The Formation of the Wannon falls

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The Wannon Falls occur in the Wannon River at the edge of the Western Districts Volcanic Province. The river rises in the Grampians and would originally have run more-or-less directly south to the ocean. However a series of volcanic lava eruptions over the last five million years kept on filling in the river channel and forcing it to start new channels further and further to the west until it reached its present position.

At the Wannon Falls we see a spectacular, single, 30 m, vertical drop over a hard lava flow into a plunge pool. There are some rapids downstream that run around large blocks that have rolled down from the side walls of the narrow valley. Contrast this with Nigretta Falls which are a more interesting, multi-channel cataract of smaller drops and bounces guided by patterns of joints in a much older volcanic rock.

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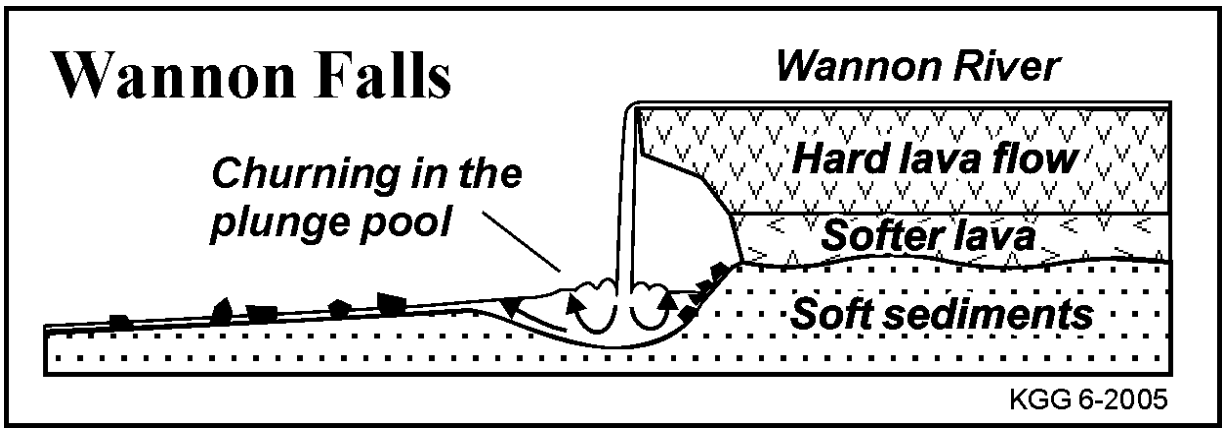
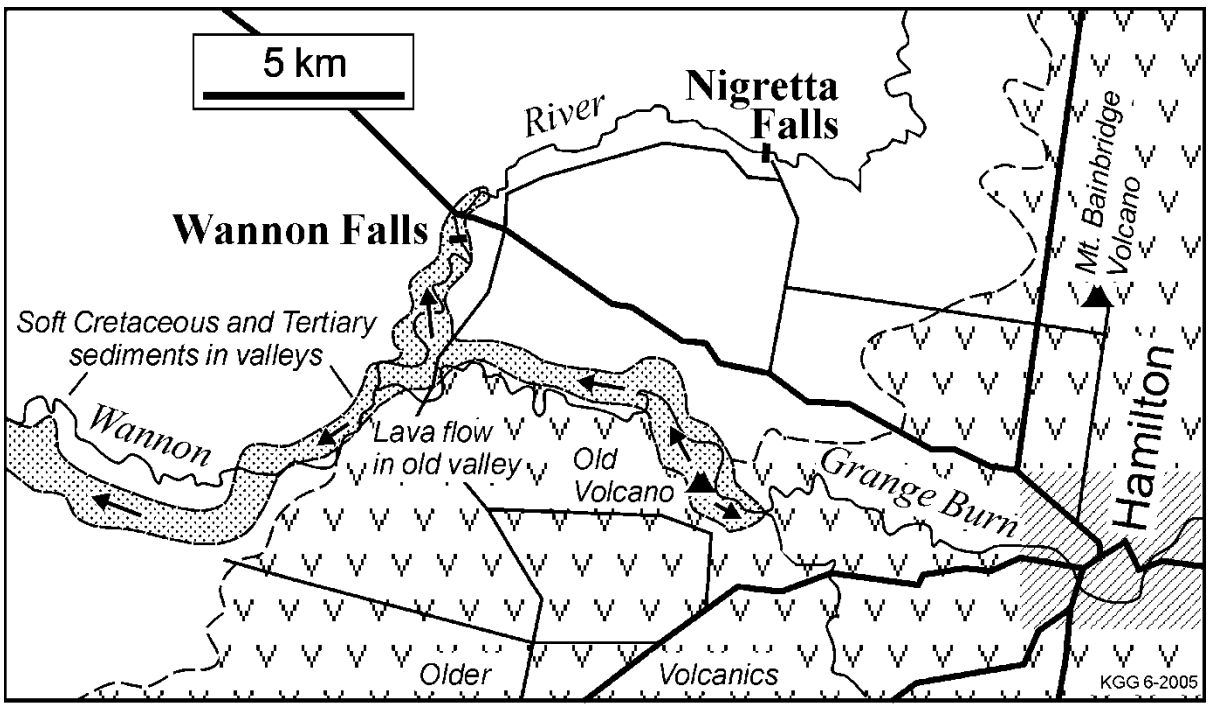
The key to the formation of these vertical falls is the existence of a hard lava bed overlying softer rock. The plunge pool at the bottom of the waterfall erodes the softer rock and undermines the resistant cap.



Thus the whole waterfall slowly migrates upstream as a vertical face rather than degrading to a sloping set of rapids.



Map showing older volcanic areas (V V) and the later lava flow (dotted) that ran down the Grange Burn and backed up the Wannon River valley.
Arrows indicate lava flow directions.

The falls have moved upstream this way for several kilometres since the lava flow initiated them. This has left the narrow gorge we see below the falls.

The source of the lava flow appears to have been a (barely recognisable) volcano 10 km to the southeast. This basaltic lava flowed down the ancestral Grange Burn and then the Wannon River. Strange as it may seem, the lava flow appears to have flowed upstream in the Wannon River valley from its junction with the Grange Burn. The valleys were not cut as deep in those days and although the bulk of the lava coming down the Grange Burn continued down the Wannon to the southwest, the volume of lava was sufficient for it to back up the Wannon valley for several kilometres to a point one km north of the present falls.

How old is the lava?

We think the lava flow at the Wannon Falls is probably between one to two million years old. Ideally we would like to date the basalt flow at the Wannon Falls using accurate isotopic methods, but it is too weathered for that and some of the isotopes would have been lost. So, instead we have to use less-accurate relative dating methods of comparing the flow to other features that have been dated. There are two main clues:

1. The lava flowed along a valley that had been cut deeply into older lavas that have been isotopically dated west of Hamilton at about four million years, so we know it is significantly younger than those.
2. The soils on this lava are not as thick as those on the older volcanics. However, they are better developed than those on the stony rises seen elsewhere in the region, which are all less than 500,000 years (by isotope dating). Thus the age of the flow lies between four million and half-a-million. Comparison of degree of soil developments suggests that an age of between 1 and 2 million is most reasonable.

So it seems that the Wannon Falls first appeared at the edge of the lava flow 1-2 million years ago and have been working their way upstream since then. They will continue to migrate as a vertical waterfall until they reach the upstream end of the hard lava bed, and will then degrade into a set of rapids – perhaps in a few hundred thousand years time.