Desktop Palaeontological Impact Assessment for the proposed replacement of the Chatty Valley collector sewer (nodes 20-24) and construction of link sewer, Bethelsdorp, Nelson Mandela Bay Municipality

EIA Ref: **ECm1/LN1&3/M/12-90**

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April 2013

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Robert Gess has more than 15 years experience in Palaeontolgical research in the Eastern Cape, and is currently South Africa's primary researcher on South African Devonian Palaeoichthyology and Palaeobotany. He has published numerous papers in international peer-reviewed journals, including a description of the oldest fossil lamprey, published in *Nature*. He lectures in palaeontology at Rhodes University.

In addition he has extensive experience in EIA work. This includes extensive consultancy and mitigation at Waterloo Farm near Grahamstown as well as numerous surveys including surveys for the Thyspunt Melkhout transmission lines, Eastern Cape Fibreco network, Albany Regional Water Scheme, Amathole District borrow pits, Chris Hani District borrowpits, Amanzi estates, Coega Chlor alkali Plant, Thornhill Housing project, Sarah Baartman Park, Kwanobuhle Extension, Nieu Betheda Water Plant works, Fort Brown Agrivillage, Waainek Windfarm, Wesley Windfarm, upgrade of R61 section 6, and National route 10 section 3

Palaeontological Papers in Peer-reviewed Journals include:

Gess, R.W. (2012). The oldest animals (*comment and opinion*), *South African Journal of Science* **108**,**1**: 1.

Gess, R. & Coates M. (2008) *Vertebrate Diversity of the Late Devonian (Famennian) Deposit near Grahamstown, South Africa*. Journal of Vertebrate Paleontology **28** (3)

Coates, M.I. and **Gess, R.W.** (2007). A new reconstruction of *Onychoselache traquairi*, comments on early chondrichthyan pectoral girdles, and hybodontiform phylogeny, *Palaeontology* **50**, **6**: 1421-1446.

Gess, R.W., Coates, M.I. & Rubidge, B.S. (2006). A lamprey from the Devonian period of South Africa. *Nature* **443:** 981-984.

Gess, R.W. (2001). A new species of *Diplacanthus* from the Late Devonian (Famennian) of South Africa. *Annales de Paléontologie* **87:** 49-60

Anderson, M.E., Long, J.A., **Gess, R.W**. and Hiller, N. (1999). An unusual new fossil shark (Pisces: Chondrichthyes) from the Late Devonian of South Africa. *Records of the Western Australian Museum* **57:** 151-156.

Long, J.A., Anderson, M.E., **Gess, R.W**. and Hiller, N. (1997). New placoderm fishes from the Late Devonian of South Africa. *Journal of Vertebrate Palaeontology* **17**: 253-268.

Hiller, N and **Gess, R.W**. (1996). Marine algal remains from the Upper Devonian of South Africa. *Review of Palaeobotany and Palynology* **91**: 143-149.

Anderson, H.M., Hiller, N. and **Gess, R.W**. (1995). *Archaeopteris* (Progymnospermopsida) from the Devonian of southern Africa. *Botanical Journal of the Linnean Society* **117**: 305-320.

Gess, R.W. and Hiller, N. (1995b). Late Devonian charophytes from the Witteberg Group, South Africa. *Review of Palaeobotany and Palynology* **89**: 417-428.

Gess, R.W. and Hiller, N. (1995a). A preliminary catalogue of fossil algal, plant, arthropod, and fish remains from a Late Devonian black shale near Grahamstown, South Africa. *Annals of the Cape Provincial Museums (Natural History)* **19:** 225-304.

Anderson, M.E., Hiller, N. and **Gess, R.W**. (1994). The first *Bothriolepis*-associated Devonian fish fauna from Africa. *South African Journal of Science* **90**: 397-403.

Declaration of Consultants independence

Dr R.W. Gess is an independent consultant to Jeffares & Green (Pty) Ltd
and has no business, financial, personal or other interest in the activity, application or appeal in respect of which he was appointed other than fair renumeration for work performed in connection with the activity, application or appeal. There are no circumstances whatsoever that compromise the objectivity of this specialist performing such work.

Executive summary

The existing Chatty Valley collector sewer (nodes 20-24) is located in Ward 33 Kleinskool within the Bethelsdorp suburb of the Nelson Mandela Bay Municipality. The proposed development will include: the replacement of the Chatty Valley Collector Sewer; decommissioning of the existing collector sewer; an additional ~165m Link sewer with additional drop sewer manholes and diversion chambers; and approximately 200m worth of additional sewer pipeline for tie-ins.

Jeffares & Green (Pty) Ltd were appointed by the Nelson Mandela Bay Metropolitan Municipality (NMBM) to undertake and complete a new environmental application in terms of the governing EIA Regulations of 2010 of the NEMA.

Jeffares & Green subcontracted Rob Gess Consulting to carry out a Palaeontological Heritage Assessment, as they have previously conducted studies in this area. Rob Gess Consulting requested a series of photos of the route from Jeffares & Green to ascertain whether any outcrop would be likely to be found on surface, as previous experience argued against the presence of viable surface outcrop in this setting. Examination of the photos confirmed the palaeontologist's initial impression and a field assessment was not deemed necessary at this point. As a result a desk top assessment was conducted based on photos, satellite imagery, geological maps and past experience

The sewer route skirts the edge of the flood plain of the Chatty River. The underlying bedrock is covered in a veneer of geologically recent flood plain alluvium and soil derived from deeply weathered bedrock. Underlying these at shallow depth are cretaceous mudstones of the **Kirkwood Formation (Uitenhage Group)**. It is almost certain that these will be disturbed during excavations for the new sewer, as it is to be laid at a depth of five metres.

The Kirkwood Formation is South Africa's primary source of Cretaceous Dinosaur fossils. These include remains of Sauropod, Theropod and Ornithopod Dinosaurs. Recent research has also revealed the remains of a primitive lizard, a type of crocodile and a primitive early mammal. A range of plant fossils have been recorded from more fine grained interbedded mudstones.

It is recommended that should pink mudstones be exposed during trenching these should be inspected by a palaeontologist prior to backfilling. This will allow any palaeontological material to be rescued for deposition in the Albany Museum

Contents:

Background

The existing Chatty Valley collector sewer (nodes 20-24) is located in Ward 33 Kleinskool within the Bethelsdorp suburb of the Nelson Mandela Bay Municipality. Access to the site is via the Uitenhage Road (R75). The socio-economic group serviced by the existing network and collector sewer was identified as predominantly category 3 low income group (2007). The land use of the area is typical residential with an existing waterborne sanitation system. Few informal settlements still prevail in the surrounding areas which may be utilising alternative sanitation systems.

The proposed development will include:

1. The Replacement of the Chatty Valley Collector Sewer: Stage 1 (Nodes 20-24)', is to include the upgrading and installation of a new collector sewer pipe line between Nodes 20 to 24 (~1 900m long).

2. Decommissioning of the existing collector sewer (1 050mm outer diameter with 960mm inner diameter, the resultant made up by the sacrificial casing).

3. The development also proposes to include an additional ~165m Link sewer with additional drop sewer manholes and diversion chambers being installed. This Link sewer is intended to provide a manageable diversion of flow downstream (east of the R75) of Node 20, into either the existing upper and lower Swartkops collector sewers, that eventually discharge into the Fishwater Flats Waste Water Treatment Works.

4. Approximately 200m worth of additional sewer pipeline for tie-ins are also envisaged (this is dependent on the distance between the proposed alignment to the existing collector sewer alignment and its associated network sewers).

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Examination of the photos (figs 1, 2) confirmed the palaeontologist's initial impression and a field assessment was not deemed necessary at this point. As a result a desk top assessment was conducted based on photos, satellite imagery, geological maps and past experience.

Figure 1: Views of the pipe route supplied by Jeffares & Green.

Figure 2: Views of the pipe route supplied by Jeffares & Green.

Age, Origin and Palaeontology of Geological Strata

The sewer route skirts the edge of the flood plain of the Chatty River. The underlying bedrock is covered in a veneer of geologically recent flood plain alluvium and soil derived from deeply weathered bedrock (fig. 3, Quaternary). Underlying these at shallow depth are cretaceous mudstones of the **Kirkwood Formation (Uitenhage Group)** (fig. 3, Kirkwood). It is almost certain that these will be disturbed during excavations for the new sewer, as it is to be laid at a depth of five metres.

The Algoa Basin is filled with strata belonging to the Cretaceous aged **Uitenhage Group**, which are overlain by more recent sediments of the Tertiary and Quaternary Periods.

During the Cretaceous (142 to 65 million years ago) a number of fault systems (resulting from the breakup of the supercontinent Gondwana), opened up along the coastline of southern Africa. Slow downward collapse of large chunks of continental margin resulted in the formation of a number of shear sided basins along the coast of southern Africa. Those of the Algoa Basin were filled with sediments that became the semi consolidated strata of the Uitenhage Group. Uitenhage Group strata are assigned to the Enon and Kirkwood and Sundays River Formations.

Coarse pebbly conglomerates assigned to the Enon Formation (Uitenhage Group) formed in close proximity to the fault scarp, where mountain valleys disgorged their contents into the basin. Further from the fault scarp rivers meandering across the coastal plain towards the sea deposited the muddy sands that gave rise to the **Kirkwood Formation (Uitenhage Group)**. A third formation deposited in the Algoa Basin, which (like the Enon Formation) is not represented within the study area, is the Sundays River Formation (Uitenhage Group). This was simultaneously deposited within a marine setting.

The Kirkwood Formation is South Africa's primary source of Cretaceous Dinosaur fossils. It was in Kirkwood Formation rocks, on the banks of the Bushman's River that South Africa's first dinosaur discovery was made in 1845 by William Atherstone and his wife. Originally dubbed "Cape Iguanadon" the fragmentary remains have, more recently been shown to be those of a *Stegosaurus*. Remains of two types of Sauropod Dinosaur, as well as a Theropod Dinosaur and an Ornithopod Dinosaur have subsequently been collected from Kirkwood Formation strata at various localities. Recent research has also revealed the remains of a primitive lizard, a type of crocodile and a primitive early mammal. These remains are sometimes found in association with fossil logs and chunks of fossil wood, which are fairly common in Kirkwood Formation rocks. Associated mudstones have yielded a range of finely preserved plant leaves and fructifications, including those of a number of species of ferns, cycads and conifers.

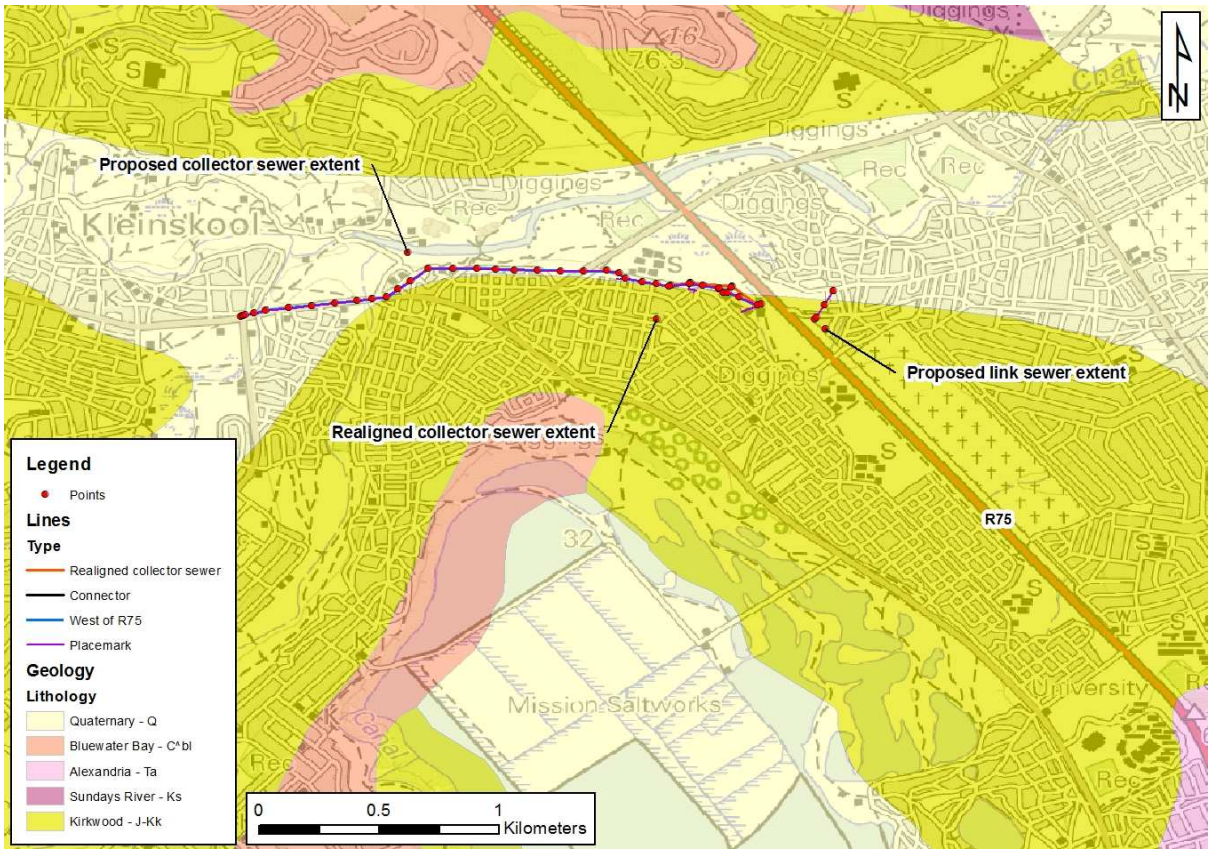

Figure 3: Geological map of the proposed development area, with the devopemental footprint indicated.

Conclusions and Recommendations

The sewer route will largely be excavated through ground cover and alluvium of the Chatty River flood plane. As it is to be excavated to a depth of five metres it is likely that it will result in exposure of fresh outcrop of the pinkish mudstones of the Cretaceous Kirkwood Formation (Uitenhage Group). These are famous as one of the sole sources of Cretaceous dinosaur remains in South Africa. Should pink mudstones be exposed during trenching these should be inspected by a palaeontologist prior to backfilling. This will allow any palaeontological material to be rescued for deposition in the Albany Museum.

References

Anderson, J.M. and Anderson, H.M. (1985). *Palaeoflora of Southern Africa: Prodromus of South African Megafloras*; Devonian to Lower Cretaceous. A.A. Balkema, Rotterdam. p.423

Council for Geosciences (Geological Survey) 1:250 000 Gelogical Maps, Eastern Cape 3324 - Port Elizabeth

De Klerk, W. J., C. A. Forster, C. F. Ross, S. D. Sampson, and A. Chinsamy (1998) A review of recent dinosaur and other vertebrate discoveries in the Early Cretaceous Kirkwood Formation in the Algoa Basin, Eastern Cape, South Africa. Journal of African Earth Sciences 27:55.

Le Roux, F.G. (2000) The geology of the Port Elizabeth – Uitenhage area. Explanation of 1: 50 000 geology Sheets 3325 DC and DD, 3425 BA Port Elizabeth, 3325 CD and 3425 AB Uitenhage, 3325 CB Uitenhage Noord and 3325 DA Addo, 55pp. Council for Geoscience, Pretoria.

Macrae, C. (1999) Life etched in stone. Fossils of South Africa. 305pp. The Geological Society of South Africa, Johannesburg.

McCarthy, T. and Rubidge, B. (2005). *The Story of Earth and Life*. Struik Publishers, Cape Town