Clarens Dinosaur Hunting Expeditions CC
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PROGRESS REPORT ON FOSSIL FINDS AT BEDFORD DAM – 27 MARCH 2009

Introduction

Dr Gideon Groenewald was requested to assist with the recording of fossil finds at the construction site of the Ingula Pump and Storage Scheme, developed by Eskom Holdings (Pty) Ltd. At a meeting with Eskom representatives it was agreed that a logbook would be kept on site for recording of the time that Dr Groenewald spend at the Ingula Pumped Storage Scheme. This report is a short summary of fossil finds up to 27 March 2009.

Please note that all fossil finds are included in this progress report.

Recording of fossils

Date	Fossil Ref	Surveyor Ref/GPS	Fossil description and status	Fossil curation
5.11.2008 6.11.2008	BDF 1	TR Y-57396.393 X 3125070.385 1707.051m.a.s Y-57395.946 X 3125070.175 1707.498m.a.s	Fossilised Tree, sample of 3m collected, sample to be transported to container supplied by Eskom, small sample (100mm section) to be sent to WITS for study by Marion Bamford. Contractor provided five labourers and heavy equipment for excavation – 2 days	Fossil to be stored in container and then taken to National Museum
19.11.2008	BDF 2	Croc Y-57399.912 X 3125058.914 1700.501m.a.s	Fossilised remains of Dicynodon discovered. Broken material collected	Broken pieces of fossil collected. To be stored in container
21.11.2008	BDF 3		Fossil remains of large Gorgonopsian discovered. Fossil collected as complete as possible (full report available). Fossil prepared for transport to National Museum in Bloemfontein. Only the skull is well preserved. Rest of skeleton to be transported to National Museum for assessment of curation. Contractor provide heavy equipment for removal of fossil	Fossil to be transported to National Museum for curation
26.11.2008	BDF 4		Fossil remains of small Dicynodon discovered	Fossil to be

			in association with the Gorgonopsian. Fossil material to be taken to National Museum for assessment and identification	delivered to National Museum
5.01.2009	BDF 5	28 14 26.7S 29 35 10.3E	Tree fossil – 4m exposed, 300mm diameter. To be collected when contractor has built access road to water works in wetland	Fossil to be collected
5. 01.2009	BDF 6	28 14 28.0S 29 35 10.6E	Tree fossil – 4m exposed, 800mm diameter. To be collected when road to water works is completed	Fossil to be collected
5.01.2009	BDF 7	28 14 28.9S 29 35 10.5E	Fossil tree. Very small piece of fossil exposed. To be assessed when other fossils are collected	Fossil to be collected
5.01.2009	BDF 8	28 14 21.4S 29 35 10.4E	Fossil tree. Very small piece of fossil tree exposed. To be assessed when other fossils are collected	Fossil to be collected
5.01.2009	BDF 9	28 14 37.0S 29 35 13.9E	Unidentified Vertebra fossil. Isolated find.	Fossil bone recorded for record purposes
5.01.2009	BDF 10	28 14 31S 29 35 9.7E	Fossil wood. Isolated fossil, not in situ.	Fossil recorded for record purposes
23.01.2009	BDF 11		Fossil tooth of Dicynodon – collected. Highly weathered, brittle – isolated	Fossil collected but highly fragile and of no value for museum curation
23.01 2009	BDF 12		Fossil remains of Dicynodon skull. Highly weathered in fault zone. Excavation necessary. Fossils collected over three days. Contractor provide assistance – 4 people and equipment over period of 6 hours.	Fossil collected – extremely poor preservation but well-defined tusks of dicynodon visible - to be delivered to National Museum for confirmation
24.01.2009	BDF 13		Fossil remains of a vertebrate animal. Possibly a shoulder blade. Fossil material highly weathered. Material not collected	Fossils material of very low quality, not collected
26.01.2009	BDF 14		Fossilised bone material recorded during excavations. Close to where Gorgonopsian was found. Material highly weathered and broken by dynamite, not collected	Fossil material not collected
2.02.2009	BDF 15		Fossilised bone with teeth. Possibly jaw bone of a predator. Collected as a single piece of fossil bone, to be assessed by National Museum in Bloemfontein. This material is associated with a deep excavation in the conduit and more material is expected from this site during construction works	Fossil material collected, to be delivered to National Museum
3.02.2009	BDF 16		Fossil reed material from the underground works at the intake tower site for the delivery tunnels. Most probably remains of the common “horsetail ferns” known as *Phyllotheca.*	Fossil material of reeds in the sandstone – to be assessed by Marion Bamford

3.02.2009	BDF 17		Coal beds at base of sandstone in the main quarry site. Plant material highly coalified and no identification of species possible with naked eye.	Samples to be assessed by Marion Bamford
9.02.2009	BDF 18		Fossilised bone – probably skull material of a Dicynodon, highly weathered. Skull material collected but due to extremely fractured nature not suitable for museum purposes	Fossil material collected to identify possible skeletal parts, not to be curated
10.02.2009	BDF 19		Fossil material, highly fractured by dynamite in material to be removed from conduit section	Material not collected for museum purposes
16.02.2009	BDF 20		Large concretion with potential bone material removed to be prepared for inspection	Material to be inspected at National Museum
16.02.2009	BDF 21		Fossil tree at intake tower. Partly coalified	Sample (300mm) collected for discussion with Marion Bamford
17.02.2009	BDF 22		Highly weathered remains of some bone in a concretion. Not possible to collect material	Material not collected for museum purposes
17.02.2009	BDF 23		Unidentified fossil material associated with high pyrite concentration in mudstone with well defined desiccation structures	Sample collected proved to be remains of desiccation structures filled with a black clay-rich substance and pyrite. Sample for discussion at National Museum
18.02.2009	BDF 24		Fossilized bone, highly enriched in pyrite. Highly fractured by excavation works	Not collected for museum purposes
19.02.2009	BDF 25		Small vertebrate found in sandstone at the tunnel intake works – isolated bone	Collected in sandstone
26.02.2009	BDF 26		Extremely well preserved point of a tusk – possibly Dicynodon lacerticeps	Collected for discussion with Museum
26.02.2009	BDF 27		Very well preserved bone material discovered in the conduit section. Difficult to ID. Fossil rich rock placed away from spoil area to weather – hope to find more remains	Small piece of bone collected for discussion with Museum
27.02.2009	BDF 28		Very well preserved bone fossil found in the main quarry area. No other remains could be found at the site	Bone fossil collected for discussion with Museum
19.03.2009	BDF 29		Large concretion with potential fossil bone material – removed to container for inspection	Concretion to be

				inspected by Museum
20.03.2009	BDF 30		Extremely well preserved reddish coloured bones of grand scale (6cm diameter). Unfortunately highly scattered and not possible to find more remains	Fossil bone collected but not possible to ID. To be discussed with Museum
27.03.2009	BDF 31		Extreme well preserved full tree fossil with branches imprinted into sandstone on the bedding plane. Photographed for museum purposes but not sampled due to extreme size and the fact that the find is mainly an imprint of the tree fossil. ID probably possible from photographic information and also the fact that the area where this fossil is found contains numerous fossils of large trees, already sampled during this survey, in the same sandstone bed	Tree fossil not sampled for museum purposes due to extremely dangerous working place and fractured sandstone
27.03.2009	BDF 32		Fractured fossil tree. Small sample retained. ID not possible	Tree fossil sampled for record purposes

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PROGRESS REPORT – MARCH 2009 - ON FOSSIL FINDS AT BEDFORD DAM

Introduction

Dr Gideon Groenewald was requested to assist with the recording of fossil finds at the construction site of the Ingula Pump and Storage Scheme, developed by Eskom Holdings (Pty) Ltd. This report is a short summary of new finds made during February and March 2009,with an interpretation of possible palaeo-environments at the Ingula Pumped Storage Scheme site.

Recording and excavation of fossils

Following the meeting of 17 November 2008, site inspections of all excavations were conducted on a regular basis after every blast. The visits to the site are recorded in the logbook for palaeontology and all fossil finds were recorded in a separate report where results are tabulated for ease of summary.

Tree Fossils on site

A Palaeontological survey was done in the area below the low water mark where the dam basin will be filled with spoil material. Several sites were identified where fossils of trees occur. The sites were recorded on GPS and the collection of the fossils was discussed with the contractor on site. The fossils will be collected with assistance from the contractor during April 2009.

Fossils of vertebrates

The sites of the excavations were inspected on a continuous basis during excavation since 12 January 2009 and up to date twenty five sites were recorded where fossilised bone were found. Remains of the vertebrates discovered were very broken and unfortunately disturbed by the excavations. It was not possible to collect complete skeletons of the animals recorded up to date. From the information gathered it is however feasible to report that the

jawbone of at least one predator was found. A very well preserved tusk of a plant-eating reptile, possibly Dicynodon lacerticeps have been recorded.

The discovery of very well preserved bone fossils in the main quarry indicates the fact that the interbedded mudstones in the region might provide valuable information on the fauna of the ancient environment in that region.

Recording of Fossil Finds

Following discussions with Eskom, the official surveyor of WBHO records every fossil find on site accurately. The fossil sites will be recorded on the plan of the dam as provided by Eskom and a short report on the condition of each find will be kept on file for future reference. Excavation of fossils is only considered in cases where at least enough material is preserved to identify the animals. Up to date the remains were highly scattered and it was not possible to excavate complete skeletons.

Geological Information from excavation site at Conduit

Excavation of the conduit exposes very good examples of fluvial deposits, including some floodplain environments with well-defined desiccation cracks exposed in the mudstone underlying the main sandstone members. The mudstone also contains structures that might indicate palaeosoil profiles preserved at this site. The mudstones and clay stones are highly unstable and dissipate very quickly after exposure. Mudstone underlying the main sandstone at the conduit also contains high volumes of carbon rich clays and in some cases coal beds of up to 2cm thick. The remains of both predators (large Gorgonopsian and Dicynodon bones) indicate that the area was populated with large herbivores and carnivores of the time (Figure 1).

Fig 1. Carnivores and herbivores of the Permian landscape at Bedford Dam

The overlying sandstone at the conduit also contain very large scale trough cross-bedding (units up to 2m high) overlying prominent conglomerates with

pebbles of up to 2cm in diameter. The remains of very large trees (30m tall, 1.5m diameter) are scattered in the sandstone (Figure 2) indicating lush vegetation on the banks of the ancient rivers. The discovery of a complete imprint of the top part of one of the Glossopteris trees is highly significant. The tree fell over and the imprint of the tree is clearly visible on the bedding plane of the sandstone layer (Figure 3).

Fig 2. Fossil of large tree at Bedford Dam site

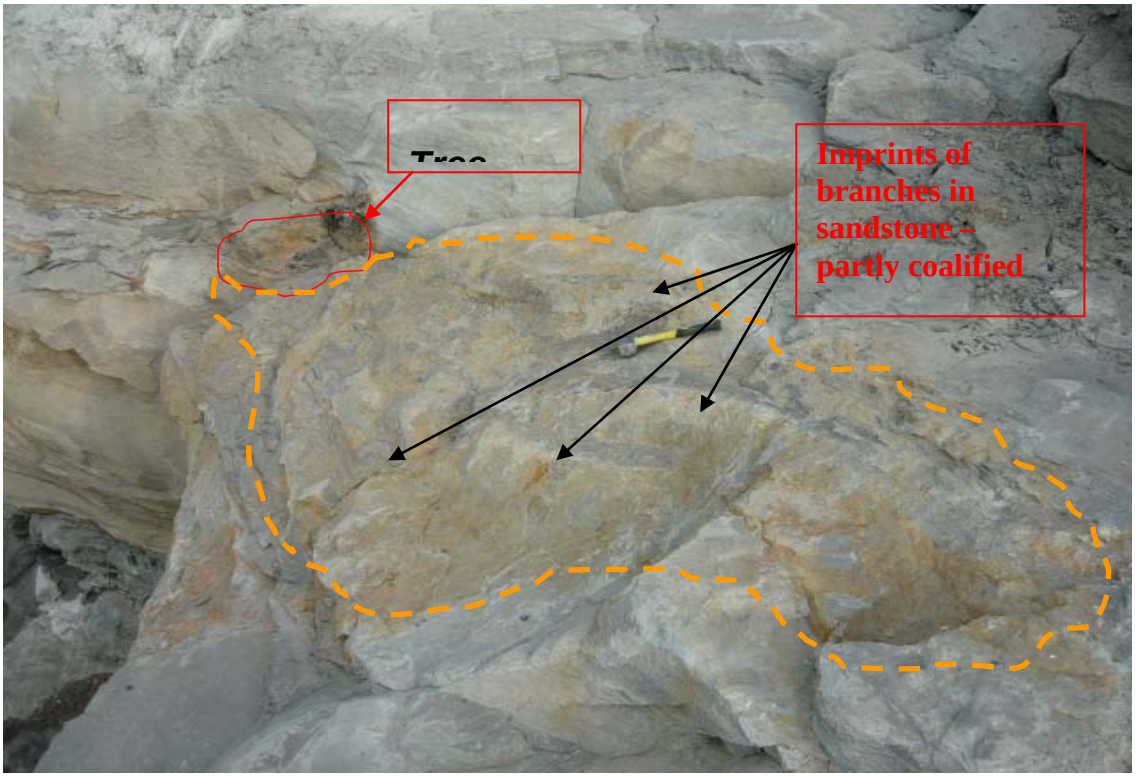

Fig 3. Imprint of large tree with branches in sandstone

Geological Information from excavations at the Main Quarry

Excavation at the main quarry exposes similar palaeo-environments as what are found at the conduit site excavations. Sandstone deposits reveal very large scale trough as well as low angled planar cross-bedding, overlying a very prominent clay-pellet conglomerate with coalified plant material suspended in both the sandstone and clay-pellet conglomerates. Fossil remains of very large vertebrates occur in the interbedded mudstone at this site, indicating abundant animal life on the inter-channel islands in this, dominantly braided river system. Extensive layers of coalified plant material (150mm thick) are present in the sandstone/mudstone interfaces, indicating highly productive marsh conditions in the inter-sandbar regions. The absence of large tree fossils in this region is apparent.

Geological Information from excavations at the Tunnel Intake Works

Excavation at the tunnel intake works did not expose deeper geology than the sandstone of the Normandien Member and from the information gathered it is apparent that the sandbars in this part of the palaeo-environment was overgrown with extensive stands of the well-known *Phyllotheca* or “horsetail” ferns, resembling bamboo of today (Figure 4). The discovery of a single vertebra of a small animal indicates that the sandbars were also used as grazing and possible hunting grounds by the reptiles of the time. It is not possible to identify any of these animals with the information available.

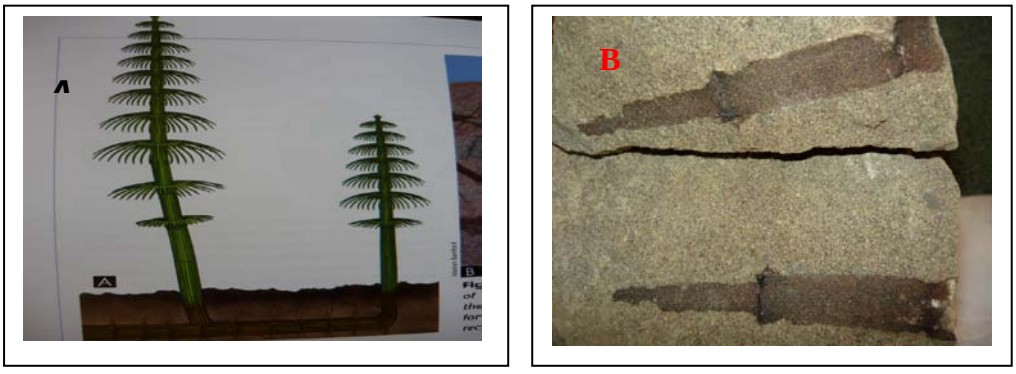

Fig 4. Phyllotheca illustrated (A) and as found in the sandstone on site (B)

Housing of fossils on site

Eskom Holdings (Pty Ltd) provided a container for storage of fossils on site. Temporary curation of fossils will be done for this storage. The Gorgonopsian and other fossils recorded up to 31 January 2009 were be transported to the National Museum in Bloemfontein on 11 March 2009. New finds will be

stored in the container and only fossils that need urgent identification will be transported to Bloemfontein.

Way Forward

Inspection of all excavation sites at Ingula Pumped Storage Scheme will be done on a regular basis and with a minimum of three site visits per week and possibly daily sites visits up to the point where initial excavations of the conduit are complete. Monitoring of the conduit area is of critical importance because the excavations are at the level of the Permian Extinction Zone and follows a prominent claystone bed with casts of desiccation cracks, indicating a very high potential zone for finding the remains of reptiles. Similarly important finds have been recorded from the mudstone beds in the main quarry and these areas will be monitored as regularly as possible to prevent unfortunate loss of fossil material during the excavation of rock fro construction purposes.

Your time is highly appreciated.

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