

ENVIRONMENTAL SITE MANAGEMENT AND REHABILITATION REQUIREMENTS

PPS2-1 INTRODUCTION

PPS2-1.1 SCOPE

This document covers most of the environmental and landscaping aspects and general conservation measures, regarding the construction sites. It also contains clauses that are generally applicable to landscape design, landscape planning, planning and site rehabilitation work coinciding with, or subject to, civil engineering construction work.

This document forms part of the Tender Documents and must be priced for.

PPS2-1.2 STRUCTURE OF THIS DOCUMENT

This document outlines the environmental actions associated with the civil components relating to DWS projects that are considered pertinent to the proper environmental management and control in terms of the legislation.

The requirements are set out according to work components, and addressed to the construction phase of the project. Specific requirements are included and relate to the condition of the dam site. The responsibility to comply with this document lies with the Contractor and his/her designated Contractor's Environmental Representative (CER). It is imperative that the Contractor appoint a full time CER, to be approved by the ECO, who will be on site permanently during the duration of the project.). **The CER should have a BTech qualification in Environmental Management and suitable experience in similar projects.**

Although this document provides very specific guidelines, requirements of the Contractor in terms of the attached EMP are also legally binding, and the contractor will need to be compliant with the specifics of this document, as well as the broader concepts described in the EMP.

PPS2-1.3 HOW THE DOCUMENT SHOULD BE USED

This document is intended to be part of the contractual documentation and the Tendering. Contractors shall take cognisance of the requirements and their price shall make provision for addressing all the items. Note that the specific environmental management items are included in the Specific Provision in the schedule for pricing.

It is for this reason that the document has been structured as follows:

- Requirements that relate to General Environmental Management common to most projects.
- Requirements that relate to the Dam site.

PPS2-1.4 COMPLIANCE WITH ENVIRONMENTAL PROTECTION SPECIFICATIONS

All persons employed by the Contractor or his sub-contractors shall abide by these requirements as they apply to the works.

Any employees of the Contractor or his sub-contractors found to be in breach of any of the Environmental Requirements may be ordered by the RE to leave the site forthwith. The order may be given orally or in writing. Confirmation of an oral order will be given as soon as practicable but lack of confirmation in writing shall not be a cause for the offender to remain on site. No extension of time will be granted for any delay or impediment to the Contractor brought about by a person ordered to leave the site.

Supervisory staff of the Contractor or his sub-contractor shall not direct any person to undertake any activities which would place such person in contravention of the Environmental Protection and Control Requirements.

The Contractor shall be fined for every tree protected by these specifications which is removed or, in the opinion of the RE / ECO, is unduly damaged by him.

Areas that require additional topsoil and seeding due to insufficient topsoil being stockpiled or due to contamination, shall be re-instated at no additional cost.

PPS2-2 ENVIRONMENTAL MANAGEMENT AND REHABILITATION OF WORKS

This section addresses all items relating to the Environmental Management and Rehabilitation of Works undertaken during the Construction phase of the Tzaneen Dam Raising Project.

PPS2-2.1 GENERAL ENVIRONMENTAL WORKS

PPS2-2.1.1 SITE ESTABLISHMENT

- a) The Contractor shall submit within three weeks of the tender being awarded, a Surface Waste Water Management Plan by which any surface water, be it from rain, excavations or any other source, is controlled and led through settling and treatment ponds where necessary. Before any water is permitted to enter natural streambeds the quality of the water shall comply with the South African Water Quality Guidelines and the Standard Requirements for Effluent and Waste Water, as set out in Government Notice 991 published in the Government Gazette 9225 of May 1984 in terms of the Water Act (Act 54 of 1956). The Contractor shall obtain approval from the RE / ECO for his design and the implementation of the Water Management Plan. (Refer also to SANS 1200 A sub clauses 5.5 and 5.6, as amended.)
- b) Provide the RE / ECO with a complete construction works programme for their approval, prior to construction.
- c) Identify, map, mark in an approved manner and monitor all specified trees, transplantable specimen trees, Red Data Species and all other relevant plant materials and protect against construction work / activities adjacent to and within the work areas.
- d) If any Cultural Historical Sites / artefacts are discovered before and or during construction the closest museum or the Cultural Historical Museum (Tel. 012 341-1320) must be contacted for record keeping and conservation / preservation actions and / or follow-up. ECO must be immediately informed.
- e) Before construction commences all social related issues / policies and structures must be in place. This may include the Project Steering Committee, labour desk, harvesting of natural resources policy, graves policy, compensation policies, the relocation action plan, royalties' policy, equity policy, recreational facilities, and housing. Any negative impacts, disputes and complaints shall immediately be brought to the attention of the RE / ECO.
- f) The identification and mitigation of graves should be determined before construction, as well as all other foreseen social impacts.
- g) The Contractor shall ensure that all the works are undertaken in such a manner that vegetation outside the Works area is not damaged under any circumstances.
- h) Trees that have been selected for conservation by the RE / ECO, shall be fenced around their crown drip lines. The fence shall be clearly marked with danger tape. No open fires shall be allowed within this fenced area, nor shall vehicles be parked underneath these trees. The area shall also not be used for material storage or as allocation for temporary buildings.
- i) No heavy equipment, machinery and vehicles may be parked under any tree.
- j) Red Data Species to be relocated / conserved prior to construction and in consultation with Nature Conservation Agencies.
- k) The land forming the site, connected with the Works, shall not be used for any other purpose whatsoever other than for the proper carrying out of the Works under the Contract.
- l) The Contractor shall place any camps that may be required for himself and his employees only on Sites approved by the RE / ECO. No trees or bushes shall be damaged or cut down by anyone for use on the works or otherwise, without the written consent of the RE / ECO and then only where and in the manner as they may direct.
- m) All areas likely to be affected by construction shall be identified and a plan produced showing the positions of all buildings, lay-down yards, vehicle wash and service areas, fuel storage areas, batching areas and other infrastructure for the approval by the RE / ECO.

- n) Slopes that need protection in terms of the sensitivity of soils and species occurring on these slopes shall be identified.
- o) The Contractor shall arrange for Environmental Awareness / Training programmes for the personnel on site, to the satisfaction of the RE / ECO.

PPS2-2.1.2 ACCESS AND SITE ROADS

- a) The design of access routes and new roads shall be planned in conjunction with RE and ECO to ensure blending in with the environment, and once finalised only the agreed roads must be used. Failure to do so will result in being blacklisted.
- b) All roads to be designed to be aesthetically pleasing, to the satisfaction of ECO.
- c) Unnecessary bush removal / damage or deviations off planned roads will result in being blacklisted.
- d) Stripped topsoil to be stored in an approved manner for later reuse in the rehabilitation process.
- e) Temporary access roads must be rehabilitated after usage by the spreading of previously stripped topsoil. The Contractor shall rip the disturbed area parallel with the contours to a depth of 300mm and vegetate according to methods approved by the RE/ ECO.
- f) Any despoiling or damage of public roads will be cleaned / made good immediately, at the contractor's cost.

PPS2-2.1.3 EROSION CONTROL

- a) Cut slope gradients to not exceed the natural angle of repose for the particular soil type. If steeper areas are encountered, other measures must be undertaken such as the construction of retaining walls or the implementation of rock protection.
- b) Generally, no slopes are to be steeper than 1:3.
- c) All exposed surfaces to be revegetated as soon as practically possible, utilising specified grass, shrub and tree species.
- d) The Contractor shall protect all areas susceptible to erosion and shall take measures, to the approval of the RE / ECO, to ensure that there is no undue storm water damage and soil erosion resultant from the Construction Establishment, Maintenance and or other activities inside and outside the construction camp and Works areas.
- e) Surface storm water shall, where possible, not be allowed to be concentrated and to flow down cut or fill slopes or along pipeline routes without erosion protection measures being in place
- f) Overflow and / or scour channels shall be lined with stone pitching along their length and at their points of discharge to prevent soil erosion. The point of discharge shall be at a point where there is dense natural grass cover.
- g) These channels shall not discharge straight down the contours but shall be aligned at such an angle to the contours that they have the least possible gradient.
- h) The Contractor shall not allow erosion to develop on a large scale before effecting repairs and all erosion damage shall be repaired as soon as possible and in any case not later than six months before the termination of the Maintenance Period to allow for sufficient rehabilitation growth.
- i) All topsoil or other material accumulated in side drains shall be removed at the same time.
- j) Topsoil that has washed away will have to be replaced by the Contractor at his own cost.
- k) The Contractor's Works Programme must clearly indicate that the rehabilitation will immediately be executed, per phase, upon the completion of the civils related works.

PPS2-2.1.4 VEGETATION CLEARANCE (Debushing)

- a) Debushing means the removal of trees and shrubbery and not topsoil, unless otherwise specified. Normally identified trees and shrubs get destumped. It may also be specified that trees must be cut at ground level and poisoned with products like Round-up, Chopper or Tordon and Diesel. In these instances, particular care is to be taken to not result in environmental damage. Manufacturers' instructions to be adhered to.
- b) Destumping shall only occur at the request of the RE / ECO. Where roots can act as erosion protection, trees should be cut as close as possible to the ground level.

- c) Prior to debushing taking place trees which are to remain in borrow and stockpile areas must be marked with hazard tape by the ECO. In all other areas containing buildings, small dams, housing, offices, water treatment plants, reservoirs and pump stations, trees for removal must be marked and approved by ECO.
- d) Remove exotic and invasive species in the way of construction during the construction and maintenance periods. Such vegetation will be identified by the RE / ECO and the method of eradication will be specified by him.
- e) Topsoil for rehabilitation contaminated with the seed of alien vegetation (i.e. black wattle), will not be permitted.
- f) Protect, maintain and monitor identified specimen trees and Red Data Species in safe areas.
- g) During the clearing of woody vegetation, no basal cover or grass and topsoil shall be removed and damage to this layer shall be minimised as far as possible.
- h) Unnecessary damage to or removal of trees identified for retention shall be monitored.
- i) Prevent vehicular and personnel access into undisturbed areas.

PPS2-2.1.5 TOPSOIL (Includes stripping, stockpiling and rehabilitation)

- a) Topsoil shall be defined as the upper soil profile irrespective of the fertility appearance, structure, agriculture potential, fertility and composition of the soil.
- b) Where possible a top layer of 300mm in depth must be stripped and stockpiled in an approved manner (normally to the higher side of a disturbed area) and above a 1:20 year flood line, in heaps not higher than 2m.
- c) Herbaceous vegetation, overlying grass and other fine organic matter shall not be removed from the stripped soil.
- d) Stripped topsoil shall not be buried or in any other way be rendered unsuitable for further use by mixing with spoil or subjected to compaction by machinery.
- e) Topsoil shall preferably be stripped when it is in a dry condition in order to prevent compaction.
- f) Topsoil of at least 200 mm in thickness shall be placed over all stripped areas as well as over disused borrow pits outside of the inundated area. Topsoil placement shall be done concurrent with construction or as soon as construction in an area has ceased.
- g) All areas onto which topsoil is to be spread shall be graded to the approximate original landform with max. Slopes of 1:2.5 and shall be ripped to 300mm depth or at least 100mm into the sub base soil prior to topsoil placement. The entire area to be top soiled shall be ripped parallel to the contours, 300mm apart and to a minimum depth of 300mm, where possible. The top soiling activity shall be executed prior to the rainy season and or to any expected wet weather conditions
- h) Stockpiled topsoil shall be placed onto the same zone from where it had been stripped. However, if there is insufficient topsoil available from a particular soil zone to produce the minimum specified depth, topsoil of similar quality may be brought from other zones of similar quality, where the topsoil requirement is less, on the approval of the RE / ECO.
- i) Topsoil shall be mounded and shaped around manholes and valve chambers which protrude above ground and over pipelines to facilitate subsequent consolidation of the backfill. The Contractor shall ensure that storm water run-off is not channelled alongside the gentle mounding, but that it is taken diagonally across it.
- j) No vehicles shall be allowed access onto or through areas that have been top soiled.
- k) After topsoil placement is complete, cleared and stockpiled vegetation matter shall be spread randomly by hand over the top soiled area as indicated by the RE / ECO.

PPS2-2.1.6 SPOIL DUMPS AND STOCKPILES

- a) Spoil Dumps
Scrap material shall either be spoiled at the designated storage site on site or sold/given to an approved scrap metal dealer for recycling as approved by the Engineer in writing.
- b) Stockpile Sites
Where there is a requirement for stockpile sites the Contractor shall:
 - Obtain written permission from the Engineer to create the stockpile;

- Submit a Method Statement for approval by the Engineer;
 - Ensure that topsoil that would have been buried as a result of the stockpile is moved to one side and replaced over the stockpile on completion;
 - Ensure that any rare local plant species as identified by the Engineer that would have been buried or destroyed are replanted elsewhere as directed by the Engineer;
 - Ensure that the spoil dumps do not have slopes steeper than 1:2;
 - Ensure that drainage is provided to control ground water exit gradients within the stockpiles such that migration of fines is kept to a minimum;
 - Ensure that surface water runoff is conducted through or over or around the stockpiles to prevent erosion damage resulting from stormwater runoff;
 - Ensure that perimeter drainage channels are provided, and lined with rock or other suitable material to prevent scour, so that runoff will be collected and conducted past the stockpiles;
 - Rehabilitate the surface of the stockpile site once it is no longer required; and
 - Ensure that bentonite slurry and/or spoil contaminated with bentonite is tested for toxicity and appropriately handled and disposed.
- c) All materials from demolition activities shall be collected and reused in the rehabilitation of the Ramadiepa Dam

PPS2-2.1.7 SLOPE PROTECTION (e.g. cut and fill, dam walls, river diversions).

- a) Slopes that need protection shall be identified by the RE / ECO and the specifications drawn up using the latest approved methods and technology.
- b) On all man-made slopes, the following approved rehabilitation methods are specified:
- (1) Replacing and redistribution of stripped topsoil to a min. depth of 200mm, unless otherwise instructed by the RE / ECO.
Ripping at 300mm but not more than 400mm apart and parallel to contours, through the placed topsoil, to a depth of 300mm at least, into the sub base soil below. Sowing of specified grass seed mixture and fertiliser, if required.
 - (2) Specified hydroseeding.
 - (3) Topsoil, plus a specified geotextile, plus a specified grass seed mixture. Here the slope must be steeper than 1(V):3(H). The mixing of the topsoil and the subsoil as well as the anchorage of the geotextile must be detailed. The openings of the geotextile must at least be 225mm² in size, preferably made of sisal or an alternative approved material, guaranteed to last at least 24 months.
 - (4) Instead of a geotextile, a 50:50% by volume rock (crusher run) to topsoil mixture approx. 200 mm thick, plus the specified grass seed mixture. The crusher run can be equal and less than 75 mm in diameter.
 - (5) A combination of 3 and 4 above.
 - (6) The slopes of any river diversion must be protected (e.g. sandbags, plastic liners and coarse rock – undersize rip-rap). Rubber dams may also be used.
 - (7) Downstream flanks of weirs and dams must be protected in such a way that it is environmental friendly with a proper drainage and anchor system designed.
 - (8) Placement and anchorage of poles for erosion control.
 - (9) Storm water berms and drains at correct intervals and positions.
 - (10) Environmentally acceptable channel lining plus a proper drainage and anchor system, topsoil and a grass seed mixture.
Note: Items 3, 4 and 5 are normally on slopes where the soils are dispersive or sandy.
 - (11) Modular retaining systems.

PPS2-2.1.8 SHAPING AND TRIMMING

- a) Areas requiring shaping involving bulk earthworks shall be excavated, filled, compacted when required and shaped to correct contours to within a tolerance of approximately 150mm. Shaping will be to roughly rounded off cuts and fills and any other earthworks to stable forms, sympathetic to the natural surrounding landscape. Such works shall be

- b) Trimming shall consist of bringing the existing or previously shaped ground to an even surface with the final levels generally following the original surface. Where machine operations are not practicable, determined by the Engineer, trimming shall be carried out using hand tools, but trimming of rock outcrops or “koppies” will not be required. Areas previously shaped shall be trimmed to within a tolerance of approximately 100mm, with all undulations following a smooth curve.
- c) This tolerance shall apply only to areas where the final contours are shown on the drawings.
- d) Trimmed surfaces shall be left slightly rough to facilitate binding with the topsoil for the natural establishment of vegetation. During trimming, all stones with any dimension in excess of 30mm in areas to be mown by machines, all stones with dimension in excess of 150mm in other areas and all other excess material, shall be removed to selected and approved dumping sites. Trimming of any areas requiring grassing shall be carried out in such a way that, following application to any topsoil and cultivation, the finished surface of the area is approximately 25mm below the top of adjacent curbing, channelling or pavement. Shaping and trimming must be tendered for in this specification.

a) Trees, shrubs and individual plants (Including Transplanting):

Plant medium mixture: 2 parts of supplier approved topsoil.
1 part of approved compost.

Positions of trees, shrubs and individual plants: Trees, shrubs and individual plants shall be planted in positions as indicated on the plant plans prepared and or approved by ECO.

If impenetrable shale, rock, clay or a high water table is encountered, making the above hole sizes impossible, the Contractor shall then immediately request the RE / ECO for the necessary guidance.

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Transplanting of natural vegetation: Natural vegetation such as trees, shrubs, cycads, ferns, groundcover, grass sods, grass runners, perennials and aquatic species on the Site, which shall be identified by the RE / ECO shall be transplanted. Transplanting activities shall preferably take place in winter and with deciduous trees, before the new growth appears. Transplanted plants shall be pruned back to limit transpiration. Plants shall also be sprayed with an evapotranspiration retardant liquid if they are evergreen. Aloes and bulbous plants shall be transplanted into similar soil conditions and to the same depth as they were before removal and shall be watered once directly after transplanting.

Method:

(a) Trees to be transplanted must be carefully removed from the soil so as to leave its original in-situ position with as large a rootball as practically possible, using their respective driplines as an indicator. The larger the tree the larger the rootball. As far as is possible, great care shall be taken to minimise disturbance of soil to remaining roots in rootball, during the lifting, moving and or transportation of all transplantable species. For trees from 1 to 1,5 m in height, trenching around the tree shall occur at least 0,5 m away from the stem. The tree's dripline is indicative of the rootball's size.

(b) The rootball shall be wrapped in Hessian or in plastic sheeting to retain the soil.

(c) The original tree's orientation to north, prior to trenching, shall remain the same when planted in its new position.

Planting of container plants: As much of the soil from the container as possible shall be retained around the roots of the plant during planting. The plant shall be planted into the specified hole size with the approved soil, compost and fertiliser mix used to refill the plant hole and shall cover all the roots and be well firmed down to a level equal to that of the surrounding in-situ material. After planting, each plant shall be well watered, adding more soil upon settlement if necessary. All trees shall be anchored as described below. Add mulch to the surface area of the bermed basin.

Anchoring and the protection of plants: All trees shall be tied to three weather resistant wooden or steel stakes anchored firmly into the ground. Two of the three stakes shall be located on the leeward side of the plant. Galvanised wire binding, 3 mm thick, covered with a 20mm diameter plastic hosepipe shall be tied tightly to the stakes, half to two thirds the height of the tree above the ground and looped around the trunk of the tree. The stakes shall be placed at least 500 mm apart and away from the stem and roots of the tree, so as not to damage the tree or its roots. This distance shall depend upon the size of the tree planted and shall be approved by ECO before staking.

Where necessary, newly planted trees must be protected against the elements like wind, frost and wild animals by means of fencing and sacking.

Pruning of trees: Where fruit trees have been specified for planting by ECO, house owners shall be instructed, by the Contractor, as to the correct method of pruning to be used for maximum results.

Fertilising of grass areas: All existing and newly prepared topsoil areas allocated for grass planting / seeding shall be soil sampled to a depth of 200 mm, if possible and sent for soils analysis to determine the type of fertiliser and rate thereof to be applied.

b) Grassing:

Flat areas: The stripped topsoil layer, when spread, must be evenly distributed to the specified thickness over the disturbed areas e.g. borrow area, and shall be ripped into the compacted sub layer parallel to the contours, all as agreed upon by the RE / ECO and then seeded by the specified seeding and seed mix.

Slopes: The slopes shall be protected as per slope protection elsewhere mentioned in this document.

Note: ECO shall, where applicable, specify the grass specie to be planted and or the seed mixture to be sown. ECO shall also specify the method of planting and or the seeding method to be used by the Contractor.

Hand-seeding: (Pipelines and other disturbed areas.) The area to be seeded must be ripped and be wet to a depth specified by the RE / ECO, before any seeding commences. The seed mixture and fertiliser mixture, if any, halved and applied evenly in two immediate successive applications perpendicular to each other when spread by hand. The seeded area shall then immediately thereafter be brushed over by in an approved manner, to the satisfaction of ECO. The seeded area shall then be well watered, if possible. All types of seeding shall preferably be done prior to the rainy season. The Contractor shall use all the appropriate tools and equipment for the ripping and sowing works.

Hydroseeding: Irrespective of the method specified, the seedbed shall be kept moist after hydroseeding, to ensure good germination.

Method A: (To be specified.)

The specified seed mix and necessary fertiliser shall be added to the required amount of water and applied using an approved hydroseeding machine.

Unless otherwise specified, the rate of application of the slurry shall not be less than 30 cubic metres per hectare and shall be applied in such a manner as to ensure even distribution of seed and fertiliser throughout.

Method B: (To be specified.)

As per Method A but using various other additional ingredients which shall be used in the slurry. It may also be specified that the Contractor designs a suitable mixture using additional ingredients.

Method C: (To be specified.)

Mulch shall firstly be applied by hand to the area to be hydroseeded. The surface shall then be hydroseeded as described under Method A.

Planting of grass runners: The areas to be planted, unless already wet, shall be thoroughly watered before planting to ensure that the soil is uniformly wet to a depth of at least 150mm if possible, when planting takes place. Approved grass runners shall be evenly planted by hand or mechanical means at a rate of at least 40 grain bags of runners per hectare. Only fresh runners shall be used and no grass runners that have been allowed to dry out shall be used. After planting, runners shall be given copious amounts of water and, when sufficiently dry, shall be rolled with a light agricultural roller and re-watered.

Sodding: Areas to be grassed by sodding shall be trimmed to the required level, raked or spiked to give a loose surface for a depth of at least 70 mm and covered with a layer of approved topsoil not more than 75 mm thick. The necessary soil amendments as indicated by soil tests shall be added to and worked into the topsoil or subsoil. The areas to be sodded shall be thoroughly watered beforehand to ensure a wet depth of at least 150 mm (if possible) at the time of sodding the surface shall be made slightly rough to ensure a good penetration of roots into the soil. Sods shall be protected against drying out and kept moist from the time of harvesting until final placement.

The first row of sods shall, where possible, be laid in a straight line and, if on a slope, start at the bottom thereof. The sods shall be tightly butted against each other, care being taken not to stretch or overlap sods. Where a good fit cannot be obtained the intervening spaces shall be filled with parts of sods or topsoil. The next row of sods shall be placed in the same way tightly against the bottom row with the joints staggered, until the full area is covered with sods. On steep slopes the sods shall be laid in position by sufficient timber stakes of at least 300 mm in length. The Contractor shall water the sods directly after placing to prevent drying out of the sods.

c) Time of soiling and seeding:

The Contractor shall undertake all soiling, seeding and grass establishment as specified at times specified, taking into account the climatic conditions prevalent in order to maximise the growth of vegetation and therefore reduce erosion.

d) Maintenance:

All grassed areas including, smaller planted areas, shall be maintained during the Establishment Period through adequate watering at frequent and regular intervals in order to ensure the proper germination of seeds and the growth of grass. This maintenance shall continue until an acceptable grass cover of 80% has been maintained and thereafter until the end of the Period of Maintenance of the grassed areas. The amount and frequency of watering shall be at the discretion of the Contractor, but shall be a minimum weekly rate of 20mm which shall be applied at 8-12 mm / h. Where hydroseeding is carried out, the commencement of watering may be postponed until a more favourable time of the year. Watering shall, however, commence and continue immediately after the seeds have germinated and growth begins.

Weeds shall be controlled by means of extraction, cutting or other approved methods.

The Contractor shall mow or cut all grassed areas to promote adequate coverage, until the end of the Maintenance Period. Mowing shall take place after the grass has shed its seed and not before the grass has fully grown. All grass cuttings shall be collected and disposed of if so directed by ECO. Mowing shall be undertaken with an approved power mower. All established grass cover shall be cut to a height of 50 mm above ground level for lawns. Where mechanical mowing is not possible, an approved method of cutting the grass by hand (e.g. by means of scythe) shall be used.

Any bare areas where grass has not taken or where the grass has dried out or where damage has occurred, shall be recultivated, planted, sodded, hand sown or hydroseeded at the Contractor's own expense.

All grassed areas shall have an acceptable grass cover of 80% at the end of the Establishment and Maintenance Periods.

During the Establishment Period and the Maintenance Period (generally 12 months) the Contractor shall be responsible for watering the plants where indicated and keeping the area immediately around the plants free from weeds and pests. The contractor shall check all plants for pests and diseases at least once every two weeks and treat the plants accordingly and if necessary. Every plant that, in the opinion of ECO, is not healthy or shows unsatisfactory growth shall be replaced at the expense of the Contractor, with the same species as originally specified, or be replaced by another specie/s as approved in writing by ECO.

From the date of commencement of grassing (whether by hydroseeding, sodding, hand-seeding, planting of runners or any other method) and / or planting of trees, shrubs and other individual plants, the Contractor shall be responsible for maintaining all grassed areas and plants. Maintenance of these areas and plants shall be such that the grass coverage and growth of individual plants is enhanced. This shall be such that a minimum grass cover of 80% is achieved and that individual plants are strong and healthy growers at the end of the Maintenance Period. Failure to achieve this coverage by following the specifications will require redesign.

PPS2-2.1.10 FENCING AND GATES

- a) Maintain and monitor fences, gates and fire breaks.
- b) In places where temporary fencing and or gates are required, the contractor shall erect such fencing and or gates when and where required by the RE / ECO, and re-erect and maintain temporary fencing and or gates as necessary. Temporary fencing and or gates shall remain in position either until it is replaced by permanent fencing and or gates or until completion of the whole of the Works, unless the Contractor requires, or the RE / ECO directs their earlier removal. The Contractor shall erect and maintain the aforementioned temporary fencing and or gates in the locations and for the period described in the Contract.
- c) If temporary fencing and or gates are removed temporary for the execution of any part of the Works, they shall be reinstated as soon as practicable by the Contractor.

- d) The clearing for permanent fencing shall be limited to the removal of trees and shrubs within 1 m of the fence line. Where possible, the fence line must be aligned to retain trees or tree groups. There shall be no removal of the grass cover or topsoil within this width.

PPS2-2.1.11 PROTECTION OF FAUNA

- a) The Contractor shall ensure that all the Works are undertaken in a manner which minimises the impact on the local fauna and shall apply the following specifications with respect to fauna management and protection.
- a) Relocate specified wild animal species, populations or nests to areas where these will not be at risk, either on-site or in other areas. Care is to be taken to not introduce animals to areas where population stress is already being felt.
- b) Under no circumstances shall any animals be handled, removed, killed or be interfered with by the Contractor, his employees, his subcontractors or his subcontractors' employees.
- c) The Contractor and his employees shall not bring any domesticated animals onto the Site.
- d) The Contractor shall ensure that the work site be kept clean, tidy and free of rubbish that would attract animal pest species.
- e) There shall be no feeding of animals on Site.
- f) The Contractor shall ensure that domestic and native animals belonging to the local community are kept away and are safe from the unprotected works.
- g) No poaching of fauna and flora shall be tolerated by the Contractor or his personnel on Site or elsewhere.
- h) The Contractor shall advise his workers of the penalty clause associated with the needless destruction of wildlife, as set out in the Animals Protection Act (Act 71 of 1962) section 2. (Fine of R2 000 and / 12 months' imprisonment).

PPS2-2.1.12 DUST & VEHICLE EMISSION CONTROL

(Refer to Occupational Health and Safety Act)

- a) The Contractor shall take precautions to the satisfaction of the RE / ECO to limit the production of dust and damage caused by dust. The minimum requirement in this regard is regular watering. The methods employed by the Contractor shall be acceptable to ECO and the contractor must supply masks and must ensure that these are used.
- b) A dust control programme shall be implemented by the Contractor to maintain a safe working environment, minimise nuisance for surrounding residential areas, prevent damage to the natural vegetation of the area and protect topsoil.
- c) The Contractor shall take appropriate measures to minimise the generation of dust as a result of his works, operations and activities to the satisfaction of the Engineer.
- d) The Contractor shall prepare and submit a Dust Control Method Statement to the Engineer within 28 days after the Commencement Date. As a minimum, the statement should address the following:
 - Schedule of spraying water on unpaved roads paying due attention to control of runoff;
 - Speed limits for vehicles on unpaved roads and minimisation of haul distances;
 - Measures to ensure that material loads are properly covered during transportation;
 - Minimisation of the area disturbed at any one time and protection of exposed soil against wind erosion;
 - Location of material stockpiles taking into consideration prevailing wind directions and location of sensitive receptors;
 - Adherence to the dust loads and protective gear stipulated in the Occupational Health and Safety Act; and
 - Reporting mechanism and action plan in case of excessive wind and dust conditions.
- e) The control measures shall also include regular and effective treatment of gravel access roads, with chemical stabilisers where required, and working areas, use of dust extractors on drilling equipment or wet drilling, water sprays on aggregate crushing and screening plants, etc.
- f) Vehicles emitting noticeable diesel fumes will not be permitted to continue working on Site. Vehicle emissions shall be monitored on a regular and on-going basis in order to ensure

that vehicles working on Site comply with legislated requirements. Vehicle emissions shall be monitored by the Contractor using a suitable portable monitoring device.

PPS2-2.1.13 NOISE CONTROL

- a) All equipment must be SABS approved. Communities must be informed by the Contractor before any blasting event. A siren to be effective within 1 km radius will be used for 10 minutes in advance of a blast and until completion of the blasting works. People operating equipment like jack hammers, or people working within excessively noisy areas, must be issued with and make use of ear plugs.
- b) Noise is to be managed within the guidelines of the EMP. The EMP does not dictate the exact maximum limit of noise propagation allowed, and such current norms and standards apply. The Engineer will be doing regular noise measurements as part of the environmental monitoring program, and should the noise be deemed to be excessive by the ECO, in conjunction with substantial community complaints, further alternative mitigation factors are to be sought, with the contractor obliging to comply with these. Excessive noise will be at the discretion of the ECO, taking noise measurements, community complaints, and the applicable norms into account, with a degree of pragmatism.
- c) Having due regard for public/private amenities and developments, the Contractor shall restrict any of his operations which result in undue noise disturbance to those public/private amenities and developments to the hours of 07:00 to 18:00 on weekdays and Saturdays or otherwise as agreed with the Engineer.
- d) Noisy operations should be combined so that they occur where possible at the same time. All construction vehicles, plant and equipment are to be kept in good repair. The Contractor shall not use sound amplification equipment on Site unless in emergency situations.
- e) The Contractor shall ensure that environmental awareness and training for all employees includes the need to minimise noise. The Contractor shall provide suitable ear protectors to all of his staff and others entering areas with high noise levels. Zones of risk shall be clearly identified with warning signs. As construction workers operate in a very noisy environment, it must be ensured that their working conditions comply with the requirements of the Occupational Health and Safety Act (OHSA) (Act No 85 of 1993). Where necessary ear protection gear should be worn.
- f) Given that construction activities will expose workers to excessive noise rating levels, a baseline noise survey shall be conducted as soon as possible following commencement of site activities. This noise survey will quantify worker exposures to noise during typical activities and allow for informed comment on the relative risks to hearing presented by various activities — i.e. identify sources of excessive noise and allow for demarcation of noise zones. A formal noise survey will also permit structuring of an appropriate audiometric examination protocol for construction workers — as required by the Noise Induced Hearing Loss Regulations — OHSA Act 85 of 1993.
- g) The Contractor shall provide all his equipment with suitable silencers such that the noise level in habitated areas adjacent to the work areas will not increase by more than 7dB (A)Leq 60 above residual background sound levels. Similarly in habitated areas adjacent to access roads maximum noise levels shall not exceed 60 dB(A)Leq 60 and maximum sound pressure level of 70 dB(A).
- h) The Contractor shall provide and maintain equipment to measure noise levels. Equipment shall meet the IEC Publication G51 standard for a Class 1 integrating sound level meter. The meter shall be recalibrated at yearly intervals by an acoustics laboratory approved by the Engineer. A set of sound measuring equipment shall be made available for use by the Engineer as required.
- i) Noise levels shall be measured at intervals of not more than one week at locations on the Site which shall be agreed with the Engineer. These locations shall include the following:
 - Batch Plant sites;
 - Areas where excavation and fill are taking place; and
 - Areas where demolition takes place (e.g drilling and cutting)
- j) The Engineer may from time-to-time instruct the Contractor to carry out more frequent testing of noise levels. Furthermore, he may require the Contractor to carry out testing in other areas of the Site.

- k) The Contractor shall keep records of all noise level measurements for the duration of the Contract. These records shall be submitted each month to the Engineer, or on the request of the Engineer.

PPS2-2.1.14 AESTHETICS

- a) Aesthetics shall be to the ECO's approval. Measures by the ECO to enhance the aesthetics shall be executed by the Contractor according to site-specific specifications. However, the minimum requirements shall be applied by the Contractor, to ensure that the development blends in with the surrounding landscape.
- b) The Contractor shall not establish any activities which, in the opinion of the RE or ECO, are likely to adversely affect the scenic quality of the area. The RE may direct the Contractor to refrain from such activities or to take ameliorative actions to reduce the adverse effects of such activities.
- c) No painting or marking of natural features shall take place. Marking for surveying and other purposes shall only be done with pegs and beacons.
- d) All cut and fill forms shall be rounded at the edges to blend them with the surrounding landforms.
- e) All packed rock and exposed rock cuttings shall be treated in order to blend their colour with the colours of the natural weathered rocks of the adjacent environment.
- f) All concrete structures shall be treated so as to blend in with the colours of the surrounding landscape. This shall be done either through painting or through treatment with a staining or coloration compound. All other permanent structures shall have the colours which are chosen to blend in with the dominant colours of the surrounding environment. Painted surfaces shall be painted with non-reflective (matt) colours.

PPS2-2.1.15 WATER QUALITY MONITORING

- a) The Engineer shall test the quality of the water in the river downstream and upstream of the construction site every month for a total dissolved solids (TDS), turbidity and pH, in order to detect any differences in water quality. Turbidity should not exceed 10 NTU's and the TSS should not be more than 100mg/l or 10% of the background concentration (upstream of disturbance).
- b) ECO shall take water samples once a month before construction commences to establish base values for further comparison.
- c) Water quality must be in accordance with the South African Water Quality Guidelines (DWAF 1996).

PPS2-2.1.16 FIRE CONTROL

- a) Prevent uncontrolled burning, the burning of rubbish and dead plant materials. The burning of waste shall not be permitted. The making of open fires or fires for cooking shall be restricted to demarcated areas on site. No vegetative matter shall be removed for firewood.
- b) The Contractor shall take adequate precautions to prevent and control veld fires to the satisfaction of RE / ECO. The contractor shall take all steps to ensure that the fire hazard on and near the Site is reduced to a minimum. The Contractor shall be held responsible for any damage to property adjoining the Site as a result of any fire caused by one of his employees. The Contractor shall issue his employees with gas and / or paraffin stoves, to be used only in designated areas, for the preparation of food.
- c) The Contractor shall take immediate steps to extinguish any fire which may break out on the construction site and shall comply with all statutory provisions which may be in force from time to time in relation to fire danger or to restrictions on the lighting of fires in the open. The Contractor shall have a supply of beaters to use in the event of extinguishing veld fires.
- d) No vegetative materials shall be randomly burnt on Site.
- e) Fire breaks shall be established and maintained around the Sites at all times. The effectiveness of the fire breaks shall be decided by the contractor and assessed by the RE. All fire breaks shall be in place by end April and end of October for the summer and winter rainfall areas respectively. Note: In areas highly susceptible to fire (plantations), insurance cover shall be compulsory and night time security guards shall be employed.

PPS2-2.1.17 ACCIDENTS

- a) The Engineer or Contractor shall have a register with contact numbers of all people employed and one relative for each, with a plan of action in dealing with any accidents. A list of all relevant emergency numbers must be kept on site, in terms of the Labour Act and the Occupational Health and Safety Act.

PPS2-2.1.18 SERVICE INSTALLATION

- a) Define services zones, in which services can be consolidated, thereby reducing the need for services being installed over large areas.
- b) Install underground services within a services zone and align route to clearly avoid retained trees and plant materials wherever possible.

PPS2-2.1.19 OFFICES AND OTHER STRUCTURES

- a) The Sustainable Utilisation Plan and permanent structures must get preference of location.
- b) Controlled residential accommodation: All labour housing to be in predetermined zones off site. Only security and emergency personnel to be housed on site. Housing to be provided with adequate cooking and sanitary facilities.
- c) Lighting: Spill-off lighting to not constitute light pollution, specifically where this is invasive on neighbours.
- d) Sanitation: Proper water-borne sewage or approved chemical toilet facilities or improved ventilated pit latrines are to be provided, to the approval of the Department of Health and ECO. Sanitary facilities to be monitored for defects and maintenance effected immediately on noticing defects. Temporary construction tent camps must be in accordance with the Dept. of Health's regulations for the appropriate sanitation, washing and drinking water facilities.)
 - Portable chemical toilets / improved ventilated pit latrines should preferably be used and located at the following work areas in quantities related to the number of users: crusher, main dam wall excavation, workshop, resting / eating areas, borrow areas, batching plant, offices and temporary housing. Facilities to be provided at spacing of 150m maximum along linear projects such as pipelines.
 - A water tank with an attached tap, permanently filled with drinking water and hand washing water shall also be provided to the above areas.
 - The design and layout of septic tanks and French drains shall be done to approved Dept. of Health standards.
 - Temporary workers housing / tents must be provided with cold and hot water showers and electricity.
 - Workers to be educated on sanitary implementation as part of environmental awareness / training programmes.
- e) Parking: Parking of vehicles to be on hard surfacing. No day to day or permanent parking to be permitted under trees. Where oil and fuel spills are expected, parking to be on impervious surface with adequate pollution control mechanisms in place.
- f) Waste disposal: Waste and litter bins to be provided at regular and strategic positions, with spacing not exceeding 100m through the work areas.
- g) Waste and litter to be removed from site on a weekly basis and disposed of at a suitably registered and licensed disposal site. Where disposal is to be on site, the necessary approvals and permits are to be in place before any such disposal takes place.
- h) Only non-toxic bio-degradable materials, which have no risk of polluting.
- i) The groundwater may be dumped and buried only in designated approved areas at acceptable depths below ground level.
- j) No waste or litter shall be burnt on site.
- k) At the mechanical workshop oil separators shall be installed.
- l) All hazardous waste shall be disposed of at a licensed waste site.
- m) Security: The camp is to be kept secure at all times. The contractor is responsible for the adequate protection of his works and materials.

PPS2-2.1.20 STORAGE**EQUIPMENT STORAGE**

- a) Provide suitable imperviously paved storage for equipment, specifically those potentially leaking fuel / oil.
- b) Provide adequately protective areas for vehicle / equipment wash down.

FUEL STORAGE

- c) Fuel to be stored in bunded safe areas, where the bund is able to accommodate 110% of the full capacity of the tank(s).
- d) Provide impervious paving around fuel tanks to accommodate fuel spills during refuelling, with appropriate protection against soil and water pollution.

CHEMICAL STORAGE

- e) Chemicals to be stored in weatherproof, secured facilities.
- f) Provide for controlled loading / unloading areas, with appropriate protection against soil and water pollution.
- g) Chemicals to be stored in weatherproof, secured facilities.

PPS2-2.1.21 POLLUTION PREVENTION

- a) The Contractor shall design, maintain and operate suitable pollution control facilities necessary to prevent discharge of water containing polluting matter or visible suspended materials into rivers, streams or existing drainage systems.
- b) Waste run-off water from vehicle wash bays, workshops and diesel / fuel tank areas to pass through oil baffles / oil traps / oils separators. The oil sludge thus collected shall be disposed of at an approved toxic waste disposal site. Water from conservancy tanks shall be drained to retention areas to allow silt settlement.
- c) Above mentioned areas should be dished concrete floor slabs which drain into conservancy tanks.
- d) All spillage of oil onto concrete surfaces shall be controlled by the use of an approved absorbent material.
- e) All oils shall be retained for re-cycling by the supplier.
- f) All soil contaminated by oil, fuel, etc. shall be collected immediately and disposed of at an acceptable disposal site to be approved by the RE / ECO.
- g) All water pumped from pipe trenches shall be piped to specially constructed silt retention ponds or areas or be evenly dispersed through and over grasslands to filter the silt laden water. The nearest point of discharge to any river, stream or drainage way shall be 50 m. At least 90 % grass cover of minimum height 150 mm shall occupy the land downslope of the discharge area.
- h) Settling dams shall be built at batching plants, vehicle wash areas, sand washing plants and crusher areas. The settling dams shall be built outside the riparian vegetation zones and rehabilitated afterwards on the approved sites.

PPS2-2.1.22 REFUSE AND WASTE CONTROL

- a) The management of solid waste on Site shall be strictly controlled and monitored. Only approved waste disposal methods shall be allowed;
- b) Littering shall be avoided;
- c) The quantities of waste generated on Site shall be minimised;
- d) Eating areas for the construction staff shall be designated and supplied with waste bins to control litter;
- e) No on-site burying or dumping or unauthorised burning of any waste materials, vegetation, litter or refuse shall occur;
- f) The bins should be emptied at least once a day;
- g) Waste from bins may be temporarily stored on Site in a central waste area that is weatherproof and scavenger-proof and which the Engineer has approved;

- h) All solid waste shall be disposed of off site, at an approved landfill site. The Contractor shall supply the Engineer with a certificate of disposal; and
- i) Waste shall be separated into domestic waste, building/construction rubble, scrap metal, oil and grease and hazardous waste and dealt with in the following manner:
 - Domestic waste
Plastic refuse bins, all with lids, shall be provided by the Contractor for all buildings. Refuse shall be collected and removed from all facilities on the Site at least twice per week. Domestic Waste shall be transported to the approved refuse disposal site off site in covered containers or covered trucks.
 - Organic waste
Refuse from food preparation and eating areas shall be collected and removed daily. Organic Waste shall be disposed of as per Domestic Waste.
 - Building/Construction waste
Inert building/construction rubble shall be disposed of off site.
 - Scrap metal
Scrap metal shall be disposed of off site.
 - Used oil and grease
Used oil and/or grease shall be removed from Site.
 - Hazardous waste
All hazardous waste shall be handled and disposed of as per the relevant Material Safety Data Sheets (MSDS). Such substances shall be disposed of in an approved hazardous waste disposal site and a disposal certificate supplied to the Engineer.

PPS2-2.1.23 LANDSCAPE REHABILITATION

- a) Monitor the construction site at least every month during construction and up to and until 1 year after the commencement of the maintenance period, 3 times yearly.
- b) Make use of indigenous species as replacement planting in natural areas.
- c) Ensure maintenance of road and fence verges for fire breaks.
- d) Maintain acceptable vegetation cover (80% coverage).
- e) Replace exotic vegetation with indigenous species appropriate to the region.
- f) Re-introduce indigenous species in disturbed areas.
- g) Eradicate invasive plant species.
- h) Remaining stockpiled topsoil not utilised elsewhere to be shaped off in an acceptable manner so as to blend in with the local surrounding area.
- i) Clear and completely remove from Site all constructional plant, equipment, surplus rock and other materials, foundations, plumbing and other fixtures, rubbish and temporary works of every kind. Areas thus cleared shall be graded and scarified to restore the ground to its original profile as near as practicable before topsoil placement and re-vegetation commences.

PPS2-2.1.24 NON-COMPLIANCE

- a) Late completion

The works will be carried out according to a formal programme, to be approved by all parties involved. Adherence to the programme will be enforced by the RE / ECO. Failure to meet the programme will result in the Contractor being blacklisted as well as delayed payment of retention moneys.

- b) Non-compliance with these requirements

These requirements have been drawn up in terms of the current legislation. Failure to comply with these guidelines will constitute a civil offence in terms of the relevant acts, and will be handled according to the provisions of the acts. The following acts and legislation apply:

- Conservation Act. (Act 73 of 1989.
- NEMA. (Act 107 of 1998.)

- Water Act, 1998. (Act 36 of 1998.)
- Forestry Act.
- National Parks Act 57 of 1976.
- Lake Areas Development Act 139 of 1975.
- Mountain Catchment Areas Act 63 of 1970.
- Environment Conservation Act 73 of 1989.
- Forest Act 122 of 1984.
- Ramsar Convention.
- Bonn Convention.
- National Monuments Act 28 of 1969.
- National Monuments Act 28 of 1969.
- Defence Act 44 of 1957.
- Sea Fishery Act 12 of 1988.
- Sea-Shore Act 21 of 1935.
- Sea Birds and Seals Protection Act 46 of 1973.
- Conservation of Agricultural Resources Act 43 of 1983.
- Various provincial ordinances, as applicable.

The guidelines will be enforced and monitored by the RE / ECO and SES.

PPS2-3. MEASUREMENT AND PAYMENT

Payment for the Contractor's obligations in respect of environmental requirements shall be made through two payment items described below. The two payment items together shall include full compensation for all personnel (including a dedicated full time Environmental Officer), costs and incidentals in respect of compliance with and enforcement of the environmental specifications.

PPS2-3.1	Contractor's initial obligations in respect of the Environmental Specifications	Lump Sum
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The full amount will be paid in one instalment only once the RE and ECO have approved all method statements on the project.

PPS2-3.2	Contractor's time related obligations in respect of the Environmental Specifications	Lump Sum
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Payments of incremental amounts (calculated by dividing the sum by the contract duration in months as slated in the Appendix to the Form of Tender) will be authorised in each of the subsequent progress certificates for the authorised duration of the contract.