Geology of Lark Quarry, Winton and the Great Artesian Basin

The extensive plains and uplands of western Queensland span some two billion years of geological time. Four main elements comprise the geology of the outback:

1. the ancient basement which forms the Cloncurry and Mt Isa blocks
2. the Georgina Basin in the far west extending southwest from Boulia to Cammoweal and beyond
3. the Great Artesian Basin covering most of outback Queensland
4. the Lake Eyre basin and younger rocks which overlie the older strata

The geological makeup of western Queensland controls almost all aspects of the physical and economic conditions of the Outback – the locations of mineral, oil and gas deposits, the landforms, the soils and hence the location of grasslands, desert uplands and channel country. The flow of underground water is inextricably linked to the geology.

The Great Artesian Basin

Winton is located on the Great Artesian Basin, stretching from South Australia and New South Wales to the Gulf of Carpentaria and Cape York. It is the largest artesian basin in the world and its rocks contain a rich history of the continent and the plants and animals living here from 200 million to 95 million years ago. The rocks of the basin cover a basement of much older rocks of different ages and types; some contain oil, gas and mineral deposits.

The Basin was created some 220 million years ago when enormous tectonic forces down-warped the region which then began to fill with the sediments of rivers and lakes. These sediments eventually became the sandstones and other rocks at the base of the Basin. These rocks are exposed at Carnarvon Gorge, in the range northeast of Tambo, in the White Mountains and in Porcupine Gorge, near Hughenden.

The first phase of the basin's geological history consisted on the deposition of river and lake sediments from 200-130 million years ago, during the Jurassic and Early Cretaceous.

A series of inland seas, perhaps five in all, then flooded the continent. The most extensive flooding was around 110 million years ago and covered much of inland Australia. The last marine flooding was about 100 million years ago. The rocks laid down during these times contain many marine fossil types – giant marine reptiles, shellfish and sharks, even dinosaurs, washed into the sea.

These rocks are the richest source of fossils in the Outback. They are nearly 1 km thick and lie over the sandstones holding the water of the Artesian Basin.

The final phase of the development of the Artesian Basin occurred over the next 20 million years after the seas retreated north. Thick layers of sands and mudstones were laid down by lakes and rivers. They contain many plant and animal fossils and are up to a kilometre thick.

These rocks are called the Winton Formation, and are the rocks in which Lark Quarry's trackways, and Winton's many other dinosaur finds – such as Elliot – Australia's largest dinosaur have been found.

Weathering the Winton formation

The Winton Formation then underwent heavy weathering and erosion, creating the present day landscapes around Winton. Two major phases of erosion and weathering occurred, the first around 80-55 million years ago, the second around 30-20 million years ago. These processes also formed the world famous opals from areas around Jundah, Yowah and Opalton.

The tops of the distinctive mesas and flat-topped escarpments of the Jump Up country are composed of hard, chemically altered rocks known as duricrusts, laterites and silcretes. These are formed from deep weathering of the sediments, which leached minerals from the rocks and deposited silica, iron oxides and some clays.

Mesas around Winton, including the Merton Range and Rangelands are approximately the same height. This height represents the old surface some 30-20 million years ago.

Most of the surface outcrop of the lower Winton formation has weathered down to a thin veneer of clay soil – the black soil of the Mitchell grass downs.