

**Federal Cave** is a set of narrow stream passages at several levels (colour coded). The highest levels are the oldest, and progressively lower levels were formed as the watertable\* dropped..

The passages include the main straight sections, which follow the strike\* of the tilted beds, together with shorter cross-passages, some of which slope down the dip\* of the beds.

At the **Junction Chamber**, there is a 3 m drop in the floor level. This is a result of underground stream capture\* (see diagram to right). The original stream flowed north at the higher level (1: red arrow) but its flow was captured (2: yellow arrow) by a side passage that connected to the lower **Dukes Streamway** (green). The section to the north of the capture point was abandoned, but the stream in the southern part continued to cut down, leaving a small scarp at the stairway (3). Both sections are now abandoned but the two levels of the **Crystal Streamways** can still be recognized.

An underground stream runs through the lowest passage (green) during floods, but the permanent stream at the modern watertable is only seen in a couple of deep pits (blue).

## Stages in the formation of Federal Cave and its valley

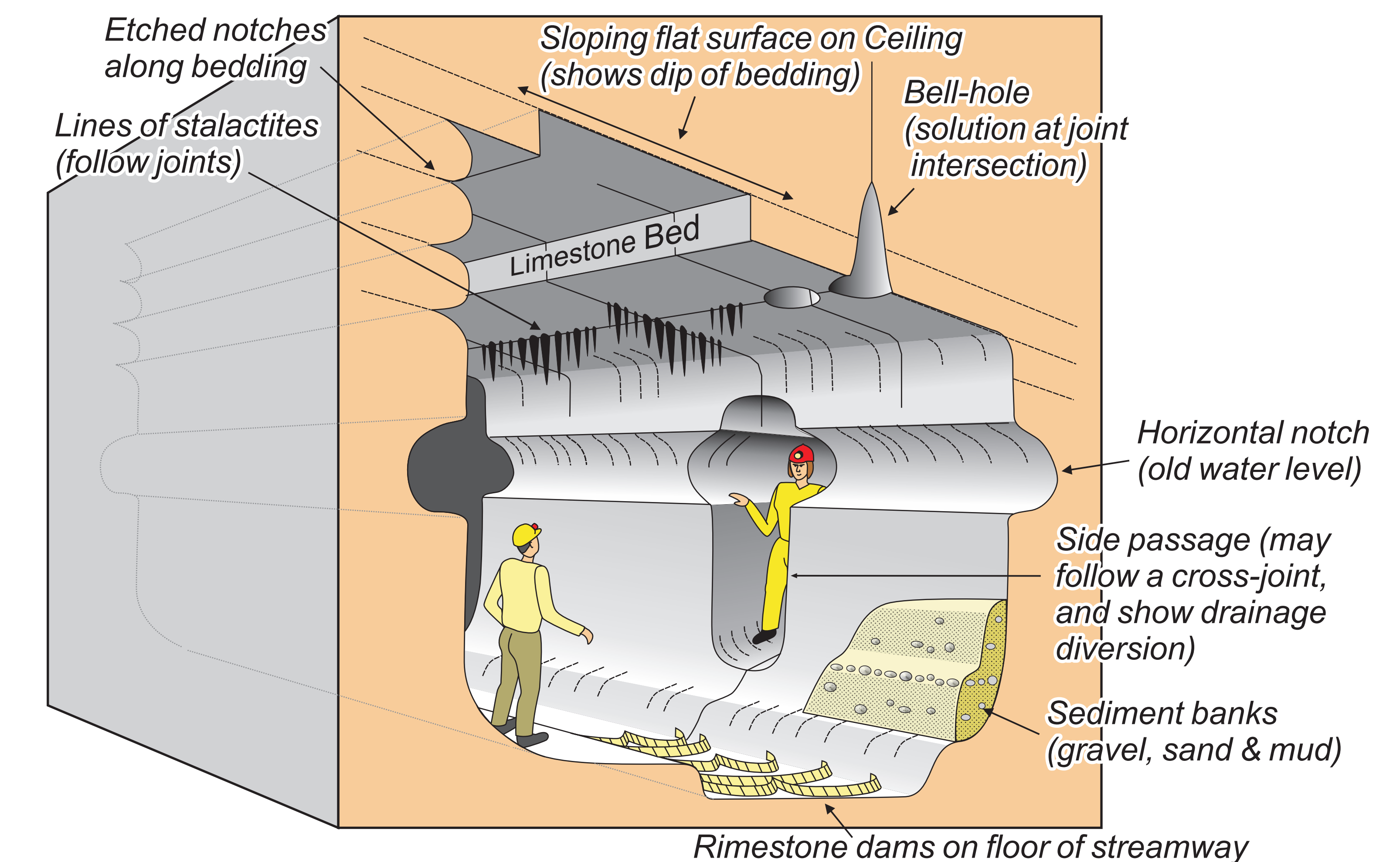
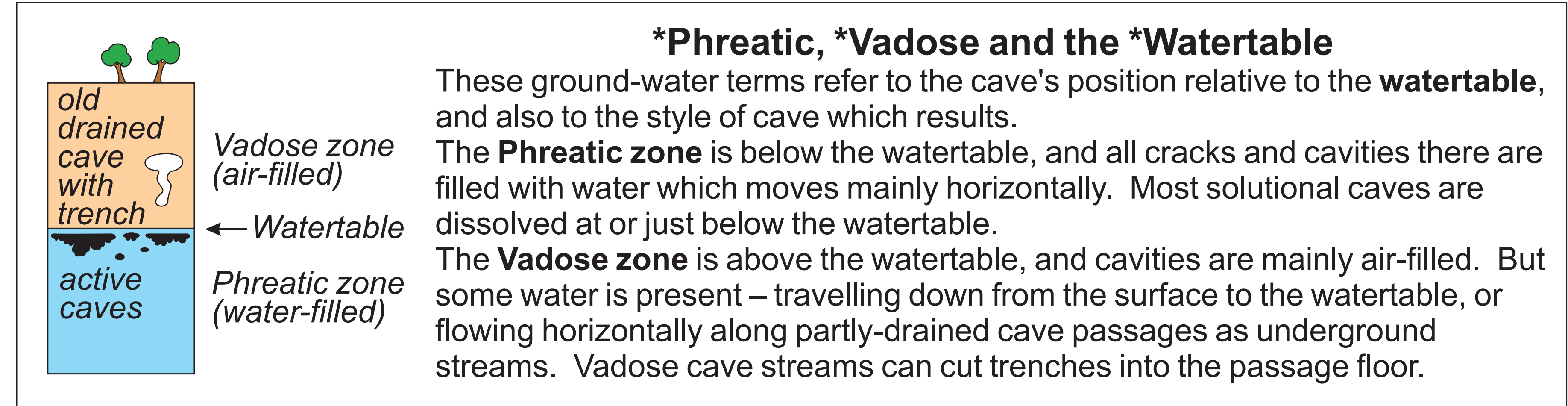
The key to understanding the Buchan Caves lies in the relationship between the ground levels, the watertables and the caves. **Caves** form where limestone ( $\text{CaCO}_3$ ) is dissolved by water, and that mainly occurs at or just below the level of the watertable\*. The **watertable** is tied to the surface **ground level**, especially the base level of the major stream valleys. As the ground level is lowered by erosion the watertable also drops and so does the level of cave development.

In the Buchan area the caves formed at successively lower levels as the surface hills and valleys eroded down over a long period of time – millions of years. Thus we find multiple levels of drained passages within the cave systems – only the lowest has an active stream. The Interpretation Sign at the Potholes describes an older set of caves that formed at levels much higher than here in the Reserve.

But even here the caves are quite old by human standards. The dated gravels in them tell us that the passages are at least 800,000 years old.

Cave passages can be guided by joints (cracks) or by the bedding. The limestone beds have been folded by earth movements so they dip\* steeply to the east, and the north-trending passages follow their strike\* direction (see diagram). Cross-passages follow joints. Some passages show a more meandering pattern; this may be a secondary effect from erosion by a vadose\* cave stream cutting down from a higher level.

\* Words marked with a star (\*) are defined or illustrated elsewhere on this sign.



While exploring the cave, look for the following features that help us interpret its origins:

- Long straight passages follow the strike\* of the beds, where a soluble bed was intersected by an old watertable\* (see diagram to left). Side passages follow cross-joints
- The limestone bedding can commonly be seen. The originally horizontal beds have been tilted to the east, as seen from the sloping ceilings.
- Horizontal wall notches and relict stream gravels show prior levels of the cave stream as it cut down.
- Phreatic\* sculpturing (spongework, hollows & cusps) formed when the passage was flooded.
- Speleothems (secondary calcite deposits) form decorative draperies, stalactites and columns. These were deposited by water that became saturated with lime as it seeped through the rock and deposited that lime when it entered the cave air. Some stalactites are in lines that follow the joints which fed the water into the passage.
- The Crystal Streamways are now dry, but the beds of crystals would have grown beneath water, in old pools. The sharp upper level of the crystal growths indicates the old water levels.
- Rimstone dams curving across the floor channel indicate the flow directions of the old streams.

