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Palaeontological Heritage component of FibreCo Telecommunications Basic assessment for the proposed fibre optic data cable project: Port Elizabeth to Colesberg

DEA REFERENCE: 12/12/20/2162

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Background

SRK Consulting Pty (Ltd) ("SRK") has been appointed by FibreCo Telecommunications ("FibreCo"), to undertake a BAR in terms of the National Environmental Management Act (NEMA), (Act No. 107 of 1998) as amended in 2010 for the construction and operation of an optic fibre data cable and associated infrastructure linking certain cities and towns in South Africa. The authorisation of the BA study will be managed by the Department of Environmental Affairs (DEA).

This BA (DEA reference 12/12/20/2141) deals with the section of the route linking Port Elizabeth and Colesberg. Separate BA's are being undertaken for other sections of the route in South Africa. The FibreCo data cable is anticipated to follow national/ provincial road servitudes. Exact details regarding road cutting and river crossings have not yet been finalized.

Rob Gess consulting was contracted on 17th March 2011 to conduct a phase one Palaeontological Impact Assessment for this and five other routes, by the 31st March. The tight time constraints on this project only permitted a drive through examination of sensitive routes with very limited sampling, together with a basic desktop assessment.

Geology and Palaeontlogy

This route crosses strata of the upper portion of the Cape Supergroup and lower portion of the unconformably overlying Karoo Supergroup. In addition, at its southern limit, it encounters weathered sediments of the Uitenhage Group and Alexandria Formation, together with immature aeolian deposits of the Nanaga Formation and lime deposits of the Bluewaterbay Formation.

Cape Supergroup rocks represent sediments deposited in the Agulhas Sea, which had opened to the south of the current southern African landmass, in response to early rifting between Africa and South America during the Ordivician.

Port Elizabeth is, in part, situated over Ordivician strata of the **Peninsular Formation (Table Mountain Group, Cape Supergroup)**. These consist of quartzitic sandstones derived from coarse riverine sands deposited on the coastal plane of the Agulhas Sea. In the Western Cape they have occasionally been found to contain trace fossils, perhaps related to brief marine incursions.

Apart from this, the earliest deposited strata underlying the route consist of shales and mudstones of the **Adolphspoort Formation (Bokkeveld Group, Cape Supergroup)**. This constitutes the locally uppermost subdivision of the Early to Mid Devonian Bokkeveld Group. Shales and mudstones of the Adolphspoort Formation represent marginal marine muds deposited during the Mid Devonian. Important Adolphspoort Formation fish and plant fossil localities have been recorded further to the west, in the Klein Karoo. In addition bivalves, brachiopods and trace fossils have been noted.

Locally these mudstones and shales are overlain by siltstones and mudstones of the Mid to early

Late Devonian **Weltevrede Subgroup (Witteberg Group, Cape Supergroup)**. In the Eastern Cape the Weltevrede Subgroup has yielded a sparse invertebrate fauna comprising bivalves, brachiopods and a trilobite. In addition undescribed plant fossils are known from this subgroup.

Stratigraphically overlying the Weltevrede Subgroup, the Late Devonian (Famennian) **Witpoort Formation (Lake Mentz Subgroup, Witteberg Group, Cape Supergroup**) is locally mapped as the 'Rooirand Member'. This quatzitic unit represents mature sandy strata deposited along a linear barrier island type coast. Particularly around Grahamstown black shale lenses, interpreted as estuarine deposits preserved during brief transgressive events, have proved remarkably fossiliferous. A series of lenses at Waterloo Farm have provided southern Africa's most important Late Devonian locality, which has yielded at least 20 taxa of fossil fish (including jawless fish (Agnatha), armoured fish (Placodermi), spiny sharks (Acanthodii), sharks (Chondrichthyes), ray finned fish (Actinopterygii) and lobe finned fishes (Sarcopterygii) including Coelacanths (Actinistia), lungfish (Dipnoi) and Osteolepiformes. Dozens of plant and algal taxa, remains of giant eurypterids and other arthropods as well as abundant trace fossils have also been collected. The top of the Witpoort Formation coincides with the end of the Devonian and is similar in age to the end-Devonian extinction event.

The early to mid Carboniferous is represented by overlying mudstone and sandy units of the remainder of the **Lake Mentz Subgroup (Witteberg Group, Cape Supergroup**) and These were deposited as sediment during the last phase of the Agulhas Sea, by which time it was much restricted and was possibly (at least partially) cut off from the open sea. The **Waaipoort Formation** (uppermost **Lake Mentz Subgroup Witteberg Group, Cape Supergroup**) provides evidence for a post-extinction Agulhas Sea fauna, dominated by a range of ray-finned-fish (Actinopterygii), but also containing a relict shark and 2 types of spiny sharks (Acanthodii).

The Lake Mentz Subgroup is discontinuously overlain in the Eastern Cape by various members of the Early to early Mid Carboniferous **Kommadagga Subgroup (Witteberg Group, Cape Supergroup**). These consist of glacial diamictites of the Miller Formation and shallow marine originated sandstones and shales, stratigraphically uppermost of which are sandstones of the **Dirkskraal Formation** (**Kommadagga Subgroup (Witteberg Group, Cape Supergroup)**. This latter formation contains fragmentary plant remains, further investigation of which is hoped to yield important results.

The strata of the **Karoo Supergroup** were deposited within the Karoo sedimentary Basin, which resulted from shortening and thickening of the southern margin of Africa, with coeval folding and uplift of the Cape Supergroup strata along its southern margin. Lowermost Karoo strata of the Dwyka and lower Ecca Groups were affected by folding in the vicinity of the Cape Fold Belt. Deposition was shifted from the northern edge of the Agulhas Sea to the increasingly freshwater, inland Karoo Basin. The Karoo Supergroup strata are between 310 and 182 million years old and span the Upper Carboniferous to Middle Jurassic Periods. During this interval the basin evolved from an inland sea flooded by a melting ice cap, to a giant lake fed by seasonal meandering (and at times braided) rivers. This lake steadily shrank as it filled with sediment and the basin's rate of subsidence stabilised. The land became increasingly arid and was covered with wind blown sand towards the end of its cycle. Finally the subcontinent was inundated with basaltic lava that issued from widespread linear cracks within the crust, to form the capping

basalts of the Drakensberg Group.

The **Dwyka Group** (**Karoo Supergroup),** particularly here in the south of the basin consists almost exclusively of diamictite known as the Dwyka tillite. This is a distinctive rock type which, when freshly exposed, consists of a hard fine-grained blueish-black matrix in which abundant roughly shaped clasts are embedded. These vary greatly in both lithology and size. During the formation of the Dwyka, beginning in the Late Carboniferous, southern Africa had drifted over the south pole, whilst simultaneously, the world was experiencing a cold episode. Glaciers flowing into the flooded Karoo basin broke up, melted and discharged a mixture of finely ground rock flour and rough chunks of rock. These formed the matrix and clasts of the Dwyka tillite. Within the study area fossils are not known from the **Dwyka Group (Karoo Supergroup)**.

Early in the Permian Period the ice sheets retreated and fine muds were washed into the Karoo Basin, forming the **Prince Alfred Formation** and **Whitehill Formation** (lower **Ecca Group, Karoo Supergroup)**. These interfinger, at first, with the last tillites of the Dwyka Group. Probably due to the lack of good outcrop in the Eastern Cape, body fossils have as yet not been found in rocks of the Whitehill Formation**,** though invertebrate trace fossils are known from the top of the Ecca Pass. In other parts of the country the Whitehill Formation has, however yielded some exquisite fossils. These include Africa's earliest known reptile, the aquatic *Mesosaurus*, early crustaceans, and scarce but beautifully preserved ray-finned fish.

Subsequent deposition of the **Collingham Formation**, **Ripon Formation**, **Fort Brown Formation** and **Waterford Formation** (**Ecca Group, Karoo Supergroup**) resulted from sediment carried into the Ecca Lake by rivers draining the recently upthrust Cape Mountains. These rivers formed deltas where they flowed into the Ecca Lake. Proximally the deltas tended to be sandy. Mud accumulating on the more distal front of the deltas periodically slumped and cascaded down into deep water, spreading out and depositing large layered fan shaped turbidite deposits. Plant fossils are found in these strata. These belong to the earliest appearance of the *Glossopteris* fauna – named after *Glossopteris,* an early genus of seed plant that may ultimately have included the ancestors of flowering plants. Fish trails have also been found in the vicinity of the Ecca Pass, underlying the potential for fish fossils could be recovered from these horizons. A fish fossil was reliably reported from Ecca strata near Fort Brown, but it was destroyed by construction of a roadside drainage ditch before it was collected. Actinopterygian fish have been collected from these strata in other parts of the country.

As the Ecca Lake silted up a subaerial (exposed) shoreline began to develop, initially in the south east of the basin. The lake steadily shrank towards the centre of the basin, leaving behind flat silty plains across which long rivers meandered from the Cape Mountains towards the much reduced lake. Sands were deposited along the river channels whereas periodic flooding deposited muds on the broad flood planes. These in time came to form the interbedded sandstones and mudstones of the **Koonap Formation**, **Middleton Formation** and **Balfour Formation** (**Adelaide Subgroup**, **Beaufort Group, Karoo Supergroup)**.

The flood planes of the **Beaufort Group (Karoo Supergroup)** provide an internationally important record of life during the early diversification of land vertebrates. Giant amphibians

coexisted with diapsid reptiles (the ancestors of dinosaurs, birds and most modern reptiles), anapsids (which probably include the ancestors of tortoises) and synapsids, the dominant group of the time which included the diverse therapsids (including the ancestors of mammals). Rocks of the Beaufort Group provide the worlds most complete record of the important transition from early reptiles to mammals

Therapsid diversity, along with that of most plant and animals was decimated during the end-Permian extinction event, a serious contender for the most severe extinction event to affect life on Earth. Ongoing research on the effects of this extinction event is facilitated by the detailed record, afforded by Beaufort Group strata, of life immediately before and after the event, as well as the gradual recovery of life afterwards.

The Beaufort Group is subdivided into a series of biostratigraphic units on the basis of its faunal content. The lowermost, the *Eodicynodon* Assemblage Zone is not represented in this area.

The **Koonap Formation (Adelaide Subgroup, Beaufort Group, Karoo Supergroup)** within the study area largely corresponds with the *Tapinocephalus* Assemblage Zone, though also including the lower part of the *Pristerognathus* Assemblage zone. The *Tapinocephalus* Assemblage Zone contains a diversity of therapsids including a large range of Dinocephalia (including *Tapinocephalus*), Gorgonopsia and Therocephalia, as well as a small number of Dicynodontia, *Hipposaurus*, a member of the Biarmosuchia, and *Elliotsmithia*, a member of the Pelycosauria. Fish (*Namaichthys*, *Atherstonia* and *Elonichthys*), Amphibia (*Rhinesuchus*) and a number of captorinid Reptilia (*Bradysaurus*, *Eunotosaurus*, and *Embrithosaurus*) are known, in addition to trace fossils, plant fossils and the bivalve *Paeleomutela*. Transition to the *Pristerognathus* Assemblage Zone is market by the abrupt and permanent disappearance of all members of the Dinocephalia and massive (though not permanent) reduction in diversity of the Gorgonopsia and Therocephalia. Pelycosauria also do not occur beyond the *Tapinocephalus* Assemblage Zone.

The **Middleton Formation** (**Adelaide Subgroup, Beaufort Group, Karoo Supergroup)** includes the upper *Pristerognathus*, *Tropidostoma* and lower *Cistecephalus* Assemblage zones. These zones are characterised by a changing cast of captorhinind and eosuchian reptiles as well as therapsids of the Dicynodontia, Biarmosuchia, Gorgonopsia and Therocephalia. Small numbers of fish and Amphibia are also known. A diversity of plant fossils of the Glossopteris fauna, as well as a number of trace fossils have also been described.

Though including the upper *Cistephalus* Assemblage Zone and lowermost *Lystrosaurus* Assemblage Zones, the **Balfour Formation** (**Adelaide Subgroup, Beaufort Group, Karoo Supergroup**) largely corresponds to the *Dicynodon* Assemblage Zone. Characterised by the co-occurence of *Dicynodon* and *Theriognathus* this zone demonstrates the Beaufort Groups greatest diversity of vertebrate taxa, including numerous taxa of dicynodont, biarmosuchian, gorgonopsian and therocephalian and cynodont therapsid Synapsida, together with diverse captorhinid Reptilia and less well represented eosuchian Reptilia, Amphibia and Pisces. *Glossopteris* flora plants and trace fossils are also described.

The beginning of the Triassic Period in South Africa was marked by a change in sedimentation,

leading to the distinct sandstone dominated lithology of the **Katberg Formation** (**Tarkastad Subgroup, Beaufort Group, Karoo Supergroup**). Extensive sandy deposits resulted from multi channelled braided river systems that replaced the meandering rivers of the underlying Adelaide Subgroup. This change may have resulted from increased erosion of the landscape due to widespread extinction of plant groups during the end-Permian mass extinction. A marked faunal change occurs between the *Dicynodon* and *Lystrosaurus* Assemblage Zones approaching the top of the Balfour Formation, corresponding with the major extinction event associated with the Permo-triassic boundary. The Katberg Formation falls entirely within the *Lystrosaurus* Assemblage Zone.

The *Lystrosaurus* Assemblage Zone is dominated by a single genus of dicynodont, *Lystrosaurus,* which together with the captorhinid reptile, *Procolophon*, characterise this zone. Biarmosuchian and gorgonopsian Therapsida do not survive into the *Lystrosaurus* Assemblage Zone, though therocephalian and cynodontian Therapsida exhibit moderate abundance. Captorhinid Reptilia are reduced, however an unprecedented diversity of giant amphibians characterises this interval. The effects of the end Permian extinction event are also evident in the extensive and important record of fossil plants present in the rocks of the Karoo. Whereas faunas of Permian age are dominated by a wide range of early seed plants, the Glossopteridales (which probably include the ancestors of modern gymnosperms and ultimately angiosperms), this group appears to have gone entirely extinct during the end-Permian extinction. The rocks of the Karoo provide an unrivalled sequential record of these changes and the diversification of other groups of plants in the aftermath of the extinction. The strata of the Karoo basin have also yielded fossil insects and insect leaf damage of a range of ages.

During the formation of the volcanic **Drakensberg Group**, during the Jurassic, crack like fissures in the earths crust became filled with molten lava that later cooled to form dolerite dykes. Other magma was injected under pressure between horizontal sedimentary strata and cooled to form extensive horizontal sills of dolerite. Dolerite, being an intrusive igneous rock, contains no fossils.

The Enon Formation, Kirkwood Formation and Sundays River Formation (**Uitenhage Group)**, were deposited during the Ctretaceous. Only the latter two are represented along this route. Uitenhage Group sediments were laid down in one of a number of small coastal basins created by stretching and tearing of the crust during the final breakup of the supercontinent Gondwana during the early Cretaceous, 140 to 120 million years ago.

The **Enon Formation** (**Uitenhage Group**) consists of pebbly conglomerates, deposited where rivers ran down into this steep sided rift basin. More distally, sand and muddy material formed a narrow coastal plane deposited by braided rivers, which would ultimately become the **Kirkwood Formation** (**Uitenhage Group)** strata. Silt and mud washed out onto the marine coastal shelf formed the clays of the **Sundays River Formation** (**Uitenhage Group)**. Three marine transgressions (rises in sea level) during the Cretaceous resulted in interlayering of the Sundays River marine clay deposits and sandy, terrestrial, Kirkwood Formation deposits.
Deposits of the **Sundays River Formation** (**Uitenhage Group**) contain a wealth of marine invertebrate remains, including a range of ammonite species, nautiloids, bellomnites, bivalves

and gastropods. In addition, the skull and partial skeleton of a 3 metre long Plesiosaur (marine reptile) is known from Sundays River Formation rocks in the Zwartkops River valley.

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 Dinosoar 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

Strata of the **Algoa Group** were laid down in Tertiary to Quaternary times along the coastline of the Eastern Cape (in particular around the Algoa Bay), and have gradually been uplifted through time. The Miocene to Pliocene aged **Alexandria Formation** (**Algoa Group**) generally consists of alternating layers of calcareous sandstone, conglomerate and coquinite (shelly conglomerate), containing a rich assemblage of marine invertebrates. The Alexandria Formation appears to have been laid down in a full range of coastal depositional environments ranging from shoreface and foreshore to lagoonal and/or estuarine. In the sandstones of the **Alexandria Formation** (**Algoa Group**) some gastropod and pelycopod shells are preserved, as well as *in situ Echinodiscus* ("pansy shells"), and burrows. Oyster shells occur within the conglomerate, whereas the coquinite layer consists of about 70 percent invertebrate remains, including the remains of pelycopods, gastropods, corals, bryozoans, brachiopods, echinoids and sharks teeth. Some mammal bones have also been recorded.

More recent coastal Quaternary cover includes the lime-rich **Bluewaterbay Formation** (**Algoa Group**) and the sandy **Nanaga Formation** (**Algoa Group**) which consolidated from dunes of windblown sand. These have not proven to be fossiliferous.

Inland during Quaternary times the poor drainage of the low gradient plains south of Middleberg and between Middleberg and Colesberg has resulted in deposition of isolated calretised palaeosols associated with former brak pans. Calcrete hardpans may very rarely contain the remains of mammal species differing from those of today, in addition, potentially, to the remains of early *Homo sapiens*. Though of little importance, rhizoliths formed by the calcretisation of plant roots are also common in these deposits.

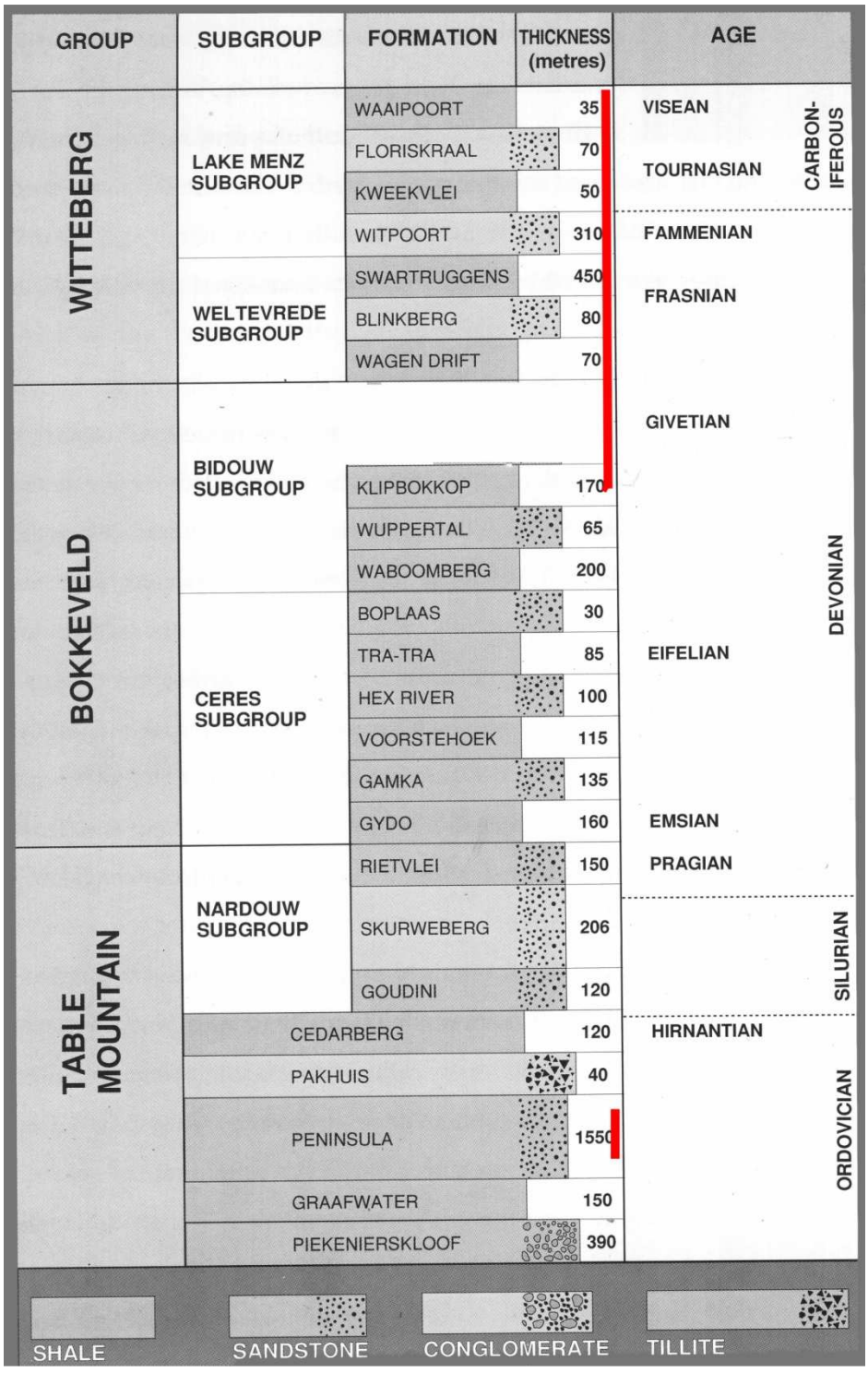

Figure 1: Stratigraphic column of the Cape Supergroup (with exception of Swartwaterspoort Subgroup) modified after Theron and Thamm (1990) following Cotter (2000). Adolphspoort Formation is locally equivalent to Klipbokkop Formation. Red line indicates strata impacted by the development.

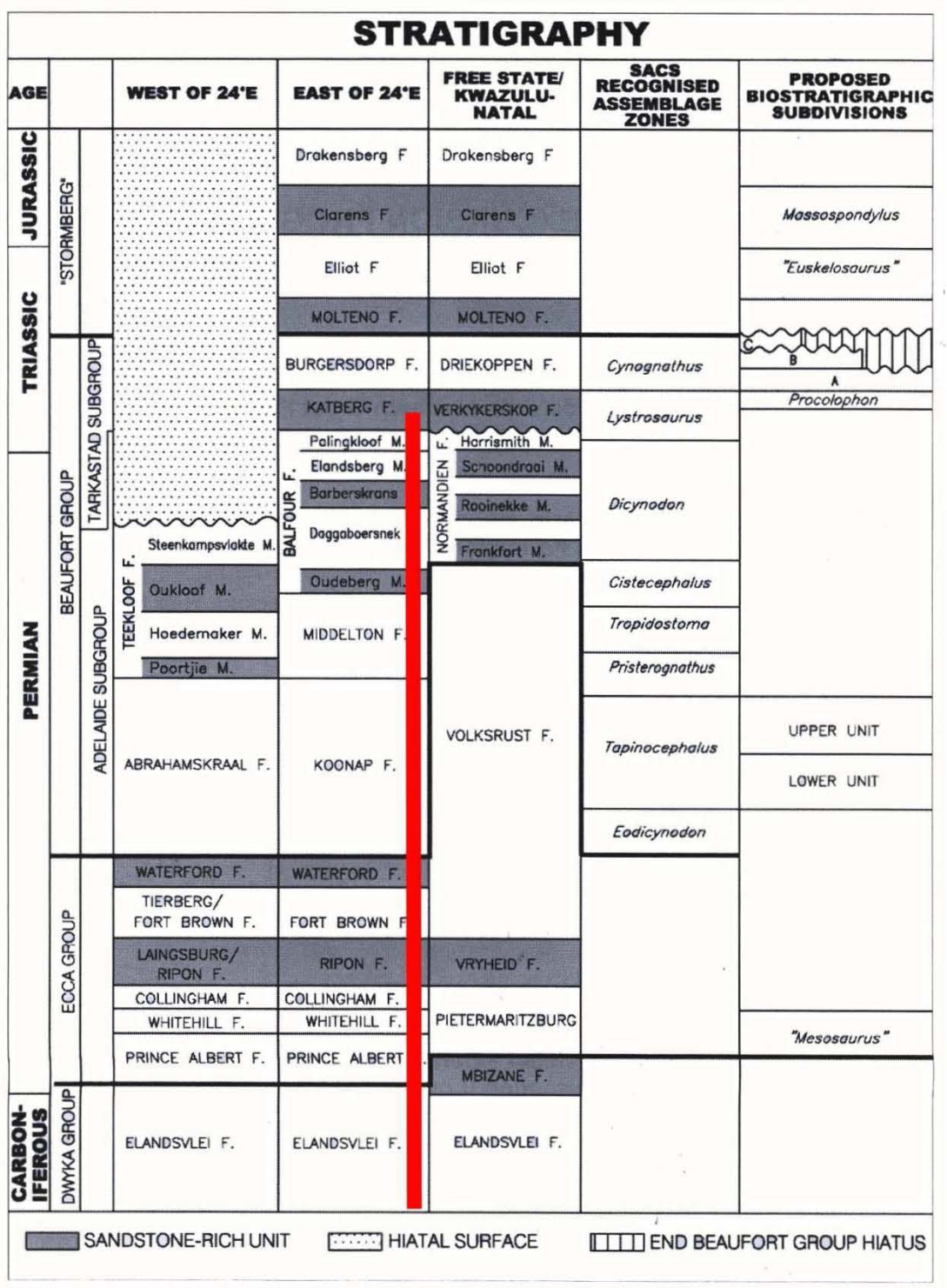

Figure 2: Stratigraphic column and corresponding biostratigraphy of the Karoo Supergroup (modified after Rubidge, B.S. 2005. *South African Journal of Science*. 108: 135-172). Red line indicates strata affected by the development)

Site visit

As the greatest part of this route passes over strata of known palaeontological importance a drive through survey was conducted to establish areas of particular palaeontological sensitivity. Due to time constraints only limited sampling was possible. Along much of the route (particularly coinciding with even topography), deep weathering of strata, deposition of recent alluvium and disturbance of the road reserve have rendered the recovery of palaeontological material improbable. Where the road passes through more varied topography it frequently follows the road between steep cuttings in sensitive strata, into which the cable route will need to be cut. Road cuttings were assessed for potential palaeontological sensitivity (see maps).

Peninsular Formation and Kirkwood Formation strata underlying Port Elizabeth are deeply weathered and obscured by urbanisation. As a result no palaeontological material is expected to be disturbed therein.

Until Nanaga the route is largely underlain by unfossiliferous Quaternary deposits of the Bluewaterbay and Nanaga Formations. Outcrops of Alexandria Formation and Sundays River Formation sediments in the valley sides of the Swaatkops, Coega and Sundays rivers are, along this route, negligible and inconsequential.

In the vicinity of Coega Sundays River Formation with a capping of Alexandria Formation has been reduced to deeply weathered cattle pastures with very low potential. The few low cuttings with very weathered Sundays River Formation sediments are not considered significant.

Where the road cuts northward through the Zuurberg Mountains, which here represent the Cape Fold Belt range, abundant sensitive cuttings are encountered. These include good exposures of shales and quartzites of the Weltevrede Formation, exhibiting abundant trace fossils including burrows, feeding trails of arthropods and the complex feeding trace, ‘Spirophyton,’ and bioturbation. These suggest a vibrant shallow coastal setting suitable for the preservation of body fossils.

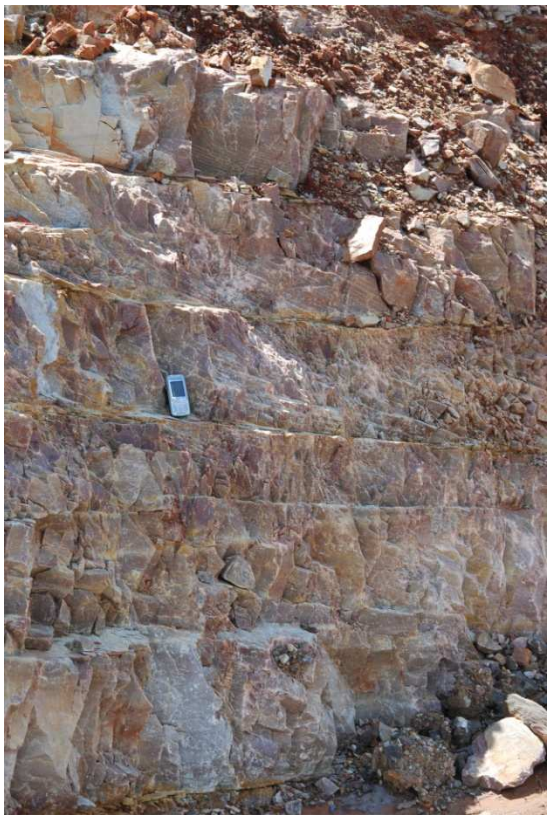

Photo 1. Cross bedded quartzites of the Weltevrede in cutting along route 6 in the south of the Zuurberg (see map)

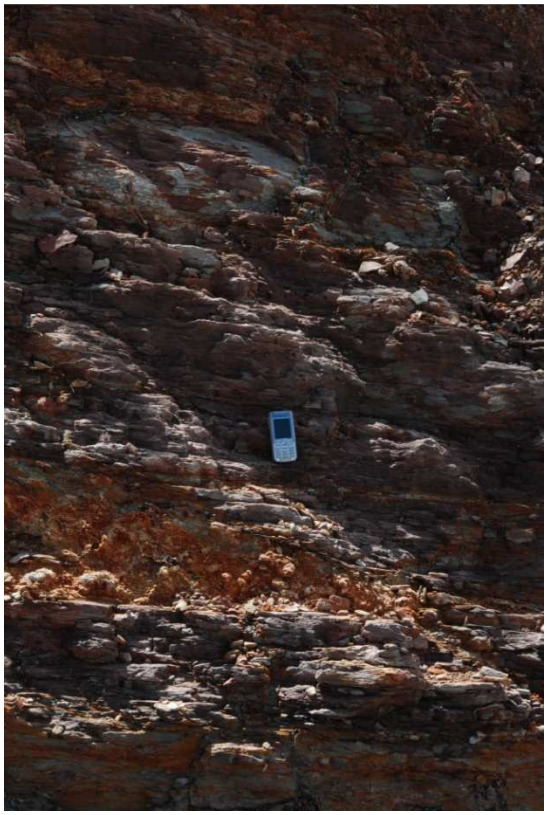

Photo 2. Weltevrede Formation mudstones (see map)

Photo 3. "*Spirophyton*" trace fossils in Weltevrede Formation near beginning of pass through the Zuurberg (see map)

The Adolphspoort Formation is unfortunately relatively prone to weathering, having been carved out to form a deep valley that does not reveal any fresh material.

Approaching the northern end of the pass through the Zuurberg, fine outcrops of Witpoort Formation Quartzites contain a potentially important black shale layer in overturned strata. This black shale is near the top of the Witpoort Formation sequence and is closely stratigraphically associated quartzitic horizons which are also of palaeontological interest. One of these exhibits sole marks representing fairly broad horizontal and vertical burrows. The other is covered in an *Arumberia* –like surface, probably produced by shallow water currents flowing over algal mat bound sands.

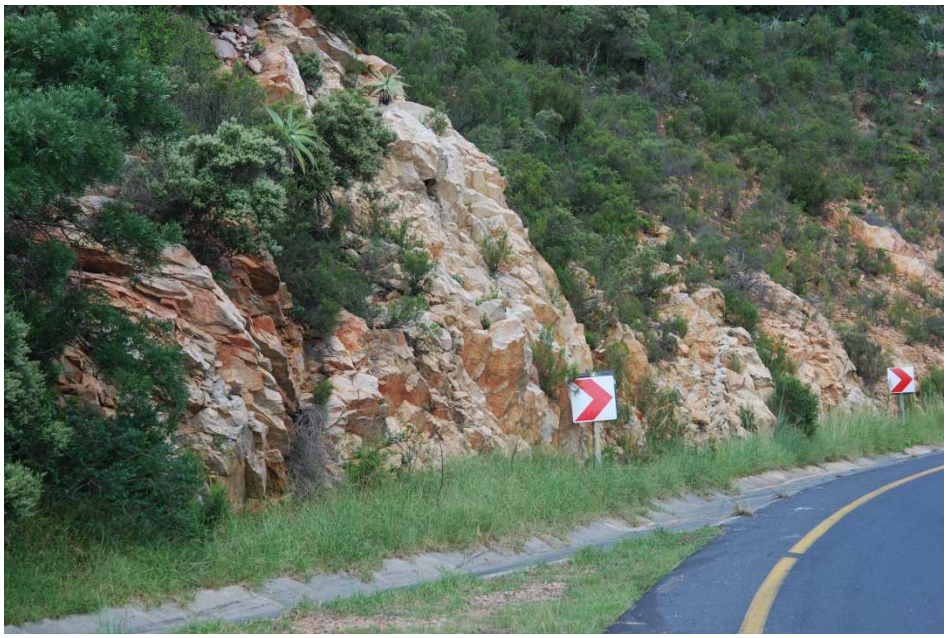

Photo 4. Witpoort Formation quartzites exposed to the north of the Zuurberg (see maps)

Photo 5. Weathered black shale horizon near the top of the Witpoort Formation sequence

Photo 6. *Arumbaria*-like trace in the upper Witpoort Formation north of the Zuurberg (see maps)

Photo 7. Sole marks of horizontal and vertical burrows in upper Witpoort strata north of the Zuurberg

Still within the fold belt, important cuttings were identified in the relatively resistant Dirkskraal Formation. These were found to contain plant fragments and are a potential source of far more significant material.

Photo 9. Contact between the Dwyka Tillite (left) and Dirkskraal Formation (right) north of the Zuurberg (see maps)

Photo 10. Plant fragments in Dirkskraal formation strata north of the Zuurberg (see maps)

As a general rule Ecca strata have been deeply weathered and are not well exposed. Nonetheless the Ripon Formation and Fort Brown Formation are exposed on the northern side of the Klein Visrivier near the railway siding of Ripon.

As the road (and therefore the cable route) north from here largely follows the alluvial plain of the Fish River and its tributaries (including the Groot Brakrivier and the Venterspasspruit) as far as the Joubertsberge there is disappointingly little outcrop of Karoo Supergroup strata along this section. Important exceptions include very good outcrops of the Middleton Formation at Middleton, its type locality.

Balfour Formation mudstones are exposed south and immediately to the north of Cradock, as well as near Willow Grove.

The Katberg Formation is well exposed in cuttings in the north of the pass through the Joubertsberge where it protrudes from beneath a protective capping of dolerite.

Between the Joubertsberge and Middleberg the route crosses a broad plane forming part of the Miocene African land surface. Karoo sediments are planed off and deeply weathered. In places brak pans have formed due to poor drainage resulting from poor relief. These have accumulated calcretised palaeosols.

Midway between the Joubertsberge and Middleberg a small koppie to the left of the road preserves mudstones of the upper Balfour Formation, protected by a capping of dolerite. The foot of this hill is exposed at ground level alongside the road by a small stream and a borrow pit for extract of extract of purplish mudstone by the National Roads Agency (photo 10). During a PIA survey of borrow pits commissioned by the National Roads Agency in September 2010 a semi articulated *Lystrosaurus* skeleton was discovered in this borrow pit (photo 11) and removed to the Albany Museum. This should therefore be treated as an area of palaeontological sensitivity.

Between Middleberg and Colesberg, the southern part of the route encounters a number of cuttings through rich purple coloured mudstones of the Katberg Formation (protected from erosion by robust sandstone interbeds) as well as a few exposing greenish mudstones of the Balfour Formation (protected by proximal dolerite cappings).

Photo 10. Balfour Formation mudstones exposed in an old borrow pit alongside the road midway between the Joubertsberge and Middleberg.

Photo 11. Lystrosaurus skull discovered in September 2010 in a borrow pit between the Joubertsberge and Middleberg.

Conclusions and Recommendations

As has been discussed there are a large number of places along this route where the cable route will have to be cut through palaeontologically sensitive strata, particularly where these are exposed in road cuttings (see maps). In these cases there is a high likelihood that palaeontological material will be exposed and potentially lost.

There is also a far lower likelihood that palaeontological material will be disturbed during trenching through areas of lower topography.

It is therefore recommended that:

1. Excavations into roadcuttings identified as sensitive during the survey (see maps) are monitored on site by a qualified palaeontologist, who should collect and log important palaeontological material identifiable prior to cutting, as well as material freshly disturbed during cutting.

2. Excavation crews should be warned to be on the lookout for palaeontological material when working in areas between those identified to be of likely palaeontological sensitivity. Any suspected palaeontological material should immediately be reported to the palaeontologist for assessment.