

REVEGETATION AND REHABILITATION PLAN

1. PURPOSE

The purpose of the rehabilitation plan is to ensure that areas cleared or impacted during construction activities of the Gunstfontein Wind Energy Facility are rehabilitated with plant cover that reduces the risk of erosion from these areas as well as restores some ecosystem function. The purpose of the rehabilitation plan for the site can be summarised as follows:

- » Achieve long-term stabilisation of all disturbed areas to minimise erosion potential.
- » Re-vegetate all disturbed areas with suitable local plant species.
- » Minimise visual impact of disturbed areas.
- » Ensure that disturbed areas are safe for future uses.

This Revegetation and Rehabilitation Plan should be closely aligned with other site-specific plans, including the Erosion Management Plan, Alien Invasive and Open Space Management Plan, and Plant Rescue and Protection Plan.

2. RELEVANT ASPECTS OF THE SITE

The site occurs within a semi-arid environment and a fundamentally different approach to rehabilitation efforts in such areas is required as compared to traditional rehabilitation approaches within more mesic areas. In addition, rehabilitation techniques which rely on agricultural techniques such as the application of fertilizer and the planting of annual grasses or other alien species are not appropriate. The major implication of the semi-arid nature of the site is that the use of appropriate species and techniques is key in order to achieve long-term success.

3. IDENTIFICATION OF TARGET AREAS

The construction activities required for the development will result in significant disturbance at the site. Rehabilitation is costly and time-consuming and therefore priority areas where rehabilitation should be focused must be identified. Priority areas include areas vulnerable to erosion such as on steep slopes as well as areas near to important ecosystems such as areas near to drainage lines.

4. TOPSOIL MANAGEMENT

Effective topsoil management is a critical element of rehabilitation, particularly in arid and semi-arid areas where soil properties are a fundamental determinant of vegetation composition and abundance. Although some parts of the site consist of exposed bedrock, most parts of the site have at least some topsoil. Where any excavation or topsoil clearing is required, the topsoil should be stockpiled and later used to cover cleared and disturbed areas once construction activity has ceased.

- » Topsoil is the top-most layer (0-25cm) of the soil in undisturbed areas. This soil layer is important as it contains nutrients, organic matter, seeds, micro-organisms fungi and soil fauna. All these elements are necessary for soil processes such as nutrient cycling and the growth of new plants. The biologically active upper layer of the soil is fundamental in the maintenance of the entire ecosystem;

- » Topsoil should be retained on site in order to be used for site rehabilitation. The correct handling of the topsoil is a key element to rehabilitation success. Firstly, it is important that the correct depth of topsoil is excavated. If the excavation is too deep, the topsoil will be mixed with sterile deeper soil, leading to reduction in nutrient levels and a decline in plant performance on the soil;
- » Wherever possible, stripped topsoil should be placed directly onto an area being rehabilitated. This avoids stockpiling and double handling of the soil. Topsoil placed directly onto rehabilitation areas contains viable seed, nutrients and microbes that allow it to revegetate more rapidly than topsoil that has been in stockpile for long periods;
- » If direct transfer is not possible, the topsoil should be stored separately from other soil heaps until construction in an area is complete. The soil should not be stored for a long time and should be used as soon as possible. The longer the topsoil is stored, the more seeds, micro-organisms and soil biota become sterile;
- » Ideally stored topsoil should be used within a month and should not be stored for longer than three months. In addition, topsoil stores should not be too deep, therefore a maximum depth of 1m is recommended to avoid compaction and the development of anaerobic conditions within the soil;
- » If topsoil is stored on a slope then sediment fencing should be used downslope of the stockpile in order to intercept any sediment and runoff should be directed away from the stockpiles upslope.
- » Reduced activity at the site after large rainfall events when the soils are wet is encouraged. No driving off of hardened roads should occur immediately following large rainfall events until soils have dried out and the risk of bogging down has decreased.
- » Any topsoil, waste rock or other material dumps should be protected from erosion with silt traps and other suitable prevention measures.
- » Gabions and other stabilisation features should be used during construction activities on steep slopes in order to prevent erosion.

5. GENERAL PRINCIPLES FOR REHABILITATION

5.1. Mulching

Mulching is the covering of the soil with a layer of organic matter of leaves, twigs bark or wood chips, usually chopped quite finely. The main purpose of mulching is to protect and cover the soil surface as well as serve as a source of seed for revegetation purposes.

- » During site clearing the standing vegetation should not be cleared and mixed with the soil, but should be cleared separately, either mechanically or by hand using a brush-cutter. The cleared vegetation should be stockpiled and used whole or shredded by hand or machine to protect the soil in disturbed areas and promote the return of indigenous species;
- » Mulch is to be harvested from areas that are to be denuded of vegetation during construction activities, provided that they are free of seed-bearing alien invasive plants;
- » No harvesting of vegetation may be done outside the area to be disturbed by construction activities; and
- » Brush-cut mulch shall be stored for as short a period as possible, and seed released from stockpiles shall be collected for use in the rehabilitation process.

5.2 Seeding

In some areas the natural regeneration of the vegetation may be poor and the application of seed to enhance vegetation recovery may be required. Seed should be collected from plants present at the site

(where permissible and appropriate) and should be used immediately or stored appropriately and used at the start of the following wet season. Seed can be broadcast onto the soil, but should preferably be applied in conjunction with measures to improve seedling survival such as scarification of the soil surface or simultaneous application of mulch.

- » Indigenous seeds may be harvested for purposes of re-vegetation where appropriate and permissible in areas that are free of alien / invasive vegetation, either at the site prior to clearance or from suitable neighbouring sites;
- » Seed may be harvested by hand and if necessary dried or treated appropriately;
- » Seed gathered by vacuum harvester, or other approved mass collection method, from suitable shrubs or from the plant litter surrounding the shrubs must be kept apart from individually harvested seed; and
- » No seed of alien or foreign species should be used or brought onto the site.
- » An ecologist should be approached to assist in the development and execution of the re-seeding process during rehabilitation if recommended as a suitable option.
- » If manual seed harvesting is not possible, effective or sufficient then seeds will have to be obtained from other sources such as commercial or private nurseries.
- » The specialist should provide the EO and ECO with clear guidelines on how and when to harvest seeds and what process to follow in terms of ground preparation, fertilisers (if needed) and if appropriate.

5.3 Transplants

Where succulent plants are available or other species which may survive translocation are present, individual plants can be dug out from areas about to be cleared and planted into areas which require revegetation. This can be an effective means of establishing indigenous species quickly.

- » Plants for transplant should only be removed from areas that are going to be cleared;
- » Perennial grasses, shrubs, succulents and geophytes are all potentially suitable candidates for transplant;
- » Transplants should be nearby and should not be transported around the site to distant areas; and
- » Transplants must remain within the site and may not be transported off the site. Therefore, it is recommended that before construction commences individuals of listed species within the development footprint should be marked and translocated to similar habitat outside the development footprint under the supervision of an ecologist or someone with experience in plant translocation (i.e. ECO / EO). Permits from the relevant provincial authorities will be required to relocate listed plant species.

5.4 Use of soil savers

On steep slopes and areas where seed and organic matter retention is low, it is recommended that soil savers are used to stabilise the soil surface. Soil savers are man-made materials, usually constructed of organic material such as hemp or jute and are usually applied in areas where traditional rehabilitation techniques are not likely to succeed.

- » In areas where soil savers are used, it should be pegged down to ensure that it captures the soil and organic matter at the surface; and
- » Soil savers may be seeded directly once applied as the holes in the material catch seeds and provide suitable microsites for germination.

5.6. General

- » Progressive rehabilitation is an important element of the rehabilitation strategy and should be implemented where feasible;
- » Once revegetated, areas should be protected to prevent trampling and erosion;
- » No construction equipment, vehicles or unauthorised personnel should be allowed onto areas that have been vegetated;
- » Where rehabilitation sites are located within actively grazed areas, they should be fenced;
- » Fencing should be removed once a sound vegetative cover has been achieved; and
- » Any runnels, erosion channels or wash ways developing after revegetation should be backfilled and consolidated and the areas restored to a proper stable condition.

6. MONITORING REQUIREMENTS

As rehabilitation success, particularly in arid areas is unpredictable, monitoring and follow-up actions are important to achieve the desired cover and soil protection.

- » Re-vegetated areas should be monitored every 3 months for the first 12 months and every 6 months thereafter for the next year.
- » Re-vegetated areas showing inadequate surface coverage (less than 30% within 12 months after re-vegetation) should be prepared and re-vegetated.
- » Where transplants have been used, the survival rate of the different species used should be monitored every 3 months for the first 12 months and every 6 months thereafter for the next year. The results should be used to inform the choice of species for transplant and other factors which may influence survival.