THE GEOLOGY AND PALAEONTOLOGY OF TWO SITES ON THE ASRIVIER ON KRUIS VALLEI 190, BETHLEHEM

BY

JOHAN CHRISTIAAN LOOCK

MARCH 2010

CONTENTS

FIG 1 Coarse cross-bedded sandstone of the Molteno Formation

FIG 2 The dam at the Spioenkop. Elliot Formation mudstone and sandstone. The Spioenkop is capped by Clarens sandsone.

FIG 3 Quaternary beds in the valley below the dam near Spioenkop

FIG 4 Rapids at the thick sandstones at the northern boundary of Kruisvallei

1. BACKGROUND

Two sites along the Asrivier were examined in order to determine the presence, if any, of fossils, artefacts and rock paintings. None were found.

2. GENERAL GEOLOGY OF THE AREA SOUTH OF BETHLEHEM

The northern part of the Karoo Supergroup crops out around Bethlehem and in the area directly to the south. The three formations of the Stormberg group all intruded by a few dykes of Karoo Dolerite, can be recognised very clearly, the hills and slopes are covered by vegetation and a thin cover of soil. Alluvium occurs in the shallow valleys.

The stratigraphic column of the area is given below:

	Quaternary Beds	Alluvium
	Karoo Dolerite	Dolerite
Stormberg Group	Clarens Formation	Fine-grained sandstone
	Elliot Formation	Mudstone and sandstone
	Molteno Formation	Mudstone, sandstone and conglomerate

A very brief description of the geology of the area will allow the engineer to understand the nature and properties of the rocks, as well as the possible fossil content.

2.1 Molteno Formation

The sediments of this formation were deposited by northward-flowing rivers during a cool climate. The sands and occasional pebble conglomerates (Fig 1) were deposited in river channels while the grey muds settled on the floodplains. Due to the cool climate and the reducing conditions the grey mudstones do not contain fossils of reptiles. Plant fossils and insects are known from a few scattered localities in the Eastern Cape.

2.2 Elliot Formation

The maroon mudstones attest to deposition on floodplains by ephemeral streams during an arid climate. Sandstones are found in ancient river channels. The fossils are reptiles, a few dinosaurs and rare lungfish. These fossils can be found in denuded hillslopes and erosion gullies more to the south and east (Fig 2).

2.3 Clarens Formation

The fine-grained sandstones seen on the hills (Fig 2) were originally blown in from the west. The structures in the Clarens Formation vary from faint stratification to large scale cross-bedding, it is dune cross-bedding. Because of the desert environment in which the beds were deposited, few fossils can be expected. A few scattered bones and rare arthropods are known more to the south.

2.4 Karoo Dolerite

When the supercontinent of the south, Gondwana, started to rift in the early Jurassic Period, tension permitted basic magma to ascend and cool and solidify in the form of dykes and sills. In the Stormberg Group dykes are more common than sills. As the intrusive magma had a temperature of 1000°C, the Karoo rocks next to the dyke are undurated and thus baked very hard. In the Bethlehem area the high rainfall of 1000 mm/a caused chemical weathering of the dolerite, especially near the surface.

2.5 Quaternary Beds

The mudstones beds are usually covered by a thin layer of soil and vegetation. The river valleys contain up to three metres of alluvium resting with a sharp contact on the bedrock (Fig 3). In places a thin layer of ferruginous conglomerate lies between the alluvium and the bedrock.

The upper layer of the alluvium containing organic material and vegetation, is darker than the basal beds.

A diligent search for the bivalve, Unio, which is usually found in deposits in or near perennial streams in the interior of the country, revealed nothing.

3. DESCRIPTION OF LOCALITIES

3.1 Locality: Kruis Vallei 190
24° 24' 18.65" S
28° 21' 56.38" E
The precise site is at the dam, northwest of the Spioenkop (Fig 2).

Geology: Maroon mudstones of the Elliot Formation. Due to a lack of outcrops of the mudstones, no fossils were seen. The river flows in a channel cut in Quaternary deposits namely mud and silt. A few lenses of ferruginous conglomerate rest directly on the bedrock exposed in places in the river channel. No fossils were seen in the Quaternary deposits.

3.2 Locality: Kruis Vallei 190
28° 22' 42.82" S
28° 21' 52.70" E
The locality is in the northwest corner of the farm (Fig 4).

Geology: Maroon mudstone and sandstones of the Elliot Formation. The bend in the river is cut into a thick sandstone.

No fossils can be expected in the cross-bedded sandstone and none were seen. The overlying mudstones in the immediate vicinity are covered with vegetation. No fossils will be visible.

Later Stone Age implements are known from a valley south of Clarens. On Kruis Vallei none were seen, either on the surface or in the Quaternary beds.

Rock art was not seen. In this comprehensive monograph on the distribution of rock art in South Africa, C van Riet Lowe does not list Kruis Vallei 190.

4. SUMMARY AND CONCLUSIONS

No fossils, artefacts or rock paintings were seen.

It is now necessary to sketch a perspective of the Elliot Formation:

The outcrop area of the formation forms an ellipse with a circumference of 1500 km around Lesotho. The total outcrop area runs into thousands of square kilometres. In this huge area palaeontologists have collected many fossils.

The construction of dams and a hydroelectric plant will cover a miniscule portion of the outcrop area and will not impact on our knowledge of the palaeontology of the formation.

5. WHITE WATER CENTRE, HYDROELECTRIC POWER GENERATION SITE

This site was also investigated during the visit to the Asrivier. The geology is basically the same as that of the two sites described in this report. The geology may be briefly described.

Thick sandstones form the rapids where the hydroelectric plant was built. The coarse sandstones deposited under high energy and at times violent periods of fluvial

deposition cannot be expected to contain fossils. Away from the sites, the mudstones are covered by vegetation. No fossils were found

CONCLUSION

The construction of the Whitewater site will not impact on the palaeontology or archaeology of the area.

No further site inspections are necessary.

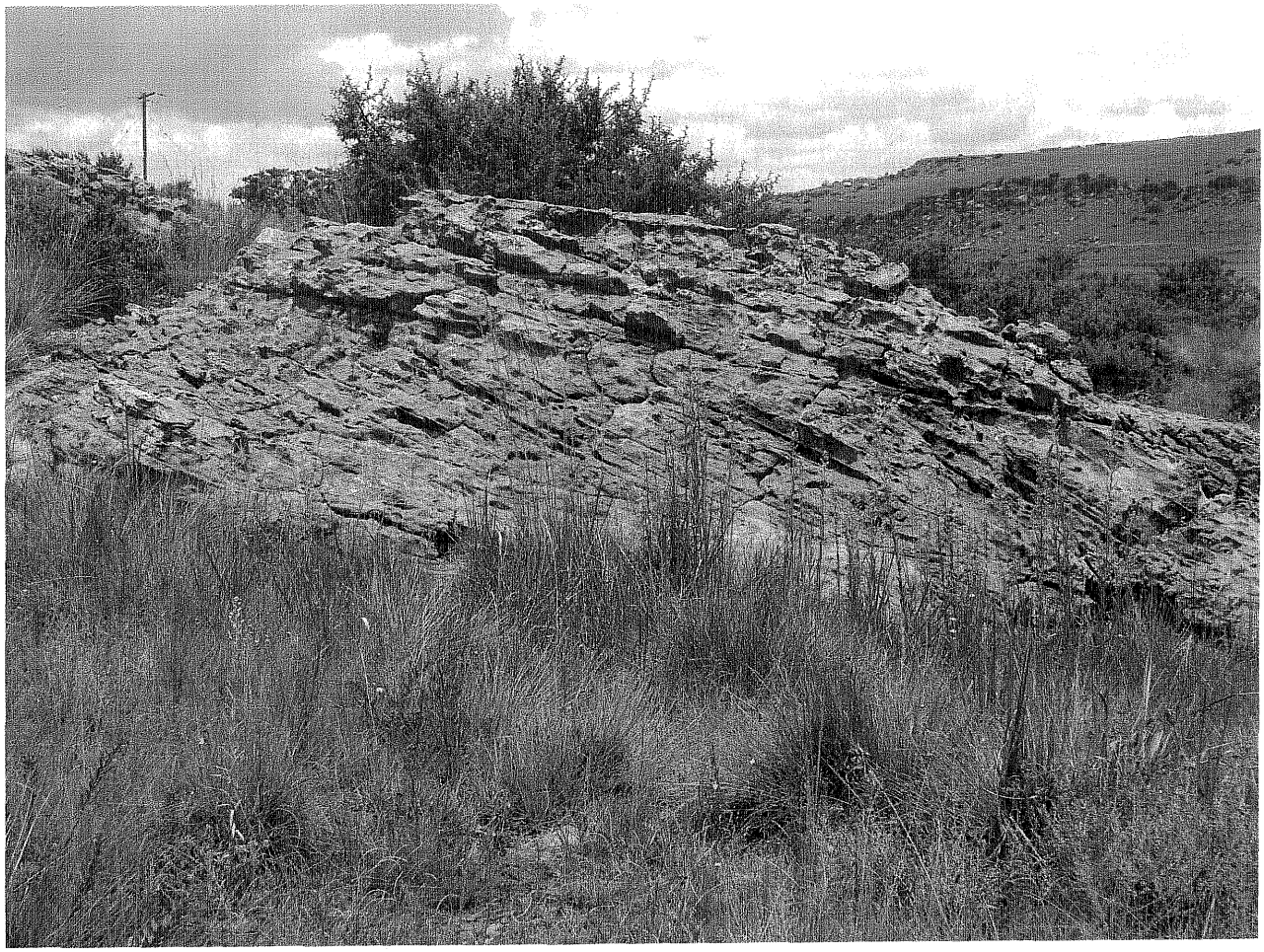

FIG 1 Coarse cross-bedded sandstone of the Molteno Formation

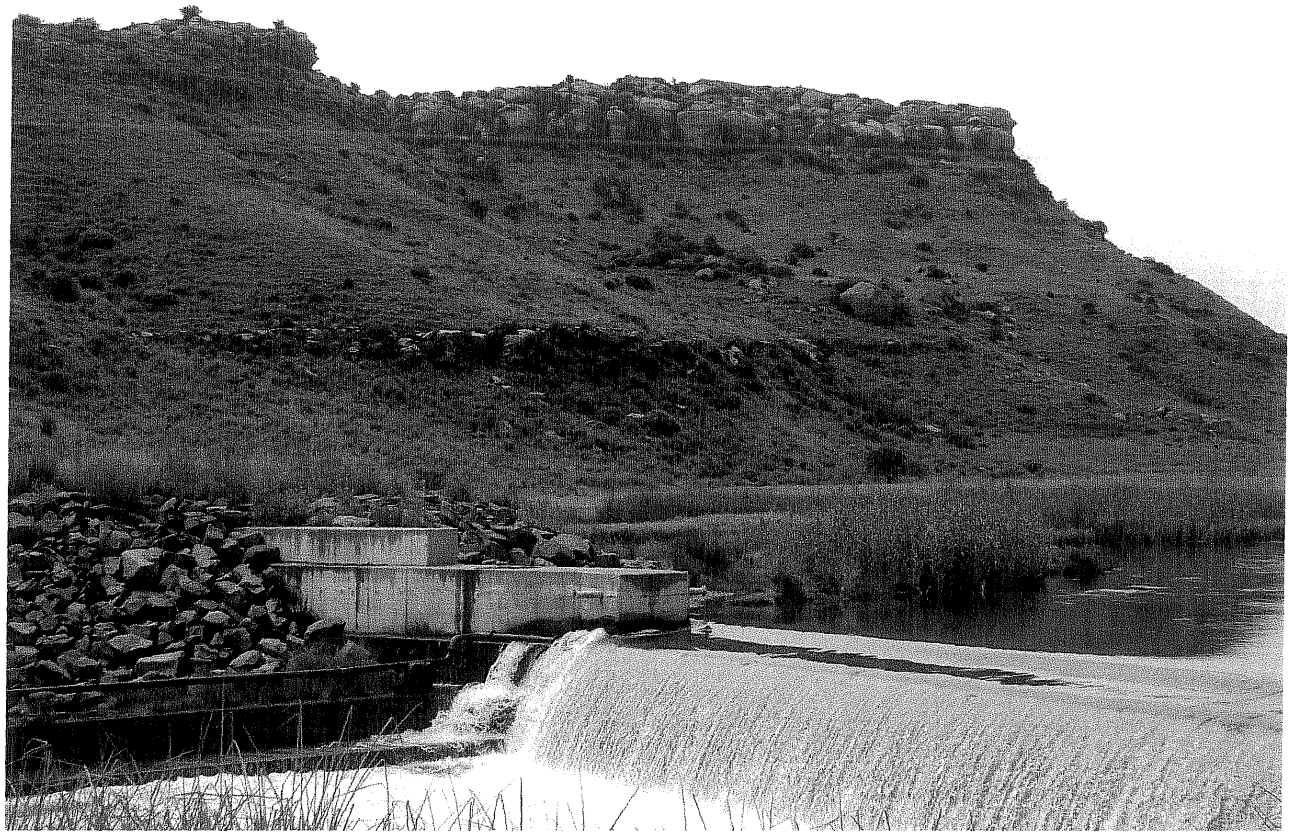

FIG 2 The dam at the Spioenkop. Elliot Formation mudstone and sandstone. The Spioenkop is capped by Clarens sandsone.

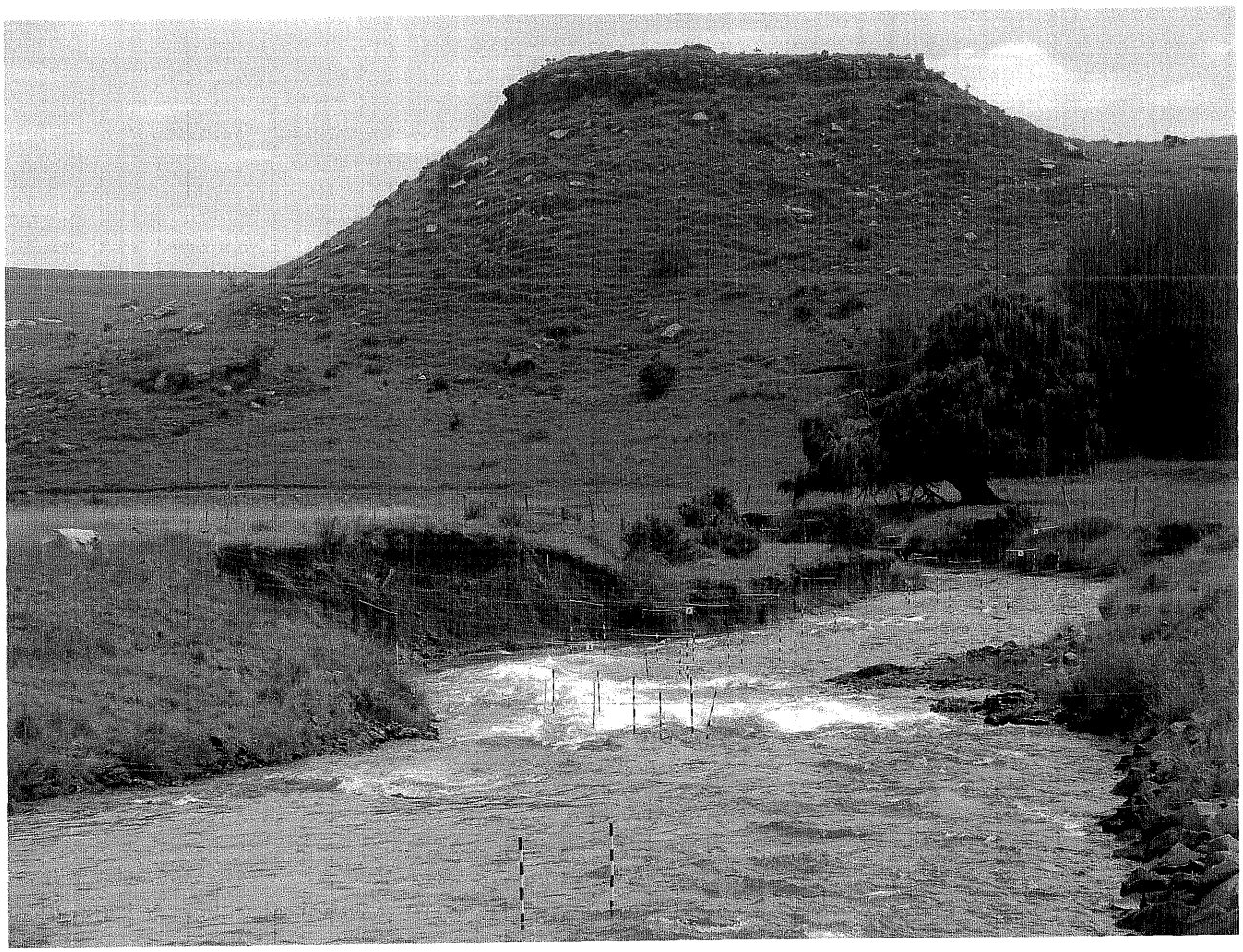

FIG 3 Quaternary beds in the valley below the dam near Spioenkop.

FIG 4 Rapids at the thick sandstones at the northern boundary of Kruisvallei.