

This Specification covers the requirements for the planting and establishment of vegetation on Site following construction activities.

MATERIALS

Plant material to be used for rehabilitation purposes shall be made available to Eskom by the Responsible Contractor.

It must be noted that many species are hardy and will grow in a wide range of soil types. However, to revegetate an area as accurately as possible to its original flora, plant species used should be those that occur naturally in the nearest site with a similar soil type and aspect. A suitably qualified botanist should be consulted with in this regard.

Shrubs and trees

1. All plant material shall be obtained either from nurseries, from the Site prior to clearing or from an area in close proximity to and of the same veld type as the Site, as indicated by the Site Manager.
2. Indigenous plants shall be obtained either from the Site prior to clearing or from an area in close proximity to and of the same veld type as the Site, as indicated by the Site Manager.
3. Plants shall be obtained from nurseries. Nursery plants shall be grown from locally obtained seed unless approved by the Site Manager. The Contractor shall inform the Site Manager of the source of his plants
4. Plants shall be obtained from their natural habitat. *{provide site specific detail on exactly where}*
5. The Contractor shall ensure that each plant is handled and packed in the approved manner for that species or variety, and that all necessary precautions are taken to ensure that the plants arrive on Site in a proper condition for successful growth.
6. Trucks used for transporting plants shall be equipped with covers to protect the plants from windburn. Containers shall be in a good condition. Plants shall be protected from wind during the transportation thereof.
7. No plants or plants with exposed roots shall be subjected to prolonged exposure to drying winds and sun, or subjected to water logging or force-feeding at any time after purchase.
8. The Contractor shall ensure that the plants are in a good condition and free from plant diseases and pests. The Contractor shall immediately remove plants containing any diseases and/ or pests from the Site.
9. All plants supplied by the Contractor shall be healthy, well formed, and well rooted. Roots shall not show any evidence of having been restricted or deformed at any time. The potting materials used shall be weed free.
10. There shall be sufficient topsoil around each plant to prevent desiccation of the root system. Where plants are stored on site prior to planting they shall be maintained to ensure that the root systems remain moist.

Grass

Sods and runners

1. Grass sods shall be clean of invasive plants or weeds.
2. Sods shall be obtained from a source approved by the Site Manager. Sods rejected by the Site Manager shall be removed from the site immediately.
3. Grass shall have been grown specifically for sod purposes, mown regularly and cared for to provide an approved uniformity to the satisfaction of the Site Manager. It shall be harvested by special machines manufactured for

this purpose to ensure an even depth of cut with sufficient root material and soil.

4. Sods shall be delivered in healthy conditions and be free from weeds and disease.
5. Sods shall be obtained from an approved nursery. Nursery sods shall have been maintained regularly to the required quality. Nursery grass sods shall have at least a 30 mm layer of topsoil.
6. Sods shall be obtained directly from the veld. Veld sods shall contain at least a 50 mm topsoil layer and the roots shall be minimally disturbed. They shall be obtained from the near vicinity of the site from an area selected by the Site Manager. The soil shall be compatible with that removed from the area to be revegetated and shall not have been compacted by heavy machinery.
7. Runners shall be of an approved quality and free from disease or weeds.

Basic regrassing seed mix

{These are basic seed mixtures to use when regrassing. When developing basic regrassing spec, ensure that information on mulch, soilbinder, fertilisers, applications rates etc. is included.}

1. Summer seed mixture:
 - a. *Cynodon dactylon* {germinates in summer from end September onwards and is widespread}
 - b. *Eragrostis tef* {germinates in summer from September, smaller in stature than *Lolium* and has a very short growing season. It is not invasive and is good for stabilisation. It is widespread.}
 - c. *Hyparrhenia hirta* {well-drained stoney soils}
2. Winter seed mixture:
 - a. *Lolium multiflorum* {widespread, germinates in winter, grows until November/ December. Don't sow after September since temperatures too high.}
 - b. *Chaetobromus dregeanus* {well-drained sandy soils}

Indigenous vegetation sods

1. Appropriate indigenous vegetation sods shall be decided upon between the Contractor, the ECO and the Site Manager.
2. Sods rejected by the Site Manager shall be removed from the site immediately.
3. Indigenous vegetation sods shall be clean of weeds or invasive plants in specified areas before planting.

Seed

1. The seed mix quantities and purity levels shall be specified and approved by the Site Manager.
2. Seed shall be utilised for the cultivation of material for revegetation.
3. Seed shall be utilised for direct sowing.
4. Seed must be pre-dried then stored under cool, dry, insect free conditions until required either for cultivation in the nursery or in the rehabilitation process. Only viable, ripe seed shall be used.
5. A record of stock relevant to the project that is held in the nursery shall be provided to the Site Manager on a monthly basis.
6. Seed shall be stored at the Contractors expense.

Commercial seed

1. All seed used shall be labelled in accordance with the Government Seed Act No. 28 of 1961 or amendment thereof. The Contractor shall furnish the Site Manager with signed copies of a statement from the seed merchant certifying that each container of seed delivered is fully labelled in accordance with the Government Seed Act. This certification shall appear on, or be submitted with, all copies of invoices for the seed.
2. Commercial seed shall only be used in previously disturbed areas.

Harvested seed

1. Indigenous seed shall be harvested in an areas which are free of alien/ invasive vegetation, either at the site prior to clearance or from suitable neighbouring sites, as indicated by the Site Manager.
2. Following harvesting, the seed shall be dried under cool airy conditions. The seed shall be insect free and shall be stored in containers under cool conditions that are free of rodents or insects. No wet, mouldy or otherwise damaged seed is acceptable.
3. Seed harvested by hand from selected species, should be treated and stored separately.
4. Seed gathered by vacuum harvester, or other approved mass collection method, from suitable shrubs or from the plant litter surrounding the shrubs shall be kept apart from individually harvested seed .
5. Harvested seed obtained by means of vacuum harvesting, shall be free of excessive quantities of organic and/ or substrate material.

Mulch

Brush-cut mulch

1. The stockpiled vegetation from the clearing operations shall be reduced to mulch.
2. Indigenous plant material shall be kept separate from alien material. The vegetative material, shall be reduced by either mechanically means (chipper) or by hand-axing to sticks no longer than 100mm. The chipped material shall be mixed with the topsoil at a ratio not exceeding 1:1.
3. Mulch shall 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.
4. No harvesting of vegetation outside the area to be disturbed by construction activities shall occur.
5. Mulch shall be harvested from areas in close proximity to the site, as approved by the Site Manager. Any collection of indigenous material from nearby veld that will not be subject to complete denudation shall only be done in mature vegetation in areas identified by the Site Manager.
6. Harvesting shall be performed in a chequer board fashion, cutting the indigenous vegetation down to ± 100 mm above the ground, in 2 m wide strips, leaving 2 m gaps of undisturbed vegetation in between.
7. The Contractor shall take every effort to ensure the retention of as much seed as possible in mulches made from indigenous vegetation. Mulches shall be collected in such a manner as to restrict the loss of seed.
8. 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.

Processed commercial mulches

1. Processed commercial mulch, in the form of a 'roll-on blanket' or fibrous product shall be utilised as mulch during revegetation and rehabilitation of the site.
2. The mulch used shall be weed free, of a reputable make and approved by the Site Manager.
3. The packaged fibrous mulch shall be processed in such a manner as to contain no growth or germination inhibiting factors. The mulch shall remain in uniform suspension in water under agitation.
4. When packaged fibrous mulch is used together with seed and fertiliser in a hydro-seeder, the Contractor shall ensure that it blends with other constituents to form homogenous slurry.

Wood chips

1. Wood chips (including bark) shall be utilised as mulch during revegetation and rehabilitation of the site.
2. The chips shall be no longer than 50 mm in length or breadth and shall be free of seed. The Site Manager shall approve the source of chips.
3. The wood shall be chipped during winter
4. Chips shall not be made from wood treated with preservatives.
5. Half-composted chips shall be utilised in preference to non-composted chips
6. Indigenous seed shall always be added to wood chip mulches.

Compost

1. Compost shall be utilised as mulch during revegetation and rehabilitation of the site.
2. The compost shall be well decayed, friable and free from weed seeds, dust or any other undesirable materials.
3. Seed free, half-composted material, such as mulled-bark, shall be used as an additive to extend indigenous mulch. No more than 50% compost shall be used under these circumstances.

Alternative products

1. Molasses extract (Foermol)/ Aquasorb/ Stoscorsorb/ Synpol H or other product approved by the Site Manager shall be utilised as mulch during revegetation and rehabilitation of the site.

Slope stabilisers and anti-erosion measures

Slope stabilizer and/ or anti-erosion materials shall be provided by the relevant Contractor.

Stabilisation cylinders

1. Stabilisation cylinders shall consist of cylindrical capsules approximately 125 mm in diameter by 1.5 m in length.
2. Stabilisation cylinders shall be manufactured from biodegradable material such as hessian or of extruded biodegradable plastic netting. The plastic material shall be sufficiently robust to last for a period of not less than 3 years and not more than 10 years before disintegrating under normal service conditions.
3. Stabilisation cylinders shall be filled with shredded or partly compressed pine chips or similar material. Only material passing through a 31 mm sieve with round holes and retained on a 5 mm sieve with square holes shall be used. Wood chips shall be treated with Tanalith C wood preservative. Splinters and flat chips are not acceptable.

4. A seed approved by the Site Manager shall be included in the cylinders.
5. Cylinders shall be anchored in position using biodegradable material.
6. Cylinders shall not be used to stabilise any rock faces.

Biodegradable netting / matting

1. Biodegradable netting/matting shall be made from jute, sisal, coir or similar material.
2. A 1 m² sample of the geofabric, geogrid or nylon (biodegradable) fabric shall be submitted to the Site Manager for approval prior to procurement.
3. The netting/matting shall be sufficiently robust to last for a period of not less than 5 years under normal service conditions.
4. Holes in the netting/matting shall have a minimum size of 400 mm² and a maximum size of 900 mm² and be made from at least 4-6 mm thick cord.

Logs

1. The Contractor shall ensure that for slopes of less than 1:3, the Site shall be stabilised by means of "geojute" and continuous rows of logs, secured to the slope with timber pegs, parallel to the contour. Logs shall be untreated pine (or gum) poles of not less than 150 mm with a taper of not more than 75 mm over its length. Timber pegs to be treated and not less than 400 mm in length. Timber pegs must be longer if thicker logs than the minimum are used.
2. The slope shall be covered with "geojute" prior to placing the logs. The Contractor shall install Kaytech Soil Saver 292 (or a similar product) as per the manufacturer's specifications except for the pegging that is replaced by the log stabilization.
3. Logs shall be secured to the slope in such a manner that they will not become dislodged during construction and/ or planting. Logs to be secured to the slope by means of a minimum of two pegs driven into the soil not less than 250 mm deep. For logs longer than 3 m, additional pegs shall be required. Log ends to be butt-jointed and plugged with wood chips or similar to prevent water from washing through at the joint. Logs shall be placed at 2 m intervals with a bottom row parallel to the edge of the road. Logging of the slope to start at the top of the slope to prevent the stretching of the "geojute".

Hard structures

1. All hard structures used for slope stabilisation shall have natural pebble face finishes.

Soil stabilisers

1. Flobond/ Hydropam or other product approved by the Site Manager shall be utilised as mulch during revegetation and rehabilitation of the site.
2. Soil stabilisers shall consist of an organic or inorganic material to bind soil particles together and shall be a proven product able to suppress dust and form an encrustation.
3. Soil stabilisers shall be of such a quality that grass and indigenous seeds may germinate and penetrate the crust. Samples of the proposed material shall be supplied to the Site Manager before any of the material is delivered to the Site.

Fertiliser

Hydro-seeding

1. Liquid fertiliser shall be used where fertiliser is applied during the hydro-seeding process {*The fertilizer ratio would be dependant on the seed used during hydro-seeding*}.

Mountain and acid Sandplain Fynbos

1. The Contractor shall use 3:1:1, 3:1:2, 4:1:1, 8:1:1, or similar in a solid form and 4:1:1 (19) Phosan, or similar, in a liquid form, as approved by the Site Manager.

Granite soils

1. The Contractor shall use 3:1:0 and 4:1:0, or similar as approved by the Site Manager.

Basic regrassing

1. The Contractor shall use 2:3:2 and super-phosphate.

Cultivated lawns

1. The Contractor shall use 3:2:3, super-phosphate or similar as approved by the Site Manager.

Manure

Topsoil and subsoil

1. All soil imported to act as bedding material shall be free of alien plant seeds, and their use shall be restricted to 500 mm below the soil surface.

Boulders and rocks

1. Boulders or rocks used in rehabilitation shall come from comparable geomorphological units to those that they are being utilised to rehabilitated.
2. Where possible, boulders and rocks utilised during rehabilitation, shall be collected from the Site and stockpiled prior to the commencement of construction activities on Site.

Rock stains

1. Where required, viakote bitumen primer solution, or a similar product, as directed by the Site Manager, shall be used as a rock stain.
2. Care shall be taken to ensure that the stain does not inhibit plant growth.
3. Where required, cement-based screed or grout sprayed onto the rock face, shall be used to rehabilitate and stabilised cut rock surfaces.

PLANT

Hydro-seeder

1. The hydro-seeder shall be capable of pumping the specified seed mix, fertiliser, soil stabiliser, aqueous smoke solution, mulch and wetting-agent (mixed in water) at specified rates over the areas to be seeded.
2. The hydro-seeder shall have an agitation system, which shall be sufficient to agitate, suspend and homogeneously mix the specified slurry.
3. The slurry distribution lines shall be large enough to prevent stoppage. The discharge line shall be equipped with a set of hydraulic spray nozzles suitable for the even distribution of the slurry on the various slopes to be seeded.
4. The slurry tank shall be mounted on a travelling unit, either self-propelled or drawn by a separate unit. The travelling unit shall be capable of placing the slurry tank and spray nozzles within sufficient proximity to the areas to be seeded so as to provide uniform distribution without waste.

Seed store

1. Facilities should be available to store seed, collected or required on-site, in rodent- and insect-free, cool (7 - 10 °C), dry, conditions.

Site-specific nursery

1. On-site nursery facilities shall be erected for the holding of rescued plant material and the propagation of appropriate species for revegetation. The nursery shall be suitably located and constructed under the supervision of the Site Manager.
2. An off-site nursery shall be made available for the holding of rescued plant material and the propagation of appropriate species for revegetation. The plants shall be cultivated and stored separately from other material in the nursery.
3. The site-specific nursery shall be utilised for the cultivation and maintenance of the stocks of living plant material required for the revegetation and rehabilitation of the Site.
4. The nursery, including irrigation, water shall be free of Phytophthora.
5. Irrigation water shall be de-chlorinated.
6. Soil used to cultivate or grow plants shall be weed free.
7. The area where plants are stored shall be kept free of weeds.
8. A record of stock relevant to the project that is held in the nursery shall be provided to the Site Manager on a monthly basis.

Please also refer to Appendix??, Construction/Enabling Works Specification, where specific requirements for the nursery are outlined.

Irrigation

1. The design and layout of the irrigation shall be indicated on a plan and approved by the Site Manager prior to its installation.
2. The 100 mm uPVC sleeves connecting the planters shall be installed by others, but the Contractor shall insure that all sleeves are in the correct position prior to the installation of paving. The irrigation system shall meet the following requirements:
 - a. It shall be connected to an appropriate water supply with a water meter.
 - b. The system shall be semi-automatic.

- c. Six drippers per tree shall be required (underneath mulch level)
- d. The system shall be operated by means of a hand-operated stopcock in a lockable metal box.

CONSTRUCTION

Method Statements

The following Method Statements shall be provided by the Contractor 14 days after receipt of the Letter of Appointment (*only Method Statements relevant to the particular project should be selected*):

1. Rehabilitation of disturbed areas and revegetation after construction is complete.
2. Use of herbicides, pesticides and other poisonous substances.

Preparation of ground surfaces

1. Prior to the application of topsoil, the ground surface shall be ripped or scarified with a mechanical ripper to a depth of approximately 150 mm.
2. Prior to the application of topsoil, the ground surface shall be ripped or scarified by hand tilling to a depth of approximately 150 mm. *{this specification shall be used on small sites}*
3. Compacted soil shall be ripped to a depth of greater than 250 mm. The ripped area shall be hand-trimmed.
4. The subsoil shall be thoroughly tilled to a depth of at least 100 mm by means of a plough, disc, harrow or any other approved method until the condition of the soil is acceptable, as approved by the Site Manager.
5. Where tilling is difficult, the Contractor shall use rotary tillage machinery until no clods or lumps larger than 40 mm in size remain, and the mixing of soil is acceptable to the Site Manager.
6. In road cuttings, a weed-free gravel / sand / organic mix shall be utilised as a sub-surface layer.
7. Topsoil shall be applied *{give such details as are required additional to SABS 1200D CI 5.2.4.2}*
8. Subsequent to the addition of the sub-soil, topsoil shall be spread evenly over the ripped or tilled surface to a depth of 75-150 mm on flat ground or to a minimum depth of 75 mm on slopes of 1:3 or steeper or as specified in this specification.
9. The final prepared surface shall not be smooth but furrowed to follow the natural contours of the land, with scattered rocks of varying sizes according to the natural condition of the area.
10. Where sodding is required slight scarification shall be carried out to contain the sods. The soil shall be uniformly moist to a depth of 150 mm prior to planting or seeding. If this condition is not met by rainfall, the Contractor, as directed by the Site Manager, shall carry out irrigation.
11. In artificial wetland areas, topsoil shall be removed to a depth of approximately 200 mm, the wetlands excavated, and topsoil replaced. Wetland areas are then to be selectively composted, as determined by the Site Manager, and permanent irrigation systems installed where necessary.
12. Prior to any site clearance, the wetland areas, along with 10 m buffer zones, as indicated on the Revegetation Plan are to be effectively fenced off to prevent any damage to wetland material on sites prior to transplanting.

Mulch

Basic regrassing

1. Aquasorb, Stoscosorb, Synpol H are a similar product approved by the Site Manager, shall be applied at a rate of 24 kg/ha. The mulch shall be worked into the soil prior to seeding.

Soil stabilisation

Methods for soil stabilisation shall be given as part of the Environmental Method Statement.

Straw stabilisation

1. Straw shall be utilised as a binding material in areas with deep sand.
2. Baled straw shall be placed on the cleared area, opened and spread evenly by hand or machine at a coverage rate of 1 bale per 10 m² over the area to be stabilised. It shall then immediately be rotovated into the upper 100 mm layer of soil. This operation shall not be attempted when the wind strength is such as to remove the straw before it can be rotovated into the sand.

Mulch stabilisation

1. Mulch shall be applied by hand to achieve a layer of uniform thickness. The mulch shall then be lightly worked into the topsoil layer so that it mixes with the soil and serves to bind it.
2. The mulch shall be spread at a coverage rate of 100 kg per 250 m² or 4 t/ha.
3. Where brush-cut material is to be utilised as mulch, this material shall be evenly spread across the area to a uniform depth of 25 mm. The mulch shall then immediately be rotovated into the upper 100 mm layer of soil. This operation shall not be attempted when the wind strength is such as to remove the mulch before it can be rotovated in.
4. In very rocky areas a layer of mulch shall be added prior to adding the top-material. The mulch must then be worked into the top-material to bind it.
5. Alien vegetation mulch shall be in a non-seed bearing state and shall be chipped prior to application. The preparation of alien vegetation mulch shall be done at source.
6. The Contractor shall cut bush to a height of 400 mm above ground level from designated areas. This vegetation shall then be passed through the chipping machine as above, and be stockpiled for later use as mulch.
7. If the area is exposed to strong wind the mulch stockpile shall be covered with a fine nylon net with 100 mm × 100 mm openings.

Compost stabilisation

1. The soil shall be stabilised by placing and lightly compacting a 75 mm layer of compost over the designated areas or by working a 75 mm layer of compost into the ground to a depth of 150 mm.

Gravel stabilisation

1. The soil shall be stabilised by the placing of a 50 mm layer of gravel wearing course quality material complying with the physical properties specified in subclause 3.2.2 of SABS 1200 ME.
2. The material shall be placed, spread, trimmed and compacted by means of 3 passes of the same compaction equipment used for the bulk earthworks.

Stabilisation of steep slopes

1. The Contractor shall take measures to protect all areas susceptible to erosion by installing all the necessary temporary and permanent drainage works as soon as possible. The Contractor shall take any other measures that may be necessary to prevent surface water from being concentrated in streams and from scouring the slopes, banks or other areas.
2. If runnels or erosion channels develop, they shall be back-filled and compacted, and the areas restored to a proper condition. The Contractor shall not allow erosion to develop on a large scale before effecting repairs.
3. Where artificial slope stabilisers are used, these shall be applied to the slope, preferably before topsoiling, but according to the detailed construction plan and as specified in this specification.
4. Near vertical slopes (1:1 to 1:2) shall be stabilised using hard structures following specifications.
5. Where the slopes are 1.3 to 1:6 they shall be logged or otherwise stepped (using stabilisation cylinders or similar) in order to prevent soil erosion. Logs/ cylinders must be laid in continuous lines following the contours and spaced vertically 0.8-1.2 m apart, depending on the steepness of the slope. These logs/ cylinders must be secured by means of steel pegs and wire in rocky areas, and treated wooden pegs in other areas.
6. In areas where slopes are less than 1:6, horizontal grooves, shallow steps or ledges parallel to contours shall be made on the cut slopes. They shall be made at random to appear natural.
7. In areas where slopes are less than 1:6 these slopes shall be stabilised by using logs in parallel rows, or stabilisation cylinders fastened randomly into position or using biodegradable netting. These structures shall hold the top-material on the slopes and serve as erosion prevention structures.
8. Shallow slopes shall be stabilised using commercial available and approved anti-erosion compounds.

Basic regrassing

1. Flobond soil binder shall be applied at a rate of 12 kg/ha prior to the application of the grassing seed mixture.

Slope modification and stabilisation

Cut slopes

1. Cut and fill slopes shall be shaped and trimmed to approximate the natural condition and contours as closely as possible and be undulating. Levels, incongruous to the surrounding landscape, shall be reshaped using a grader and other earthmoving equipment.
2. All cut and fill slopes shall be left as rough as possible, and shall contain ledges to facilitate the accumulation of topsoil. The ledges shall be dug at random to appear natural. Furthermore, the Contractor shall ensure that any embedded rocks that will not pose a danger to traffic, remain on the slopes.
3. Boulders / rocks, collected on the site before disturbance, shall be scattered at a predetermined density approved by the Site Manager.
4. Any eroded areas deeper than 50 mm shall be either trimmed down by back cutting the slope face or repaired to the satisfaction of the Site Manager with boulders and soil or any other approved method.
5. Catchwater drains shall be installed above the cut slopes.
6. Where cut slopes are greater than 4 m in height, the Contractor shall construct berms at regular intervals.
7. Natural water flow paths shall be identified and subsurface drains (using riprap or superfluous rock material) or surface drains and chutes *{use water speed control structures where necessary}*, preferably using cemented natural rock, shall be constructed along the flow paths.

8. Near vertical slopes (1:1 to 1:2) shall be stabilised using natural rock wall structures constructed using conventional building methods or in forms with slurry forced between the structures. All structures shall have a 'natural' look and facilities for plants to grow in.
9. Near vertical slopes (1:1 to 1:2) shall be stabilised using stacked precast concrete terraforce/ löffel blocks. All structures shall have a 'natural' look and facilities for plants to grow in.
10. Near vertical slopes (1:1 to 1:2) shall be stabilised using rock-filled gabion baskets.
11. All areas where the slopes are 1:3 to 1:6 shall be logged or otherwise stepped (using stabilisation cylinders or similar) in order to prevent soil erosion. Logs/ cylinders shall be laid in continuous lines following the contours and spaced vertically 0.8-1.2 m apart, depending on the steepness of the slope. These logs/ cylinders shall be secured by means of steel pegs and wire in rocky areas, and treated wooden pegs in other areas.
12. In areas where slopes are less than 1:6 horizontal groves and shallow steps and ledges parallel to contours shall be made on the cut slopes. They shall be made at random to appear natural.
13. In areas where slopes are less than 1:6 horizontal, these slopes shall be stabilised by using logs in parallel rows, or stabilisation cylinders fastened randomly into position shall be utilised. These structures shall hold the top-material on the slopes and serve as erosion prevention structures.

Borrow pits

1. Borrow pits shall be shaped to have undulating slopes and surfaces and upon completion shall blend into the natural terrain. *{in terms of minimising legislation these areas require an approved rehabilitation programme on application to use as a borrow pit}*

Blasted areas

1. Blasted areas shall be finished so as to be as rough as possible to facilitate establishment of vegetation.

Fertilisation

Trees and shrubs

1. One third of the fertiliser shall be scattered at the bottom of the hole, one third dug into the topsoil to be replaced in the hole and the remainder watered into the soil at surface level.

Basic regrassing

1. 2:3:2 fertiliser shall be applied with the seed mix, at the rate of 400 kg/ha. Super phosphate shall be applied post germination at the rate of 200 kg/ha

Timing of planting

1. Reseeding shall occur in late Summer to Autumn (January to March).
2. Replanting shall occur during April / June.
3. Wetland preparation shall occur during Autumn and planting shall occur during early Winter after the first rains (May to June). If planting occurs in a dry late Autumn (end March) or early Winter (April to June) season it shall be necessary to irrigate plants to ensure their successful establishment.

4. Plant material shall be planted into the ground within a maximum period of 5 days after delivery to the Site, unless otherwise specified by the Site Manager.

Planting guidelines

Planting shall be carried out as follows {*give details of required methods*}

Reseeding

1. Aqueous smoke solution (= smoke water) treatment shall occur after the first Early Winter rains following sowing.
2. If mulching is done at the end of Autumn to Early Winter, aqueous smoke solution (= smoke water) shall be applied as part of the hydro-mulch mixture.
3. For natural areas a 1 delbs solution of aqueous smoke shall be diluted in a ratio of 1:150.
4. Seed shall not be left exposed to smoke water.
5. Hydro-seeding machines shall be thoroughly cleaned after each operation and before different seed mixes of different origins are introduced into it. The mixture shall be kept uniform during the seeding operation by means of a power-driven agitator.
6. The following components shall be added to the hydro-seeding slurry:
 - a. Compost;
 - b. Fertiliser;
 - c. Soil binding agents (such as Surfamol or similar);
 - d. Wetting agents (such as Aqua-gro or similar);
 - e. Seed and growth stimulants;
 - f. Micro-organisms; and/ or
 - g. Anti-erosion compounds.
7. Where broadcast seeding is carried out, the seed shall be sown evenly over the designated area. During sowing half the seed shall be sown by the sower moving in one direction and the remainder by the sower moving at right angles to the first sowing.
8. In confined areas the seed shall be covered by means of rakes or other approved hand tools. Broadcast seeding shall not be done under windy conditions.
9. Drill seeding shall be done in rows not more than 0.25 m apart. The seeding shall be done with an approved grain drill with fine seed attachment or a combination grass planter and land packer or pulveriser. A combine grain and fertiliser drill may be used where appropriate, as directed by the Site Manager.
10. Reseeding shall only occur during a period approved by the Site Manager.
11. The Contractor shall demonstrate to the Site Manager in a trial section that the application of the materials required can be made at the rates specified in this specification.

Basis regrassing

1. Grass seed shall be applied at the following rates {*specify applicable grass mix depending on season and nature of soils*}:

Summer mix -	<i>Cyndon dactylon</i>	20 kg/ha
	<i>Eragrostis tef</i>	10 kg/ha
	<i>Hyparrhenia hirta</i>	5kg/ha
Winter mix -	<i>Lolium multiflorum</i>	10kg/ha
	<i>Ehrharta villosa</i>	5kg/ha
	<i>Chaetobromus dregeanus</i>	5 kg/ha

Planting of grass runners

1. The runners shall be planted within 30 hours of being harvested. Storage in the interim period shall be in aerated bags under cool dry conditions. The runners shall be planted at even spacing, by hand or mechanically at a rate of at least 70 grain bags of runners per hectare.
2. Only fresh runners, that are in good condition and have not dried out, shall be accepted. These runners shall be planted in trenches not less than 50 mm deep with leafy ends, and not roots, exposed.
3. The runners shall be well watered after planting and rolled with a light agricultural roller when the soil has dried sufficiently, as directed by the Site Manager.

Sodding

1. Prior to sodding, the area shall be re-innolated with microbes contained within natural veld sods. Veld sods of restios or grasses shall be collected, as directed by the Site Manager, and replanted in shallow hollows for this purpose.
2. Re-innolation shall occur during or immediately after a rain event. Innolation sods shall be watered lightly after placement.
3. Revegetation sods shall be planted in strips to reduce erosion.
4. Sodding shall take place on moist, rock free topsoil that has been scarified.
5. Sods, once harvested or delivered from a nursery, shall not be allowed to dry out and shall be planted within 30 hours of being removed from the soil or growing medium. If necessary, they shall be lightly watered prior to planting.
6. Sods shall be planted so they abut tightly against one another. The first row shall be in a straight line with subsequent rows planted so that the joints are staggered. Any gaps shall either be planted with a sod reduced to the gap size or filled with topsoil.
7. Where grass sods are planted on slopes steeper than 1:2, wooden stakes of 500 mm diameter shall be used to anchor the sods in position.
8. In the absence of rain, sods shall be well watered after planting and not be allowed to deteriorate through a lack of moisture.
9. Where grass sods are planted in the floodplain, wooden stakes of 500 mm in diameter shall be used to anchor the sods in position.

Planting trees, shrubs and herbs

1. The Contractor will be provided with an approved planting/ landscaping plan.
2. Where planting is not direct, the plants must be brought to an approved holding area in the intended planting area where they shall be suitably maintained. The Contractor, as directed by the Site Manager, shall provide sufficient shade and water. The operation of relocation from the nursery to the planting site must occur on the same day so as to minimise losses through death and to maintain or improve their condition at delivery.
3. During transplanting of indigenous plants care shall be taken to ensure that they are not exposed to the sun. The roots as well as the leaves shall be covered with wet hessian to limit transpiration during transportation and storage. Plants shall be kept in this state for as short a time as is reasonably possible.
4. Planting shall occur as specified in this specification or planting/ landscaping plan.

Planting guidelines

1. The size of holes shall be sufficiently large to ensure that the entire root system is well covered with topsoil, without having to be compressed. The soil around the roots of the plants being transplanted shall not be disturbed. Topsoil and subsoil from the hole shall be stored nearby to be replaced to the same depth intervals from which it was originally removed.
2. Individual spacing between trees shall be 2-3 m and clumps shall consist of 6-12 trees. The trees in the clumps shall be planted in staggered rows of 5 trees per 6 m² with low to medium tall shrubs planted between the clumps. The clumps shall be spaced at about 8-12 m distance.
3. In the case of transplanted trees up to 3 m tall, the hole size shall be 2 500 mm × 2 500 mm in width and 1 800 mm deep
4. Shrubs shall be planted 1-2 m apart around the trees and in the intervening areas between the clumps or as circumstances dictate.
5. Plugs of herbs shall be planted at densities of up to 12 per 1 m².

6. Bulbous plants shall be planted as features in selected areas and shall be protected from moles and baboons using rock linings to the holes and surface soil.
7. Before the placement of the plant specimens into prepared holes, the holes shall be watered substantially.
8. One to two handfuls of bone meal shall be added to the hole before planting.
9. Plants shall be carefully transplanted into holes.
10. Plant holes shall be back-filled using a mixture of two-thirds loamy to sandy topsoil to one-third compost. Where the natural soil is very clayey or heavy, sand shall be added at a ratio of one-third soil, one-third compost and one-third sand. The soil and compost / sand additives shall be well mixed to the satisfaction of the Site Manager.
11. The topsoil shall be replaced at the same depth intervals at which it was excavated. The soil shall be lightly compacted and well watered.
12. Care shall be taken to keep root damage to a minimum when transplanting seedlings. Where plants have a taproot this shall not be cut. Excess foliage, flowers and side branches shall be pruned as directed by the Site Manager.
13. Coarsely chipped bark from pine trees shall be supplied and placed in a 75 mm deep layer at the bases of the trees following planting.
14. Large rocks shall be placed around the base of planted trees in fire-prone environments.
15. Plants planted at the waters edge in wetlands and rivers shall be planted as follows:
 - a. Wetland material harvested from existing wetland areas shall be transplanted directly to the newly created wetland area, along with as much soil, and surrounding material as possible.
 - b. Indigenous shrubs and small trees shall be planted 3 m apart
 - c. Palmiet shall be planted 1- 2 m apart
 - d. Bulrushes, reeds, sedges and herbs shall be planted in sods 0.4-0.5 m apart or as circumstances dictate.
16. Plants shall be watered immediately after transplanting to ensure that the soil is wet around the plants. If necessary additional soil must be added after initial watering to fill any subsidence back up to ground level.

Traffic on revegetated areas

Establishment

Irrigation

1. The Contractor shall be responsible for maintaining the desired level of moisture necessary to maintain vigorous and healthy growth. The quantity of water applied at one time shall be sufficient to penetrate the soil to a minimum depth of 800 mm, where appropriate, and at a rate that will prevent saturation of the soil.
2. Water used for the irrigation of revegetated areas shall be free of chlorine and other pollutants that will have a detrimental effect on the plants.
3. All seeded, planted or sodded grass areas and all shrubs or trees planted shall be irrigated regularly at the specified intervals.
4. Grassed areas shall require irrigation coverage of 100% and a permanent watering programme. The watering programme shall be modifiable to accommodate natural climatic variations.
5. Revegetated areas shall require irrigation coverage of 100% and a modifiable watering programme.
6. Were an irrigation system is required, the Contractor shall be responsible for its installation and maintenance.

7. In the event of a delay between the planting programme and installation of the irrigation system, a water truck shall be utilised for watering, according to a programme approved by the Site Manager.
8. Every effort shall be made to reduce irrigation overspray onto natural patches.
9. The Contractor shall water the planted areas as necessary, using a suitable fine spray which shall not disturb the vegetation and which will not cause any erosion.
10. The Contractor shall ensure that the planted area receives 25 mm of irrigation water, including rain, per week applied uniformly over the whole area.
11. The Contractor shall supply all water required and shall provide all pipework, pumps, irrigation equipment and other plant necessary. All this infrastructure and its positioning shall be approved by the Site Manager.

Fertilising

1. The Contractor shall strictly control the use of fertilisers.
2. Care shall be exercised strict control when using such materials near sensitive natural areas, so as to avoided contamination of these areas.
3. The Contractor shall manage the fertilisation programme for different areas of planting.
4. Additional fertiliser shall be applied at the intervals specified with due regard to favourable climatic conditions and the state of growth of the vegetation. Application shall be by hand or approved mechanical spreader and shall provide uniform distribution.
5. Fertilisers shall be suitably sealed and stored in a location approved by the Site Manager.

Weeding and mowing

1. The Contractor shall be responsible for controlling all woody alien/ invasive species including kikuyu grass or other invasive species. The Contractor shall ensure that all weeds and alien/ invasive species are removed as specified. *{clause not appropriate in areas infested by kikuyu}*
2. The Contractor shall be responsible for ensuring that the site remains free of kikuyu during the contract and establishment period.
3. Where seedlings occur sparsely, they should be removed manually.
4. Where dense stands of seedlings are present a foliar spray of Garlon (0.5% concentration in water with a wetting agent such as Actipron, and a blue dye to indicate area applied) shall be utilised.
5. Larger individuals of alien/ invasive species shall be controlled by cutting or lopping and treating the cut stumps with herbicide to prevent regrowth (e.g. a 2% Garlon solution in diesel oil coloured with a red dye to indicate which stumps have been treated).
6. Alien/ invasive plants and weeds shall not be stockpiled, they should be removed from the site and dumped at an approved site.
7. If, during the establishment period, any noxious or excessive weed growth occurs or other undesirable vegetation threatens to smother the planted species in the seeded or planted areas, such vegetation shall be removed.
8. The Contractor shall mow the grass in specified grassed areas or on road verges at intervals ordered by the Site Manager. Grass cuttings shall be collected and disposed of as directed by the Site Manager. The grass shall be mown at regular intervals to stimulate lateral growth. The first cutting shall take place when the grass is 50 mm high and thereafter the height shall be maintained at between 30 and 50 mm.
9. If during the establishment period, non-indigenous weeds or other non-indigenous plants are present in the planted areas, such vegetation shall be removed by hand.

Disease and pest control

1. The Contractor shall inspect all plant materials at least once a month to locate any diseased or insect pest infestation. Once the nature and species of disease/ pest has been identified the Contractor shall submit a method statement outlining the proposed method of control to the Site Manager for approval, prior to application of proposed control measure.

Pruning

1. All plant material shall be kept free from dead wood, broken branches, dead flower heads or otherwise harmful or objectionable branches or twigs. All other pruning shall be done only as directed by the Site Manager.
2. All pruning wounds greater than 12 mm diameter shall be painted with an approved tree wound paint.
3. Secateurs and other cutting equipment shall be kept sterilised to avoid spreading fungal infestations.

Tree establishment

1. Trees should be watered three times weekly in summer and once weekly in winter unless sufficient rain occurs.
2. All tree guards shall be maintained in good condition. This includes ensuring that tree ties remain taut and the replacement of all such accessories when required. Where the tree ties damage the trees, this shall be rectified immediately.
3. Trees that die or become unhealthy from any cause or appear to be in a badly impaired condition shall be promptly removed and replaced, or as soon as the weather permits, as directed by the Site Manager. All

replacements shall be trees of the same kind and quality as those originally planted.

Erosion control

1. In the case of surface wash-away or wind erosion, the Contractor shall implement remedial measures, as approved by Site Manager, as soon as possible.
2. Appropriate erosion control/ soil stabilisation measures shall be implemented.

TESTING

Seed

Commercial seed

1. Each lot of commercial seed shall be subject to sampling and testing at the discretion of the Site Manager.
2. Sampling and testing shall be in accordance with the latest Rules and Regulations under the Government Seed Act.

Harvested seed

1. Purification shall be to an agreed standard
2. The quantities and quality of bulk harvested seed shall be assessed according to seed to volume ratios.

Responsibility for establishing an acceptable cover

1. Where only indigenous seed, harvested from the site, has been used, acceptable cover shall mean that:
 - a. Not less than 60% of the area seeded shall be covered with acceptable plants; and
 - b. There shall be no bare patches greater than 800 mm in maximum dimension through the area, except where large rocks or boulders occur.
2. Where commercial grass seed is used, acceptable cover shall mean that:
 - a. Not less than 75% of the area seeded shall be covered with grass; and
 - b. There shall be no bare patches greater than 500 mm in maximum dimension.
3. In the case of grass sodding, acceptable cover shall mean that the full area shall be covered with live grass at the end of any period not less than three months after sodding. Where this cover is not achieved, the Contractor shall, at his/her own expense, plant additional grass and tend it in a similar manner to the original planting until the acceptable cover is achieved.

MEASUREMENT AND PAYMENT

Watering

1. There will be no separate payment for watering to establish or maintain the vegetation required and the Contractor shall include the costs thereof in the prices tendered for the various operations which have been scheduled.

Slope modification

1. Slope modification will be measured and paid according to the applicable items of SABS 1200D or SABS 1200DM.

Preparation of ground surfaces

By scarifying	Unit: ha
By tilling	Unit: ha

1. The unit rates shall cover the cost of scarifying or tilling the ground, as the case may be, prior to topsoiling, of shaping and finishing off, of analysing

soils samples both ground and topsoil, of watering prior to application of seed, of all labour, tools, equipment and transport and of any other thin except trimming necessary to bring the ground surface to a condition to the satisfaction of the Site Manager prior to the application of topsoil.

Commercial seed

Commercial seed

Unit: ha

1. The unit rate for commercial seed shall cover the cost of the supply of seed to the place of application, of labelling and certification, of sampling and testing, of labour, equipment and transport and of any other thing necessary for the proper execution of the work to the satisfaction of the Site Manager.

Harvested seed

Harvested seed

Unit: ha

1. The unit rate for harvested seed shall cover the cost of harvesting and transfer to place of application or storage, of all labour, tools, equipment, plant and of any other thing necessary for the proper execution of the work to the satisfaction of the Site Manager.

Fertiliser

Fertiliser (type stated)

Unit: t

1. The unit rate for fertiliser shall cover the cost of supply and application of fertiliser whether by hand or mechanical means, of all labour, tools, equipment, plant and of any other thing necessary for the proper execution of the work to the satisfaction of the Site Manager.

Soil stabiliser

Soil stabiliser

Unit: kg

1. The unit rate for soil stabiliser shall cover the cost of supply and transport to the point of application, of all labour, tools, equipment, plant and of any other thing necessary for the proper execution of the work to the satisfaction of the Site Manager.

Wetting agent

Wetting agent

Unit: kg

1. The unit rate for wetting agent shall cover the cost of supply and transport to the point of application, of all labour, tools, equipment, plant and of any other thing necessary for the proper execution of the work to the satisfaction of the Site Manager.

Brush-cut mulch

Brush-cut mulch

Unit: ha

1. The unit rate for brush-cut mulch shall cover the cost of harvesting, clearing, stockpiling and baling, of reducing the mulch to required size, of application by hand, of imprinting into soil, of all labour, tools, equipment, plant, transport and of any other thing necessary for the proper execution of the work to the satisfaction of the Site Manager.

Commercial and other non-brush cut mulches

Commercial/ non-brush cut mulches Unit: ha

1. The unit rate for commercial and other non brush-cut mulch shall cover the cost of supply to the place of application, of application by hand, 'roll-on' or mechanical means other than by hydroseeding, of all labour, tools, equipment, plant, transport and of any other thing necessary for the proper execution of the work to the satisfaction of the Site Manager.

Hydroseeding

Hydroseeding Unit: ha

1. Measurement will be by the hectare of grass established by seeding and having acceptable cover.
2. The unit rate for hydroseeding shall cover the cost of mixing and agitating of all the materials including seed, fertiliser, mulch, soil stabiliser and wetting agent required in the seed-cocktail, of applying the mixture, of watering, weeding, rehydroseeding bare patches, of all labour, tools, equipment, plant, transport and of any other thing except mowing of grass which may be necessary to establish acceptable cover and to maintain the grass during the establishment period to the satisfaction of the Site Manager.

Drill or broadcast seeding

Drill of broadcast seeding Unit: ha

1. Measurement will be by the hectare of grass established by seeding and having acceptable cover.
2. The unit rate for drill or broadcast seeding shall cover of drill or broadcast seeding, as the case may be, of watering, weeding, reseeding bare patches, of all labour, tools, equipment, plant, transport and of any other thing except mowing of grass which may be necessary to establish acceptable cover and to maintain the grass during the establishment period to the satisfaction of the Site Manager.

Planting of runners

Planting of runner (type stated) Unit: ha

1. Planting of runner will be measured by the area of grass planted and having acceptable cover.
1. The unit rate for planting of runners shall cover the cost of the supply and planting of runners, of watering and weeding, replanting of bare patches, of all labour, tools, equipment and of any other thing except mowing of grass which may be necessary to establish acceptable cover and to maintain the grass during the establishment period to the satisfaction of the Site Manager.

Sodding

Sodding Unit: ha

1. Measurement shall be by the hectare of sods planted and having acceptable cover.

2. The unit rate for sodding shall cover the cost of procuring, excavating, loading, transporting, off-loading and placing sods, or replanting of bare patches, of watering and weeding the grass, of filling gaps between sods of topsoil, of placing stakes of all labour, tools, equipment and of any other thing except mowing of grass which may be necessary to establish acceptable cover and to maintain the grass during the establishment period to the satisfaction of the Site Manager.

Trees and shrubs

Trees and Shrubs

Unit: No

1. Measurement shall be by number of trees of shrubs planted and established.
2. The unit rate for each tree or shrub shall cover the cost of supplying, storing and maintaining it in a transition nursery, of excavating the hole to the specified dimension, of supplying topsoil, wooden stakes, broken rock, manure and compost, of mixing them and other soil, of watering the plants until the end of the establishment period of supplying and planting substitute plants that have died, of maintaining the plants until the end of the establishment period of all labour, tools, equipment and of any other which may be necessary to establish acceptable cover and to maintain the tree or shrub during the establishment period to the satisfaction of the Site Manager.

Slope stabiliser

Slope stabiliser

Unit: m²

1. Measurement will be by the square metre of ground stabilised.
2. The unit rate for slope stabilised shall cover the cost of supplying, installing and fixing the stabilising material, of all labour, tools, plant, equipment, transport and of any other thing necessary for the execution of the work to the satisfaction of the Site Manager.

Mowing grass

Mowing grass

Unit: ha

1. Measurement will be by the hectare measured each time the grass has been cut on the order of the Site Manager.
2. The unit rate shall cover the cost of mowing, of all labour, equipment, plant and transport required for each cutting of the grass, and disposal of grass cuttings to the satisfaction of the Site Manager.

All other requirements of the revegetation specification

1. All other work not measured elsewhere, associated with complying with any requirement of environmental management will be measured in appropriate items and units.
2. The tendered rates shall cover any cost associated with complying with the revegetation specification and shall include for all labour, equipment, plant, transport and any other thing required to execute and complete the work as specified, described in the Schedule of Quantities or shown on the drawing(s), to the satisfaction of the Site Manager.