TENDER NO: RW10396648

TENDER FOR THE CONSTRUCTION OF EMBANKMENT STABILISATION AT INTAKE 1 AT ZUIKERBOSCH PUMPING STATION

TECHNICAL PART

TABLE OF CONTENTS

SECTION D
SPECIFICATIONS

SPECIFICATIONS

INDEX

PART 1 – GENERAL SPECIFICATION

General

The Standard Specification for all associated civil work shall be the SABS 1200 – Standardized Specification for Civil Engineering Construction.

The Standardized Specifications applicable to this Contract are listed in the Project Specification.

These Specifications are not issued with this volume but are available at the Contractor's expense from: SA Bureau of Standards, Private Bag X191, Pretoria, 0001.

Scope

This Project Specification is set out in two sections:

Section A: PROJECT SPECIFICATION covers a general description of the project, the facilities available and the requirements to be met.

Section B: VARIATIONS AND ADDITIONS TO THE STANDARDISED SPECIFICATIONS covers variations to the standardized specifications and particular specifications which are applicable to the contract.

Status

Should any requirement of the Project Specification conflict with any requirement of the standardized or particular specifications, the requirements of the Project Specifications shall prevail.

PART 2 : PROJECT SPECIFICATION - SECTION A

PS 1 DESCRIPTION OF THE CONTRACT

PS 1.1 Scope of Contract

A previous river embankment stabilization project was undertaken in 2007/2008 at the Zuikerbosch Pumping Station and comprised the installation of hybrid piles, gabion baskets and a concrete block retaining wall near Engine Room 1. Embankment erosion has occurred during the flooding of the Vaal River north of Engine Room 1 (opposite the workshops) over the last number of years.

A geotechnical investigation was conducted in 2019 and 2020 and comprised the drilling of rotary core boreholes and DPSH testing to determine the soil and rock conditions at the river embankment opposite the workshops. The embankment slope is steep and comprises loose sandy soils and uncompacted fill.

Stormwater drainage must also be addressed on site as uncontrolled runoff flows over the river embankment resulting in erosion.

The Contractor's obligations under the contract will comprise the following:

- Removal of vegetation and flattening of the river embankment to a 1V:1,75H slope.
- Placement of large 1m size rip rap rock along the length of the embankment to stabilize the slope and to provide erosion protection up to the 1:50 year flood line.
- Remedial work along the embankment including placing a rock fill buttress along a section of slope which had previously slipped.
- Remedial work at a steel catwalk which leads to the east access portal tunnel below the Vaal River where significant soil erosion has occurred.
- Remedial work at an existing gabion chute where the outlet has been damaged during river flooding.
- Construction of 3 new gabion chutes along the river embankment to direct stormwater runoff into the Vaal River.
- Construction of a stormwater diversion gabion wall to direct runoff into the new gabion chutes.
- Raising the floor height of the stormwater attenuation dam and excavating and backfilling a sinkhole next to the dam.

The Contractor’s obligations under the contract include provision of all labour, materials, plant, temporary work and extras, whether of a temporary or permanent nature required for such construction and completion as far as the necessity for providing the same is specified in or to be inferred from the contract.

PS 1.2 Duration of the Contract

It is expected that the contract will commence in June 2020 and on the assumption that the contract is placed as stated, the Contractor shall undertake to commence work on site within 14 days and complete the work within 20 weeks after appointment.

PS 2 SUBCONTRACTING

Should the Contractor wish to appoint subcontractors, each subcontractor must have a CIDB contractor grading designation governed by his field of expertise and value of work to be carried out. However, this does not imply a contract between the Employer and the Subcontractor, or a responsibility or liability on the part of the Employer to the Subcontractor. The employer holds the Contractor responsible for the work and any other effect that may result from this contract whether undertaken by the Subcontractor or the Contractor himself.

PS 3 DESCRIPTION OF THE SITE

PS 3.1 Site Location

The site of the work is on the Gauteng side of the Vaal River at the Zuikerbosch Pumping Station which is located approximately 4km south of Three Rivers. The site locality is shown in Figure 1 at the back of the Tender Document.

PS 3.2 Site Boundaries

The Contractor shall confine his construction activities to within the boundaries of the site as determined by the Engineer and Rand Water. The contractor shall not extend his activities outside these boundaries unless the Engineer has specifically authorized the extension in writing.

PS 4 CONSTRUCTION PROGRAMME

The contractor is required to furnish a realistic construction programme showing the order of procedure and methods which he proposes to use in executing the Works within 14 days from the date of delivery of the letter of acceptance.

The contractor shall submit an updated copy of the programme at each site meeting clearly indicating actual versus scheduled progress.

PS 5 SITE MEETINGS

The Contractor shall attend site meetings with representatives of Rand Water and the Engineer at dates and times determined by Rand Water.

PS 6 PROTECTION OF WORK

The contractor shall in particular keep free from water those portions of the site as are necessary to allow the Works to be carried out in dry conditions.

The contractor shall supply, operate and maintain such pumping plant as may be necessary to remove, control and dispose any water, including seepage, which may enter the Works.

The Engineer may take or order the Contractor to take additional precautions where he is not satisfied with the Contractor's arrangements. The contractor shall not be relieved of his responsibility by reason of the Engineer taking or ordering additional precautions, or by reason of the engineer failing to do so. All expenditure incurred by Rand Water in taking any additional

precautions or otherwise in remedying the default of the Contractor and making good of the Works shall be recovered from the moneys due to the Contractor.

PS 7 FEATURES REQUIRING SPECIAL ATTENTION

PS 7.1 Existing Features

Care must be taken that no damage to the nearby existing buildings and related infrastructure at the north (Gauteng) river bank is incurred.

Should existing buildings and related infrastructure or services be damaged due to the contractor's negligence, the cost of repairs will be for the contractor's account.

PS 7.2 Quality Plan

The Contractor will be required to submit a detailed integrated construction and quality plan to undertake the Works to the Engineer or the Engineer's representative for approval. A Method Statement of how the work will be undertaken must be submitted to the Engineer or the Engineer's representative for approval, prior to commencing with the work.

PS 11 APPLICABLE STANDARDIZED SPECIFICATIONS

Although not bound in or issued with this document, the following SABS 1200 Standardized Specification for Civil Engineering Construction as approved by the Council of the South African Bureau of Standards shall apply to this Contract. The Contractor shall be in possession of these Standardized Specifications and their related SABS 0120 Code of Practice which apply equally and shall keep a copy of each on site for reference by him and the Engineer for the duration of the Contract.

For "Workmen's Compensation Act" read "Compensation for Occupational Injuries and Diseases Act, 1993 (Act No.130 of 1993)" wherever it appears. For "Machinery and Occupational Safety Act" and "Mines and Works Act" read "Occupational Health and Safety Act, 1993 (Act 85 of 1993)" wherever they appear.

For "maintenance period" read "Defects Liability Period" in terms of Clause 53.1 of the General Conditions of Contract for Construction Works 2004, wherever it appears.

SABS 1200A - 1986	:	General
SABS 1200AD - 1984	:	General (Small Dams)
SABS 1200 C - 1980 (as amended 1982)	:	Site Clearance
SABS 1200 D - 1982 (as amended 1983)	:	Earthworks
SABS 1200 DB - 1982	:	Earthworks (Pipe Trenches)
SABS 1200 DE - 1984	:	Small Earth Dams
SABS 1200 DK - 1995	:	Gabions and Pitching
SABS 1200 DM - 1981	:	Earthworks (Roads, Subgrade)
SABS 1200 GA - 1982	:	Concrete (Small Works)
SABS 1200 ME - 1981	:	Subbase

Copies of SABS 1200 Standarized Specifications are available from the South African Bureau of Standards, Private Bag X191, Pretoria, 0001.

PS 12 APPLICABLE TECHNICAL SPECIFICATIONS

No Rand Water Technical Specifications shall apply to this Contract.

SECTION B : VARIATIONS AND ADDITIONS TO THE STANDARDIZED SPECIFICATIONS

PSA GENERAL (SABS 1200A-1986)

PSA5 CONSTRUCTION

PSA5.1 SURVEY

PSA5.1.1 Setting out of the Works

The Contractor is responsible for the setting out of the Works from the information given on the drawings or from information provided by the Engineer. The Contractor is to place pegs (of adequate type and in sufficient quantity) as basic control points, appropriate to the nature of the Works.

Benchmarks that are to be disturbed by the temporary or permanent works must be referenced by the Contractor, prior to the disturbing thereof, at the Contractor's cost.

If at any time during the progress of the Works, any error shall appear or arise in the position, levels, dimensions or alignment of any part of the Works, the Contractor, on being required to do so by the Engineer, shall at his own expense rectify such error to the satisfaction of the Engineer.

PSA5.5 DEALING WITH WATER ON THE WORKS

The Contractor's attention is drawn to the fact that, apart from normal dealing with stormwater and seepage water which may influence the construction of the temporary or permanent Works, special arrangements and de-watering measures will have to be made to control and/or remove water for the protection of excavations.

PSA5.8 ACCESS TO THE WORKS

The Contractor shall provide temporary access to the Works and to the dumping areas/ spoil site, as may be required by him and to the approval of the Engineer.

PSA5.9 WORKMAN’S COMPENSATION ACT

All labour employed on the Site shall be covered by the Workmen's Compensation Act. The Contractor shall pay in full, such amounts, as are due in terms of the Act, including the payment of the necessary levies.

The manner in which Workman’s Compensation will be handled, shall be resolved by the Contractor with all the relevant parties at the commencement of the Contract.

PSC SITE CLEARANCE (SANS 1200 C)

PSC3 MATERIALS

PSC3.1 DISPOSAL OF MATERIAL AND DEBRIS

Material obtained from clearing of surface vegetation shall be disposed of by the Contractor in a manner and to a registered landfill of the Contractor's choice. The burning on Site of vegetation and debris will not be permitted.

PSC5 CONSTRUCTION

PSC5.1 AREAS TO BE CLEARED AND GRUBBED

Site clearance shall only be done after receipt by the Contractor of the Engineer's written approval to that effect on areas designated by the Engineer. Site clearance prior to bulk excavation shall only be performed on areas designated by the Engineer on a plan and in writing. The area to be cleared shall be the minimum area required for the execution of the Works but shall include areas identified for the stockpiling of excavated materials and topsoil.

PSD EARTHWORKS (SANS 1200 D)

PSD5.2.2.3 Disposal and spoil site(s) (Sub-clause 5.2.2.3)

Except when it is required and designated by the Engineer that surplus and unsuitable material from excavations shall be disposed of on the Site, such material shall be disposed of to Spoil Sites.

PSD6 TOLERANCES

PSD6.1 POSITION, DIMENSIONS AND LEVELS FOR BULK EARTHWORKS

Except that finished levels shall comply with Sub-clause 6.1(b)(3) for Degree of Accuracy II, a degree of accuracy III shall be applicable to bulk earthworks.

PSD7.2 Testing Procedure

A minimum of 3 moisture/density tests are to be carried out per G6 backfill layer at the steel catwalk. The Engineer reserves the right to call for the calibration of the nuclear device against sand replacement tests at his discretion. In the event of any dispute the sand replacement method shall be the only recognised method of density testing.

PSDE SMALL EARTH DAMS (SANS 1200 DE)

PSDE8.3.5 RIP RAP

Stone for rip rap shall be uniformly graded, rock fragments or quarry stone, not susceptible to disintegration or excessive weathering (which includes loss of mass, strength or the development of cracks) on exposure to the atmosphere or water. It shall be free from soft material such as sand, clay, shale or organic material and shall not contain an excessive amount of elongated stone.

The stone shall be obtained from an approved source, which may include quarry overburden, which shall be blasted to produce the required size of stone fragments. It is not intended that any screening of rockfill should be undertaken, but dust and fines should be eliminated as far as possible.

Rip rap shall consist of a course or courses of selected rock placed on bank slopes and toes, river and streambeds and other localities where protection of this type may be required. The grading, minimum dimensions and mass of the rock shall be as specified or as detailed in the Drawings.

The surface of areas to receive rip rap shall be neatly trimmed to line and level and all loose material compacted. The perimeters of rip rap shall be protected by the construction of either rock toes, rock-filled trenches, walls or other structures, as may be required. Perimeter trenches shall normally be backfilled with rock of the same size and

quality as used in the construction of the rip rap it adjoins, but any cavities shall be filled with smaller material and the whole backfill shall be well compacted.

Dumped Rip Rap

Dumped rip rap shall be constructed by dumping the stone on the prepared surfaces, spreading it by means of bulldozers or other suitable earth-moving equipment and trimming it to the required lines and levels. Rip rap shall be placed in a manner to ensure that the larger rock fragments are uniformly distributed and the smaller rock fragments serve to fill the spaces between the larger rock fragments in such a manner as will result in well keyed, densely placed, uniform layers of rip rap of the specified thickness.

Rip Rap Slope Protection

Where rip rap protection is required on slopes which are too steep to allow the dumped method (b) above to be used the rip rap shall be placed in layers concurrently with the construction of the fill. The rip rap shall be placed in a manner to ensure that the larger fragments are uniformly distributed and the smaller fragments fill the spaces between the larger fragments forming well keyed densely placed, uniform layers of rip rap of the specified thickness.

All stone for rip rap shall:

(a) be hard, dense, durable rock that is free from weathering, cracks, seams and other defects that will cause rapid or excessive deterioration or degradation during service,

(b) conform to the grading given on the Drawings, and

(c) contain not more than 5% by weight of undesirable material such as individual pieces of rip rap which do not meet the quality requirements as specified and which can be visually differentiated from satisfactory pieces, plus dirt, sand, clay and rock fines.

The rip rap shall generally comply with the requirements for stone for concrete given in SANS 1083:2006 with the following modifications:

(i) The specific gravity of the material used for rip rap shall be greater than 2,6.

(ii) The 10% FACT value shall be not less than 110kN.

(iii) The wet 10% FACT value shall be not less than 75% of the determined dry value.

(iv) The loss after 5 cycles measured by the modified magnesium sulphate soundness test (see Clause 10.9.3.4) shall not be greater than 8%.

Measurement for rip rap will be the net volume of rip rap in place calculated from the lines and levels on the Drawings including rock in trench backfill for the different type and critical mass of stone specified.

The rate tendered shall include full compensation for the preparation of surfaces, and for furnishing, transporting, handling and placing the rip rap. The rates shall also include full compensation for all other incidentals necessary for completing the work as specified.

PSDK GABIONS AND PITCHING (SANS 1200 DK)

PSDK8.2.2 GABIONS

(a) General

Gabions shall be fabricated of wire mesh of the size and type and selvedge as specified below and on the Drawings. The gabions shall be subdivided into cells by wire mesh diaphragms and will be of two types:

i) Cages, which are generally used for the construction of gabion walls, shall be subdivided into cells by diaphragms spaced at 1.0m intervals.

ii) Mattresses, which are generally only used as single-layer aprons in revetments, channel linings, chutes etc., and in which the maximum width shall be 2.0m and the maximum depth 0.5m, shall be subdivided by diaphragms into cells having a width of 600mm or 1.0m, as specified in the Bill of Quantities.

(b) Selvedges

The cut edges of all mesh used in the construction of gabions, except the bottom edge of diaphragms and end panels, shall be selvedged with wire having a diameter of at least 0.5mm more than that of the mesh wire. Where the selvedge is not woven integrally with the mesh but has to be fastened to the cut ends of the mesh, it must be attached by binding the cut ends of the mesh about it so that a force of not less than 8.5kN applied in the same plane as the mesh, at a point on the selvedge of a mesh sample 1m long, is required to separate it from the mesh.

(c) Diaphragms and End Panels

The diaphragms and end panels shall be selvedged on the top and vertical sides only. The end panels shall be attached by twisting the cut ends of the mesh wires at the bottom of the panel about the selvedge on the base of the gabions. Similarly, the diaphragms shall be attached by twisting the cut ends of the mesh to the twisted joints of the mesh at the base of the gabion. In each case the force required to separate the panels from the base should not be less than that required to break the mesh over the same length.

(d) Binding and Connecting Wire

Sufficient binding and connecting wire must be supplied with the gabions to perform all the wiring operations to be carried out in the construction of the gabion work. The diameter of wire shall be 2.0mm.

(e) Tolerances

A tolerance on the specified diameters of all wire shall be ± 2.5%. The length of gabions is subject to a tolerance of ± 3% and the width of gabions is subject to a tolerance of ± 3% up to a maximum of 25mm.

(f) Preparation of the Foundation and Surface for Bedding

The bed on which the gabions are to be laid prior to filling shall be levelled to a depth as shown on the Drawings or as directed by the Engineer so as to present an even surface. If necessary, cavities between rock protrusions shall be filled with approved material. Where required a foundation trench along the toe of the revetment or wall shall be excavated to the dimensions shown on the Drawings or indicated by the Engineer.

(g) Assembly

The methods of erection, stretching, aligning, wiring and filling the gabions shall generally be in accordance with the manufacturer's instructions as approved by the Engineer, but nevertheless sufficient connecting wire braces shall be provided and tensioned between the vertical sides of each of the outer visible cells to prevent the deformation of cages as they are being filled with stone.

It is essential that the corners of gabion cages be securely wired together to provide a uniform surface and to ensure that the structure does not appear as a series of blocks or panels. Consecutive courses of cages should preferably be "bonded" as in brickwork in order to avoid the coincidence of vertical joints.

(h) Rockfilling

i) Cages in retaining walls: particular care shall be exercised in packing visible faces of gabion cages, for which only selected stone of adequate size shall be used and be so prepacked that a fair-faced finish is obtained. The filling of cages shall be done in stages in order to prevent deformation and bulging. Cages shall be filled to just below the level of the wire braces, after which the braces shall be twisted to provide tension. Care must be taken to ensure that consecutive layers of cages being filled are filled evenly to a level surface ready to receive the next course.

ii) Mattresses used in revetments and aprons: The filling of the 0.3m and 0.5m gabions forming aprons and revetments shall be carried out by spreading random stones on the first layer and using selected stones for the top layer so as to present a dry stone-pitched surface.

Anchor bars will be installed to anchor the cages and mattresses.

Stone for gabions and Reno mattresses shall be clean, hard, durable, unweathered boulders or rock fragments. Rocks or stone shall be of such a shape that a stable protection structure of the required thickness is formed. Rounded boulders or cobbles shall not be used. No rock particles shall exceed the maximum size given in Table DK/1 and at least 85% of the rocks shall have a size equal to or bigger than the minimum size given in Table DK/1.

TABLE DK/1

ROCK SIZE ACCORDING TO LARGEST DIMENSION OF THE ROCK

Depth of Cage (m)	Minimum (mm)	Maximum (mm)
0.2	75 * (95**)	125
0.3	100	200
0.5	100	250
1.0	100	250

* Using 60 x 80mm mesh
** Using 80 x 100mm mesh

All stone intended for use on any particular part of the Works shall receive the prior approval of the Engineer and includes rock fill.

Measurement will be the net volume calculated from the dimension of the gabions given on the Drawings or ordered by the Engineer.

The rate tendered shall include full compensation for the supply of all materials, including rockfill, wire mesh gabions, binders, connectors, for loading, transporting and off-loading, for the assembly and filling of the gabions, levelling and preparation of areas to receive cages or mattresses, and for any other work necessary for the construction of the gabions.

PSGA **CONCRETE (SANS 1200 GA)**

PSGA8.4.3 GROUTING

Grout shall generally consist of a suitable mixture of a homogeneous balanced blend of cement, additives, admixtures and water that comply with this specification. No lumps shall be permitted in the grout mixture. All grout mixtures specified in this specification shall be by volume and shall be batched by volume unless batching by weight is approved by the Engineer.

Where grout is required to fill large cavities the Contractor shall obtain the Engineer's instructions regarding the possible use of a filler, such as sand that complies with this specification. The use of admixtures to control the rate of setting of the grout shall be subject to the approval or direction of the Engineer. The proportions of cementitious material, water and sand and any admixtures used shall be as approved or directed by the Engineer and shall be varied to meet the characteristics of each hole as determined by conditions encountered from time to time.

Grout that has not been injected within two hours after mixing shall not be used for grouting, and shall be disposed of as directed.

The method of batching shall be such that the ingredients are proportioned to an accuracy of within 5%. Where sand is added to the grout, frequent bulking and moisture content

determinations shall be made and the necessary adjustments made to the batching proportions.

Prior to introducing the mixed grout into the grout circuit, it shall be mixed for at least 5 minutes, as measured from the instant when all the ingredients have been added.

Grouting shall only be performed in a workmanlike manner by competent and experienced workmen. The Contractor shall submit details of the qualifications and experience of the supervisors and operators he proposes to use to the Engineer for approval before starting any grouting operation.

Grouting of the first three primary holes and subsequent splitting holes shall be used to confirm the grout mix, pressures and proposed grouting procedure.

The Contractor shall take all steps necessary to ensure that no pollution is caused as a result of drilling and grouting work. Before work commences the Contractor shall submit details of the methods proposed to be employed to cope with grout spillages, which may occur as a result of defective equipment, burst pipes or any other reason, for the approval of the Engineer.

The Contractor shall adequately provide for the disposal of all wash water and waste grout resulting from all grouting operations. Such water and grout shall not be allowed to contaminate the Works and shall not be allowed to flow into any watercourse until it has passed through settlement ponds or tanks approved by the Engineer.

The Contractor shall give all facilities to the Engineer for inspecting the operations at all times and for checking the results.

Unless otherwise approved all grouting which has been started shall be performed without interruption until completed.

Regulation measurements and supervision of pressure shall be carried out continuously. Pressure increases shall be controlled and the Contractor shall take care that the pressure does not reach too high a value, keeping it within such limits as will ensure that it does not cause cracking or deformation of rock or concrete. The Contractor shall be entirely responsible for any damage which may occur due to the use of pressures in excess of the maximum allowable pressure for any particular stage as directed by the Engineer.

Grout samples shall be taken from time to time as directed by the Engineer for the purpose of performing density and strength tests.

PART 3 - SHE SPECIFICATION

3.1 HEALTH AND SAFETY

The work under this contract is defined as “Construction Work” and regulated under the Occupational Health and Safety Act, 1993 (latest amendment) and the Contractor shall adhere to all the legislative requirements as per Construction Regulations 2003.

The Contractor shall provide for the cost of the health and safety measures in the Bill of Quantities.

The Contractor shall notify the Department of Labour in writing of the construction activities before work commences.

The Site Representative shall be present on site during working hours and any orders or instructions which the Engineer may give to the Site Representative shall be deemed to have been given to the Contractor.

The Contractor shall develop and demonstrate to Rand Water a suitable and sufficiently documented Health and Safety plan based on the safety specification.

The Contractor shall if called upon to do so, submit a preliminary Health and Safety Plan, failing to do so may lead to the disqualification of this tender.

3.2 HEALTH AND SAFETY SPECIFICATION

a) The Contractor shall appoint and notify the Engineer in writing, a competent Site Representative, with the duty of supervising the construction work.

b) The Contractor shall appoint and notify the Engineer in writing, a competent person to perform a risk assessment before construction work commences, during construction work and which shall form part of the Health and Safety Plan.

c) The Contractor shall appoint and notify the Engineer in writing, a competent person responsible for the preparation of a fall protection plan, amending, maintaining and adherence thereto.

d) The Contractor shall execute the necessary steps to prevent uncontrolled collapse of new or existing structures and no part shall be loaded in a manner which would render it unsafe.

e) The Contractor shall appoint and notify the Engineer in writing, a competent person responsible that all formwork and support work structures are adequately designed, erected, supported, braced and maintained.

f) The Contractor shall appoint and notify the Engineer in writing, a separate competent person with relevant experience for each of the operations whose first duty will be to, and who shall, supervise all stages in the operation.

g) All explosive power tools shall comply to and be in accordance to Construction Regulations 2003 (latest amendment).

h) The Contractor shall ensure that all construction vehicles and mobile plant are maintained, operated and used in a safe manner by competent operators.

i) Notwithstanding the provision of the Electrical Installations Regulations (Government Notice R2920 latest amendment) and the Electrical Machinery Regulations, (Government Notice R1953 latest amendment), the Contractor shall take the necessary steps to provide a safe environment for construction work to proceed.

j) Notwithstanding the provisions for the use and storage of flammable liquids as determined in the General Safety Regulations (Government Notice No R1031, latest amendment), flammable liquids shall be stored in such a manner to prevent fires and explosions.

k) The Contractor shall provide lifejackets for workers where construction work is done near or over water.

l) Notwithstanding the provisions of the Environment Regulations for Workplaces (Government Notice No R2281, latest amendment), implement and maintain suitable housekeeping.

m) Notwithstanding the provisions for the stacking of articles in the General Safety Regulations (Government Notice R1031, latest amendment) the Contractor shall appoint a competent person in writing, responsible for supervising all stacking and storage on site.

n) Subject to the provisions of the Environment regulations for Workplaces (Government Notice No R2281, latest amendment), the Contractor shall take appropriate measures to avoid risk of fire.

o) Notwithstanding the provisions of the Facilities Regulations (Government Notice No R1593, latest amendment), the contractor shall provide clean and maintained facilities as required.

p) The contractor shall take all reasonable steps to ensure co-operation between all sub-contractors to enable each sub-contractor to comply with provisions of the Act.

PART 4 - ENVIRONMENTAL MANAGEMENT PLAN ("EMP") & ENVIRONMENTAL AUTHORISATION ("EA") (WHERE APPLICABLE)

ENVIRONMENTAL MANAGEMENT PLAN

4.1 Introduction

This is a generic Environmental Management Plan (EMP) based on information, conditions and specifications of typical Rand Water construction activities and is not restricted to a single or specific site of construction.

Should further site information and/or environmental requirements become available as part of the Environmental Impact Assessment (EIA) process, it will be included to form part of this EMP where necessary.

Provisions already included within the General and Specific Conditions of Contract have not been included in this EMP. The guidelines contained in this EMP and the provisions contained within the General and Special Conditions will apply. The guidelines should be implemented as appropriate for each work site.

The contractor shall comply with the requirements described in this EMP and any additions and/or alterations hereto.

All maintenance, construction and associated activities should be confined to the applicable servitude and identified or indicated areas for construction purposes.

4.2 Objectives

The objectives of the EMP are to:

Ensure that the maintenance and construction of the works are carried out within the concepts of Integrated Environmental Management; and

Identify measures, which, may be necessary to manage and ensure mitigation of environmental impacts associated with the maintenance and construction of the works.

4.3 Scope

The management of impacts on the environment is described below.

4.3.1 Soil Preservation

i. If any Borrow Pit is to be established it should be done in accordance with the Minerals Act No. 51 of 1993, as amended. An Environmental Impact Assessment must take place prior to the development of any borrow pit.
ii. Topsoil (minimum 300 mm) should be temporarily stockpiled separately from subsoil or rocky material when areas are cleared (the topsoil contains both the seedbed and the

nutrient supply necessary for plant growth: if mixed with subsoil layers the usefulness of the topsoil for rehabilitation of the site will be lost).

iii. The stockpiled topsoil should be replaced as the final soil layer.
iv. No imported topsoil should be used as the final soil layer.
v. The surface topsoil should not be used for bedding material.
vi. Stockpiled topsoil should not be compacted; this includes the movement of any form of vehicle over the stockpiles.
vii. Stockpiled soil should be protected by erosion-control berms if exposed for a period of greater than 14 days during the wet season.
viii. Soil stockpiles should be located away from rivers, streams, drainage lines and areas of temporary or permanent inundation.
ix. Soil should be exposed for the minimum time possible once cleared of vegetation to avoid prolonged exposure of soils to wind and water erosion.
x. Topsoil stockpiles must not be contaminated with oil, diesel, petrol, waste or any other foreign matter, which may inhibit the later growth of vegetation and micro-organisms in the soil.
xi. Vehicular access must be limited across rocky outcrops and ridges.
xii. Appropriated measures must be taken to stabilize all cut and fill surfaces on completion of construction.
xiii. Erosion and donga crossings must be dealt with as river crossings. Appropriate soil erosion and control procedures must be applied to all embankments that are disturbed and destabilized.
xiv. Soil contaminated with oil must be appropriately treated and disposed of at a permitted landfill site or regenerated using bio-remediation methods.
xv. Run-off must be reduced and controlled by channelling water into existing surface drainage system.
xvi. No impediments to natural water flow other than approved erosion control works should occur.

4.3.2 Water, rivers, streams and wetlands

i. Construction disturbances in the vicinity of riverine areas, riverbeds and river crossings must be restricted to the absolute minimum.
ii. Adequate sedimentation control measures shall be instituted at any river crossings where excavations or disturbance of riverbanks, riverbeds or drainage lines of wetlands may take place.
iii. Sedimentation weirs shall be placed downstream of the crossing.
iv. During construction at river crossings as much as possible of the full flow of the river should be allowed to pass downstream. In-river bed diversions should be used rather than the construction of new channels.
v. During construction through a wetland, the majority of the flow of the wetland should be allowed to pass downstream.
vi. Due to the sensitivity of the riverbanks, erosion control measures must be employed both during and after construction. Erosion matting must be used on all exposed/disturbed riverbanks and these must allow for the re-growth of the natural vegetation.
vii. The surface of the work area should be re-profiled so that the pre-excavation drainage patterns and hydrology are restored.

viii. Use appropriate structures and methods to confine accidental spillages such as the construction of berms and pans, or through the application of surface treatments that neutralize the toxic effects prior to the entry into a watercourse.
ix. Oil absorbent fibres must be used to contain oil spilt in water.
x. Vehicular traffic across wetland areas must be avoided.
xi. Dumping of foreign materials and/or object in rivers, streams and wetlands is not allowed.
xii. The wetland area and/or river must not be drained, filled or altered in any way including alteration of a bed and/or, banks, without prior consent from the DWAF. The necessary licenses must be obtained in terms of Section 21 and 22 of the National Water Act, 36 of 1998 from DWAF.
xiii. No fires or open flames are allowed in the vicinity of the wetland, especially during the dry season.
xiv. No swimming, washing (including vehicles and equipment), fishing or related activity is permitted in a river stream or wetland.

4.3.3 Air Pollution

i. Dust generation should be kept to a minimum by the implementation of dust suppression measures where appropriate. Special care should be taken in areas where the route passes close to inhabited areas.
ii. Water used for the purpose of dust suppression must be used in quantities that will not result in the generation of run-off.
iii. Speed limits must be implemented in all areas, to limit the levels of dust pollution.
iv. Waste must be disposed of, as soon as possible at a municipal transfer station, skip or on a permitted landfill site. Waste must not be allowed to stand on site to decay, resulting in malodours.
v. No fires are allowed as smoke from such fires could cause a nuisance to landowners and other parties in the vicinity of the construction site.

4.3.4 Pollution control

i. Soil and water pollution through fuels, oils or other substances must be avoided.
ii. No maintenance work on earth moving equipment, vehicles or other large machinery should take place within the vicinity of river or stream crossings, wetlands or other sensitive sites as may be identified during the EIA process. Such work should only take place on and within a designated workshop area.
iii. Littering, discarding or burying of any material (excluding the pipeline) on site should not be allowed
iv. All machinery is to be maintained and in good working order so as to prevent soil or water pollution from oil, fuel or other leaks.
v. Contaminated water should be appropriately disposed of and should not be allowed to discharge to the surrounding environment. This includes water used for cleaning of pipes and which may contain rust, chemical residues, etc.

4.3.5 Noise and other disturbances

i. Construction activities should be restricted to between 07:00 and 17:00 Monday to Friday, unless otherwise approved by the Engineer, subject to the Contractor having obtained appropriate consent of the affected landowners and affected parties.

ii. The Contractor must inform all adjacent landowners of any after-hour construction activities and any other activity that could cause a nuisance e.g. the application of chemicals to the work surface.
iii. No loud music is allowed on site and in construction camps.

4.3.6 Social and cultural

i. Open liaison channels should be identified and developed to ensure that all queries, complaints from all affected persons/parties may be addressed with the shortest possible delay. This is particularly important in the vicinity of habitation.
ii. If work is to take place on privately owned land, i.e. not belonging to Rand Water, the landowners should be informed of all work to take place and permission should be obtained before any work commences.
iii. Access to the site should be restricted to employees of the contractor.
iv. Construction staff should be educated as to the need to refrain from destruction of animals and plants, as well as from indiscriminate defecation, waste disposal and or pollution of local soil and water resources.
v. Contractors to ensure that labourers remain within the servitude and construction areas, especially at sensitive sites such as river crossings, wetland areas and koppies.
vi. Machine/vehicle operators should receive clear instructions to remain within identified access routes and operational/construction areas. Penalties should be introduced to ensure that this requirement is adhered to.
vii. Staff should be informed that access to adjacent/private properties is strictly off-limits, and that it will be deemed a serious offence if any person is found trespassing (i.e. no fences should be jumped at any time and no gates are to be opened without permission from the relevant landowner.
viii. The Contractor's crew must be easily identifiable by means clothing, identification cards or other methods.
ix. Sub-Contractors and their employees must comply with all the requirements of this document and supporting documents e.g. the Contract document that applies to the Contractor. Absence of specific reference to the sub-contractor in any specification does not imply that the sub-contractor is not bound by this document.
x. The Contractor must arrange for all his employees and those of his sub-contractors to be informed of the requirements of the environmental report before the commencement of construction to ensure:

a) A basic understanding of the key environmental features of the work site and environments, and
b) Familiarity with the requirements of this document and the site-specific report.

xi. The Contractor must maintain a detailed complaints register, together with solutions and appropriate actions taken where necessary, which must be forwarded to the authorities on request.
xii. The contractor should ensure proper supervision of employees at all times.

4.3.7 Aesthetics

i. Measures to limit damage to the natural environment will be sustained by the Contractor.

ii. Trees and tall shrubs must be protected from damage to provide a natural visual shield.
iii. The clearing of all sites must be kept to a minimum and surrounding vegetation must, as far as possible, be left intact as a natural shield.
iv. Marking and painting of natural features will not be allowed.
v. Above ground structures (valve chambers, hammer tanks, reservoirs, etc.) should be located in areas where the visual impact from roads, houses etc is minimized.
vi. Above ground structures could be treated or painted to blend in with the natural environment.
vii. Cut and fill areas, river and stream crossings and other soil stabilization works must be constructed to blend in with the natural environment.
viii. Natural outcrops, rocky ridges and other natural linear features, must not be bisected. Vegetation on such features must, as far as possible, not be cut unless absolutely necessary for construction.
ix. Excavated material must be flattened (not compacted) or removed from site. No heaps of spoil material must be left on site once the Contractor has moved from site.
x. Any complaints regarding the appearance of the construction site must be recorded and addressed promptly by the Contractor.

4.3.8 Archaeology and cultural Sites

i. All finds of human remains must be reported to the nearest police station.
ii. Human remains from the graves of victims of conflict, or any burial ground or part thereof which contains such graves and any other graves that are deemed to be of cultural significance may not be destroyed, damaged, altered, exhumed or removed from their original positions without a permit from the South African Heritage and Resource Agency (SAHRA).
iii. Work in areas where artifacts are found must cease immediately.
iv. Under no circumstances must the Contractor, his/her employees, his/her sub-contractors or his/her sub-contractors' employees remove, destroy or interfere with archaeological artifacts. Any person who causes intentional damage to archaeological or historical sites and/or artifacts could be penalized or legally prosecuted in terms of the National Heritage Resources Act, 25 of 1999.
v. All known and identified archaeological and historical sites must be left untouched. A fence at least 2m outside the extremities of the site must be erected to protect the site.
vi. Work in the area can only be resumed once the site has been completely investigated and the Engineer has given his consent to do so.

4.3.9 Fauna and flora

i. It is possible that red data animal and plant species may occur within the construction area and it is imperative that disturbance be minimized and that labourers do not pouch any animals.
ii. Construction activities should avoid destruction of areas of extensive animal habitation.
iii. If animal habitats, e.g. warrens, have to be destroyed, this should be done with prior approval from the environmental site officer or the environmental consultants.
iv. Excavations left open during construction should be checked periodically (especially once the rain season begins) such that animals falling in can be safely removed and released away from construction activities.

v. No species of animal may be poached, snared, hunted, captured or willfully damaged or destroyed.
vi. Snakes and other reptiles that may be encountered on the construction site must not be killed unless the animal endangers the life of an employee.
vii. Anthills and/or termite nests that occur must not be disturbed unless it is unavoidable for construction purposes.
viii. Disturbances to nesting sites of birds must be minimized.
ix. Disturbances to nesting, breeding and roaming sites of animals in or adjacent to wetland areas must be minimized.
x. The Contractor must ensure that the work site is kept clean and free from rubbish, which could attract pests.
xi. Only vegetation falling directly in demarcated access routes or construction/operational areas should be removed to provide essential access for construction purposes.
xii. The spread of alien vegetation must be minimized.
xiii. A minimum servitude width should be used on koppie slopes.

4.3.10 Infrastructure

a) Services

i. The relevant authorities must be notified of any interruptions of services. In addition, care must be taken to avoid damaging any services.
ii. The integrity of property fences must be maintained.
iii. All crossings of services must be protected, raised or relocated with the consent of the relevant authority.

b) Storage

i. Proper storage facilities should be provided for the storage of oils, grease, fuels, chemicals and any hazardous materials to be used during construction.
ii. These storage facilities (including any tanks) should be stored on an impermeable surface and surrounded by a bund wall, in order to ensure that accidental spillage does not pollute local soil or water resources.

c) Equipment

i. Refueling and maintenance of vehicles should occur within specified depots only. Working/fuel transfer areas within these depots should be underlain by an impermeable surface and should have grease traps to ensure that no spillage of greases, oils or fuels occur into local soil or water resources.
ii. All equipment must be inspected regularly for oil or fuel leaks before it is operated. Leakages must be repaired on mobile equipment or containment trays placed underneath immobile equipment until such leakage has been repaired.

d) Hazardous materials

i. An inventory of any hazardous chemicals/substances (including that within equipment), along with a description of possible ill effects and treatment of health-related afflictions resulting from accidents, should be kept in the storage area as well as by the appropriate manager.

ii. Workers should at all times be made aware of the health risks associated with any hazardous substances used (e.g. smoking near refueling depots), and should be provided with appropriate protective clothing/equipment in case of spillages or accidents.

e) Traffic and access

i. Any traffic diversions should be undertaken with the approval of all relevant authorities and in accordance with all relevant legislation.
ii. Wherever possible traffic diversion should only take place on existing disturbed areas and remain within the existing road reserve.
iii. Traffic diversion routes may need to be rehabilitated as per the rehabilitation guidelines as described by the relevant authority.
iv. Access routes to the servitude and work site should be controlled such that only vehicles and persons directly associated with the work at a particular section of the pipeline have access.
v. Temporary access roads must not be opened until required and must be restored to its former state as soon as the road is no longer needed.

f) Construction camp and stockpile areas

i. The siting of construction camp(s), offices, workshops, maintenance and refueling sites and materials storage areas should not be in the vicinity of sensitive sites e.g. areas of periodic water logging (at any point in time), draining lines, rivers, stream, wetlands, steep slopes and areas of extensive animal habitation.
ii. These facilities should be constructed in areas, which are already disturbed (e.g. adjacent to existing/old buildings; within an existing servitude).
iii. The erection of signs alongside or near roads should comply with all relevant legislation and meet with the approval of the relevant authorities.
iv. Stockpiling of pipes, bedding, padding and other material must not be carried out near sensitive areas such as river and stream crossings, wetland areas, steep slopes and koppies or other areas which may be identified by the environmental consultants as part of the EIA process.
v. Stockpile areas must remain within the appropriate servitude.

g) Other

i. Cement and other potential environmental pollutants should be stored and mixed on an impermeable substratum. There should be no opportunity for environmental contamination.
ii. The Contractor must ensure that accidental spillage does not pollute soil and water resources.
iii. Chemical toilet facilities should be managed and serviced by a qualified company. No disposal or leakage of sewerage should occur on or near the site or during its transport.
iv. All material imported for use on site, e.g. for fills, cement mixing etc. should be obtained from a legal, commercial source. No waste or mine dump material may be used on site without prior approval from the environmental consultant.

4.3.11 Safety

a) General

i. Measures must be taken during thunderstorms to protect workers and equipment from lightning strikes.
ii. All tall structures must be properly earthed and protected against lightning strikes.

b) Fire

i. Smoking should be prohibited in the vicinity of flammable substances.
ii. The contractor should ensure that fire-fighting equipment is available on site, in particular where flammable substances are being stored or used.
iii. Any welding or other sources of heating of materials should be done in a controlled environment wherever possible and under appropriate supervision, in such a manner as to minimize the risk of veld fires and/or injury to staff.
iv. Fires started for comfort (warmth) is prohibited, due to the risk of veld fires and risk to adjacent property owner's lands.
v. No waste material must be burned.
vi. No fires or open flames are allowed on site unless directly used for construction purposes, e.g. acetylene blowtorch.

c) Excavations

i. Excavations should only remain open for a minimum period of time and during this time they must be clearly demarcated so as to prevent accidental ingress of people, animals or vehicles.
ii. Where there is any obvious well used paths or tracks which cross the work area, care must be taken to ensure thoroughfare without injury or prejudice to those using the path.
iii. Open trenches and excavations must be clearly demarcated. If excavations place the public at risk these sites must be fenced.
iv. The residents directly affected by open trenches must be notified of the dangers. This will be done during the site-specific phase.

d) Blasting

i. If any blasting is to take place all surrounding landowners and businesses, as appropriate, should be informed of the blasting plan at least two (2) weeks prior to blasting.
ii. Full precautions (mats etc.) should be taken during all blasting operations to avoid missile damage to society and the environment, in particular any riparian (riverine) vegetation.
iii. Any areas where the blasting residue (nitrates etc.) could accumulate should be avoided or washed out.
iv. All the provisions of the Explosives Act, 26 of 1956 and the Minerals Act, 50 of 1991 must be complied with.

4.3.12 Waste

a) Solid Waste

i. Littering on site and the surrounding areas is prohibited.
ii. Clearly marked litterbins must be provided on site. All bins must be cleaned of litter regularly.
iii. All domestic waste generated in the site camp(s) should be disposed of in a proper manner off site, and only at legal dumping sites.
iv. All construction waste should be either a) removed from site and disposed of at an appropriate municipal dumping site, or b) temporarily stored in a clearly demarcated area on site for future use.
v. The position of such a site should be approved by the Environmental Consultants or Environmental Site Officer prior to the disposal of such wastes.
vi. Contaminated soil must be treated and disposed of at a permitted waste disposal site, or be removed and the area rehabilitated immediately.
vii. Any spoil generated in the process of maintaining, repairing or laying of the pipelines should only be stockpiled within the appropriate servitude or within areas approved by the environmental consultants or environmental site officer.
viii. Spoil which is to remain on site after the completion of the contract must be shaped, trimmed and vegetated as soon as possible.
ix. All waste generated during construction, other than natural materials, e.g. soil and rock, should be disposed of in a proper manner off site, i.e. at a registered site.

b) Liquid Waste

i. All wastes generated by the ablution and kitchen facilities shall be disposed of in a proper manner off site.
ii. The site should be serviced by properly managed and maintained toilet facilities. Chemical toilet facilities should be managed and serviced by a qualified commercial company. The contractor is to ensure that permanent on-site toilet facilities are properly maintained and are in working order. No disposal, or leakage, of sewage should occur on or near the site.
iii. The waste generated under i) and ii) above must be discharged into a municipal sewer system, at a discharge point and in a manner approved by the local authority.
iv. All waste oils, greases, fuels etc. should be collected and disposed of in an appropriate manner off site. The contents of grease traps or other waste oil, grease and/or fuel disposal/storage containers, should under no circumstances be voided to the surrounding area.

c) Hazardous Waste

i. No hazardous materials must be disposed of in the veld or anyplace other than a registered landfill for hazardous material. Hazardous waste must be stored in containers with tight lids that must be sealed and must be disposed at an appropriately permitted hazardous waste disposal site. Such containers must not be used for purposes other than those originally designed for.
ii. The Contractor must maintain a hazardous material register.

4.3.13 Rehabilitation

i. Once construction is completed, all redundant infrastructure, waste and construction materials should be removed from site by the contractor and disposed of in an appropriate manner, i.e. at a registered site.
ii. Disturbed areas, which are to remain free of infrastructure, should be rehabilitated to a state comparable to the surrounding vegetation (this should be determined and prescribed by the environmental consultant).
iii. Areas compacted by vehicles during construction may have to be scarified (ripped) to allow penetration of plant roots and the re-growth of natural vegetation.
iv. Large disturbed areas may need to be rehabilitated as per a rehabilitation plan. This may make provision for the control or removal of invasive vegetation at specified time intervals.
v. All drainage deficiencies including abandoned pit latrines and waste pits must be corrected.
vi. Borrow pits must be re-shaped into even slopes and surfaces to blend with the natural terrain and topsoil must be replaced.

PART 5 - SITE RULES & REGULATIONS

5.1 Existing Services

Exact positions of existing services must be confirmed on site prior to commencement of excavations. Care must be taken by the contractor not to damage any services.

5.2 Accommodation

No housing is available. The contractor shall make his own arrangements to house his employees outside of the boundaries of the site and transport them to the works. The Contractor shall ensure that he complies with all the laws and regulations applicable to labour, accommodation and amenities and shall make his own arrangements with the authorities to house his employees.

5.3 Sanitation

The Contractor shall provide latrine accommodation on the site in the form of chemical toilets for the use of persons employed on the works. All latrine accommodation provided shall be efficient, sanitary, non-offensive and all sanitary fees payable to any local authority shall be paid by the Contractor.

5.4 Water

A sufficient supply of water will be provided by Rand Water, free of charge, from one convenient point near the site. The Contractor shall make his own arrangements for the distribution of the water.

5.5 Compressed Air

No compressed air is available on the site.

5.6 Electricity

Electricity is available on the site. The Contractor shall make his own arrangements for the supply of electricity to the working area subject to the approval of the Engineer.

The site power cable rating and installation shall comply with SABS0142.

5.7 Roads

The Contractor shall provide and maintain, at his cost, any temporary access roads, deviations, gangways and drains as may be necessary for the proper execution of the Works and shall confine his transport to these roads and the roads indicated by the Engineer.

5.8 Security

The site is subject to strict security control and the contractor and his staff shall comply fully with any requirements imposed by Rand Water's security personnel. Permits, issued by the Station Manager of the applicable station, are required for admission to the site and before starting work on site, the Contractor shall make arrangements with the Engineer for the issue of the permits for himself and his employees. For purposes of identification, all personnel will be required to carry their identity documents and shall present these on request. The Contractor and his employees will be confined to the site and action will be taken against anyone outside the prescribed areas.

5.9 Buildings and Structures

Care should be taken not to damage the existing structures. The contractor shall bear the cost of repair of existing infrastructure damaged due to his activities.

5.10 Possession of Site

The engineer's representative will issue a Site Access Certificate to the Contractor prior to site establishment by the Contractor. This will be done after the Station Manager of the applicable station is satisfied that all the contractor's staff that will be working on site has acquainted themselves with and attended all compulsory site safety induction courses presented at the applicable station. Proof of contractor staff attending these courses shall be kept, on site, by the Contractor and shall be presented to the Engineer or any Rand Water representative on request.

SECTION E
DRAWINGS

DRAWINGS

The following drawings shall form part and be read as part of the Contract:

Drawing No.	Rev. No.	Drawing Description
RA29311-001	**T**	**GENERAL ARRANGEMENT**
RA29311-002	**T**	**EROSION REMEDIATION BELOW STRUCTURES NEAR EAST ACCESS PORTAL**
RA29311-003	**T**	**STORMWATER DIVERSION AND PROTECTION WEST OF WORKSHOPS**
RA29311-004	**T**	**EMBANKMENT SECTIONS**
RA29311-005	**T**	**GABION CHUTE AND STORMWATER DIVERSION GABION WALL DETAILS**

Note that these drawings are for tender purposes only.