

CHAPTER 6

CONCLUSION

The rehabilitation design, incorporating the principle of balancing statutory specifications and/or requirements and economically viable rehabilitation goals in order to obtain a cost-effective solution realistically accommodating the interests of all parties concerned, required specific and sometimes delicate negotiation with specific disciplines and statutory bodies.

- At Rustenburg Minerals the difference between backfilling and levelling the quarries and the landscaping principle approved by the DME resulted in an estimated cost saving of more than 60%;
- Further design refinements and negotiations between African Mining, EKO-REHAB and the DME made a further $\pm 8\%$ saving possible;
- Specialised knowledge, enabled a team effort with the DME and other affected government departments as well as interested and affected parties, EKO-REHAB and African Mining delivered superior results in terms of an aesthetically pleasing self-sustainable environment (grazing land).

This study shows that artificial limitations could make it impossible or very expensive to rehabilitate. *Planning however is the essence of success* and a number of factors should be considered as part of the planning process, as they could have significant cost implications and the objective is *to keep costs as low as possible*. These factors include material and soil movement; drainage and flood management; management of run-off water; surface water management; soil characteristics; and the removal of waste and infrastructure. For example, at Rustenburg Minerals, the rehabilitation of the quarries would normally require levelling with waste from the waste dumps – which would probably be successful but not cost effective, due to the volume and the distance over which the waste had to be moved. This was resolved by making use of the Model Maker software – limiting material movement and creating the “hill and valley” landscape.

South Africa is blessed with a wide variety of plant species tolerant of limiting factors such as temperature, pH, rainfall and metal content to name but a few. In planning and designing the rehabilitation model for cost effective self-sustainability, plant species should be selected carefully taking drought tolerance, an aggressive root system and easy establishment into

account. In conjunction, the terrain should also be evaluated on a holistic basis with special attention given to those factors directly influencing the disturbed area. By utilising the efficiency of digital modelling software costs can be limited by avoiding double handling of soil and other material. At Rustenburg Minerals accurate calculations using Model Maker software led to the minimisation of material movement through levelling-out instead of backfilling. Water control is another factor to be included in rehabilitation planning - the final design of the rehabilitated quarry must either contain the water in the quarry or disperse of it into the same water catchment area from which it originated. Revegetation of the “hill and valley” landscape, approved by the relevant authorities at Rustenburg Minerals, has been successful by *allowing nature to be one’s guide*. A holistic approach to rehabilitation should thus be adopted taking soil conditions and topography, specifically slope gradients and lengths as well as surface temperatures, available sunlight, water retention ability of the material, and revegetation with indigenous plant species into account.

The affected area at Rustenburg Minerals has been upgraded beyond the limitations of the rehabilitated site and the vegetation is capable of functioning with minimal human interference. The rehabilitated area has survived a number of seasons of which the 2000 season comprised of excessive rain (462mm in February) which included a single shower of 164mm in 24 hours. The 2003 season on the other hand consisted of virtually drought conditions (only 50mm of rain in the first three weeks of October). The rehabilitated area is currently being used by the local community as grazing land for their cattle which, given the above conditions, is proof of self-sustainability. This study shows in conclusion that the rehabilitation process implemented by Rustenburg Minerals in conjunction with their consultants and statutory bodies has been successful mainly due to effective planning, careful design, maintenance and continuous supervision.

Figure 27 is a schematic presentation of the Rehabilitation Model developed as part of this study. It simulates the rehabilitation and implementation process followed by Rustenburg Minerals in conjunction with African Mining and EKO-REHAB which resulted in Rustenburg Minerals (Makgope & Clementine Mines) being awarded First Place in the Excellence in Mining Environmental Management (“EMEM”) competition in the large open cast mining category in the Northwest Province for 2001. This EMEM competition is a national DME initiative with a view to encouraging responsible environmental management in the South African Mining Industry.

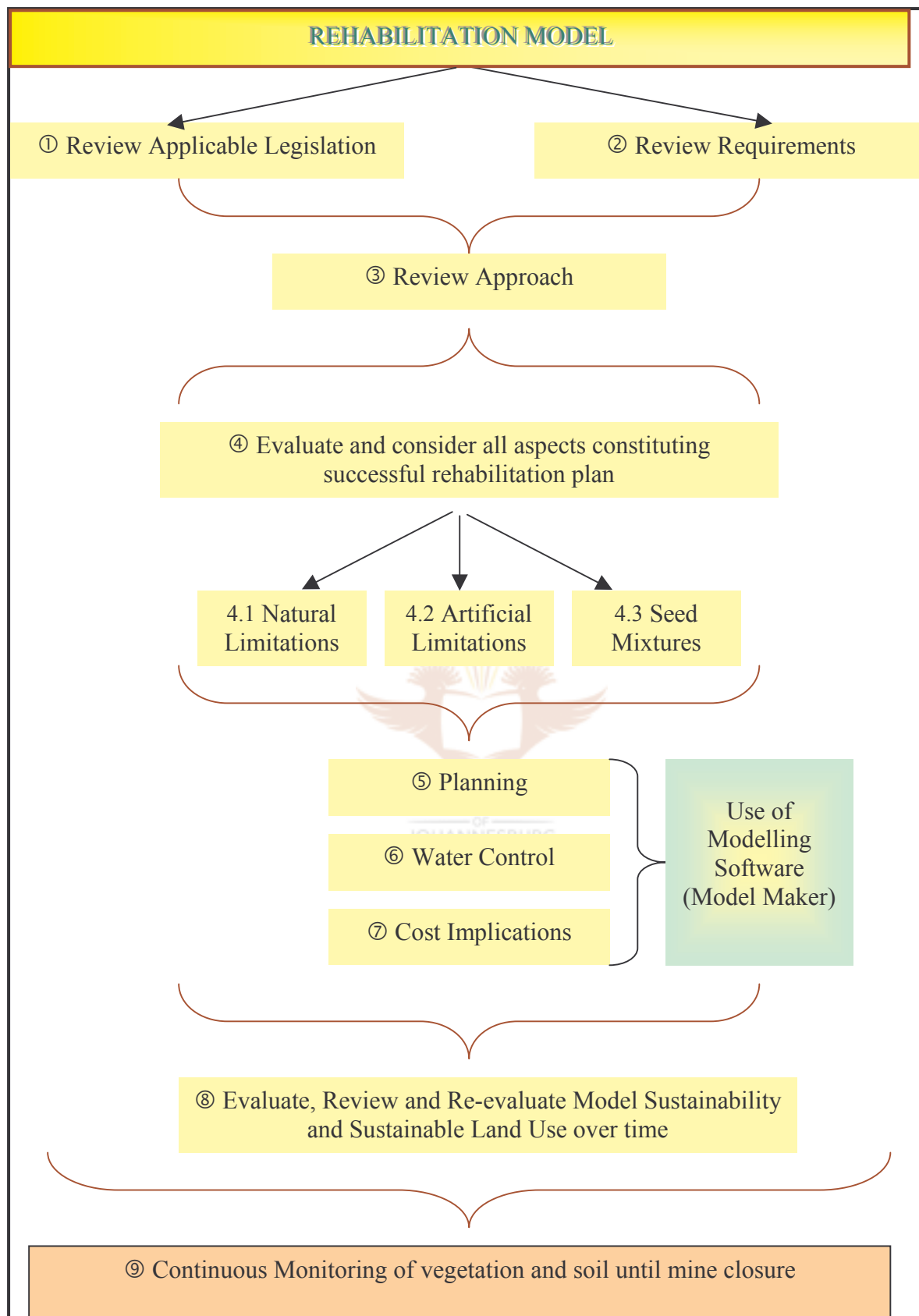


Figure 27: Rehabilitation Model for an open cast chromite mining operation