COLESBERG ROAD UPGRADE PROJECT: PALAEONTOLOGICAL IMPACT ASSESSMENT

Colesberg Kop viewed from the south (N1 / N9 interchange construction site) showing lenticular channel sandstone halfway up slope and thick dolerite sill towards the crest

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1. SUMMARY

The proposed road upgrade will involve the construction of a new interchange at the N1 / N9 intersection on the outskirts of Colesberg, Northern Cape Province, and the re-excavation of four abandoned borrow pits along the N9 to the south of town. Potentially fossiliferous bedrock of the lower Beaufort Group at the interchange development site is almost entirely obscured by deep drift and no fossils were observed here. Three of the four borrow pits involved (Numbers 1,2 and 4) are excavated into deeply weathered dolerite and are therefore of no palaeontological interest. Borrow Pit 3 is excavated into distal floodplain sediments of the Beaufort Group and might yield fossil tetrapods, but the chances of useful fossils emerging here are low.

There are no objections on palaeontological grounds to the proposed development.

However, palaeontologically significant specimens of fossil tetrapods, vascular plants and trace fossils are quite likely to be exposed during excavations into fresh Beaufort Group bedrock (especially mudrocks) during construction of the N1/N9 interchange and, less so, at Borrow Pit No. 3. Before development starts, the responsible ECO should therefore inspect the local palaeontological material in the Colesberg Museum to gain experience in recognising Karoo fossils. The position of any obvious finds of fossil material found during development should be accurately recorded by the ECO on a 1: 250 000 map / aerial photo or with a GPS. Where practicable, fossil specimens, together with the surrounding rocky matrix, should be carefully collected, labled and handed over to a professional palaeontologist for examination. Should substantial skeletal material be discovered (*eg* the articulated skeleton of a Karoo “reptile”), the ECO should inform Heritage Western Cape so that it can be inspected and, if necessary collected, by a professional palaeontologist. Fossil specimens that are not of research interest could be usefully donated to the Colesberg Museum for educational purposes.

2. INTRODUCTION

The proposed upgrading of the N9 Section 7 from Wolwefontein to Colesberg in the Northern Cape by SANRAL will involve the construction of a new interchange at the N1 / N9 intersection at Colesberg and the re-opening of four abandoned borrow pits to the south of town (**Figure 1**). All proposed construction south of Colesberg would take place within the existing road reserve. A palaeontological scoping study of the interchange site, borrow pits and nearby roadcuts was commissioned by CCA Environmental on behalf of SANRAL as part of a NEMA Basic Assessment. All four borrow pits concerned as well as the interchange area were visited by the author on 16 April 2008. A small fossil collection at the Colesberg Museum was also inspected to obtain a better understanding of the palaeontological potential of the area as a whole.

3. GEOLOGICAL & PALAEONTOLOGICAL BACKGROUND

The characteristic Karoo koppie landscape of the Colesberg area is underlain by Late Permian sediments of the **Lower Beaufort Group** (**Adelaide Subgroup**) which have been extensively intruded by dolerite sills and dykes of the Early Jurassic (182 Ma) **Karoo Dolerite Suite** (Le Roux, 1993). The outcrop distribution of these two major geological units in the Colesberg area is clearly shown on the geological map 1: 250 000 sheet 3024 Colesberg (Council for Geoscience, Pretoria 1997). The peculiar, intersecting ring-shaped outcrop pattern of the Karoo dolerites in this part of the Great Karoo is due to the dish-shaped 3d configuration of the intrusions (Chevallier & Woodford 1999, Cole *et al*. 2004).

According to le Roux (1993) the lithostratigraphic subdivision of the Adelaide Subgroup into constituent formations in the Colesberg sheet area is still unresolved. A prominent pale-weathering sandstone around halfway up the Adelaide succession is tentatively correlated with the Oudeberg Member at the base of the Balfour Formation in the southern Karoo (*ibid*., p. 5). If correct, this would allow the differentiation of the Adelaide succession in the Colesberg area of an underlying Middleton Formation and an overlying Balfour Formation. However, several pale-weathering sandstones occur within the Beaufort Group succession in this portion of the basin - see, for example, the middle slopes of Colesberg Kop shown on the title page. Therefore further biostratigraphic data – such as the demonstration of *Cistecephalus* Assemblage Zone fossils within the aforementioned pale-weathering sandstone - is required to test this model. Current biozonation maps for the Main Karoo Basin (Rubidge 1995, Fig. 1) show Colesberg as situated within the latest Permian *Dicynodon* Assemblage Zone (AZ), close to its northern boundary with the slightly older *Cistecephalus* AZ. Early Triassic sediments of the *Lystrosaurus* AZ crop out much further to the south, *en route* to Middelburg.

The *Dicynodon* Assemblage Zone is very latest Permian in age, *ie*. 253.8 - 251.4 Ma (Changhsingian / Late Tartarian; Rubidge 2005) It represents the end-Palaeozoic continental biota of Gondwana, dominated by therapsid “mammal-like reptiles” and the *Glossopteris* Flora, that was largely wiped out by the catastrophic end-Permian Mass Extinction Event (Ward *et al*. 2005). Detailed lists of fossils from this biozone are provided by Keyser & Smith (1979) and updated by Kitching (*in* Rubidge 1995). Popular illustrated accounts are also given by Cluver (1978), MacRae (1999) and McCarthy & Rubidge (2005). The diverse vertebrate fauna comprises palaeoniscoid fish (**Figures 11-12**),

crocodile-like temnospondyl amphibians, reptiles such as large herbivorous pareiasaurs and lizard-like younginids, as well as a large spectrum of therapsids or "mammal-like reptiles". These last include numerous small- to large-bodied herbivorous dicynodonts (**Figure 13**), several carnivorous gorgonopsians and cynodonts, and a range of therocephalians, among others. Invertebrates are represented by freshwater bivalves and insects, and vascular plants by petrified wood ("*Dadoxylon*", **Figure 16**) and leaves, stems and other debris of the characteristic Gondwanan *Glossopteris* Flora (Anderson & Anderson 1985, Bamford 1999). Trace fossil assemblages are generally low in diversity and include a variety of tetrapod trackways, fish swimming trails, invertebrate burrows and coprolites (Smith 1993b, Smith & Almond 1998).

The Lower Beaufort sediments were deposited by large-scale meandering river systems flowing northwards from the youthful Cape Fold belt across the extensive floodplains of the ancient Karoo Basin (Smith 1980, Johnson *et al*. 2006). They mainly comprise bluish-grey, grey-green and rarer purplish overbank mudrocks with subordinate lenticular channel sandstones. These last commonly have a basal conglomeratic lag of rolled mudflake pellets and calcrete nodules. Small, often transient playa lakes were also present on the floodplain and may be associated with disarticulated amphibian bones and a range of trace fossils. Well-preserved tetrapod fossils, from isolated skulls and post-cranial bones to fully articulated skeletons, are mainly found in overbank mudrocks, often in association with pedogenic calcretes (palaeosol horizons). Disarticulated, water-worn bones occur in the channel lag conglomerates (Smith 1980, 1993a). Fossils embedded within metamorphosed sediments (quartzites, hornfels) adjacent to dolerite intrusions may be well-preserved, but are very difficult to prepare out from the matrix and therefore usually of limited scientific value.

Various types of **superficial deposits** ("drift") of Late Caenozoic (Miocene / Pliocene to Recent) age occur in the Colesberg area of the central Karoo. They include pedocretes (*eg* calcretes), colluvial slope deposits (dolerite scree *etc*), river alluvium, as well as spring and pan sediments (Keyser 1993, with more extensive discussion in Holmes & Marker 1995, Cole *et al.* 2004, Partridge *et al*. 2006). These central Karoo drift deposits have been comparatively neglected in palaeontological terms for the most part. However, they may occasionally contain important fossil biotas, notably the bones, teeth and horn cores of mammals (*eg* Pleistocene mammal faunas at Florisbad, Cornelia and Erfkroon, Free State and elsewhere; Wells & Cooke 1942, Cooke 1974, Skead 1980, Klein 1984, Brink, J.S. 1987, Bousman *et al.* 1988, Bender & Brink 1992, Brink *et al*. 1995, MacRae 1999, Meadows & Watkeys 1999, Churchill *et al*. 2000 Partridge & Scott 2000). Other late Caenozoic fossil biotas from these superficial deposits include non-marine molluscs (bivalbes, gastropods), ostrich egg shells, trace fossils (*eg* calcretised termitaria, coprolites), and plant remains such as palynomorphs in organic-rich alluvial horizons (Scott 2000) and diatoms in pan sediments.

4. RESULTS OF PALAEONTOLOGICAL SCOPING STUDY

A map of the showing the location of the proposed road developments in the Colesberg area is given in **Figure 1** (kindly provided by CCA Environmental).

4.1. N1/N9 interchange area, Colesberg

The area of the proposed new N1/N9 interchange on the southwestern outskirts of Colesberg is largely covered with thick alluvial soil and grassy Karoo bossieveld (**Figure 2**). A few, very limited exposures of Beaufort Group bedrock were seen – for example, near the concrete wall north of the dam (30º 43' 52.5" S, 25º 04' 47.9" E), and on the northern edge of property, south of the Colesberg Country Club golf course (30º 43' 43.2" S, 25º 04' 56.2" E). Here small *in situ* outcrops and dumps of excavated rock rubble include buff to greenish-buff sandstone, crumbly grey-green mudrock, pale calcrete and ferruginous concretions ("koffieklip"), but no fossils were seen. Locally the sandstones (with vugs) and hornfelsed mudrocks reflect thermal alteration by dolerite intrusions. Alluvium exposures in deeper gullies and the margins of the shallow dam were also inspected for fossils without success.

4.2. Borrow Pit 1 (km 84.0)

This abandoned borrow pit (30º 49' 54.9" S, 25º 04' 30.1" E) is excavated into deeply weathered dolerite, and hence unfossiliferous (**Figure 3**). Good exposures of weathered dolerite, including onion-skin weathered corestones and narrow, resistant-weathering, late stage basaltic dykes are seen in nearby roadcuts along the N9 (**Figure 4**). Bedded mudrocks are exposed at the northern end of the roadcuts, but these have been thermally altered, are brittle in consequence, and unlikely to yield scientifically useful fossil material.

4.3. Borrow Pit 2 (km 74.3)

This abandoned borrow pit (**Figure 5**; 30º 54' 48.1" S, 25º 02' 48.6" E) is excavated into weathered dolerite, intruded by narrow basaltic or perhaps felsitic dykes (**Figure 7**), and is therefore unfossiliferous. Excellent examples of dolerite onion-skin weathering (**Figure 6**) and are seen here.

4.4. Borrow Pit 3 (km 69.6)

This borrow pit (30º 57' 29.4" S, 25º 02' 01.9" E) is excavated in crumbly, thin-bedded to laminated sediments of the lower Beaufort Group, overlain by *c*.1m of colluvial soils with a thin calcrete hard pan (**Figure 8**). Close up the sediments at the margins of the pit are seen to consist of stacked thin fining-upwards cycles, with pale greyish fine sandstone at the base and buff, shaley siltstone to claystone at the top (**Figure 9**). Thin, laterally persistent distal crevasse splay sandstones with current ripple cross lamination are also seen. No fossils were found here during this scoping study. These rocks are probably distal floodplain deposits within which vertebrate fossils – predominantly scattered post-cranial bones with rare, usually compressed skulls - are typically scarce and poorly

preserved (Smith 1993a). Lacustrine (playa lake) facies can be expected within such successions, showing small scale wave ripples, *Scoyenia* Ichnofacies burrows (*eg* fish trails, arthropod scratch burrows) and disarticulated but associated amphibian remains. Finely laminated, darker brown (?ferruginised) sandstones exposed in the SW corner of the pit may have a lacustrine association.

4.5. Borrow Pit 4

This abandoned borrow pit (30º 57' 15.7" S, 25º 02' 01.1" E) is excavated into dolerite and therefore unfossiliferous (**Figure 10**).

5. BEAUFORT GROUP FOSSILS IN COLESBERG MUSEUM

A small collection of fossils, most collected locally by the Colesberg amateur naturalist L. Kemper, is housed at the Colesberg Museum. A few specimens are illustrated here because they should give some idea of the sort of fossil material that might well be encountered during road development in the region.

Beaufort Group fossils in the Kemper collection include:

- well-preserved, albeit incomplete specimens **palaeoniscoid fish**.from Suffolk Hill on the northern outskirts of Colesberg (**Figures 11, 12**). This *might* be related to the well-known Late Permian genus *Atherstonia*, type material of which (*A. scutata*) was collected from the Dicynodon Assemblage Zone at "the Fish River site of the Colesberg District" (Woodward 1889, Bender 2004)

- skulls and postcranial remains of **Karoo "reptiles"**, the majority of which are attributable to small **therapsids** or "mammal-like reptiles". Examples are the distorted dicynodont skull with large canine tusks shown in **Figure 13** and the limb bones, girdle, vertebrae and ribs seen in **Figures 14** and **15**.

- **petrified wood**. Several small pieces of silicified wood are present in the Colesberg museum collections (**Figure 16**), and a more substantial log is on display at The Barracks guesthouse, 15-17 D'Urban Row, Colesberg. Petrified wood is often shoehorned into the basket-genus *Dadoxylon* in older literature, but a small range of gymnospermous wood genera, including podocarps, has now been identified from the Beaufort Group (*eg* Bamford 1999, 2004).

- **pseudofossils** – *ie* non-biological structures with a fortuitous and superficial resemblance to organic remains. A good example is the ferruginous diagentic concretion in **Figure 17** that looks very like the petrified hoof of a horse or zebra.

5. RECOMMENDATIONS

There are no objections to the proposed development on palaeontological grounds.

Fresh exposures of Beaufort Group sediments excavated during development at the Colesberg N1/N9 interchange and Borrow Pit No. 3 may well be of palaeontological interest, however, and should be inspected at intervals by the responsible Environmental Control Officer (ECO) before they are infilled or sealed. The ECO for this development should briefly inspect the Karoo fossils on display at the Colesberg Museum at the start of operations so that (s)he acquire some familiarity with the appearance of typical Beaufort Group fossil material.

Should loose fossils be encountered during excavations, they should be carefully collected, with adherent matrix where necessary, given a provisional reference number (*e.g.* marked on masking tape) and carefully wrapped in newspaper. It is *essential* that the locality where the fossil is found be accurately marked on a 1: 50 000 map or recorded by GPS; specimens without locality information are of limited scientific value. Fossils should be checked over by a professional palaeontologist at a later date. Some of this material may be of scientific interest - in which case it should be deposited ultimately in an approved repository (*e.g.* Iziko: South African Museum, Cape Town) – while other specimens may be of educational value and might be donated for display at the Colesberg Museum.

If well-articulated skeletons are encountered during construction, they should *not* be informally excavated since this will almost invariably lead to damage and loss of useful contextual information (*e.g.* taphonomy – data on mode of death and burial of animals). If feasible, the skeleton should be photographed (with scale), covered with a protective layer of loose gravel, and the site marked and carefully recorded (GPS / 1: 50 000 map / aerial photograph). The Environmental Control Officer should inform Heritage Western Cape so that the specimen can be examined and, if necessary, properly excavated by a palaeontologist.

6. ACKNOWLEDGEMENTS

Louise Costandius of CCA Environmental, Cape Town is thanked for commissioning this study and for providing necessary contextual information, including maps and locality details. Landowners in the Colesberg area kindly allowed access to their land. David Lardner of The Barracks guesthouse, Colesberg generously took time to introduce me to the Colesberg Museum collections and also showed me the fossil log on display at the guesthouse. The curator of the Colesberg Museum is thanked for allowing me to photograph fossil specimens under her care.

7. REFERENCES

ANDERSON, J.M. & ANDERSON, H.M. 1985. Palaeoflora of southern Africa. Prodromus of South African megafloras, Devonian to Lower Cretaceous, 423 pp. Botanical Research Institute, Pretoria & Balkema, Rotterdam.

BAMFORD, M. 1999. Permo-Triassic fossil woods from the South African Karoo Basin. Palaeontologia africana **35**: 25-40.

BAMFORD, M.K. 2004. Diversity of the woody vegetation of Gondwanan southern Africa. Gondwana Research 7, 153-164.

BENDER, P.A. 2004. Late Permian actinopterygian (palaeoniscid) fishes from the Beaufort Group, South Africa: biostratigraphic and biogeographic implications. Bulletin 135, 84pp. Council for Geoscience, Pretoria.

BENDER, P.A. & BRINK, J.S. 1992. A preliminary report on new large mammal fossil finds from the Cornelia-Uitzoek site. South African Journal of Science 88: 512-515.

BOUSMAN, C.B. *et al.* 1988. Palaeoenvironmental implications of Late Pleistocene and Holocene valley fills in Blydefontein Basin, Noupoort, C.P., South Africa. Palaeoecology of Africa 19: 43-67.

BRINK, J.S. 1987. The archaeozoology of Florisbad, Orange Free State. Memoirs van die Nasionale Museum 24, 151 pp.

BRINK, J.S. *et al*. 1995. A new find of *Megalotragus priscus* (Alcephalini, Bovidae) from the Central Karoo, South Africa. Palaeontologia africana 32: 17-22.

CHEVALLIER, L. & WOODFORD, A. 1999. Morphotectonics and mechanism of emplacement of the dolerite rings and sills of the western Karoo, South Africa. South African Journal of Geology 102, 43-54.

CHURCHILL, S.E. *et al.* 2000. Erfkroon: a new Florisian fossil locality from fluvial contexts in the western Free State, South Africa. South African Journal of Science 96: 161-163.

CLUVER, M.A. 1978. Fossil reptiles of the South African Karoo, 54pp. South African Museum, Cape Town.

COLE, D.I., NEVELING, J., HATTINGH, J., CHEVALLIER, L.P., REDDERING, J.S.V. & BENDER, P.A. 2004. The geology of the Middelburg area. Explanation to 1: 250 000 geological sheet 3124 Middelburg, 43 pp. Council for Geoscience, Pretoria.

COOKE, H.B.S. 1974. The fossil mammals of Cornelia, O.F.S., South Africa. In: Butzer, K.W., Clark, J.D. & Cooke, H.B.S. (Eds.) The geology, archaeology and fossil mammals of the Cornelia Beds, O.F.S. Memoirs of the National Museum, Bloemfontein 9: 63-84.

HOLMES, P.J. & MARKER, M.E. 1995. Evidence for environmental change from Holocene valley fills from three central Karoo upland sites. South African Journal of Science 91: 617-620.

JOHNSON, M.R. *et al.* 2006. Sedimentary rocks of the Karoo Supergroup. In: Johnson, M.R., Anhaeusser, C.R. & Thomas, R.J. (Eds.) The geology of South Africa, pp. 461-499. Geological Society of South Africa, Marshalltown.

LE ROUX, F.G. 1993. Die geologie van die gebied Colesberg. Explanation to 1: 250 000 scale geological sheet 3024 Colesberg, 12 pp. Council for Geoscience, Pretoria.

KEYSER, A.W. & SMITH, R.M.H. 1979. Vertebrate biozonation of the Beaufort Group with special reference to the western Karoo Basin. Annals of the Geological Survey of South Africa **12**: 1-35.

KLEIN, R.G. 1984. The large mammals of southern Africa: Late Pliocene to Recent. In: Klein, R.G. (Ed.) Southern African prehistory and paleoenvironments, pp 107-146. Balkema, Rotterdam.

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

McCARTHY, T. & RUBIDGE, B. 2005. The story of Earth and life: a southern African perspective on a 4.6-billion-year journey. 334pp. Struik, Cape Town.

MEADOWS, M.E. & WATKEYS, M.K. 1999. Palaeoenvironments. In: Dean, W.R.J. & Milton, S.J. (Eds.) The karoo. Ecological patterns and processes, pp. 27-41. Cambridge University Press, Cambridge.

PARTRIDGE, T.C. & SCOTT, L. 2000. Lakes and pans. In: Partridge, T.C. & Maud, R.R. (Eds.) The Cenozoic of southern Africa, pp.145-161. Oxford University Press, Oxford.

PARTRIDGE, T.C., BOTHA, G.A. & HADDON, I.G. 2006. Cenozoic deposits of the interior. In: Johnson, M.R., Anhaeusser, C.R. & Thomas, R.J. (Eds.) The geology of South Africa, pp. 585-604. Geological Society of South Africa, Marshalltown.

RUBIDGE, B.S. (Ed.) 1995. Biostratigraphy of the Beaufort Group (Karoo Supergroup). South African Committee for Stratigraphy, Biostratigraphic Series No. 1, 46pp. Council for Geoscience, Pretoria.

RUBIDGE, B.S. 2005. Re-uniting lost continents – fossil reptiles from the ancient Karoo and their wanderlust. South African Journal of Geology **108**: 135-172.

SCOTT, L. 2000. Pollen. In: Partridge, T.C. & Maud, R.R. (Eds.) The Cenozoic of southern Africa, pp.339-35. Oxford University Press, Oxford.

SKEAD, C.J. 1980. Historical mammal incidence in the Cape Province. Volume 1: The Western and Northern Cape. 903pp. Department of Nature and Environmental Conservation, Cape Town.

SMITH, R.M.H. 1980. The lithology, sedimentology and taphonomy of flood-plain deposits of the Lower Beaufort (Adelaide Subgroup) strata near Beaufort West. Transactions of the Geological Society of South Africa **83**: 399-413.

SMITH, R.M.H. 1993a. Vertebrate taphonomy of Late Permian floodplain deposits in the southwestern Karoo Basin of South Africa. Palaios **8**: 45-67.

SMITH, R.M.H. 1993b. Sedimentology and ichnology of floodplain paleosurfaces in the Beaufort Group (Late Permian), Karoo Sequence, South Africa. Palaios **8**: 339-357.

SMITH, R.M.H. 2007. Environmental impact of the End-Permian extinction on the Karoo Basin of South Africa. Extended abstracts, Problems in Western Gondwana Geology 1, Gramado, Brasil pp. 172-179.

SMITH, R.M.H. & ALMOND, J.E. 1998. Late Permian continental trace assemblages from the Lower Beaufort Group (Karoo Supergroup), South Africa. Tercera Reunión Argentina de Icnologia, Mar del Plata, 1998, Abstracts p. 29.

WARD, P.D. *et al*. 2005. Abrupt and gradual extinction among Late Permian land vertebrates in the Karoo Basin, South Africa. Science 307: 709-714.

WELLS, L.H. & COOKE, H.B.S. 1942. The associated fauna and culture of Vlakkraal thermal springs, O.F.S.; III, the faunal remains. Transactions of the Royal Society of South Africa 29: 214-232.

WOODWARD, A.S. 1889. On *Atherstonia*, a new genus of palaeoniscid fishes from the Karroo Formation of South Africa. Annals and Magazine of Natural History (Series 6) 4, 239-242.

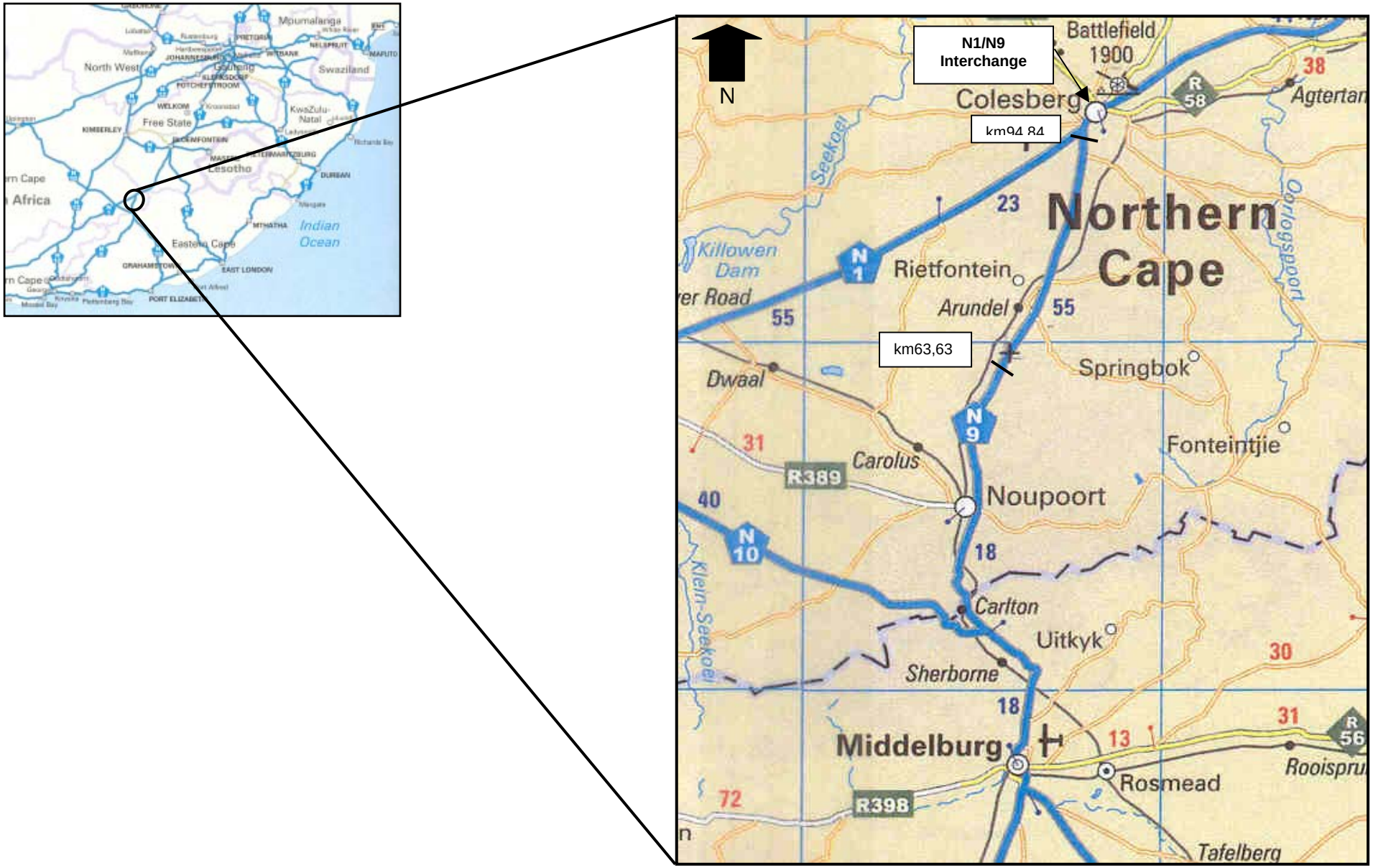

Figure 1. Proposed rehabilitation of National Route 9 Section 7 from Wolwefontein (km63.63) to Colesberg (km94.84).

Figure 2. **View looking west across construction site for new N1 / N9 intersection, Colesberg**

Figure 3. **General view towards east of Borrow Pit 1 excavated into weathered dolerite**

Figure 4. **Roadcut along N9 adjacent to Borrow Pit No 1 showing typical dolerite weathering (*eg* rounded corestones)**

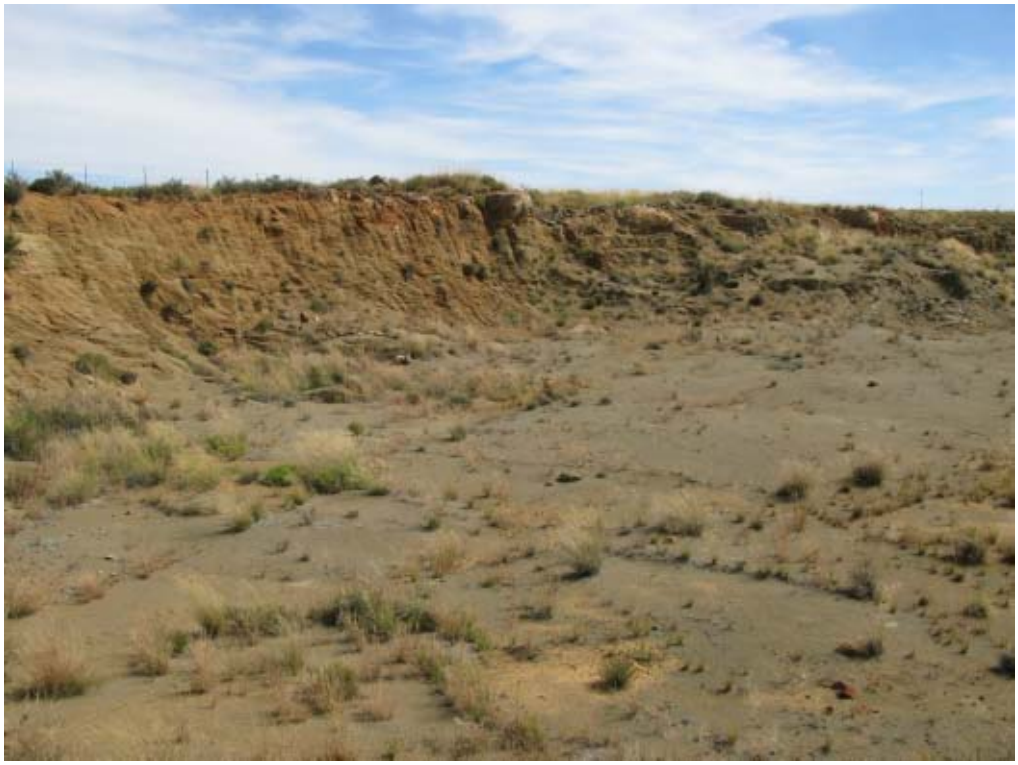

Figure 5. **Borrow Pit No. 2 excavated into deeply weathered dolerite**

Figure 6. Classic onionskin weathering in dolerite, Borrow Pit 2

Figure 7. Narrow dyke of fine-grained ?felsite intruding dolerite in Borrow Pit 2

Figure 8. **Borrow Pit 3, excavated into Beaufort Group sediments, looking souhwest**

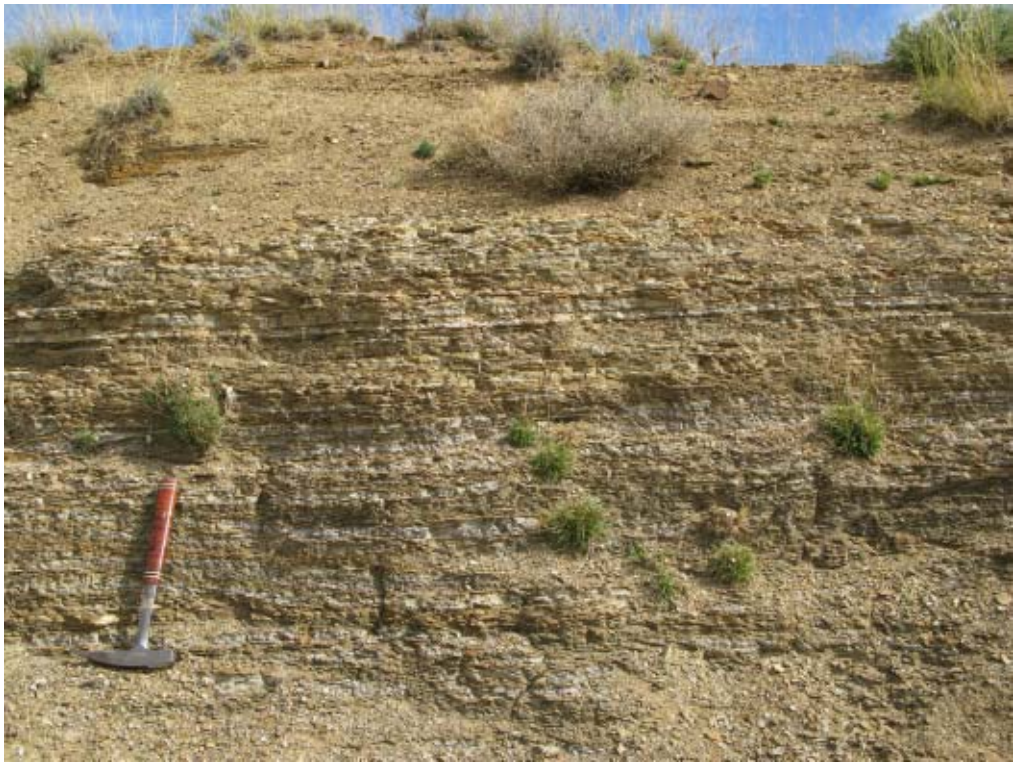

Figure 9. **Thin-bedded to laminated sediments of Beaufort Group, Borrow Pit 3 – probably distal floodplain facies**

Figure 10. General view of Borrow Pit 4, excavated into dolerite, looking northwest

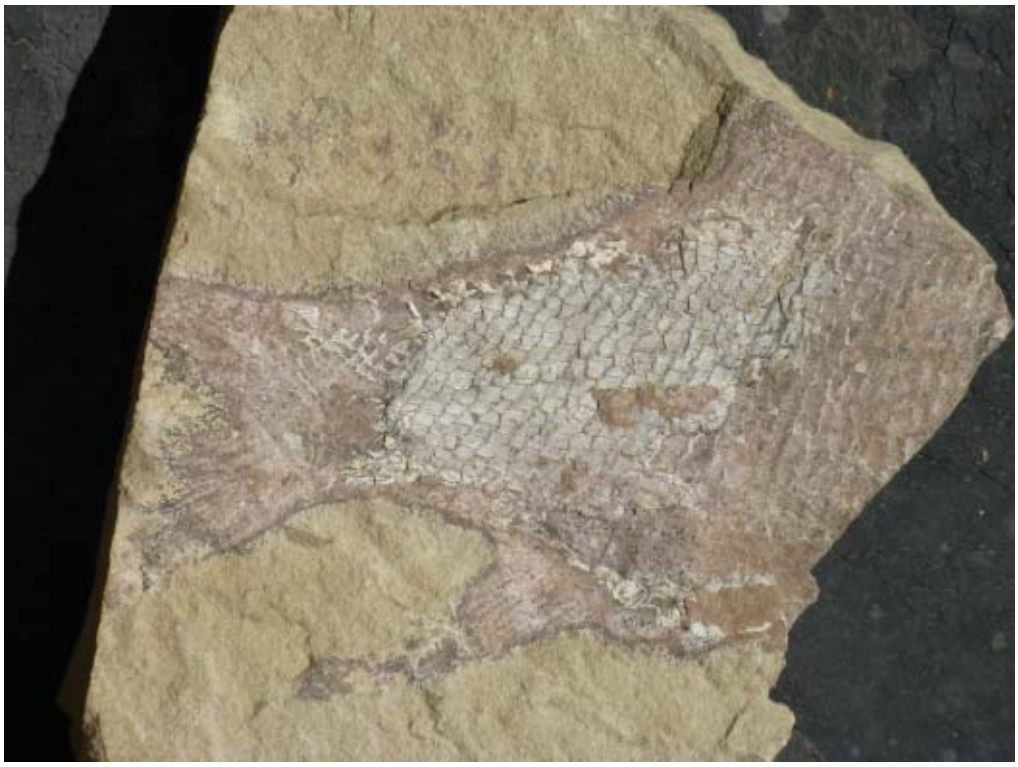

Figure 11. Palaeoniscoid fish from Beaufort Group at Suffolk Hill, Colesberg (Colesberg Museum, X 0.9)

Figure 12. **Palaeoniscoid fish from Beaufort Group at Suffolk Hill, Colesberg (Colesberg Museum, X1)**

Figure 13. **Dicynodont skull from Beaufort Group, Colesberg area (Colesberg Museum), showing large canine tusk (X1.2)**

Figure 14. Postcranial remains of a small therapsid, Beaufort Group near Colesberg (Colesberg Museum, X1.2)

Figure 15. Backbone and ribcage of small therapsid from the Beaufort Group near Colesberg (Colesberg Museum, X0.75)

Figure 16. **Silicified wood from the Beaufort Group near Colesberg (Colesberg Museum, X0.9)**

Figure 17. **Horse's hoof-like pseudofossil formed by a ferruginous concretion, Beaufort Group in the Colesberg area (Colesberg Museum)**