

Peer review report prepared by:

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For the attention of:

Peer Review Unit Manager: Ms Elisabeth Nortje, GIBB, Lynnwood Corporate Park, 36 Alkant Road, Pretoria 084-702-1353, enortje@gibb.co.za

Reports reviewed:

1. **ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED NUCLEAR POWER STATION ('NUCLEAR 1') AND ASSOCIATED INFRASTRUCTURE** Dune Geomorphology Impact Assessment October 2010 Prepared by: Illenberger & Associates, Port Elizabeth Prepared for: Arcus GIBB Pty Ltd on behalf of ESKOM
2. **NUCLEAR POWER STATION ('NUCLEAR 1') AND ASSOCIATED INFRASTRUCTURE** Second Addendum to Dune Geomorphology Impact Assessment: New western access routes and 2011 - 2012 floods June 2013 Prepared by: Illenberger & Associates Prepared for: Arcus GIBB Pty Ltd on behalf of ESKOM

Independence statement:

I, Professor I.C. Rust, hereby state and confirm that I am an independent consultant with no connection or association with Illenberger & Associates, or with Arcus GIBB Pty Ltd., or with ESKOM, or with any of their associates or subsidiaries or holding companies. While I was affiliated with the then University of Port Elizabeth Dr Illenberger was a doctoral student under my supervision as part of a regional research programme on coastal dunefield dynamics.

Introductory comments:

The main report (1) by Illenberger and Associates deals with an assessment of potential environmental impact on the dunefield systems at three identified nuclear power station sites, namely Dwynefontein, Bantamsklip and Thyspunt. The addendum (2) deals with aspects of possible western access routes at the Thyspunt site in addition to providing information on flooding in the Sand River area, St Francis.

Report (1) consists of 78 pages A4 text supplemented by 8 tables, 41 illustrations (maps, figures, aerial photographs, satellite images, field photographs), a list of acronyms, and a glossary clarifying specialist terms used in the report.

The report is subdivided into 7 chapters and contains a list of 25 relevant references.

It is clear from report (1) that the dune environments of the Duynefontein and Bantamsklip sites are relatively problem-free in terms of potential impacts resulting from the construction and presence of a nuclear power station complex.

However, the Thyspunt site is the most problematic by far in terms of its dunefield setting; accordingly report (1) stresses various sensitive dunefield issues and their interrelationships in the St Francis headland by-pass dunefield, where the Thyspunt site is located.

Report (2) deals with various options for access roads at the Thyspunt site, as well as comments on the Elkington thesis on the nearby Oyster Bay headland bypass dunefield, and an analysis of two recent flooding events in the nearby Sand River. Report (2) consists of 48 pages subdivided into 13 sections. The report is extensively illustrated. A pertinent topic deals with the possibility of debris flows in the dunefield.

Reviewer's comments:

1. **Does the report fulfilment its ToR set?** The various key aspects of interest at each of the three sites (Duynefontein, Bantamsklip and Thyspunt), listed in the Terms of Reference (page 2 of the report), are individually described in detail in the body of report (1) and, where applicable, are illustrated in detail. Each aspect is clearly identified and satisfactorily dealt with in the report. The crux of the report is summarised in Table 6. The report is deemed to have fulfilled the ToR specifications. Report (2) provides specific information and recommendations in respect of environmental aspects in the vicinity of the Thyspunt site. The findings of report (2) are summarised in Table 5.1.
2. **Is the report entirely objective?** Report (1) is exhaustive, authoritative and objective. The report is acceptable as it stands. There is no evidence in the report of any bias. At first glance the level of treatment of the three sites might appear uneven; fact is, it is easily deduced from the report that the Duynefontein and Bantamsklip sites each presents a manageable environmental scenario. The data and their interpretation are objective and pragmatic. In contrast the Thyspunt region is clearly highly complex and problematic. It's not unexpected that the Thyspunt region might attract alternate viewpoints simply because of complex environmental variables operating in the region; nevertheless the Illenberger & Associates report (1) is factual and unbiased. Presentation and appraisal of the data are considered objective and acceptable. In the view of this reviewer the report presents a fair, objective and pragmatic view of the St Francis headland bypass dune field dynamics. Report (2) is a competent and extensive review of three topics: (a) an analysis of options for an access road across the dunefield to the Thyspunt site; (b) an objective albeit critical analysis of the Elkington thesis on the nearby Oyster Bay headland bypass dunefield, and (c) an in-depth compilation of two recent flood events in the nearby Sand

River. Report (2) is considered to be authoritative and comprehensive. The criticism on the idea of debris flows in the dunefield, as suggested by Elkington and others, is fair. In this region uncontrolled deflation and flash-flood damage are more likely to be of significance than debris flows.

3. **Is the report technically, scientifically and professionally credible?** Both reports are focussed, entirely credible and acceptable. Dr Illenberger has wide experience in the fields of dune dynamics and related aerodynamics, dune sedimentology, dunefield geomorphology, coastal dynamics, aerial photography and comparative aerial monitoring techniques, and other related technologies applicable to dunefields. The reports are technically competent, adequately supported by relevant information, and extensively illustrated. The underlying scientific basis is on par with accepted international scientific understanding of coastal zone dunefield systems. The professional credibility of the reports is excellent.
4. **Is the approach to the study method defensible?** Both study method and presentation of the results and conclusions are practical and relevant. Dr Illenberger has extensive scientific background and wide practical experience of dunefields of various types. He fully understands the dynamics of dune systems and their geomorphological expressions. Both reports are concise, containing no superfluous or non-essential information. The reports remain focussed on matters of practical importance and significance that relate directly to the expected impacts on the environment by the proposed construction of a nuclear power station.
5. **Are there any gaps, omissions or errors in the report?** This reviewer recognised no significant gaps in information, no obvious omissions of fact, or no blatant errors in the reports. The reports provide reliable and credible information at each of the three potential sites under discussion. The Thyspunt site, because of its environmental complexity, received most attention in the reports. Both reports are acceptable in their entirety. Even though the current scenario for global climatic change is quite complex (and its understanding contentious) both reports show how a fundamental understanding of coastal dunefield geomorphology can underpin a most useful predictive method of possible future coastal landscape modifications resulting from possible climate change. This aspect has a direct bearing on design parameters for a nuclear power plant and its infrastructure in the nearshore coastal zone.
6. **Are the recommendations sensible and best options?** The recommendations in both reports are sensible, practical and credible. Of the three sites under consideration the report provides detailed information indicating that the Thyspunt site is by far the most sensitive, by far the most complex, and by far the most problematic. The appraisal of various expected environmental impacts in the case of the Duynefontein dunefield (see Table 6.1 in report (1)) is credible and acceptable. The same applies to the analysis of expected environmental impacts on the Bantamsklip dunefield (see Table 6.2 in the same report). It needs to be stressed, nevertheless, that ill-considered disturbance of any dunefield (whether mobile or fixed, small or large) has

the potential to activate unwanted deflation and deposition that can cause long-term maintenance problems. With respect to the Thyspunt site report (1) evaluates and rates seven issues as “*high significance*”, and a further three as “*medium to high significance*” (see Table 6.3 in report (1)). An additional evaluation of the Thyspunt site appears in Table 5.1 in report (2). There are clear indications of the general level of environmental sensitivity and complexity of the Thyspunt site. Accordingly both reports list particular recommendations in the case of the Thyspunt site. Report (2) specifically rejects the notion that significant debris flows occur in the Thyspunt region; this reviewer supports Illenberger’s view that debris flows are not an issue of concern.

7. **Does the report present alternative viewpoints on issues raised and are they clearly stated?** The nature of the topics in both reports, and their treatment by the author, are in general fairly straightforward and clearly focussed. The presentation in both reports is well balanced and competently supported. The various environmental issues are dealt with systematically and adequately. The key issue under consideration deals with the dynamic sensitivity of coastal dune systems in terms of the type of infrastructural development associated with the construction of a nuclear power station. Frankly, dune systems are not attractive construction sites, and offer little luxury of alternative viewpoints. In fact, coastal dunefields are notoriously dynamic. In addition, the St Francis headland dunefield is a wet dunefield susceptible to severe flash-flood events, the latter documented in particular detail in report (2). Dune systems can broadly be separated into two types: active systems; that is, dunefields where unconsolidated loose sand is blown about daily, creating mobile dunes and a changeable dunefield setting, and fixed or stabilised dune systems; that is, dunes currently covered by vegetation (either natural or planted), so that the dune landscape is stable and no longer modified by the existing wind climate. Both reports indicate that all and any disturbance of a dune system, regardless whether the dunefield is mobile or fixed, large or small, leads to certain natural responses, some of which may lead to serious maintenance problems. The reports deal with these complexities in an unbiased and practical manner. By far the most attention is given to the dunefield systems in the vicinity of the Thyspunt site. Alternative viewpoints are not really the issue in the case of the Duynefontein and Bantamsklip sites. However, the problematic complexity and environmental sensitivity at the Thyspunt site puts it in a different class entirely. Here it is not so much a matter of an alternative viewpoints insofar as the environmental setting goes, but a question of how to successfully deal with the dunefield environment during the various phases of constructing and operating a nuclear power station. Mundane but essential land-based operations such as road construction, foundation excavation, spoil disposal, contractors’ yards, erection of transmission lines, stormwater drainage, topsoil disturbance, revegetation, etc, etc, all take on a different meaning in a dunefield environment. Both reports caution against inappropriate methods, warning against the likelihood of serious and non-reversible environmental harm and/or long-

term maintenance problems. Report (2) specifically rejects the notion of debris flows as a feature of the dunefield setting in the vicinity of the Thyspunt site.

8. **Can non-specialists read and understand the report?** Both reports are well written, clearly organised, remain focussed on the topic at hand, and contain a minimum of scientific jargon and technical terms. Essential technical terms that relate to dunes and dunefields are explained in the Glossary in report (1). Both reports are extensively illustrated in ways that any non-specialist should find easily understandable. The illustrations and tables are essential and provide superb information, also for the non-specialist. Where applicable, potential negative impacts are clearly identified and described in practical terms.
9. **Is the report professionally competent?** Both reports meet normal professional standards of competency.

Concluding remarks:

The reviewer rates both report (1) and report (2) acceptable and credible.

In the reviewer's opinion the targets of the ToRs have been met satisfactorily.

The recommendations in both reports are deemed credible and practical.