

PRINCIPLES FOR EROSION MANAGEMENT

1. PURPOSE

Exposed and unprotected soils are the main cause of erosion in most situations. Therefore, this erosion management plan and the revegetation and rehabilitation plan are closely linked to one another and should not operate independently, but should rather be seen as complementary activities within the broader environmental management of the site and should therefore be managed together.

This Erosion Management Plan addresses the management and mitigation of potential impacts relating to soil erosion. The objective of the plan is to provide:

- A general framework for soil erosion and sediment control, which enables the contractor to identify areas where erosion can occur and is likely to be accelerated by construction related activities.
- An outline of general methods to monitor, manage and rehabilitate erosion areas, ensuring that all erosion resulting from all phases of the development is prevented or reduced and to reduce the risk of future erosion.

2. RELEVANT ASPECTS OF THE SITE

The study area is located on the Maputoland Coastal Plain, characterised by relatively flat to slightly undulating paeleodune fields comprised of recent (Quaternary Age) sedimentary deposits of Aeolian/marine origin (~18 000 years old) and comprising mainly yellowish and argillaceous redistributed sands (Berea and Muzi Formations of the Maputaland Group, respectively). Soils generally comprise very loose, grey-brown sand.

The geology and the hydrological regime of the area have given rise to geotechnical conditions that represent constraints to development. An Engineering Geology Study, undertaken by Golder in 2005, broadly classified areas for the purpose of identifying constraints to development as well as difficult founding conditions, or other geotechnical factors affecting urban development (refer to Figure 1). The zonal prefix (A-D) is based on the severity of the geotechnical or development constraints, or a combination of both, for a specific unit. They serve as an early warning for engineers and developers. The geotechnical and development constraint categories of the environmental sensitive zones are:

- » **A** have no restrictions on development.
- » **B** are developable, but with minor geotechnical and/or development constraints
- » **C** is developable but with more costly geotechnical and/or development constraints. More detailed geotechnical investigations may be required.
- » **D** recommends no development, or more detailed geotechnical investigations required.

In this regard, the proposed Project site falls within conditions classified as **A** and/or **B**.

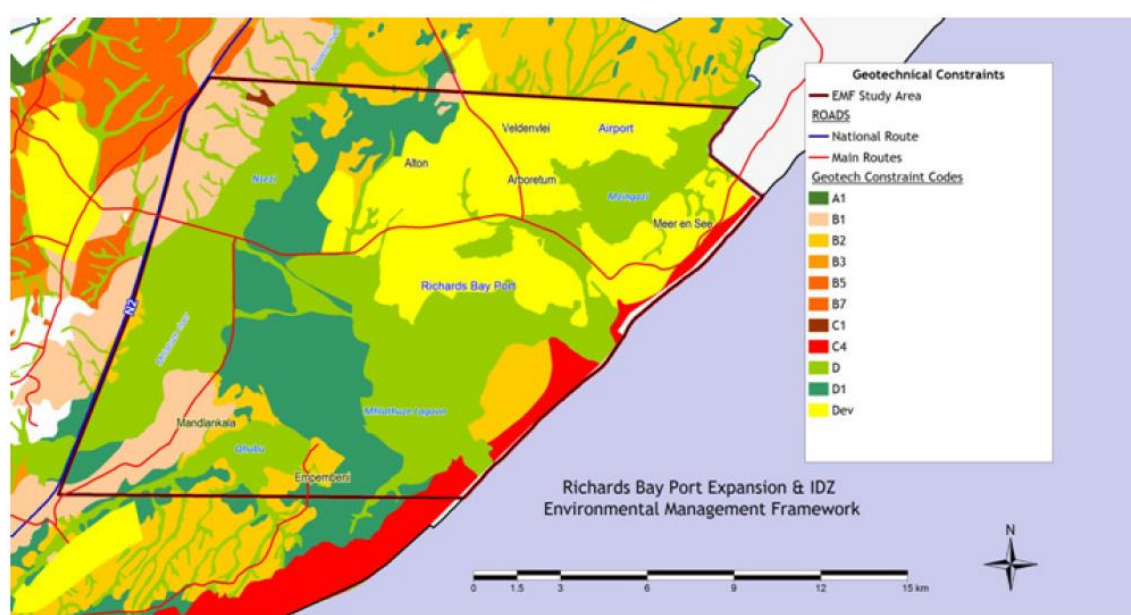


Figure 1: Geotechnical Conditions

3. EROSION AND SEDIMENT CONTROL PRINCIPLES

The goals of erosion control during and after construction at the site should be to:

- » Protect the land surface from erosion;
- » Intercept and safely direct run-off water through the site without allowing it to cause erosion within the site or become contaminated with sediment; and
- » Progressively revegetate or stabilise disturbed areas.

These goals can be achieved by applying the management practices outlined in the following sections.

3.1. On-Site Erosion Management

General factors to consider regarding erosion risk at the site includes the following:

- » Soil loss will be greater during wet periods than dry periods. Intense rainfall events outside of the wet season, such as occasional summer thunderstorms can also cause significant soil loss. Therefore, precautions to prevent erosion should be present throughout the year.
- » Soils loss will be greater along the access road that traverses land type Db6. Therefore, precautions to prevent erosion should be present throughout the construction phase.
- Soils loss will be greater on steeper slopes. Ensure that steep slopes are not de-vegetated unnecessarily and subsequently become hydrophobic (i.e. have increased runoff and a decreased infiltration rate) increasing the erosion potential.
- » Soil loss is related to the length of time that soils are exposed prior to rehabilitation or stabilisation. Therefore, the gap between construction activities and rehabilitation should be minimised. Phased construction and progressive rehabilitation, where practically possible, are therefore important elements of the erosion control strategy.
- » The extent of disturbance will influence the risk and consequences of erosion. Therefore, site clearing should be restricted to areas required for construction purposes only. As far as possible, large areas should not be cleared all at once, especially in areas where the risk of erosion is higher.
- » Roads should be planned and constructed in a manner which minimises their erosion potential. Roads should therefore follow the natural contour as far as possible. Roads parallel to the slope direction should be avoided as far as possible.
- » Where necessary, new roads constructed should include water diversion structures present with energy dissipation features present to slow and disperse the water into the receiving area.
- » Roads and other disturbed areas should be regularly monitored for erosion. Any erosion problems recorded should be rectified as soon as possible and monitored thereafter to ensure that they do not re-occur.
- » Compacted areas should have adequate drainage systems to avoid pooling and surface flow. Heavy machinery should not compact those areas which are not intended to be compacted as this will result in compacted hydrophobic, water repellent soils which increase the erosion potential of the area. Where compaction does occur, the areas should be ripped.
- » All bare areas should be revegetated with appropriate locally occurring species, to bind the soil and limit erosion potential.

- » Silt fences should be used where there is a danger of topsoil or material stockpiles eroding and entering streams and other sensitive areas.
- » Gabions and other stabilisation features should be used on steep slopes and other areas vulnerable to erosion to minimise erosion risk as far as possible.
- » Activity at the site after large rainfall events when the soils are wet and erosion risk is increased should be reduced.
- » Topsoil should be removed and stored separately during construction activities (as per the recommendations in the EMPr), and should be reapplied where appropriate as soon as possible in order to encourage and facilitate rapid regeneration of the natural vegetation on cleared areas.
- » Regular monitoring of the site for erosion problems during construction (on-going) and operation (at least twice annually) is recommended, particularly after large summer thunderstorms have been experienced. The ECO will determine the frequency of monitoring based on the severity of the impacts in the erosion prone areas.

3.1.1. Erosion control mechanisms

The contractor may use the following mechanisms (whichever proves more appropriate/ effective) to combat erosion when necessary:

- » Reno mattresses;
- » Slope attenuation;
- » Hessian material;
- » Shade catch nets;
- » Gabion baskets;
- » Silt fences;
- » Storm water channels and catch pits;
- » Soil bindings;
- » Geofabrics;
- » Hydro-seeding and/or re-vegetating;
- » Mulching over cleared areas;
- » Boulders and size varied rocks; and
- » Tilling.

3.2. Engineering Specifications

The Stormwater Management Plan developed for the project must ensure that sufficient erosion control measures have been incorporated into the plan, based on the available stormwater management facilities of the IDZ. This plan should include erosion control measures as follows:

- » Erosion control measures to be implemented before and during the construction period, including the final stormwater control measures (post construction).
- » All temporary and permanent water management structures or stabilisation methods must be indicated within the Stormwater Management Plan.
- » An onsite Engineer or Environmental Officer (EO) to be responsible for ensuring implementation of the erosion control measures on site during the construction period. The ECO to monitor the effectiveness of these measures on the interval agreed upon with the Site Manager and EO.
- » The Contractor holds ultimate responsibility for remedial action in the event that the approved Stormwater Management Plan is not correctly or appropriately implemented and damage to the environment is caused.

3.3. Monitoring

The site must be monitored continuously during construction and operation in order to determine any indications of erosion. If any erosion features are recorded as a result of the activities on site the Environmental Officer (during construction) or Environmental Manager (during operation) must:

- » Assess the significance of the situation.
- » Take photographs of the soil degradation.
- » Determine the cause of the soil erosion.
- » Inform the contractor/operator that rehabilitation must take place and that the contractor/operator is to implement a rehabilitation method statement and management plan to be approved by the Site/Environmental Manager in conjunction with the ECO.
- » Monitor that the contractor/operator is taking action to stop the erosion and assist them where needed.
- » Report and monitor the progress of the rehabilitation weekly and record all the findings in a site register (during construction).
- » All actions with regards to the incidents must be reported on a monthly compliance report which should be kept on file for if/when the Competent Authority requests to see it (during construction) and kept on file for consideration during the annual audits (during construction and operation).

The Contractor (in consultation with an appropriate specialist, e.g. an engineer) must:

- » Select a system/mechanism to treat the erosion.
- » Design and implement the appropriate system/mechanism

- » Monitor the area to ensure that the system functions like it should. If the system fails, the method must be adapted or adjusted to ensure the accelerated erosion is controlled.
- » Continue monitoring until the area has been stabilised.

4. CONCLUSION

The Erosion Management Plan must be implemented by the Proponent/ Contractor in order to prevent potential erosion and control and mitigate ongoing erosion associated with the facility. The implementation of management measures is not only good practice to ensure minimisation of degradation, but also necessary to ensure compliance with legislative requirements. This document forms part of the EMPr and is required to be considered and adhered to during the design, construction, operation, and decommissioning phases of the project (if and where applicable).