Palaeontological desktop study of proposed bulk services development at Rathwick, Queenstown, EC Province

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November 2011

Report prepared for:

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Introduction

The report is a preliminary assessment of potential palaeontological impact with regard to the planned installation and upgrade of bulk water supply, sanitation and stormwater services for the proposed Rathwick residential development in Queenstown (Fig 1). The assessment was carried out in accordance with National Heritage Resources Act 25 of 1999 with the aim to assess impact on potential palaeontological heritage resources. The palaeontological significance of the local and surrounding environment was evaluated through a desktop study and carried out on the basis of existing field data, database information and published literature.

Terms of reference for the pre-feasibility study:

- Establishing probability of finding palaeontological heritage resources in the proposed areas of impact and;
- Recommendation of mitigation measures to minimize potential impacts associated with the proposed development.

Details of area surveyed

1:50 000 scale topographic map 3126 DD Queenstown.

The proposed construction / upgrade of the bulk services will comprise the following:

- Bulk water – pipeline and reservoir
- Bulk sewerage facility – pump stations and a rising main
- Bulk stormwater – stormwater conveyance infrastructure

Routing of the proposed pipelines will mainly run along road reserves and areas falling under various land uses including municipal, industrial, residential, agricultural and communal (**Fig 1**).

Geology

The affected area is situated within the Beaufort Group, Tarkastad Subgroup of rocks (Karoo Supergroup) consisting of sedimentary layers of sandstone, siltstone and mudstone (**Fig. 2**). Bedrock geology in the region is primarily represented by uppermost Katberg Formation sandstones (*Trk*) and mudstones south of Queenstown overlain by Burgersdorp Formation mudstones (*Trb*) in and around Queenstown (**Fig. 3**). The Burgersdorp Formation is mainly represented by grayish-red and greenish-grey mudstones with subordinate greenish-grey fine-grained lithic sandstone. Based on the characteristic presence of upward-fining cycles, lenticular sandstones, massive mudstones and non-marine vertebrate remains, the depositional history of the Tarkastad Subgroup is also interpreted as a fluviatile environment. Dykes, sills and inclined sheets of resistant Jurassic dolerites (*Jd*) determine the relief of the surrounding area. Overlying Quaternary alluvial sediments are derived from the Komani River that runs through Queenstown (**Fig. 3**).

Palaeontology

The potential fossil heritage in and around the affected area are summarized in **Table 1**.

Karoo Sediments

In the Tarkastad Subgroup the the Burgersdorp Formation strata (*Trb*) are assigned to the *Cynognathus* Assemblage Zone (AZ), which overlies the *Lystrosaurus* AZ. The zone is characterized by the presence of *Cynognathus, Diadermodon* and *Kannemeyeria* and the absence of *Lystrosaurus*. Sediments assigned to this zone are well exposed in the Queenstown and Lady Frere districts and have been traced eastward as far as the Engcobo district. Rocks consist of blue-green, pale grayish green, dark red to very dark

maroon mudstones that are in many instances more consolidated than those of the underlying *Lystrosaurus* AZ. Fossil-bearing lenticular sandstones with calcareous concretions are common. The fossil record of the *Cynognathus AZ* includes a variety of plants, trace fossils, amphibians, fish, synapsids, and occasional molluscs. Complete, articulated skeletons are rare, but well preserved therapsids occur in mudrock units as dispersed and isolated specimens. Fragmentary therapsid and amphibian fossils frequently occur in localized scatters or in conglomerates at the base of lenticular sandstones.

The dolerite dykes, sills and inclined sheets dolerite represent no palaeontological impact.

Post-Karoo Sediments

Quaternary palaeontological sites are occasionally found exposed along Pleistocene alluvial terraces and dongas along rivers and streams. Quaternary alluvial deposits, especially near water courses and drainage lines, have the potential to yield microfossil and fossil vertebrate remains.

Table 1. Geology and potential fossil heritage in and around the affected area.

Geological Unit	**Rock types and Age**	**Potential Fossils / Biostratigraphy**
Superficial deposits	Alluvium. Quaternary to Recent	Vertebrate skeletal remains; freshwater molluscs, coprolites, pollen and phytoliths
Karoo Dolerite (*Jd*)	Intrusive igneous bedrock. Jurassic	No fossils
Tarkastad Subgroup Burgersdorp Formation (*Trb*)	Fluvial and lacustrine mudstones and sandstones. Early Triassic	*Cynognathus* Assemblage Zone Plant fossils, trace fossils, amphibians, fish, reptiles, synapsids, and occasional molluscs

Recommendation

The nature of the proposed development suggests high-level impact on sub-surface heritage resources that may be present at the site. The development footprint will impact on fossil-bearing Burgersdorp Formation strata (*Trk*) and partially overlying Quaternary alluvial deposits adjoining the Komani River. Areas covered by dolerite bedrock are not palaeontologically significant.

The intent of palaeontological mitigation is to recover in *situ fossils* before possible damage or destruction. However, the rescue of fossil material (mitigation) can in most cases be done only after the commencement of excavation activities when potentially fossil-bearing strata are freshly exposed. Excavations exposing fresh bedrock or ancient river alluvium are therefore of conservation and research interest. At this stage, it is recommended that, as part of a phase 1 mitigation procedure incorporated into the project's management plan, palaeontological inspection of fresh excavations as well as of material excavated, be conducted at the earliest practicable opportunity before new excavations are in-filled or backfilled or fresh bedrock have the chance to weather or be otherwise damaged by further development.

References

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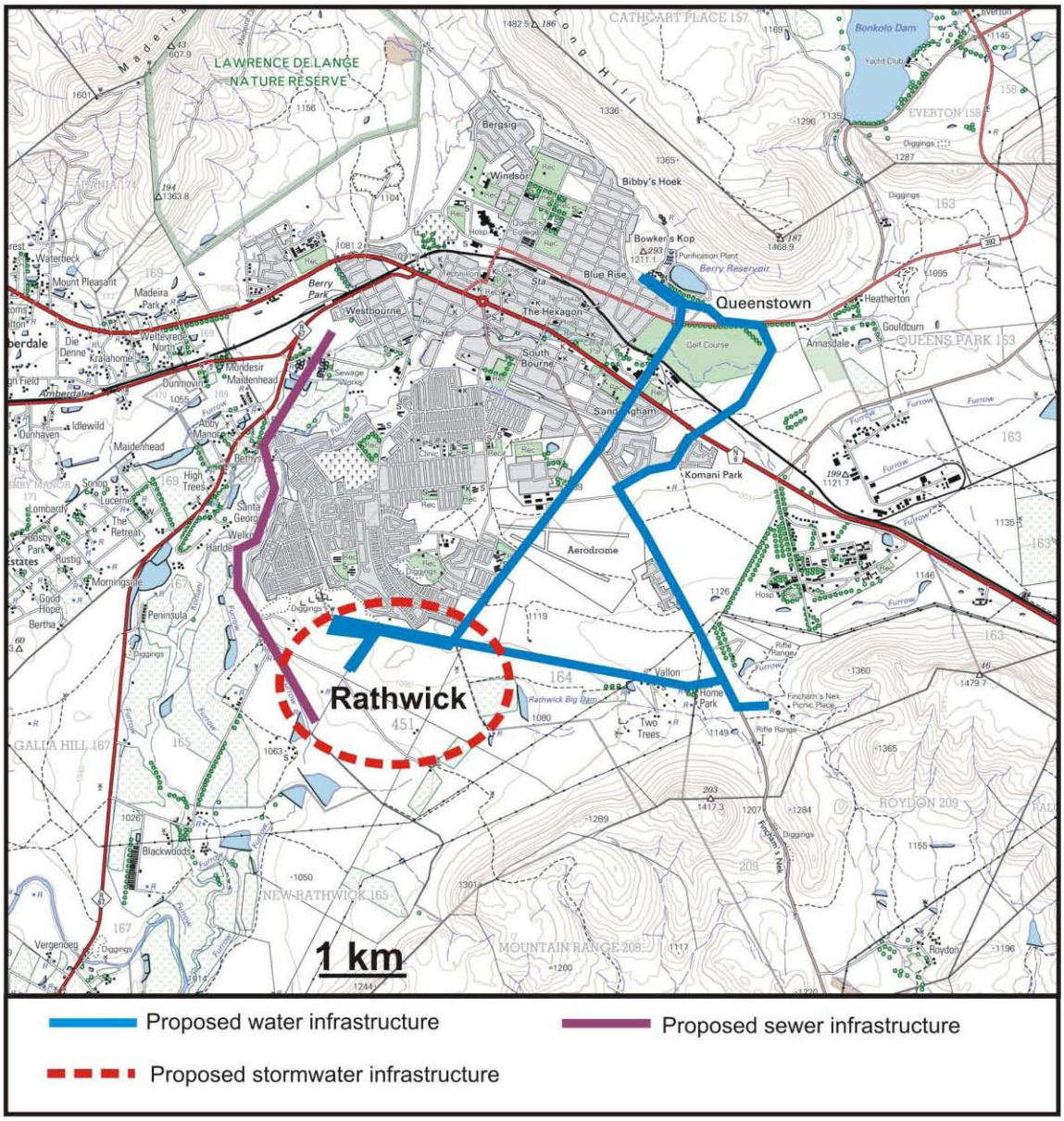

Figure 1. Portion of 1 : 50 000 topographical map 3126 DD Queenstown showing the locality of the affected area and associated development.

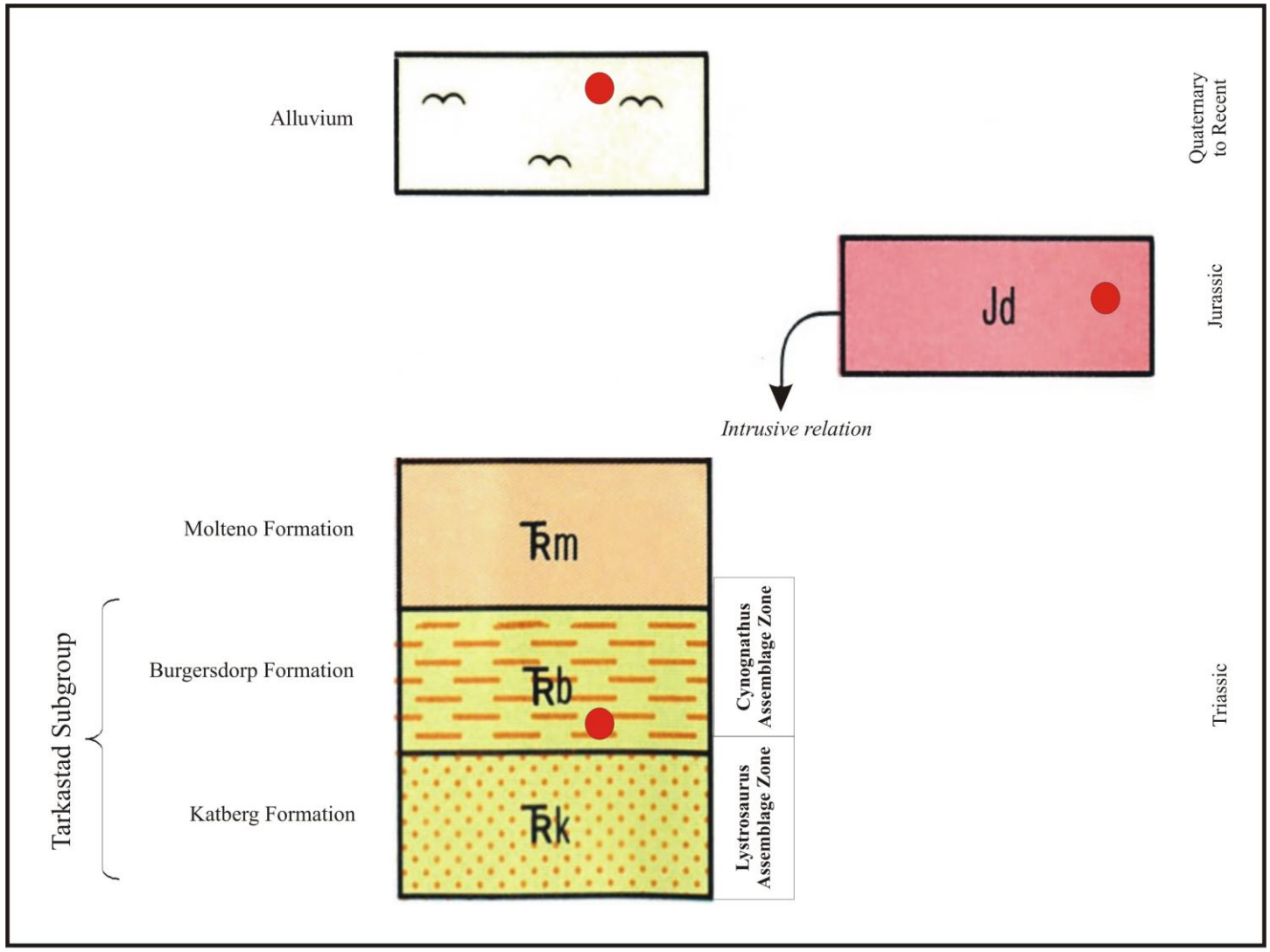

Figure 2. Stratigraphic section and schematic representation of local geology (marked).

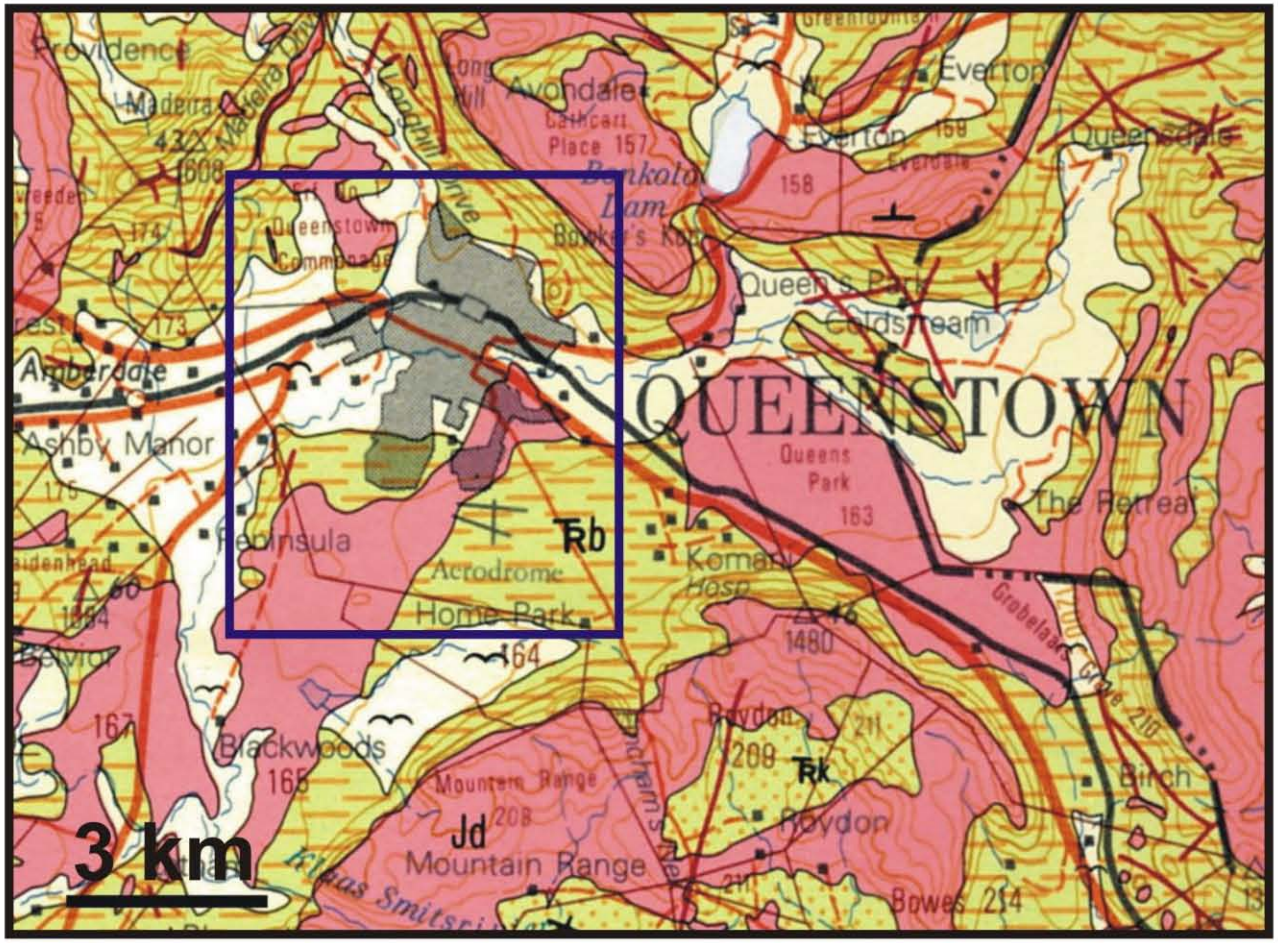

Figure 3. Portion of the 1 : 250 000 scale geological map 3126 Queenstown showing bedrock geology in the study area. From oldest to youngest, strata consist of Beaufort Group rocks, namely the Early Triassic Katberg (*Trk*) and Burgersdorp Formation (*Trb*) of the Tarkastad Subgroup, Jurassic age dolerite intrusions (*Jd*) and Quaternary alluvium along the Komani River drainage.

Declaration

Dr. L. Rossouw occasionally does independent specialist consulting and is in no way connected with the proponents of the development, other than delivery of consulting services.