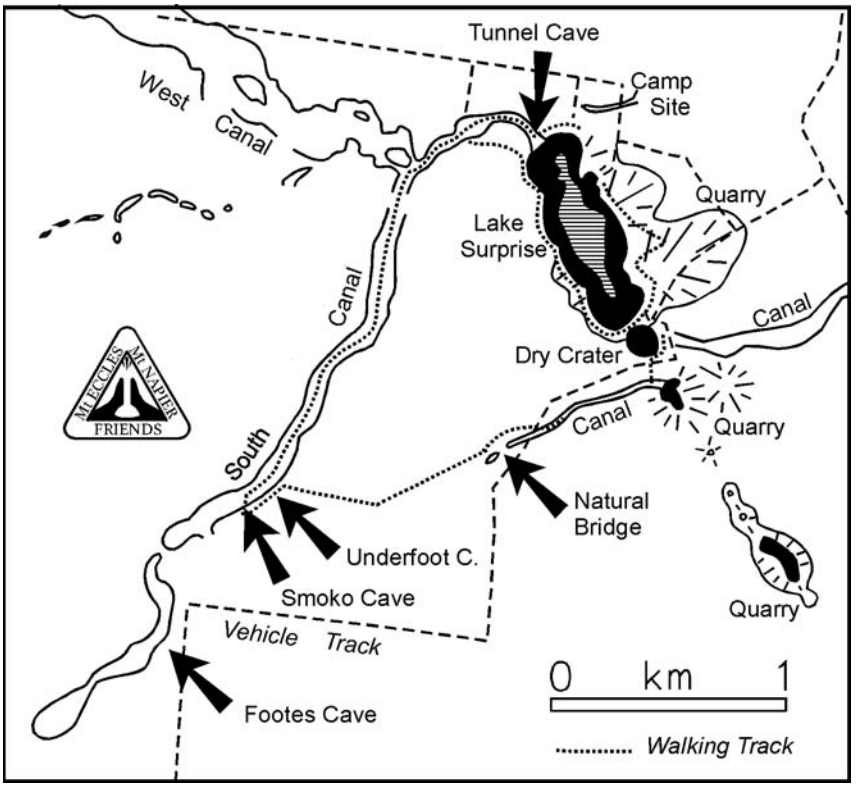

Figure 1: Mt. Eccles and its craters, lava channels, and those caves which are commonly visited by the general public.

Features of the cave

As you approach the main, south, entrance note the contorted lava layering on the wall of the cliff to the left. This is the result of slumping of the layers while they were still hot and soft. Look up at the roof of the entrance (Figure 2). The walls come together at a sharp angle and in places inside the cave they leave a narrow slot. It is this angular arched roof that gives the cave its other name, *Gothic Cave*, and which gives it its special interest—as we shall see later. The cave is a simple short tunnel, with a roof hole in one place (see cave map, Figure 3). Total passage length is only 36m, and the depth is 15m. A lot of material has fallen from the roof and walls and the floor is mostly rubble–covered apart from one flat soil–covered section—a lava surface probably underlies this. The roof has a distinctive angular "gothic" shape (Front Cover Photo). The main passage has a narrow roof slot, where the walls almost meet. A small high–level chamber and daylight hole occur above the roof slot at section X5. At one point (between sections X3 and X4) there is another small high–level chamber visible above the slot. Lower down the cave is wider, and partly modified by collapse. Collapsed sections reveal the contorted layering in the walls (Figure 4). The floor within the cave is much lower than the open sections of the channel outside, those have been partly filled by rubble from collapse of a former roof and walls. Upstream

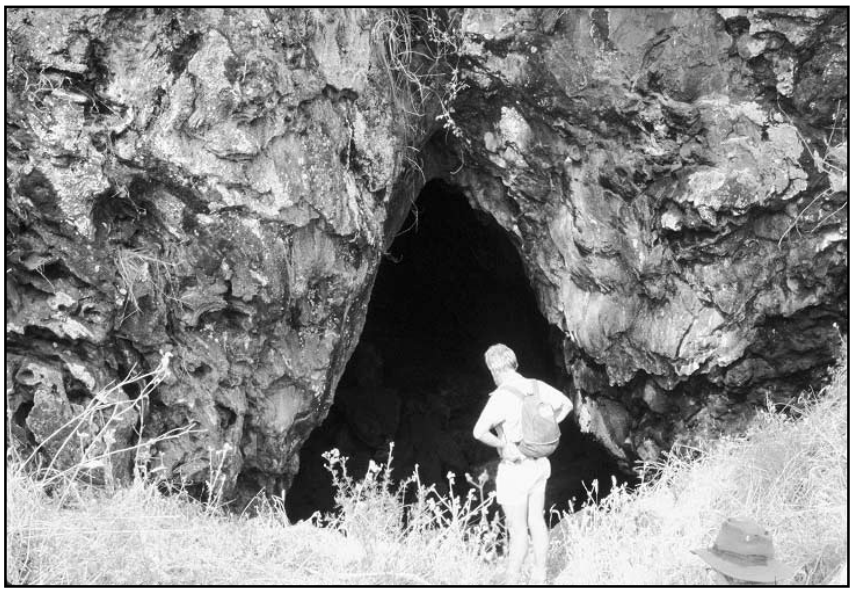

Figure 2: Southwest entrance to Natural Bridge. Note the "Gothic" roof outline.

(northeast) the open channel is quite narrow, and a roofed tube may have once extended some distance this way. Downstream, the channel widens and loses its character quickly.

The cave has a few lava drips and dribbles, but nothing special in the way of lava decorations. However, near cross section X4 the south wall has a smooth surface with scattered sub–horizontal grooves. These formed where slabs of crust, floating on a past lava stream, have scraped against the soft lava lining on the wall (Figure 5).

The cave environment

Cave environments are characterised by darkness, dampness and a stable temperature with little air movement. This cave generally has a pool of cool air, most noticeable in summer; however, in a small cave such as this the light from both entrances prevents complete darkness.

As your eyes adapt to the twilight you will notice a greenish tinge to the rocks. A range of small plants are managing to survive on the limited light that comes through the entrance. These include small ferns, mosses, liverworts and algae. You will see that there is a marked change in colour from green on the sides facing the entrance to black on the shaded side. The cave is quite colourful if you have a bright light (floodlight)—a mix of greens and rich browns.

The origin of the cave

There are two main ways in which lava caves form: by the roofing of a surface lava stream running in an open lava channel or by draining out from beneath a crusted lava lobe within a lava flow. The processes have been observed in active lava flows in Hawaii and elsewhere (Peterson & others, 1994) and I have illustrated examples of these processes in Grimes (1995 & 1999)

At Mt. Eccles, Natural Bridge and Tunnel Cave both formed by roofing of open lava channels. There are three ways this can happen (see above references). At Tunnel Cave (Grimes, 1998) there is no definite evidence of which of these operated. However, at Natural Bridge good evidence for the mode of formation is provided by the "gothic" shape of the walls and in the thin contorted layers exposed in the walls (Joyce, 1976).

At Natural Bridge the channel is steeper than other channels at Mt. Eccles, and the lava flow appears to have been more turbulent and variable in height. So we had a lot of splashing and periodic brief overflows of the channel. These built up levee banks composed of successive thin sheets of lava. As the sheets accumulated they not only built upward but also grew inwards from the edges until they eventually met to form a roof over the lava stream (see diagram, Figure 6). The sharply angled roof is a consequence of this linking of the two banks. While the layers were still hot and soft they sagged downward into the cave and we can see these wrinkled layers exposed where parts of the cave walls have fallen away. Molten lava continued to flow in a tunnel left beneath the crust; and solid bits of floating crust scraped against the lining in places. At the end of the eruption, that liquid partly drained away from the end of the channel to leave the cave we now see. Thin linings were left stuck to the walls and partly conceal the evidence, but fortunately enough has fallen away to expose this.

Management

This seems to be a fairly robust cave capable of standing up to the visitor traffic it gets, which is

Figure 4: "Edge enhanced" detail of contorted wall linings near section X3. Staff is about 2m long.

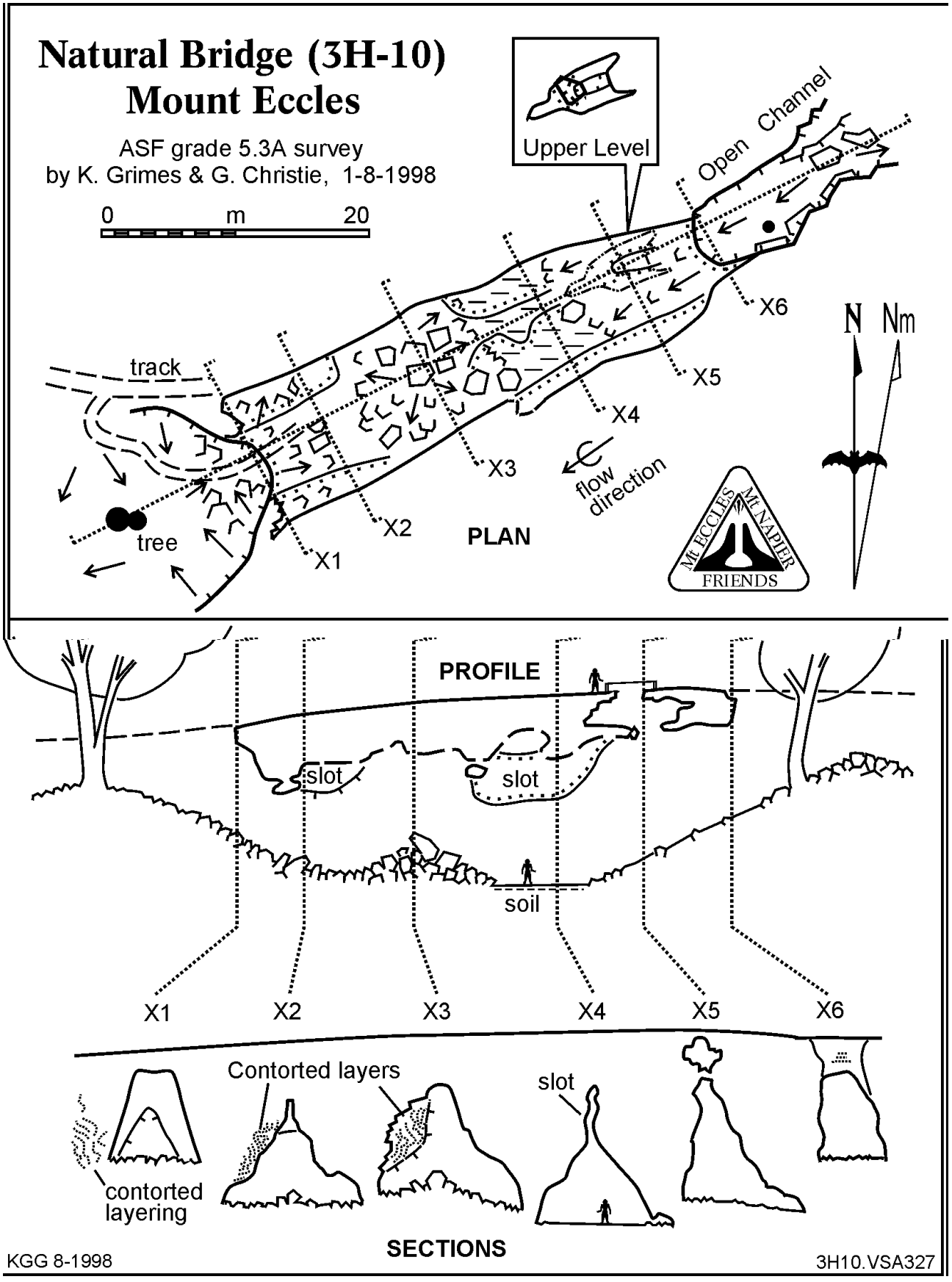
Natural Bridge (3H-10)
Mount Eccles
ASF grade 5.3A survey
by K. Grimes & G. Christie, 1-8-1998
0 m 20
Upper Level
Open Channel
track
tree
X1
X2
X3
X4
X5
X6
flow direction
PLAN
N Nm
Mt ECCLES Mt NAPIER FRIENDS
PROFILE
slot
slot
soil
X1
X2
X3
X4
X5
X6
Contorted layers
slot
contorted layering
SECTIONS
KGG 8-1998
3H10.VSA327

Figure 3

mostly non–cavers. However, there are hazards for careless visitors: the rough rubble floor can be slippery and without a light it is hard to see where to step. If visitation by the public continues (as it will), Parks Victoria will probably have to install steps and some sort of smooth path over the rubble section.

Take special care if you decide to visit the high–level chamber and roof hole. This is dangerous in that there is a hole with a 10m drop down into the main cave. The floor of this chamber frequently has branches and leaves that conceal the extent of this hole—tread in the wrong place and you might descend faster than you intended! The daylight hole has been railed off for this reason and it would be best to not enter here if any members of the general public are watching (especially kids—it may give them wicked ideas!).

Figure 5: Scrape marks made by bits of floating lava crust that bumped against the soft wall lining.

References

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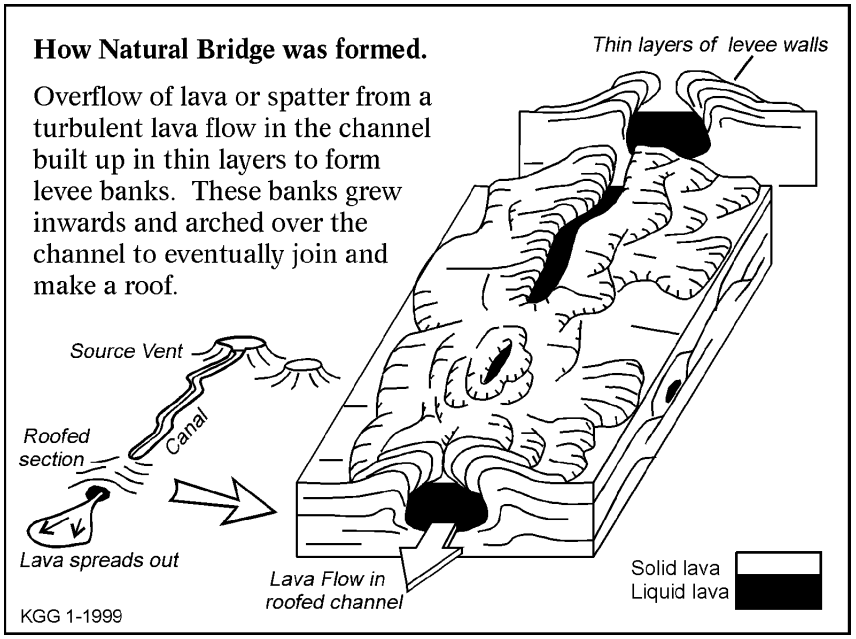

Figure 6