Project Ref: 2012/Phase 2/Report-01-GP-Draft

PHASE 2 - PLANNING REPORT
DRAFT REHABILITATION PLAN

GAUTENG SOUTH
C22D

November 2012

Environmental Affairs
Water Affairs
Agriculture, Forestry and Fisheries

SANBI
Biodiversity for Life

EXPANDED PUBLIC WORKS PROGRAMME
CONTRIBUTING TO A NATION AT WORK

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South African National Biodiversity Institute

REHABILITATION PLAN FOR GAUTENG SOUTH, C22D GAUTENG

MAIN REPORT

Draft

November 2012

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.....	.....
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SOUTH AFRICAN NATIONAL BIODIVERSITY INSTITUTE
Planning, Monitoring and Evaluation
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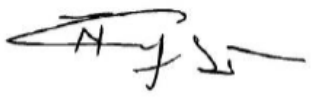

.....
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SANBI Provincial Coordinator: Gauteng Province

South African National Biodiversity Institute:
Planning, monitoring and evaluation

DISCLAIMER

- The intervention points and wetland boundary polygons provided in this report are based on the shapefiles that have been provided by SANBI. The datasets included in the Phase 1 Reports have been updated by the Wetland ecologists and verified by the SANBI Provincial Co-ordinators. All reasonable efforts have therefore been made to ensure that the data is accurate. However Aurecon does not accept responsibility for any remaining inaccuracies in the spatial data provided to us, which may be reflected in this report.
- Aurecon accepts responsibility for the engineering design to the extent that this is based on available information. The available information is limited to what could be interpreted during a single site visit of no longer than a few hours. No geotechnical, topographical, geomorphologic and other engineering related surveys have been undertaken to inform the design. This is non-standard engineering practice and therefore Aurecon is indemnified by the Client and does not accept responsibility for the associated risk of failure from the above limitations or any damages that may occur.
- This Rehabilitation Plan must not be amended without prior consultation and approval from the responsible Aurecon Engineer, SANBI Provincial Coordinator and the SANBI Planning, Evaluation and Monitoring Manager.
- All changes must be motivated using the standard change request form supplemented with additional information as necessary.
- Aurecon is indemnified against any associated damages and accepts no liability associated with the construction and implementation of engineering interventions due to Aurecon being instructed to have limited contact with the implementer during the construction phase resulting in our inability to diligently supervise and assess any progress.
- The Client confirms that by accepting these drawings or reports, he acknowledges and accepts the above mentioned limitation of Aurecon's liability.

ASSUMPTIONS AND LIMITATIONS

In compiling this report, the following has been assumed:

- The information provided in this report is based on site visits that have been undertaken by the project team (Environmental Assessment Practitioner (EAP), Engineer, Wetland Ecologist, and SANBI Provincial Coordinators (PC)) and their subsequent input into the Reporting, which includes intervention design drawings, the wetland assessment, in addition to input from SANBI's PC. It is understood that this information is sufficient forthe authorisation processes and associated Phase 3 (Implementation phase).This data and relevant information has informed the findings and conclusions of this report.

- The level of planning carried out for each project area was dependant on the information contained in the finalPhase 1 reports (August 2010), and in some cases,previously prepared Rehabilitation Plans (2012); along with the Phase 2 site visits that were undertaken during 2012. This document should therefore be read in conjunction with any existing, project-related reports (i.e. draft Phase 1 or previous rehabilitation plans).
- Information contained in this Report will be used during Phase 3 to guide and inform the Implementing Agents on design and construction specifications as part of Phase 3. Implementing Agents will thus use this Rehabilitation Plan and the information contained therein when constructing all interventions, the designs of which have been included in this Report.
- SANBI's Provincial Coordinators will be undertaking the landowner engagement and have obtained the requisite landowner consent forms required as part of Phase 1 and 2 of this project. These include:
  - WW(0): Standard operating procedure,
  - WW(1): Wetland survey and Inspection consent,
  - WW(2): Terms and Conditions for carrying out wetland rehabilitation,
  - WW(3): Wetland Rehabilitation Activities Consent, and
  - WW(4): Property Inspection Prior to Wetland Rehabilitation.
- SANBI have provided all relevant information and documentation required tocompile thisRehabilitation Report and the associated Basic Assessment Report.
- Rehabilitation activities should not be carried out until the final Wetland Rehabilitation Plan has been approved and formally signed off by SANBI.
- The implementation of this rehabilitation plan must take into account all relevant provisions of Working for Wetlands (WfWet) Best Management Practices and Construction Environmental Management Plan, the recommendations of the Basic Assessments submitted for Environmental Authorisation and the requirements of the Environmental Authorisation (EA)for the project.
- DEA's prerequisite to increase the requirement of percentage of funding to be spent on labour within the WfWet programme, has been taken into consideration by the project team during the planning process for wetland rehabilitation.
- Due to the dynamic nature of site conditions and associated biophysical changes within wetlands, this wetland rehabilitation plan is only valid for the 2013/14financial year. Where appropriate interventions that have not been previously implemented or included inthe 2009/10, 2010/11, 2011/12 and 2012/2013Project Implementation Plans (PIPs) were reviewed and where necessary re-designed for inclusion into the 2013/14wetland rehabilitation plan. This wetland rehabilitation plan therefore supersedes all previous plans for this project and only interventions from this plan should be included in the 2013/14PIP.
- Should it be necessary to exclude interventions from the rehabilitation plan, the prioritisation of interventions across the project should strictly be followed.

Gaps in knowledge

- The information in this Report is based on existing available information and input from SANBI's PC, the specialist Wetland ecologists, the Engineer, EAP as

well as comments from Interested and Affected Parties (I&APs). Until this DraftReport has been finalised and signed off by SANBI, the content of the Report should be considered as preliminary.

- Designs for the rehabilitation interventions have been developed for site conditions as at the time of the planning site visits. Should site conditions change before the designs are implemented, changes to the design may be necessary. In this case, project implementers may require the assistance of a professional engineer.
- The cost of construction at each project location will vary due to factors such as the local cost and availability of material, transport distances etc. The unit costs have been agreed with SANBI's PCs based on their knowledge of past projects and include an allowance for escalation.
- The labour intensive targets identified in this project are based on assumed productivity rates for various components of the construction process. This will vary in practise and will require regular monitoring to ensure that labour targets are attained.

Aureconacknowledges the authorship of any information contained in this document from previous planning years, to the previous provider: Land Resources International (LRI).

This Report must be read in conjunction with the following reports for this project:

1. FinalPhase 1 Report–August 2010; and
2. Other Phase 2 Planning Reports which include the:
    a. Basic Assessment Report,
    b. Mutale Rehabilitation Plan (February 2011), and the
    c. Wetland Assessment (**Appendix A** of this report).

DISTRIBUTION LIST:

		FOR ACTION	**FOR INFORMATION**	**RECEIVED PRIOR TO RELEASE**
John Dini	Director: Freshwater Programme		✓	
Umesh Bahadur	Manager: Planning, Monitoring and Evaluation		✓	
Eric Munzhedzi	Implementation Manager		✓	
Thilivhali Nyambeni	SANBI Provincial coordinator	✓		✓
National stakeholders				
Refer to **Appendix G** below			✓(email notification)	
Provincial stakeholders & I&APs				
Refer to **Appendix H** below.			✓(email notification)	

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Context of the information contained in this Rehabilitation plan in terms of the NEMA information requirements for BARs

The environmental assessment process undertaken to date has culminated in the production of a Draft Basic Assessment Report (BAR) and associated draftrehabilitation plans, which provide detailed information relevant to the projects in the Limpopo Province.

In order to guide and focus the reader, the Table below indicates where in the DraftPhase 2 reports (the BAR and/ or the DraftRehabilitation Plan) the requisite information as outlined in NEMA can be found:

Table 1:Context of report in terms of NEMA requirements

REGULATION	CONTENT AS REQUIRED BY NEMA	SECTION /ANNEXURE
22(2) (a)	(i) Details of the EAP who prepared the report; and	***Introduction of the Draft Gauteng BAR***
	(ii) Details of the expertise of the EAP to carry out basic assessment procedures;	***Introduction of the Draft Gauteng BAR***
22(2) (b)	A description of the proposed activity;	***Section B Draft Gauteng BAR; Draft Gauteng South Rehabilitation Plan***
22(2) (c)	A description and a map of the property on which the activity is to be undertaken and the location of the activity on the property,	***Draft Gauteng South Rehabilitation Plan***
22(2) (d)	A description of the environment that may be affected by the proposed activity and the manner in which the geographical, physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity;	***Draft Gauteng South Rehabilitation Plan***
22(2) (e)	An identification of all legislation and guidelines that have been considered in the preparation of the basic assessment report;	***Section B of the Draft Gauteng BAR***
22(2) (f)	Details of the public participation process conducted in terms of regulation 21(a) in connection with the application, including –	***Section D of the DraftGauteng BAR***
	(i) The steps that were taken to notify potentially interested and affected parties of the proposed application;	***Section D of the Draft Gauteng BAR***
	(ii) Proof that notice boards, advertisements and notices notifying potentially interested and affected parties of the proposed application have been displayed, placed or given;	***Appendix E of the DraftGauteng BAR***
	(iii) A list of all persons, organisations and organs of state that were registered in terms of Regulation 55as interested and affected parties in relation to the application;	***Appendix E of the Draft Gauteng BAR***
	(iv) A summary of the issues raised by interested and affected parties, the date of receipt of and the response of the EAP to those issues;	***Appendix E of the Draft Gauteng BAR***
22(2) (g)	A description of the need and desirability of the proposed activity	***Executive summary Section B of Draft Gauteng BAR***

REGULATION	CONTENT AS REQUIRED BY NEMA	SECTION /ANNEXURE
22 (2) (h)	A description of identified alternatives to the proposed activity that are feasible and reasonable, including advantages and disadvantages that the proposed activity or alternatives will have on the environment and on the community that may be affected by the activity;	***Executive summary Section B of Draft Gauteng BAR***
22(2) (i)	A description and assessment of the significance of any environmental impacts, including cumulative impacts, that may occur as a result of the undertaking of the activity or identified alternatives or as a result of any construction, erection or decommissioning associated with the undertaking of the activity;	***Section E of the Draft Gauteng BAR***
22(2) (j)	Any environmental management and mitigation measures proposed by the EAP;	***Section E of the Draft Gauteng BAR***
22(2) (k)	Any inputs made by specialists to the extent that may be necessary; and	***Wetland assessment attached to the Draft Gauteng South Rehabilitation Plan***
22 (2) (l)	A draft environmental management programme containing theaspects contemplated in regulation 33	***Appendix G of the Draft GautengBAR***
22 (2) (m)	A description of any assumptions, uncertainties and gaps inknowledge	***Context of BAR, Draft Gauteng BAR***
22 (2) (n)	A reasoned opinion as to whether the activity should or should notbe authorised, and if the opinion is that it should be authorised,any conditions that should be made in respect of that authorisation	***Section E of the Draft Gauteng BAR***
22 (2) (o)	Any representations, and comments received in connection withthe application or the basic assessment report	***Appendix E, Draft Gauteng BAR***
22 (2) (p)	The minutes of any meetings held by the EAP with interested andaffected parties and other role players which record the views ofthe participants	***Appendix E, Draft Gauteng BAR***
22 (2) (q)	Any responses by the EAP to those representations, commentsand views	***Appendix E, Draft Gauteng BAR***
22(2) (r)	Any specific information required by the competent authority.	**-**
22 (2) (s)	Any other matters required in terms of sections 24(4)(a) and (b) ofthe Act.	**-**
22(3) (a)	A BAR must take into account any relevant guidelines; and;	***Section B of the Draft Gauteng BAR***
22(3) (b)	A BAR must take into account any practices that have been developed by the competent authority in respect of the kind of activity which is the subject of the application.	**-**

ABBREVIATIONS

BAR	Basic Assessment Report
BID	Background Information Document
BMP	Best Management Practise
CARA	Conservation of Agricultural Resources Act
CEMP	Construction phase Environmental Management Programme
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DWA	Department of Water Affairs
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMP	Environmental Management Programme
EPWP	Expanded Public Works Programme
GA	General authorisation in terms of the NWA
IA	Implementing Agent
I&APs	Interested and Affected Parties
IDP	Integrated Development Plans
NHRA	National Heritage Resources Act
NEMA	National Environmental Management Act
NEM: BA	National Environmental Management Biodiversity Act
NEM: PAA	National Environmental Management Protected Areas Act
NFA	National Forests Act
NWA	National Water Act
OHSA	Occupational Health and Safety Act
PC	Provincial Coordinator
PIP	Project Implementation Plan
RHP	River Health Programme
SANBI	South African National Biodiversity Institute
SANParks	South African National Parks
SDF	Spatial Development Framework
SPWP	Special Public Works Programme

GLOSSARY OF TERMS

Auger An instrument used for boring or perforating soils or rocks, in order to determine thequality of soil, or the nature of the rocks or strata upon which they lie, and for obtainingwater (Wetland Management Series: WET-Origins, WRC Report TT 334/08, March 2008).

Avulsion An abrupt change in the course of a stream from one flow path to another.

Bedload Sediment that is transported by being rolled or bounced along the bed of the stream (Wetland Management Series: WET-Origins, WRC Report TT 334/08, March 2008).

Bedrock The solid rock that underlies unconsolidated material, such as soil, sand, clay, orgravel (Wetland Management Series: WET-Origins, WRC Report TT 334/08, March 2008).

BAR A report as described in regulation 23 of the EIA regulation, 2006 that describes the proposed activities and their potential impacts.

BID A short document describing, and inviting I&APs to comment on, the proposed activities for which authorization is sought.

BMP Procedures and guidelines to ensure the effective and appropriate implementation of wetland rehabilitation by WfWet implementers.

Biophysical The biological and physical components of the environment (Wetland Management Series: WET-Origins, WRC Report TT 334/08, March 2008).

Catchment All the land area from mountaintop to seashore which is drained by a single river andits tributaries.Each catchment in South Africa has been subdivided into secondarycatchments, which in turn have been divided into tertiary catchments. Finally, all tertiary catchmentshave been divided into interconnected quaternary catchments. A total of 1946 quaternarycatchments have been identified for South Africa. These subdivided catchments providethe main basis on which catchments are subdivided for integrated catchment planningand management (consult DWAF [1994]) (Wetland Management Series: WET-Origins, WRC Report TT 334/08, March 2008).

Collation Report A report describing the Basic Assessment process followed for a provinces and collating the Basic Assessment reports for thevarious WfWet Projects within a province.

EAP The individual responsible for the planning, management and coordination of the environmental impact assessments, strategic environmental assessments, environmental management plans and/or other appropriate environmental instruments introduced through regulations of NEMA.

Eco-log A cylindrical wire mesh sleeve filled with organic material and/or soil used to prevent and/ or repair minor erosion.

Ecosystem Services Or 'ecoservices' The services such as sediment trapping or water supply, supplied by an ecosystem (in this case a wetland ecosystem).

EIA A study of the environmental consequences of a proposed course of action via the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of that application.

EMP Details the methods and procedures for achieving environmental targets and objectives.

Gabion A structure made of wire mesh baskets filled with regularly sized stones, and used to prevent and/ or repair erosion. They are flexible and permeable structures which allow water to filter through them. Vegetation and other biota can also establish in/around the habitat they create.

I&APs People and organizations that have interest(s) in the proposed activities.

EnvironmentalImpact An environmental change caused by some human act.

Implementer The person or organization responsible for the construction of WfWet rehabilitation interventions.

Intervention An engineered structure such as a concrete or gabion weir,earthworks or re-vegetation that that achieves identified objectiveswithin a wetland e.g. raising of the water table within a drainagecanal.

Mitigation Actions to reduce the impact of a particular activity.

Maintenance The replacement, repair or the reconstruction of an existing structure within the same footprint, in the same location, having the same capacity and performing the same function as the previous structure ('like for like').

Perched wetland A wetland where the wetland water table is higher than the local and regional watertable (Wetland Management Series: WET-Origins, WRC Report TT 334/08, March 2008).

PPP A process of involving the public in order to identify issues and concerns, and obtain feedback on options and impacts associated with a proposed project, programme or development. Public Participation Process in terms of NEMA refers to: a process in which potential interested and affected parties are given an opportunity to comment on, or raise issues relevant to specific project matters.

Project An area of WfWet intervention generally defined by a quaternarycatchment or similar management unit such as a national park inwhich a single implementer operates.

Q value The peak flow (m^3/s) for which a structure is designed, based on agiven likely return period rainfall within the catchment

QuaternaryCatchment All land area drained by a fourth order tributary river and itstributaries.

Rehabilitation Refers to re-instating the driving ecological forces (includinghydrological, geomorphological and biological processes) thatunderlie a wetland, so as to improve the wetland's health and theecological services that it delivers.

Rehabilitation Restoring processes and characteristics that are sympathetic to and not conflicting with the natural dynamic of an ecological or physical system (Wetland Management Series: WET-Origins, WRC Report TT 334/08, March 2008).

Significant impact An impact that by its magnitude, duration, intensity or probability of occurrence may have a notable effect on one or more aspects of the environment.

Weir A dam-type structure placed across a watercourse to raise the water table of the surrounding ground and trap sediment on the upstream face without preventing water flow. Weirs are generally used to prevent erosion from progressing up exposed gullies.

Wetland "Land which is transitional between terrestrial and aquaticsystems where the water table is usually at or near the surface, orthe land is periodically covered with shallow water and which innormal circumstances supports or would support vegetationtypically adapted to life in saturated soils." (SA Water Act of1998).

Wetland Land where an excess of water is the dominant factor determining the nature of the soil development and the types of plants living there (Wetland Management Series: WET-Origins, WRC Report TT 334/08, March 2008).

1 WORKING FOR WETLANDS PROGRAMME OVERVIEW

WfWet is a government programme (similar to Working for Water, Working on Fire and LandCare) managed by the South African National Biodiversity Institute (SANBI) on behalf of the national government departments of Environmental Affairs (DEA), Water Affairs (DWA), and Agriculture, Forestry and Fisheries (DAFF), and forms part of the Expanded Public Works Programme (EPWP). While the programme's primary focus is wetland rehabilitation, the protection, rehabilitation and sustainable use of those wetlands is simultaneously entrenched within the programme's core aims and objectives.

1.1 Vision and Objectives

The vision of WfWet is to facilitate the protection, conservation, rehabilitation and sustainable use of wetlands in South Africa, in accordance with national policies and commitment to international conventions and regional relationships. The two main objectives of the programme are wetland conservation in South Africa and poverty reduction through job creation and skills development amongst vulnerable and marginalised groups.

Given this approach of linking wetland conservation to sustainable economic development, the programme forms part of the EPWP, which seeks to draw significant numbers of unemployed into the productive sector of the economy. These individuals gain skills while they work thusincreasing their capacity to earn an income. Projects are thus focused on rehabilitation, conservation and the appropriate use of wetlands in a way that attempts to maximize employment creation, support for small business and the transfer of skills to the unemployed and poor.

1.2 Budget and Scope of Work

The programme started off with a R20 million budget that was implemented across 14 projects in 2001. The budget has been increasing steadily and so has the number of projects implemented and beneficiaries employed. The programme is currently implemented across 35 projects countrywide with a budget of R83 million and employs over 1500 workers. The programme makes use of external support to implement its work. Seventeen implementing agents are currently employed and some are Section 21 companies. Implementers are responsible for employing contractors and their teams (workers), and ensuring that rehabilitation plans are adequately implemented. Funds are transferred from SANBI to the implementing agents, who in turn pay contractors and their teams.

Local people are recruited to work in projects. Wage information sourced from the best practice guidelines suggests that workers and contractors would be paid daily rates of R 82.00 and R251.00[1] respectively and would be employed on limited term contracts, i.e. 24 months in a five-year cycle. Employment of workers complies with the Ministerial Determination on Special Public Works Programmes (Government Notice No. R 63, 25 January 2002) and the Code of Good Practice for Employment and Conditions of Work for Special Public Works Programmes (Government Notice No. R 64, 25 January 2002). Targets for employment specify that the programme's workforce should comprise at least 60% women, 20% youth and 2% disabled people.

Typical activities undertaken within the projects include:

- The construction of structures to control erosion in the wetland, trap sediment and raise water tables;
- The control of invasive alien plants within the immediate catchment, and in the wetland;
- Plugging of artificial drainage channels in the wetland;
- Addressing offsite causes of degradation in the catchment;
- Raising awareness of wetlands among workers, landowners and the general public;
- Providing adult basic education and training, and technical skills, and;
- Developing management plans for the rehabilitated wetlands.

In response to DEA's request to increase the labour component of all government funded projects, the WfWet project team has had to consider and where practically feasible incorporate softer, more labour intensive ways of rehabilitating wetlands in order to obtain the increased labour component. Accordingly as part of the planning for Phase 2, project team members have factored this requirement into their planning when designing for structures for wetland rehabilitation. This requirement has also had a direct impact on the wetlands that are to be rehabilitated. In some instances where wetlands have already been prioritised for rehabilitation for example, should the particular wetland require hard engineering (concrete structures for example) which require less labour than softer structures, the project team may decide to find other areas within which to work and/ or investigate other rehabilitation options that are more labour intensive for that area.

1.3 Training and Capacity Building

WfWet has established a working relationship with the Department of Labour through the Working for Water programme. This partnership provides accredited training in accordance with the special public works Code of Good Practice agreements. Capacity building by WfWet operates primarily at two levels. The first concerns the need to ensure the development of adequate capacity to rehabilitate, manage and conserve wetlands in South Africa. The second relates to the commitment of WfWet as an expanded public works programme, to provide appropriate training to its workers in order for them to exit the programme with marketable skills and enhanced personal development. Workers receive two days of training, either vocational or social

[1] without a Supervisor

development-related, for every 22 days worked. Vocational training includes technical matters related to project activities, occupational health and safety, first aid, fire awareness, and business skills (contractor development). Social development includes literacy, primary health, personal finance, HIV/Aids and diversity awareness.

1.4 Support for Government, Non-Government and Private Agencies

WfWet engages with provinces, especially government departments and agencies responsible for biodiversity and environment, and municipalities through individual projects. A stronger working relationship with these spheres of government is being promoted through the programme's emphasis on partnerships. In particular, compatibility with Integrated Development Plans and rehabilitation project objectives will be a key area of future focus. WfWet encourages municipalities to participate in provincial wetland forums as these forums are the platform for the roll out of all the programmes' processes, including planning for future work. Provincial forums also offer support from the government departments and private sectors that are represented. Partnerships with non-governmental organizations and the private sector are also critical, requiring collaboration and cooperation with a wider range of stakeholders and role players in the wetland management field.

The strategic framework of WfWet underlines the need for a more refined planning process at catchment scale. Catchment scale planning seeks to promote ecosystem-scale outcomes, long-term custodianship, and the entrenchment of rehabilitation in broader local institutions and frameworks. The recent move to a systematic wetland rehabilitation planning process has provided a fertile and conducive platform for partnerships to be formed and/or strengthened as the process draws in a much wider stakeholder base.

1.5 Legislative Context

WfWet operates within the context of the Constitution Act, No. 108 of 1996, whereby everyone has the right to have the environment protected and conserved for the benefit of present and future generations. Other national legislation that protects the environment includes the:

Title of legislation, policy or guideline:	Administering authority:	Date:
The Constitution of South Africa (Act 108)	National Government	1996
National Environmental Management Act (107)	Department of Environmental Affairs	1998
The National Water Act (36)	Department of Water Affairs	1998
Conservation of Agricultural Resources Act (43)	Department of Agriculture, Forestry & Fisheries	1983
National Heritage Resources Act (25)	National Heritage Resources Agency	1999
World Heritage Conventions Act (49)	Department of Environmental Affairs	1999

Title of legislation, policy or guideline:	Administering authority:	Date:
The National Environmental Management: Biodiversity Act (10)	Department of Environmental Affairs	2004
National Environmental Management: Protected Areas Act (57)	Department of Environmental Affairs	2003
The Mountain Catchments Areas Act (63)	Department of Water Affairs	1970
EIA Guideline Series, in particular: • Guideline 3 – General Guide to the Environmental Impact Assessment Regulations, 2006 (DEAT 2006) • Guideline 4 – Public Participation in support of the EIA regulations, 2006 (DEAT 2006) • Guideline 5 – Assessment of Alternatives and Impacts, 2006 (DEAT 2006)	Department of Environmental Affairs	
International Conventions, in particular: • The Ramsar Convention • Convention on Biological Diversity • United Nations Conventions to Combat Desertification • New Partnership for Africa's Development (NEPAD) • The World Summit on Sustainable Development (WSSD) • UN Climate Change Conference 2011 (COP17)		
Gauteng Conservation Plan Version 3.3.	Legislature of the Gauteng Province	2011

This legislation informs and guides the WfWet programme in terms of its vision and objectives, whilst simultaneously regulating the wetland rehabilitation activities which WfWet carries out. WfWet has put in place systems to achieve compliance with all legislation. For example, Basic Assessments for Environmental Authorisation are carried out for all listed activities involved in wetland rehabilitation to comply with NEMA.

In terms of Section 39 of the National Water Act (No. 36 of 1998) (NWA), a General authorisation[2] (GA) has been granted for certain activities that are listed under the NWA that usually require a Water Use License; as long as these activities are undertaken for wetland rehabilitation. These activities include '*impeding or diverting the flow of water in a watercourse*[3]' and '*altering the bed, banks, course or characteristics of a watercourse*[4]' where they are specifically undertaken for the purposes of rehabilitating[5] a wetland for conservation purposes.

A Memorandum of Agreement has been entered into between the DAFF, DEA, DWA

[2]Government Notice No. 1198, 18 December 2009
[3]Section 21(c) of the NWA, No. 36 of 1998
[4]Section 21(i) of the NWA, No. 36 of 1998
[5]Defined in the NWA as "*the process of reinstating natural ecological driving forces within part of the whole of a degraded watercourse to recover former or desired ecosystem structure, function, biotic composition and associated ecosystem services*"

and SANBI for the WfWet programme. Through co-operative governance and partnerships, this Agreement aims to streamline the authorisation processes to facilitate efficient processing of applications for authorisation of wetland rehabilitation activities under CARA, NEMA and NWA respectively.

In terms of the National Heritage Resources Act (No. 25 of 1999) (NHRA), Section 38; "any person who intends to undertake a development categorised as-

(a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300min length;
(b) the construction of a bridge or similar structure exceeding 50 m in length;
(c) any development or other activity which will change the characterof a site-
    (i) exceeding 5 000 m^2 in extent; or
    (ii) involving three or more existing erven or subdivisions thereof; or
    (iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or
    (iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;
(d) the re-zoning of a site exceeding 10 000 m^2 in extent; or
(e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority,"

must at the very earliest stages of initiating the development notify the responsible heritage resources authority, namely the South African Heritage Resources Agency (SAHRA) or the relevant provincial heritage agency. These agencies would in turn indicate whether or not a full Heritage Impact Assessment (HIA) would need to be undertaken.

Section 38(8) of the NHRA specifically excludes the need for a separate HIA where the evaluation of the impact of a development on heritage resources is required in terms of an EIA process. Accordingly, since the impact on heritage resources would be considered as part of the EIA process outlined here, no separate HIA would be required. SAHRA or the relevant provincial heritage agency would review the EIA reports and provide comments to DEA, who would include these in their final environmental decision. However, should a permit be required for the damaging or removal of specific heritage resources, a separate application would have to be submitted to SAHRA or the relevant provincial heritage agency for the approval of such an activity.

SANBI has engaged with SAHRA regarding the wetland planning process and has committed to achieving full compliance with the heritage act over the next few years.

2 INTRODUCTION

Aurecon South Africa (Pty) Ltd was appointed by SANBI to undertake the various project activities and associated reporting required for the various phases of the rehabilitation planning cycle. These included Phase 1 Reports, the wetland rehabilitation plans as well as the Basic Assessment Reports required for each project area within all nine provinces. Figure 1, below, graphically depicts the entire planning process employed by WfWet to rehabilitate wetlands.

The flow diagram (**Figure 1**) also clearly demonstrates the point at which various consent forms must be approved via signature from the directly affected landowner. SANBI's Provincial Coordinators are responsible for undertaking the necessary landowner engagement and for ensuring that the requisite landowner consent forms required as part of Phase 1 and 2 of this project are signed. These include:

- WW(0): Standard operating procedure
- WW(1): Wetland survey and Inspection consent,
- WW(2): Terms and Conditions for carrying out wetland rehabilitation,
- WW(3): Wetland Rehabilitation Activities Consent,
- WW(4): Property Inspection Prior to Wetland Rehabilitation, and
- WW(5): Notification of Completion of Rehabilitation.

Refer to **Appendix E** for a copy of the landowner agreements.

The Phase 1 prioritisation and identification of wetlands thereof for rehabilitation planning is described in the separate Phase 1 Planning Report for each project.

The 2013/2014 planning approach has been one of consolidation, with limited additional Phase 2 planning. As a result only seven(7) new wetlands, in four(4) provinces have been prioritised for site visits this year (2012).All previously planned and designed interventions will be included in the 2013/2014 implementation period, along with maintenance, alien clearing, and any new interventions which receive authorisation in the current planning phase.

This document comprises the wetland rehabilitation plan for the Gauteng South project and will be the primary working document for the implementation of the project via construction/ undertaking of interventions[6] required for wetland rehabilitation. The document details the general methodology that has been adopted for the planning of rehabilitation interventions for identified wetlands. Details of the rehabilitation plan for each wetland and the individual intervention designs within each wetland are then presented, along with baseline Monitoring and Evaluation (M&E) data. Detailed wetland assessment reports and design drawings are included as appendices in this report.

[6]This could include soft options such as alien clearing, eco-logs, gabion structures as well as hard structures, for example weirs.

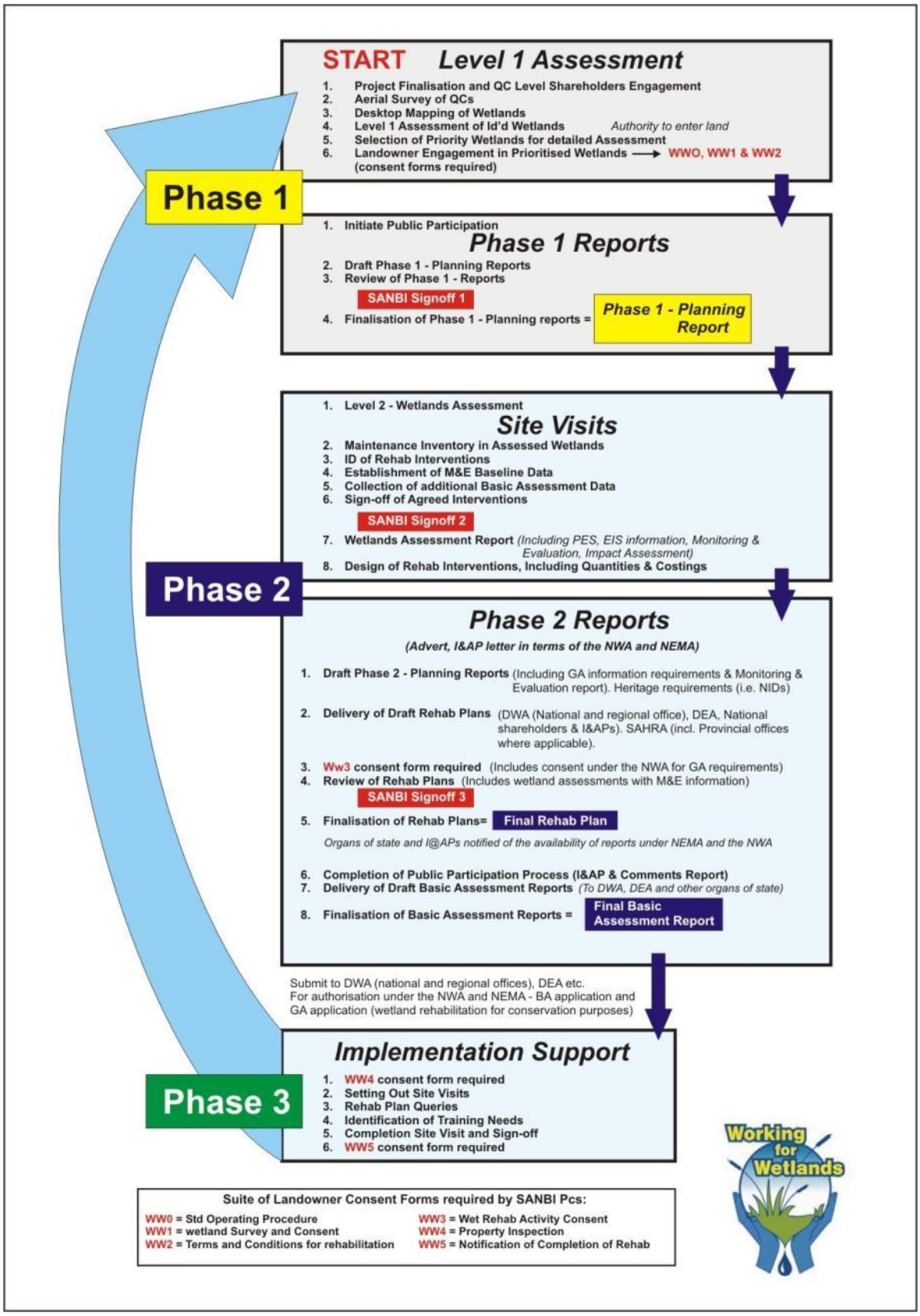

Figure 1: The three phases that must be undertaken for the successful rehabilitation of wetlands

Basic Assessment Reports are compiled as separate documents (one for each province) and are submitted to National DEA for their environmental authorisation decision. This Rehabilitation Plan is attached as an Appendix to the BAR and is therefore also submitted to DEA for their consideration as part of their decision-making process.

Upon approval of this wetland rehabilitation plan by both DEA and the directly affected landowners, the work detail for the project will be implemented within a year with on-going monitoring being undertaken from there on.

3 GENERAL METHODOLOGY

The wetlands that were prioritised for further detailed assessment in the Phase 1 planning stage were assessed in detail during the fieldwork. This assessment is described in detail below.

Increased labour requirement for the WfWet Programme (refer to Section 1.2 above).

As a result of the increased labour requirement for the WfWet programme, the project team were required to investigate more labour intensive intervention options for wetland rehabilitation. These included soft engineering options such as berms, eco-logs as well as alien clearing.

This also resulted in the project team having to investigate other wetland areas in order to meet this requirement. Consequently, some of the wetlands prioritised during Phase 1 would not be rehabilitated during this planning year (due to the large amount of hard engineering required), while new additional wetlands were identified during the Phase 2 site visits as their rehabilitation requirements contributed towards meeting the increased labour component for the programme.

Rehabilitation work within floodplain systems

Based on lessons learnt and project team discussions during the National Prioritisation workshop in November 2010, SANBI took an in principle decision regarding work within floodplain systems.

Recognising the ecosystem services provided by floodplain wetlands and the extent to which they have been transformed, SANBI do not intend to stop undertaking rehabilitation work in floodplains entirely. Instead, SANBI propose to adopt an approach to the rehabilitation of floodplain areas that takes into account the following guiding principles:

1. As a general rule, avoid constructing hard interventions within an active floodplain channel; and rather
2. explore rehabilitation opportunities on the floodplain surface using smaller (possibly more) softer engineering options outside of the main channel.

When rehabilitation within a floodplain setting is being contemplated, it will be necessary to allocate additional planning resources, including the necessary specialist expertise towards ensuring an adequate understanding of the system and appropriate design of interventions.

3.1 Site Visits

Site visits to prioritised wetlands were conducted by project teams consisting of:

- a Wetland Ecologist,
- an Engineer,
- an Environmental Assessment Practitioner,
- the WfWet Provincial Coordinator, and where possible and/ or appropriate,
- the Implementing Agent's Project Manager.

One Phase 2 site visit was undertaken for the following project:

1. Gauteng South – October 2012

3.1.1 Wetland Assessments

The time and resources required for detailed assessments of the wetlands was generally limited, and thus a rapid procedure was adopted to assist the project team in systematically carrying out the assessments under constraints. The procedure was based on the following steps:

1. Assess impacts and threats

The following steps were used by the wetland ecologist to assess the impacts and threats within each wetland system:

- Description of the hydro-geomorphic setting of the wetland according to Kotze *et al.* (2005);
- Verification and description of the overall health of the wetland at a Level 1 assessment using WET-Health (Macfarlane *et al.*, 2006);
- Based on the above findings, identification of specific impacts and/or threats to be addressed by structural rehabilitation and description of these at a Level 2. For example, for headcut erosion, the specific dimensions and level of activity of headcuts would be described.

2. Set rehabilitation objectives and choose appropriate measures for achieving the objectives

Rehabilitation objectives would be informed by the above assessments (*e.g.*, if the primary threat to the wetland was identified as headcut erosion threatening to propagate through the wetland then an appropriate rehabilitation objective would be to halt propagation of the erosion headcut). The engineer would assist the wetland specialist in choosing appropriate interventions to achieve the identified rehabilitation objectives.

3. Assess the likely contribution of rehabilitation interventions to wetlandhealth and ecosystem delivery

An assessment of the predicted contribution that the identified rehabilitation interventions will make to improving wetland health and ecosystem delivery through addressing the identified impacts/threats would be required. Without these assessments, a wetland rehabilitation programme is unlikely to have a well-informed basis on which to improve the rehabilitation's "return on investment" (with return being measured in terms of wetland health and ecosystem services delivery). This would directly link into the *WfWet* Monitoring and Evaluation Framework.

The following steps were followed to assess the contribution of rehabilitation interventions within each wetland system:

- Identify the spatial area likely to be affected by the proposed intervention/s.
- Assess the benefits that are likely to result from achievement of the rehabilitation objective/s in terms of the integrity of the affected area of the wetland (using WET-Health) and the ecosystem services that the area delivers (using WET-Ecoservices: Kotze *et al.*, 2005).

The same approach was used for the assessment of the different threats/impacts that would be addressed through rehabilitation. In this instance, the situation without rehabilitation (i.e. no intervention or *status quo*) would be compared with the situation with rehabilitation. For health, both situations would be scored on a scale of 0 (critically altered) to 10 (pristine), and this would be undertaken for the hydrology, geomorphology and vegetation components of health. The benefit achieved would be the improvement in relation to the maximum score. For example, in areas threatened by headcut erosion which are to be rehabilitated by halting the spreading of the headcut, the benefits in terms of health would be determined based on the difference between the current health and the projected health if the headcut proceeded to erode through the threatened area. In such a case, stopping the expansion of the headcut would presumably secure the current situation.

Refer to **Appendix A** which contains the Wetland Assessment Reports.

3.1.2 Identification and Location of Intervention Designs

The project teams evaluated the various rehabilitation intervention options available and selected the most appropriate to achieve the rehabilitation objectives for the wetland which included factoring in the increased labour component as required by DEA. Any previously planned interventions that had not been implemented or included into the 2012/13PIPs were assessed and included into the current year's selection, if appropriate to the re-assessed rehabilitation objectives for the wetland. Agreed cost/benefit ratios in terms of 'Rands per hectare of rehabilitated wetland' were taken into account, along with operational considerations and larger scale project objectives.

After the appropriate interventions had been decided by the planning team, the engineer, in consultation with the wetland specialist, was responsible for choosing the most appropriate designs and locations for the identified rehabilitation interventions in

order to achieve the identified rehabilitation objectives. GPS coordinates and digital photographs - sufficiently detailed to clearly identify the locations were taken for record purposes. Appropriate dimensions of the locations were measured in order to be able to design and calculate quantities for the interventions.

3.1.2.1 Intervention naming convention

A new naming convention was introduced in the 2011/2012 planning phase and this has been continued in this years' Rehabilitation plans.

The **historical naming convention** for interventions is explained below:

A00A-00-000, where

Number	**Explanation**
A00A	quaternary number
00	wetland number
000	intervention number

The accepted **naming convention**which has been applied to all interventions (old and new) is explained below with examples being provided as well.

A00A-00-000-00 (new),
A00A-00-000-01 (maintenance), where

Number	**Explanation**		
A00A	quaternary number		
00	wetland number		
200	intervention number with the '**200**' included for differentiation from previous interventions		
00	**New** intervention	**01**	**Maintenance** to intervention

An additional two digits will therefore be added to the end of each of the intervention numbers to indicate maintenance on this specific intervention and/ or whether the structure is new (00) for tracking purposes. All new interventions will have a default of 00. Should built structures require maintenance, they would be numbered numerically beginning with '01' e.g. 01, 02, 03, etc. for each year that maintenance is undertaken on the intervention.

In addition, the new naming convention also added a '200' digit in the front of the intervention number to avoid confusion from previously named interventions. This is illustrated in the 'new intervention number column' in Table 6 in section 4.5 below.

3.1.3 Collection of Monitoring and Evaluation Baseline and Basic Assessments Data

In accordance with WET-Rehab-Evaluate (Cowden & Kotze, 2007) the collection of baseline monitoring information is important to allow the evaluation of the performance of wetland rehabilitation activities. Monitoring and evaluation facilitate the dissemination of lessons learnt and provide a means of reporting on the success of specific wetland rehabilitation initiatives. The monitoring and evaluation (M&E) of an identified wetland rehabilitation project's performance is therefore considered vital to inform the evaluation of wetland rehabilitation success. Baseline monitoring needs to be carried out prior to the implementation of rehabilitation activities to provide comparable data for monitoring at a later stage, following the wetland rehabilitation.

While the engineer was working on measurement of the intervention locations, the wetland ecologist would gather the additional data required for M&E baselines which would include the following:

- Photographs and GPS co-ordinates of the identified problems;
- Fixed-point photography (in accordance with the guidelines outlined in WET-Rehab-Evaluate: Cowden & Kotze, 2007);
- WET-Health information (allowing the comparison of wetland ecological integrity before and after rehabilitation activities); and
- Details relating to the estimated hectare equivalents.

Any additional data/information required for the assessment of the potential impacts of the proposed interventions and construction activities was also collected by the wetland ecologist and the EAP to inform the Basic Assessments.

At the end of the site visit a location layout of the agreed interventions and rehabilitation objectives would be signed off by the WfWet provincial coordinator and landowner, as indicated by SANBI Signoff 2 in **Figure 1**.

3.2 Engineering Design

The detailed procedure followed by the engineers is described in the Engineering Design Brief, which documents the procedure agreed upon by Aurecon and SANBI. The document also addresses important issues such as risk and liability. A summary of the process followed for the engineering design is described below:

1. A hydrological assessment is made to quantify the volume of water expected to be dealt with by the intervention for various recurrence intervals. The results of this assessment allow the engineer to select a design flow to be applied to the intervention.
2. Soil types and their anticipated characteristics are assessed including DCP results or geotechnical investigations where these have been undertaken.
3. Construction materials are selected based on a range of site specific criteria including expected velocities, availability of materials such as rock, labour intensive targets, maintenance requirements etc.

4. Interventions are designed based on the above so that they will meet the objectives for wetland rehabilitation.
5. The designs are drafted to show, at a minimum, a plan view, a longitudinal section and front elevation at appropriate scales, and appropriate dimensions. A legend indicating basket sizes is included for gabion structures to improve design clarity for the implementers.
6. Bills of quantities are calculated for the designs and cost estimates made based on unit costs and norms for each project area, as agreed with WfWet.
7. The estimated budget allocation towards labour is indicated.
8. Maintenance requirements for existing interventions in the assessed wetlands are similarly detailed and costs calculated.

The engineer also reviews and, if necessary, adjusts any previously planned interventions that are included into the current rehabilitation plan.

3.3 Development of Rehabilitation Plans

The standardised rehabilitation plan format has previously been approved by WfWet's Manager: Planning, Monitoring and Evaluation.

Summaries of the wetland prioritisation, problems and rehabilitation objectives were included into the main body of the rehabilitation plans.

Detailed wetland assessment reports, based on, *inter alia*, the information collected during the implementation of WET-Tools, were prepared by the wetland ecologist and/ or the environmental assessment practitioner for each project, and included as an appendix in each project's rehabilitation plans.

The draft rehabilitation plans are submitted to WfWet for a two week review period. Any comment received during this period istaken into account in the finalisation of the rehabilitation plans.

3.4 Reporting Format

All relevant information acquired during the assessments and field visits has been included in this document and its appendices in a hierarchy as shown in **Figure 2** below.

All intervention locations are given in geographical coordinates, (degrees, minutes and seconds), based on the WGS84 datum.

Mapping was done in Albers Equal Area Conic projection, WGS84 datum. The grids displayed on all maps are geographic and measured in Degrees Minutes and Seconds. The scale bar on each map is based on Albers Equal Area Conic projection and measured in metres.

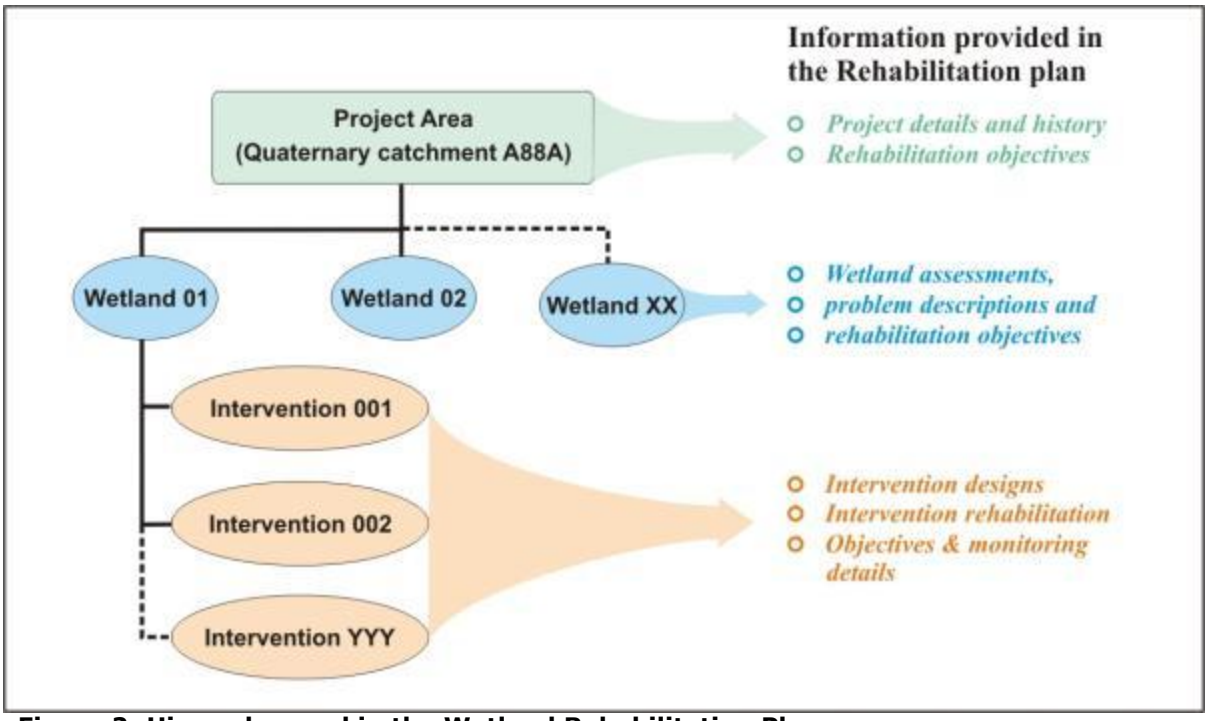

Figure 2: Hierarchy used in the Wetland Rehabilitation Plan

4 PROJECT DESCRIPTION

The Gauteng South Project replaced the 2008/9 financial year City of Johannesburg project which in turn replaced the Klip River project from the 2007/8 financial year and previously. The project was originally based around tributaries of the Klip River within Soweto and was expanded to include the City of Johannesburg Metropolitan Municipality for the 2008/9 financial year. Planning for the 2009/10 financial year looked at wetlands south of the Metro due to the limited opportunities for the type of wetland rehabilitation that the Working for Wetlands programme handles in the urban areas.

For the 2011/12 financial year it was decided to rationalise the Gauteng Province WfWet projects into the Gauteng North Project[7] and the Gauteng South project[8]. The boundary currently separating the Gauteng North and South project areas is formed by a continental catchment boundary that divides the entire province into two main drainage basins:

- The Gauteng North project area: Encompasses watercourses draining towards the Indian Ocean (catchment areas are associated with the Pienaars, Crocodile, Wilge and Olifants Rivers); and
- The Gauteng South project area: Encompasses watercourses draining towards the Atlantic Ocean (the catchment area is associated with the Vaal River and include tributaries such as the Klip, Blesbokspruit and Suikerbosrand Rivers).

For this cycle, quaternary catchment C22D is under investigation. Existing rehabilitation work in this quaternary catchment is augmented with new rehabilitation initiatives identified during a site visit undertaken in October 2012. The quaternary catchment is under pressure due to agricultural (overgrazing) and development related activities and infrastructure, e.g. stormwater outflows, roads, pipeline and railway line crossings, formal and informal residential developments. Other negative factors include alien invasive plant species, illegal dumping and mining.

Figure 3 Overgrazing and urbanization has changed the hydrology, morphology and structural diversity of wetlands

[7] Include all wetlands falling within the A21A, A23A, B20H and A23J tertiary catchments draining towards the north.

[8] Include all wetlands falling within the C21A, C21C, C21E, C21F, C21G, C22A, C22C, C22D, C22E, C22F, C22H, and C22J tertiary catchments draining to the south.

4.1 Project Details

Table 2: Project details

Project Name	Gauteng South
Region (Province)	Gauteng
Project Budget	~ R 2 million
Planning Category	Category 3
Nearest Town/s	Johannesburg
Partnership	City of Johannesburg Metropolitan Municipality

The SANBI Provincial Co-ordinator annually updates the Project's structure reconciliation spreadsheet to accurately reflect historical and current activities within the various projects. Please find the latest updated spreadsheet attached as **Appendix I.**

The scope of the project is listed in the table below:

Table 3: Project scope

Quaternary Catchments	C22D
Quaternary Catchment area (Ha)	34 520.44
Number of wetlands identified during the assessment	1
Extension of existing work (previous financial year)	Yes
Work to commence at new wetlands in 2013/ 2014	Yes
Available budget for new interventions	~ R 2 million
Available budget for maintenance to existing interventions	
Estimated cost of new interventions	R 4,704,143.72
Estimated cost of maintenance to existing interventions	R 427,444.08

4.2 Projected Rehabilitation Indicators

The rehabilitation planning process relies on the measurement of wetland ecological integrity based on the assessment of the hydrology, geomorphology and vegetation components of the specified systems. In theory this information could be converted into a hectare equivalent which could serve as a baseline indicator to provide a projection of the area of wetland habitat gained or secured. In practice the level of confidence associated with interpretations of this nature are usually of low confidence and difficult to defend and hence should be interpreted with great caution. For example, this approach should not be followed for hectare equivalents secured where a large wetland complex, with many contiguous tributary arms of unknown size are present upstream. Similarly, the area of wetland gained should not be determined if there is not good knowledge of inter alia the hydro-geological characteristics of both the bedrock and unconsolidated sedimentary cover.

In well-known systems rehabilitation plans can outline the following projected values for the proposed wetland rehabilitation, which can be used as an indicator of wetland rehabilitation success within each wetland system:

Wetland No.	Area (ha)	Hectare to be gained by rehabilitation	% of total wetland area
C22D-04	118.4	27.1	22.89

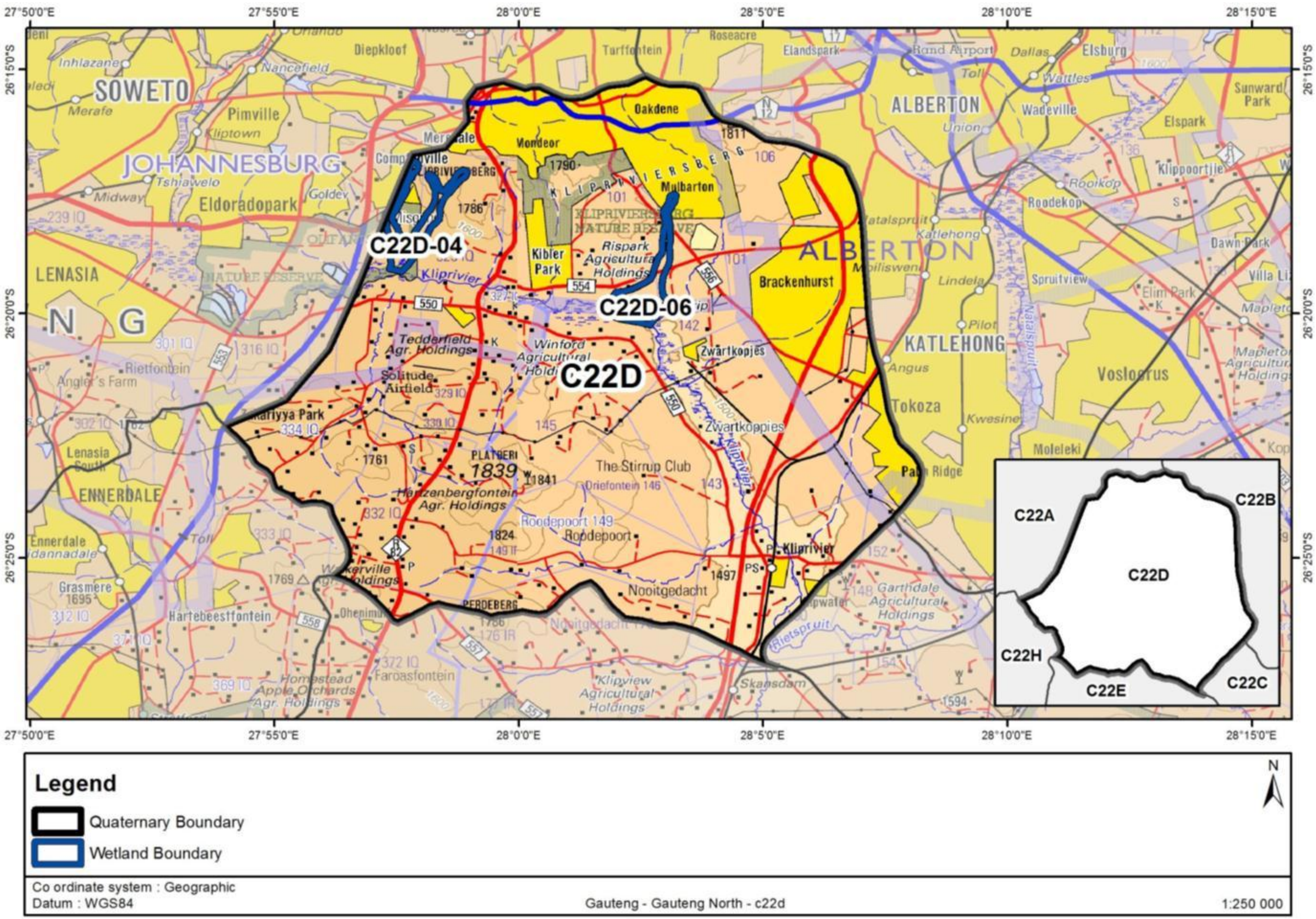

Figure 4: Topographic map of quaternary catchment C22D showing the locality of wetland C22D-04, cadastral boundaries and access routes

4.3 Intervention labelling

The following table provides a list of interventions requiring redesign, maintenance and or new structures for this project and their associated new intervention number.

Table 4: Summary of the interventions including a cross reference of intervention numbers

Descriptive name	Old intervention number (if applicable)	New Intervention number	Proposed action	Reference document
NEW				
MacMat-R	-	C22D-04-201-00	MacMat-R with earthworks and rock packing; site rehabilitation with indigenous plant species	Gauteng South Draft Rehab Plan: November 2012
Gabion weir	-	C22D-04-202-00	Gabion weir with MacMat-R, earthworks and rock packing; site rehabilitation with indigenous vegetation	
MacMat-R	-	C22D-04-203-00	MacMat-R with earthworks and rock packing; site rehabilitation with indigenous plant species	
MacMat-R	-	C22D-04-204-00	MacMat-R with earthworks and rock packing; site rehabilitation with indigenous plant species	
Gabion weir	-	C22D-04-205-00	Gabion weir with earth berm; site rehabilitation with indigenous vegetation	
MacMat-R	-	C22D-04-206-00	MacMat-R with earthworks and rock packing; site rehabilitation with indigenous plant species	
Gabion weir	-	C22D-04-207-00	Gabion weir; site rehabilitation with indigenous vegetation	
Stone Masonry weir	-	C22D-04-208-00	Stone masonry weir; site rehabilitation with indigenous vegetation	
Rock fill	-	C22D-04-209-00	Rock packing	
Gabion weir	-	C22D-04-210-00	Gabion weir with MacMat-R and earthworks; site rehabilitation with indigenous vegetation	
Gabion weir	-	C22D-04-211-00	Gabion weir; site rehabilitation with indigenous vegetation	

Descriptive name	Old intervention number (if applicable)	New Intervention number	Proposed action	Reference document
Gabion weir	-	C22D-04-212-00	Gabion weir; site rehabilitation with indigenous vegetation	
Gabion weir	-	C22D-04-213-00	Gabion weir; site rehabilitation with indigenous vegetation	
Earth works	-	C22D-04-214-00	Cut and fill drainage channel; site rehabilitation with indigenous vegetation	
Earth works	-	C22D-04-215-00	Cut and fill drainage channel; site rehabilitation with indigenous vegetation	
MAINTENANCE				
Gabion weir	C22D-04-001	C22D-04-216-00	Concrete capping with earth works to fill cavities	Gauteng South Rehabilitation Plan: October 2009
Gabion weir	C22D-04-002	C22D-04-217-00	Concrete capping with earth works to fill cavities; cut and slope downstream embankment	
Gabion weir	C22D-04-006	C22D-04-218-00	Raise spillway, key walls and splash wall; concrete capping	
Gabion weir	C22D-04-007	C22D-04-219-00	Raise spillway, key walls and splash wall; concrete capping	
Gabion weir	C22D-04-010	C22D-04-220-00	Reduce spillway height; concrete capping; raise key walls and splash walls	
Gabion weir	C22D-05-002	C22D-05-201-00	Raise left bank key wall; lengthen right bank key wall	
Gabion weir	C22D-05-003	C22D-05-202-00	Add berm to left bank key wall	
Gabion weir	C22D-05-004	C22D-05-203-00	Raise key walls and splash walls; concrete capping; earth works to fill cavities	
Gabion weir	C22D-05-006	C22D-05-204-00	Raise key walls and splash walls; extend left bank key wall; concrete capping; cut and slope downstream embankments; earth works to fill cavities	
Gabion weir	C22D-05-009	C22D-05-205-00	Cut and slope downstream left embankment	
Gabion weir	C22D-05-010	C22D-05-206-00	Cut and slope approach to bridge on both banks	
Gabion weir	C22D-05-013	C22D-05-207-00	Remove excess excavated soil; revegetation	
Gabion weir	C22D-05-014	C22D-05-208-00	Remove and redo left bank key wall and splash wall; raise left bank key wall and splash wall; revegetation	
Gabion weir	C22D-05-016	C22D-05-209-00	Fill cavities; raise key walls and splash walls	

Descriptive name	Old intervention number (if applicable)	New Intervention number	Proposed action	Reference document
Gabion weir	C22D-05-017	C22D-05-210-00	Raise spillway, key walls and splash walls	
Gabion weir	C22D-05-018	C22D-05-211-00	Raise left bank splash wall; raise key walls and right bank splash wall; earth works to fill cavities	
Gabion weir	C22D-05-019	C22D-05-212-00	Remove excess soil	
Gabion weir	C22D-05-020	C22D-05-213-00	Earth works to fill / re-compact area upstream of structure; redo upstream geo-fabric	
Gabion weir	Unknown	A21C-10-201-00	Raise key walls and splash walls; earth works to fill cavities; MacMat-R with revegetation	Pre 2007; no records could be found other than that the site being referred to as Cluny's farm.
Gabion weir	Unknown	A21C-10-202-00	Concrete capping; earth works to fill cavities	
Gabion weir	Unknown	A21C-10-203-00	Concrete capping; earth works to fill cavities	
Gabion weir	Unknown	A21C-10-204-00	Concrete capping; raise key walls; reduce spillway height; earth works to fill cavities	
Gabion weir	Unknown	A21C-10-205-00	Concrete capping	
Gabion weir	Unknown	A21C-10-206-00	Redo upstream geo-fabric; concrete capping; earth works to fill cavities	
Gabion weir	Unknown	A21C-10-207-00	Redo upstream geo-fabric; concrete capping; earth works to fill cavities	
Gabion weir	Unknown	A21C-10-208-00	Redo upstream geo-fabric; concrete capping; earth works to fill cavities	
Gabion weir	Unknown	A21C-10-209-00	Concrete capping	
Gabion weir	Unknown	A21C-10-210-00	Concrete capping	
INTERVENTION REDESIGNS				
N/A				

The intervention designs/ drawings included in this Rehabilitation plan have been labelled according to the **new naming convention** only. For historical labelling of interventions, please use the table above as a cross reference. Also refer to Annexure C for a the Bill of quantities and costing of the required maintenance work.

5 KLIPRIVIERSBERG – C22D-04

The Klipriviersberg project area is characterized by a mean annual precipitation (MAP) of 694.4 mm and evapotranspiration potential (PET) of 2170.8. The MAP/PET ratio for this area indicates that wetlands are highly susceptible to changes in water inputs, specifically reduced water inputs.

The two dominant vegetation types for the area are Eastern Temperate Freshwater Wetlands (interventions C22D-04-201-00 to C22D-04-213-00) and Tsakane Clay Grassland (interventions C22D-04-14-00 and C22D-04-215-00).

Eastern Temperate Freshwater wetlands are considered to be least threatened and characterised by flat landscapes or shallow depressions that are temporary filled with water. Aquatic and hygrophilous vegetation species occur within these flooded grasslands and ephemeral herblands. Some of these species are only visible under inundated conditions (Mucina & Rutherford, 2006). Soils have a high organic content, with wetlands forming where soils are impermeable and / or water is impeded by erosion resistant features such as dolerite intrusions.

The Tsakane Clay Grassland vegetation type is endangered and can be found in areas that are flat to slightly undulating and on low hills. The vegetation is characterised by short, dense grassland species that are dominated by a mixture of common Highveld grasses. More than 60% of Tsakane Clay Grasslands have been transformed by cultivation, urbanisation, mining, dam-building and roads. The southern suburbs of Johannesburg and the towns of the East Rand are putting increasingly more pressure on this vegetation type through urban expansions (Mucina & Rutherford, 2006).

According to the Gauteng Biodiversity Conservation Plan Version 3.3, 2011 (C-Plan 3.3), the Klipriviersberg project area falls within a Critical Biodiversity Area (CBA) with Orange Listed plant species and Red Listed mammal and bird species occurring within the area.

Figure 5 A variety of insect, bird and plant species were observed in the C22D-04 wetland

The assessment of each wetland, its problems and the development of rehabilitation objectives are described in detail in **Appendix A**: Wetland Assessment Report. The following sections provide a brief summary for this wetland.

5.1 Wetland Details

Wetland Name	Klipriviersberg
Wetland Number	C22D-04
River System Name	Klip River
Land Use in Catchment	Residential, agriculture and nature reserve[9]
Land Use in Wetland	Grazing with residential development in upper reaches
No. of Properties Intersecting Wetland Area	1
Date of Wetland Assessment	October 2012
Wetland Assessor(s)	Bhuti Dlamini
Wetland size	118.4 ha

5.2 Biophysical characteristics of the wetland

5.2.1 Gradient of the site (section B1 of the BAR)

Flat	1:50 – 1:20	1:20 – 1:15	1:15 – 1:10	1:10 – 1:7,5	1:7,5 – 1:5	Steeper than 1:5

5.2.2 Location in landscape (section B2 of the BAR)

Indicate the landform(s) that best describes the site:

Ridgeline		Closed valley		Undulating plain / low hills	
Plateau		Open valley	x	Dune	
Side slope of hill/mountain		Plain		Seafront	

5.2.3 Groundwater, soil and geological stability of the site (section B3 of the BAR)

Is the site(s) located on any of the following?

Shallow water table (less than 1.5m deep)	YES	NO
Dolomite, sinkhole or doline areas	YES	NO
Seasonally wet soils (often close to water bodies)	YES	NO
Unstable rocky slopes or steep slopes with loose soil	YES	NO
Dispersive soils (soils that dissolve in water)	YES	NO
Soils with high clay content (clay fraction more than 40%)	YES	NO

[9] Klipriviersberg Nature Reserve

Any other unstable soil or geological feature	YES	NO
An area sensitive to erosion	YES	NO

5.2.4 Groundcover (section B4 of the BAR)

Alternative S1:

Natural veld - good condition[E]	Natural veld with scattered aliens[E]	Natural veld with heavy alien infestation[E]	Veld dominated by alien species[E]	Gardens
Sport field	Cultivated land[10]	Paved surface	Building or other structure	Bare soil

If any of the boxes marked with an "E"is ticked, please consult an appropriate specialist to assist in the completion of this section if the environmental assessment practitioner doesn't have the necessary expertise.

5.2.5 Surface water (section B5 of the BAR)

Indicate the surface water present on and or adjacent to the site and alternative sites?

Perennial River	YES	NO	UNSURE
Non-Perennial River	YES	NO	UNSURE
Permanent Wetland	YES	NO	UNSURE
Seasonal Wetland	YES	NO	UNSURE
Artificial Wetland	YES	NO	UNSURE
Estuarine / Lagoonal wetland	YES	NO	UNSURE

If any of the boxes marked YES or UNSURE is ticked, please provide a description of the relevant watercourse.

The purpose of the WfWet project is wetland conservation and thereby the protection of South Africa's aquatic biodiversity and water resources. Therefore all proposed rehabilitation interventions are located within disturbed wetlands, seepage zones and riverine areas with significant problems related to erosion, sedimentation, biodiversity loss, alien infestation, etc.

5.2.6 Landuse character of surrounding area (section B6 of the BAR)

Indicate land uses and/or prominent features that currently occur within a 500m radius of the site and give description of how this influences the application or may be impacted upon by the application:

Natural area	Dam or reservoir	Polo fields
Low density residential	Hospital/medical centre	Filling station[H]
Medium density residential	School	Landfill or waste treatment site
High density residential	Tertiary education facility	Plantation
Informal residential[A] (rural urban sprawl)	Church	Agriculture

[10] Used for agriculture in the past.

Retail commercial & warehousing	Old age home	River, stream or wetland
Light industrial	Sewage treatment plant[A]	Nature conservation area
Medium industrial[AN]	Train station or shunting yard[N]	Mountain, koppie or ridge
Heavy industrial[AN]	Railway line[N]	Museum
Power station	Major road (4 lanes or more)[N]	Historical building
Office/consulting room	Airport[N]	Protected Area
Military or police base/station/compound	Harbour	Graveyard
Spoil heap or slimes dam[A]	Sport facilities	Archaeological site
Quarry, sand or borrow pit	Golf course	Other land uses

Does the proposed site (including any alternative sites) fall within any of the following:

Critical Biodiversity Area (as per provincial conservation plan)	YES	NO
Core area of a protected area?	YES	NO
Buffer area of a protected area?	YES	NO
Planned expansion area of an existing protected area?	YES	NO
Existing offset area associated with a previous Environmental Authorisation?	YES	NO
Buffer area of the SKA?	YES	NO

5.2.7 Cultural or historical features (section B7 of the BAR)

Are there any signs of culturally or historically significant elements, as defined in section 2 of the National Heritage Resources Act, 1999, (Act No. 25 of 1999), including Archaeological or paleontological sites, on or close (within 20m) to the site? If YES, explain:	YES	NO
	Uncertain	
N/A		

If uncertain, conduct a specialist investigation by a recognised specialist in the field (archaeology or palaeontology) to establish whether there is such a feature(s) present on or close to the site. Briefly explain the findings of the specialist:

Not Applicable – A copy of the 2012 Gauteng BAR and Rehabilitation Plan will however be provided to the relevant heritage authorities for consideration. Furthermore, should any archaeological and / or heritage sites / artefacts be exposed during construction, the construction team will follow the process as detailed in the WfWet Construction Environmental Management Programme (CEMP) (Annexure D of the BAR).

Will any building or structure older than 60 years be affected in any way?	YES	NO
Is it necessary to apply for a permit in terms of the National Heritage Resources Act, 1999 (Act 25 of 1999)?	YES	NO

If YES, please provide proof that this permit application has been submitted to SAHRA or the relevant provincial authority.

5.2.8 Biodiversity (Section B9 of the BAR)

Indicate the applicable biodiversity planning categories of all areas on site and indicate the reason(s) provided in the biodiversity plan for the selection of the specific area as part of the specific category):

Systematic Biodiversity Planning Category				**If CBA or ESA, indicate the reason(s) for its selection in biodiversity plan**
Critical Biodiversity Area (CBA)	Ecological Support Area (ESA)	Other Natural Area (ONA)	No Natural Area Remaining (NNR)	The wetland is located within a CBA that could potentially provide habitats to Orange Listed plant species and Red Listed mammal and bird species. Furthermore, the endangered Tsakane Clasy Grasslands vegetation type occurs within the area.

Indicate and describe the habitat condition on site:

Habitat Condition	**Percentage of habitat condition class (adding up to 100%)**	**Description and additional comments and observations (Incl. additional insight into condition, e.g. poor land management practises, presence of quarries, grazing, harvesting regimes etc).**
Natural	-	
Near Natural (includes areas with low to moderate level of alien invasive plants)	80%	The wetland is predominantly in a near natural condition with disturbances linked to cattle using the area for grazing and watering purposes.
Degraded (includes areas heavily invaded by alien plants)	-	-
Transformed (includes cultivation, dams, urban, plantation, roads, etc)	20%	Two drainage channels with sewerage infrastructure occur in the upper reaches of the wetland, just below Naturena. Kikuyu grass is also harvested in this area.

Complete the table to indicate:

(i) the type of vegetation, including its ecosystem status, present on the site; and

(ii) whether an aquatic ecosystem is present on site.

<table>
<tr><th colspan="2">Terrestrial Ecosystems</th><th colspan="7">Aquatic Ecosystems</th></tr>
<tr><td rowspan="4">Ecosystem threat status as per the NEM:BA (Act No. 10 of 2004)</td><td>Critical</td><td rowspan="2" colspan="3">Wetland (including rivers, depressions, channelled and unchanneled wetlands, flats, seeps pans, and artificial wetlands)</td><td rowspan="2" colspan="2">Estuary</td><td rowspan="2" colspan="2">Coastline</td></tr>
<tr><td>Endangered</td></tr>
<tr><td>Vulnerable</td><td rowspan="2">Least Threatened</td></tr>
<tr><td>YES</td><td>NO</td><td>UNSURE</td><td>YES</td><td>NO</td><td>YES</td><td>NO</td></tr>
</table>

Please provide a description of the vegetation type and/or aquatic ecosystem present on site, including any important biodiversity features/information identified on site (e.g. threatened species and special habitats)

Please refer to Annexure A which contains the Wetland Assessment Report.

5.2.9 Site photos: Klipriviersberg

Figure 6 View in a northerly direction

Figure 7 View in an easterly direction

Figure 8 View in a southerly direction

Figure 9 View in a westerly direction

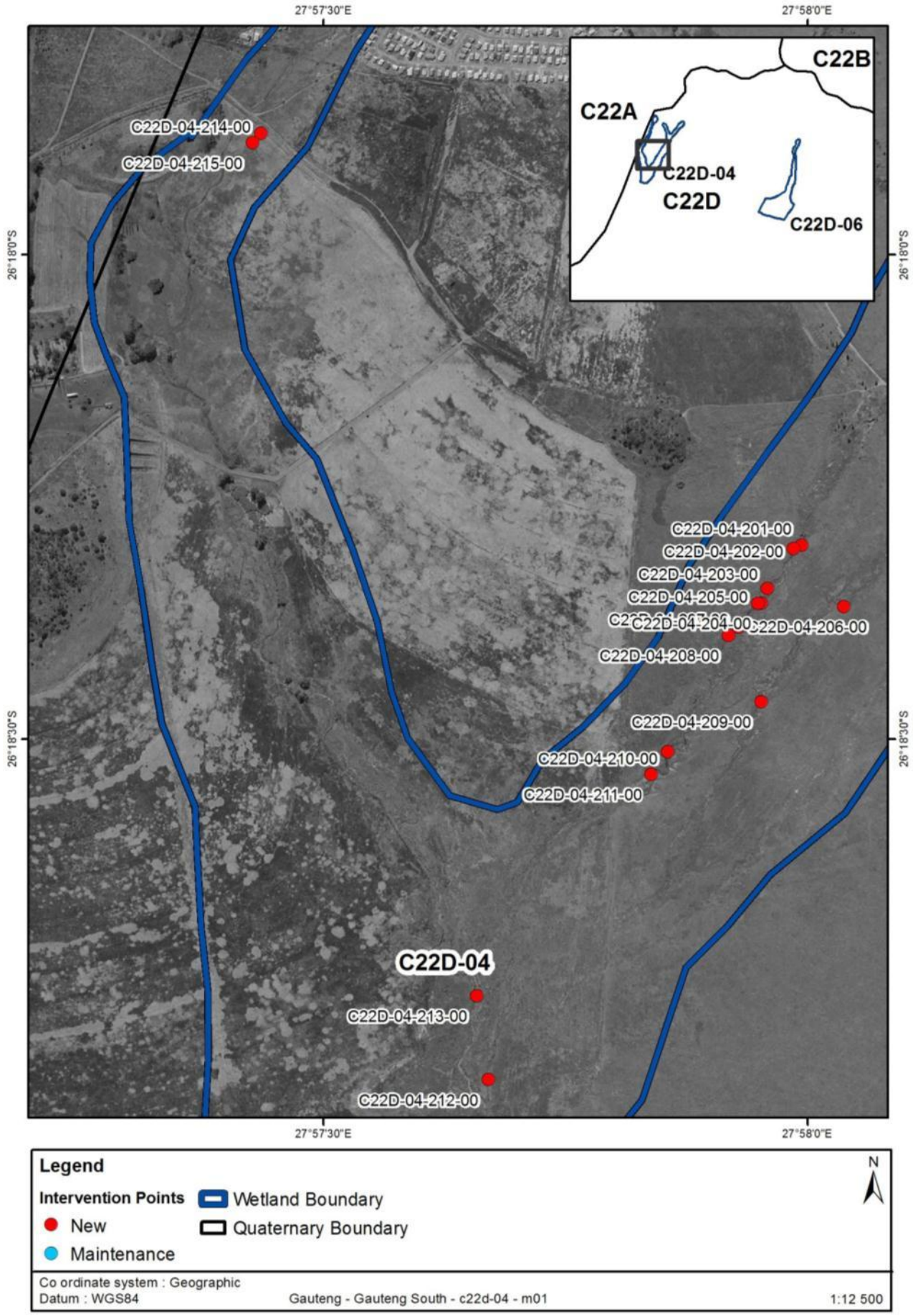

Figure 10: Wetland map, C22D-04, with proposed intervention sites

5.3 Wetland Rehabilitation Problems

The surveyed wetland areas on site have been subjected to a number of impacts such as channel incision, banks collapsing and erosion due to overgrazing, which have led to the modification of the systems' hydrology. The primary concern is that a rapidly incising channel has formed in the wetland. The erosion, causing the channel, has been exacerbated by poor vegetation cover in the wetland as a result of overgrazing and generally poor management of the area. This degradation has resulted in the lowering of the water table causing some sections of the wetland to be 'wetter' and/or drier than others. This is especially evident in the middle section of the drainage line and within the incised channel on site.

The combination of channel incision, erosion and bank instability has resulted in the uneven distribution of water across the wetland area and thus had a considerable impact on the integrity of the wetland. Without the implementation of rehabilitation interventions it is likely that the integrity of the system's hydrology and geomorphology will deteriorate further, especially with further incision and erosion.

However, restoring the wetland to its natural extent without the implementation of a proper livestock management and grazing plan would also have implications. The wetter areas would attract more livestock and thereby increase trampling, erosion and channel incisions which would further reduce the quality of water in the system. In addition, the increase in livestock, heavy grazing and hoof action would most likely result in higher sediment, nutrient and pathogen concentrations (UCCE Rangeland Watershed Fact Sheets No. 3, 2009). Therefore it is recommended that the City of Johannesburg Metropolitan Municipality, implement a livestock management and grazing plan. Furthermore, the area may also need to be fenced off and strict control of the number and timing of livestock grazing would need to be implemented.

5.4 Wetland Rehabilitation Objectives

Due to the nature and extent of the changes and impacts at this site, rehabilitation to conditions similar to the natural or reference conditions are not possible. Remediation and rehabilitation activities can, however, be undertaken to ameliorate the impacts at the site and improve some of the ecological and other functioning of the system. Several alternative approaches which could be adopted for this site are proposed below, and are discussed based on the primary objective behind each option. The following objectives are proposed to address the problems on site:

- Prevent sedimentation of the downstream areas by deactivating and trapping sediments from the active gullies and head cuttings on site and reduce channel incision;
- Restoration of natural flow patterns and flooding in the wetland areas by distributing water through the entire wetland area to improve natural wetland vegetation and;
- Improve species richness and attract local wetland dependent biodiversity.

5.5 Alternatives (section A2 in the BAR)

Soft Structures

One of the main objectives for the Working for Wetlands project is to provide training and skills to local labour forces. Soft structures are favoured in the wetlands for a number of reasons, but best offer opportunities for local labour. Other reasons these are preferred include the dynamic environment of a wetland system where soft structures are not necessarily as permanent or as visible within a wetland and allow the system to change around them.

Of the available soft structures, MacMat-R are preferred for the wetland concerned due to their success in applications in rehabilitating wetlands with similar agricultural issues, i.e. overgrazing and trampling. MacMat-R is also favoured in terms its high success rate with revegetation and soil stabilisation.

Potential alternatives would be 'hard structures' like concrete weirs and gabion weirs, or other 'soft structures' like eco-logs, rock packing or berms. These soft options are however used when they prove to be more effective and / or cost efficient.

MacMat-R offer the desired rehabilitation benefits, while also providing opportunity for unskilled labour days, and is highly successful in terms of revegetation.

Hard structures

In some instances, the 'soft structures' such as MacMat-R or earth berms will not function properly without the support of 'hard structures' like concrete or gabion weirs. In other instances, the hydrology of the catchment dictates that hard structures be used instead of soft structures as they offer better durability and more flow resistant characteristics.

Of the available hard structures, gabion weirs are the preferred option for the wetland in question for the following reasons:

- The footprint (and thus the area of disturbance) of gabion weirs are much smaller than with concrete weirs;
- The founding conditions are more suitable for gabions as there is a lack of solid rock foundations required for concrete structures;
- Gabion weirs perform well with low to medium flow velocities'
- Gabion weirs offer good labour-days both during construction and during maintenance phases of the project'
- The Implementers already have good experience with training unskilled labour in the methods of gabion weir construction; and
- Working for Wetlands has a good track record of performance of these gabion structures in wetlands requiring similar rehabilitation strategies

5.6 Summary of Existing and Proposed Interventions

The following existing interventions within the wetland require maintenance.

Table 5: Summary of maintenance interventions

Intervention Number	Intervention Structure Type	Latitude	Longitude	Estimated Maintenance Cost
C22D-04-216-00	Gabion weir	26°18'51.3"	27°57'39.5"	R 5,047.21
C22D-04-217-00	Gabion weir	26 18 50.0	E27 57 38.9	R 11,882.96
C22D-04-218-00	Gabion weir	26 18 44.0	27 57 39.3	R 33,318.82
C22D-04-219-00	Gabion weir	26 18 43.9	27 57 38.9	R 57,393.82
C22D-04-220-00	Gabion weir	26 18 49.1	27 57 40.4	R 32,548.10
			Total	**R 140,190.91**

The following new interventions are proposed for the wetland.

Table 6: Summary of proposed new interventions

Intervention Number	Intervention Structure Type	Implementation Order	Priority	Structure Cost (Excl. Vat)
C22D-04-201-00	MacMat-R	8	2	R 52,593.12
C22D-04-202-00	Gabion weir	1	1	R 665,131.60
C22D-04-203-00	MacMat-R	9	2	R 22,126.75
C22D-04-204-00	MacMat-R	12	3	R 75,303.62
C22D-04-205-00	Gabion weir	10	2	R 301,171.40
C22D-04-206-00	MacMat-R	11	2	R 6,464.63
C22D-04-207-00	Gabion weir	2	1	R 590,726.00
C22D-04-208-00	Stone masonry weir	3	1	R 350,025.41
C22D-04-209-00	Rock fill	13	3	R 9,938.49
C22D-04-210-00	Gabion weir	4	1	R 584,940.16
C22D-04-211-00	Gabion weir	5	1	R 725,066.49
C22D-04-212-00	Gabion weir	6	1	R 331,664.51
C22D-04-213-00	Gabion weir	7	1	R 524,883.98
C22D-04-214-00	Earth works	14	3	R 331,604.74
C22D-04-215-00	Earth works	15	3	R 132,502.82
			Total	**R 4,704,143.72**

The implementation order indicates the timing order in which interventions should be implemented within the wetland (number 1 first). The priority indicates the relative importance of each intervention across the project as a whole – if interventions have to be omitted for any reason, those with the lowest priority (highest number) across the whole project should be omitted first.

5.7 Wetland Rehabilitation Strategy

Currently the wetland system is losing a lot of sediments (due to erosion and bank collapse) to downstream areas. It is clear that most of the water flow is confined within the eroded incised channel, causing gradual drying out of the original extent of the wetland's wetness front. The objective for rehabilitation activities at this site is to prevent sedimentation within the tributary of the Klip River. The purpose of the proposed interventions is to raise the local water table and create a low velocity

environment for sediment deposition. These interventions would achieve the suggested objective by stabilising head-cut erosion and promote the deposition of sediment. Furthermore, the rehabilitated areas would most likely be colonised by sedges and hydrophytes grasses, adding to the stabilisation and deposition of sediments, while also improving wetland vegetation cover. The proposed interventions would also allow for the redistribution of water across the entire wetland front and minimise erosion that may occur during periods of high flows; minimising the risk channel and gully erosion.

Please note: All sites are to be rehabilitated with indigenous vegetation species. Topsoil[11] from the site must be used, as well as grass mulch to retain soil moisture. Revegetation must take place during the wet season. Also refer to Section 12 of the Construction phase EMP (CEMP) which deals with the site rehabilitation.

5.8 Design Selection and Sizing

The design type was selected for the following reasons:

The selection of design type was influenced by:

- Designs were alternated between gabions, Concrete/ stone masonry, earth structures and earth works with application of soil stabilisation materials such as MacMat-R shutes depending on the specific site requirements.
- Preference could be given to "softer" options (e.g. Gabions and MacMat liners) due to the relative small catchment area and flow seaming to be seasonal.
- Founding conditions and whether the proposed intervention was to be located in the main steam or in the off-channel.

The size of the interventions depended on:

- The depth of the channel.
- The height of the existing water level as well as the positions of proposed interventions that were to be located 'top-to-toe' with the aim of flooding back onto each other where applicable.
- The potential new required upstream water level was also taken into consideration as this would assist in reducing erosion in this area.
- The improvement of the existing structures and the associated applications.

[11]Top 300 mm of soil.

5.9 Intervention Designs

5.9.1 Intervention: C22D-01-201-00

Designer	Cilliers Blaauw
Design Date	November 2012
Intervention Description	MacMat-R
Rehabilitation Objective	Protect wetland against cattle; stabilise sediment; allow vegetation to re-establish
Latitude (DºM'S")	26°18'18.00"
Longitude (DºM'S")	27°57'59.60"
Engineering Drawings	C22D-01-201-00

Figure 11: Photo of intervention site C22D-04-201-00

5.9.1.1 Bill of quantities: C22D-01-201-00

Item	Units	Quantity	Unit Cost	Item Cost
Earthworks Volume	m³	28	R 490.02	R 13,720.48
MacMat -R	m²	250	R 107.80	R 26,950.95
Rockpacks and Reveg.	m²	250	R 47.69	R 11,921.69
			TOTAL	**R 52,593.12**

5.9.1.2 Construction Notes

General construction notes as set out in **Appendix B** apply, along with all construction notes shown on design drawings.

5.9.2 Intervention: C22D-01-202-00

Designer	Cilliers Blaauw
Design Date	November 2012
Intervention Description	Gabion weir
Rehabilitation Objective	Prevent headcut from moving upstream; promote sedimentation
Latitude (DºM'S")	26°18'18.20"
Longitude (DºM'S")	27°57'59.10"
Engineering Drawings	C22D-01-202-00

Figure 12: Photo of intervention site C22D-04-202-00

5.9.2.1 Bill of quantities: C22D-01-202-00

Item	Units	Quantity	Unit Cost	Item Cost
1.5 x 1 x 1 Gabion Basket	Baskets	14		
2 x 1 x 1 Gabion Basket	Baskets	9		
3 x 1 x 1 Gabion Basket	Baskets	1		
4 x 1 x 1 Gabion Basket	Baskets	9		
2 x 1 x 0.5 Gabion Basket	Baskets	5		
3 x 1 x 0.5 Gabion Basket	Baskets	5		
4 x 1 x 0.5 Gabion Basket	Baskets	6		
2 x 1 x 0.3 Gabion Basket	Baskets	4		
3 x 1 x 0.3 Gabion Basket	Baskets	7		
6 x 2 x 0.3 Gabion Basket	Baskets	6		
Excavation Volume	m^3	172.8		

Item	Units	Quantity	Unit Cost	Item Cost
Gabion Rock Volume	m^3	132.8	R 4,815.00	R 639,432.00
Geotextile	m^2	145		
Total Concrete Volume	m^3	3.2	R 6,737.74	R 21,560.76
Earthworks	m^3	2.1	R 490.02	R 1,029.04
Rockpacks and Reveg.	m^2	20	R 47.69	R 953.74
MacMat-R	m^2	20	R 107.80	R 2,156.08
Fencing	m	70		
			TOTAL	**R 665,131.60**

5.9.2.2 Construction Notes

General construction notes as set out in **Appendix B** apply, along with all construction notes shown on design drawings.

5.9.3 Intervention: C22D-01-203-00

Designer	Cilliers Blaauw
Design Date	November 2012
Intervention Description	MacMat-R
Rehabilitation Objective	Protect wetland against cattle; stabilise sediment; allow vegetation to re-establish
Latitude (DºM'S")	26°18'20.70"
Longitude (DºM'S")	27°57'58.50"
Engineering Drawings	C22D-01-203-00

Figure 13: Photo of intervention site C22D-04-203-00

5.9.3.1 Bill of quantities: C22D-01-203-00

Item	Units	Quantity	Unit Cost	Item Cost
Earthworks Volume	m³	2	R 490.02	R 980.03
MacMat -R	m²	136	R 107.80	R 14,661.31
Rockpacks and Reveg.	m²	136	R 47.69	R 6,485.40
Fencing	m	100		
			TOTAL	**R 22,126.75**

5.9.3.2 Construction Notes

General construction notes as set out in **Appendix B** apply, along with all construction notes shown on design drawings.

5.9.4 Intervention: C22D-01-204-00

Designer	Cilliers Blaauw
Design Date	November 2012
Intervention Description	MacMat-R
Rehabilitation Objective	Protect wetland against cattle; stabilise sediment; allow vegetation to re-establish
Latitude (DºM'S")	26°18'21.60"
Longitude (DºM'S")	27°57'57.10"
Engineering Drawings	C22D-01-204-00

Figure 14: Photo of intervention site C22D-04-204-00

5.9.4.1 Bill of quantities: C22D-01-204-00

Item	Units	Quantity	Unit Cost	Item Cost
Earthworks Volume	m³	68	R 490.02	R 33,321.17
MacMat -R	m²	270	R 107.80	R 29,107.02
Rockpacks and Reveg.	m²	270	R 47.69	R 12,875.42
			TOTAL	**R 75,303.62**

5.9.4.2 Construction Notes

General construction notes as set out in **Appendix B** apply, along with all construction notes shown on design drawings.

5.9.5 Intervention: C22D-01-205-00

Designer	Cilliers Blaauw
Design Date	November 2012
Intervention Description	Gabion weir
Rehabilitation Objective	Prevent headcut from moving upstream; promote sedimentation and spreading high flows onto embankments
Latitude (DºM'S")	26°18'21.60"
Longitude (DºM'S")	27°57'56.90"
Engineering Drawings	C22D-01-205-00

Figure 15: Photo of intervention site C22D-04-205-00

5.9.5.1 Bill of quantities: C22D-01-205-00

Item	Units	Quantity	Unit Cost	Item Cost
2 x 1 x 1 Gabion Basket	Baskets	2		
3 x 1 x 1 Gabion Basket	Baskets	3		
4 x 1 x 1 Gabion Basket	Baskets	3		
2 x 1 x 0.5 Gabion Basket	Baskets	1		
3 x 1 x 0.5 Gabion Basket	Baskets	2		
4 x 1 x 0.5 Gabion Basket	Baskets	3		
2 x 1 x 0.3 Gabion Basket	Baskets	11		
3 x 1 x 0.3 Gabion Basket	Baskets	12		
6 x 2 x 0.3 Gabion Basket	Baskets	2		
Excavation Volume	m^3	4	R 490.02	R 1,960.07

Item	Units	Quantity	Unit Cost	Item Cost
Gabion Rock Volume	m^3	60	R 4,815.00	R 288,900.00
Geotextile	m^2	65		
Total Concrete Volume	m^3	0.9	R 6,737.74	R 6,063.96
Earth Structure	m^3	7.5	R 490.02	R 3,675.13
Revegetation	m^2	12	R 47.69	R 572.24
Fencing	m	60		
			TOTAL	**R 301,171.40**

5.9.5.2 Construction Notes

General construction notes as set out in **Appendix B** apply, along with all construction notes shown on design drawings.

5.9.6 Intervention: C22D-01-206-00

Designer	Cilliers Blaauw
Design Date	November 2012
Intervention Description	MacMat-R
Rehabilitation Objective	Protect wetland against cattle; stabilise sediment; allow vegetation to re-establish
Latitude (DºM'S")	26°18'21.80"
Longitude (DºM'S")	27°58'2.20"
Engineering Drawings	C22D-01-206-00

Figure 16: Photo of intervention site C22D-04-206-00

5.9.6.1 Bill of quantities: C22D-01-206-00

Item	Units	Quantity	Unit Cost	Item Cost
Earthworks Volume	m³	0.5	R 490.02	R 245.01
MacMat -R	m²	40	R 107.80	R 4,312.15
Rockpacks and Reveg.	m²	40	R 47.69	R 1,907.47
Fencing	m	40		
			TOTAL	**R 6,464.63**

5.9.6.2 Construction Notes

General construction notes as set out in **Appendix B** apply, along with all construction notes shown on design drawings.

5.9.7 Intervention: C22D-01-207-00

Designer	Cilliers Blaauw
Design Date	November 2012
Intervention Description	Gabion weir
Rehabilitation Objective	Prevent headcut from moving upstream; promote sedimentation
Latitude (DºM'S")	26°18'23.10"
Longitude (DºM'S")	27°57'55.70"
Engineering Drawings	C22D-01-207-00

Figure 17: Photo of intervention site C22D-04-207-00

5.9.7.1 Bill of quantities: C22D-01-207-00

Item	Units	Quantity	Unit Cost	Item Cost
1.5 x 1 x 1 Gabion Basket	Baskets	23		
3 x 1 x 1 Gabion Basket	Baskets	2		
4 x 1 x 1 Gabion Basket	Baskets	6		
3 x 1 x 0.5 Gabion Basket	Baskets	5		
2 x 1 x 0.3 Gabion Basket	Baskets	8		
3 x 1 x 0.3 Gabion Basket	Baskets	4		
6 x 2 x 0.3 Gabion Basket	Baskets	6		
Excavation Volume	m³	162	R 490.02	R 79,382.79
Gabion Rock Volume	m³	102	R 4,815.00	R 491,130.00
Geotextile	m²	60		
Total Concrete Volume	m³	3	R 6,737.74	R 20,213.21

Item	Units	Quantity	Unit Cost	Item Cost
Fencing	m	50		
			TOTAL	**R 590,726.00**

5.9.7.2 Construction Notes

General construction notes as set out in **Appendix B** apply, along with all construction notes shown on design drawings.

5.9.8 Intervention: C22D-01-208-00

Designer	Cilliers Blaauw
Design Date	November 2012
Intervention Description	Stone masonry weir
Rehabilitation Objective	Prevent headcut from moving upstream; promote sedimentation
Latitude (DºM'S")	26°18'23.60"
Longitude (DºM'S")	27°57'55.10"
Engineering Drawings	C22D-01-208-00

Figure 18: Photo of intervention site C22D-04-208-00

5.9.8.1 Bill of quantities: C22D-01-208-00

Item	Units	Quantity	Unit Cost	Item Cost
Concrete: 20 MPa	m³	20.95	R 6,737.74	R 141,155.58
Cement	Pockets	142.46		
Sand	m³	13.62		
Stone	m³	14.67		
Stone Masonry Volume	m³	23.7	R 6,125.22	R 145,167.60
Excavation Volume	m³	130	R 490.02	R 63,702.24
Weldmesh Ref 617	m²	46.1		
Weldmesh Ref 888	m²	51.64		
Mass of Steel	kg	20		
Fencing	m	50		
			TOTAL	**R 350,025.41**

5.9.8.2 Construction Notes

General construction notes as set out in **Appendix B** apply, along with all construction notes shown on design drawings.

5.9.9 Intervention: C22D-01-209-00

Designer	Cilliers Blaauw
Design Date	November 2012
Intervention Description	Rock fill
Rehabilitation Objective	Protect wetland against cattle; stabilise sediment; allow vegetation to re-establish
Latitude (DºM'S")	26°18'27.70"
Longitude (DºM'S")	27°57'57.10"
Engineering Drawings	C22D-01-209-00

Figure 19: Photo of intervention site C22D-04-209-00

5.9.9.1 Bill of quantities: C22D-01-209-00

Item	Units	Quantity	Unit Cost	Item Cost
Earthworks Volume	m³	16	R 490.02	R 7,840.28
Revegetation	m²	44	R 47.69	R 2,098.22
Fencing	m	30		
			TOTAL	**R 9,938.49**

5.9.9.2 Construction Notes

General construction notes as set out in **Appendix B** apply, along with all construction notes shown on design drawings.

5.9.10 Intervention: C22D-01-210-00

Designer	Cilliers Blaauw
Design Date	November 2012
Intervention Description	Gabion weir
Rehabilitation Objective	Prevent headcut from moving upstream; promote sedimentation
Latitude (DºM'S")	26°18'30.80"
Longitude (DºM'S")	27°57'51.30"
Engineering Drawings	C22D-01-210-00

Figure 20: Photo of intervention site C22D-04-210-00

5.9.10.1 Bill of quantities: C22D-01-210-00

Item	Units	Quantity	Unit Cost	Item Cost
1.5 x 1 x 1 Gabion Basket	Baskets	8		
2 x 1 x 1 Gabion Basket	Baskets	1		
3 x 1 x 1 Gabion Basket	Baskets	10		
4 x 1 x 1 Gabion Basket	Baskets	3		
2 x 1 x 0.5 Gabion Basket	Baskets	14		
4 x 1 x 0.5 Gabion Basket	Baskets	7		
2 x 1 x 0.3 Gabion Basket	Baskets	4		
6 x 2 x 0.3 Gabion Basket	Baskets	5		
Excavation Volume	m³	144.4	R 490.02	R 70,758.48
Gabion Rock Volume	m³	104.4	R 4,815.00	R 502,686.00
Geotextile	m²	150		

Item	Units	Quantity	Unit Cost	Item Cost
Total Concrete Volume	m^3	1.6	R 6,737.74	R 10,780.38
Revegetation	m^2	15	R 47.69	R 715.30
Fencing	m	70		
			TOTAL	**R 584,940.16**

5.9.10.2 Construction Notes

General construction notes as set out in **Appendix B** apply, along with all construction notes shown on design drawings.

5.9.11 Intervention: C22D-01-211-00

Designer	Cilliers Blaauw
Design Date	November 2012
Intervention Description	Gabion weir
Rehabilitation Objective	Prevent headcut from moving upstream; promote sedimentation
Latitude (DºM'S")	26°18'32.20"
Longitude (DºM'S")	27°57'50.30"
Engineering Drawings	C22D-01-211-00

Figure 21: Photo of intervention site C22D-04-211-00

5.9.11.1 Bill of quantities: C22D-01-211-00

Item	Units	Quantity	Unit Cost	Item Cost
1.5 x 1 x 1 Gabion Basket	Baskets	14		
2 x 1 x 1 Gabion Basket	Baskets	1		
3 x 1 x 1 Gabion Basket	Baskets	5		
4 x 1 x 1 Gabion Basket	Baskets	14		
2 x 1 x 0.5 Gabion Basket	Baskets	2		
3 x 1 x 0.5 Gabion Basket	Baskets	4		
2 x 1 x 0.3 Gabion Basket	Baskets	7		
3 x 1 x 0.3 Gabion Basket	Baskets	11		
6 x 2 x 0.3 Gabion Basket	Baskets	3		
Excavation Volume	m³	207	R 490.02	R 101,433.56
Gabion Rock Volume	m³	127	R 4,815.00	R 611,505.00

Item	Units	Quantity	Unit Cost	Item Cost
Geotextile	m^2	100		
Total Concrete Volume	m^3	1.8	R 6,737.74	R 12,127.93
Fencing	m	80		
			TOTAL	**R 725,066.49**

5.9.11.2 Construction Notes

General construction notes as set out in **Appendix B** apply, along with all construction notes shown on design drawings.

5.9.12 Intervention: C22D-01-212-00

Designer	Cilliers Blaauw
Design Date	November 2012
Intervention Description	Gabion weir
Rehabilitation Objective	Prevent channels from deepening; promote sedimentation
Latitude (DºM'S")	26°18'51.10"
Longitude (DºM'S")	27°57'40.20"
Engineering Drawings	C22D-01-212-00

Figure 22: Photo of intervention site C22D-04-212-00

5.9.12.1 Bill of quantities: C22D-01-212-00

Item	Units	Quantity	Unit Cost	Item Cost
2 x 1 x 1 Gabion Basket	Baskets	3		
3 x 1 x 1 Gabion Basket	Baskets	3		
4 x 1 x 1 Gabion Basket	Baskets	2		
2 x 1 x 0.5 Gabion Basket	Baskets	1		
3 x 1 x 0.5 Gabion Basket	Baskets	1		
4 x 1 x 0.5 Gabion Basket	Baskets	4		
2 x 1 x 0.3 Gabion Basket	Baskets	5		
3 x 1 x 0.3 Gabion Basket	Baskets	6		
6 x 2 x 0.3 Gabion Basket	Baskets	4		
Excavation Volume	m³	92	R 490.02	R 45,081.58
Gabion Rock Volume	m³	57	R 4,815.00	R 274,455.00

Item	Units	Quantity	Unit Cost	Item Cost
Geotextile	m^2	55		
Total Concrete Volume	m^3	1.8	R 6,737.74	R 12,127.93
Fencing	m	50		
			TOTAL	**R 331,664.51**

5.9.12.2 Construction Notes

General construction notes as set out in **Appendix B** apply, along with all construction notes shown on design drawings.

5.9.13 Intervention: C22D-01-213-00

Designer	Cilliers Blaauw
Design Date	November 2012
Intervention Description	Gabion weir
Rehabilitation Objective	Lift water level in channel to reduce upstream erosion by flooding back to toe of existing intervention C22D-04-006
Latitude (DºM'S")	26°18'45.90"
Longitude (DºM'S")	27°57'39.50"
Engineering Drawings	C22D-01-213-00

Figure 23: Photo of intervention site C22D-04-213-00

5.9.13.1 Bill of quantities: C22D-01-213-00

Item	Units	Quantity	Unit Cost	Item Cost
1.5 x 1 x 1 Gabion Basket	Baskets	22		
2 x 1 x 1 Gabion Basket	Baskets	2		
3 x 1 x 1 Gabion Basket	Baskets	4		
2 x 1 x 0.5 Gabion Basket	Baskets	3		
3 x 1 x 0.5 Gabion Basket	Baskets	5		
4 x 1 x 0.5 Gabion Basket	Baskets	4		
2 x 1 x 0.3 Gabion Basket	Baskets	2		
3 x 1 x 0.3 Gabion Basket	Baskets	6		
6 x 2 x 0.3 Gabion Basket	Baskets	5		
Excavation Volume	m^3	142.1	R 490.02	R 69,631.44

Item	Units	Quantity	Unit Cost	Item Cost
Gabion Rock Volume	m^3	92.1	R 4,815.00	R 443,461.50
Geotextile	m^2	110		
Total Concrete Volume	m^3	1.75	R 6,737.74	R 11,791.04
Fencing	m	60		
			TOTAL	**R 524,883.98**

5.9.13.2 Construction Notes

General construction notes as set out in **Appendix B** apply, along with all construction notes shown on design drawings.

5.9.14 Intervention: C22D-01-214-00

Designer	Cilliers Blaauw
Design Date	November 2012
Intervention Description	Earth works (Remove existing earth berm / drainage channel)
Rehabilitation Objective	Deactivate drainage channel
Latitude (DºM'S")	26°17'52.50"
Longitude (DºM'S")	27°57'26.10"
Engineering Drawings	C22D-01-214-00

Figure 24: Photo of intervention site C22D-04-214-00

5.9.14.1 Bill of quantities: C22D-01-214-00

Item	Units	Quantity	Unit Cost	Item Cost
Earthworks Volume	m³	449	R 490.02	R 220,017.72
Revegetation Area	m²	2340	R 47.69	R 111,587.02
			TOTAL	**R 331,604.74**

5.9.14.2 Construction Notes

General construction notes as set out in **Appendix B** apply, along with all construction notes shown on design drawings.

5.9.15 Intervention: C22D-01-215-00

Designer	Cilliers Blaauw
Design Date	November 2012
Intervention Description	Earth works (Remove existing earth berm / drainage channel)
Rehabilitation Objective	Deactivate drainage channel
Latitude (DºM'S")	26°17'53.10"
Longitude (DºM'S")	27°57'25.60"
Engineering Drawings	C22D-01-215-00

Figure 25: Photo of intervention site C22D-04-215-00

5.9.15.1 Bill of quantities: C22D-01-215-00

Item	Units	Quantity	Unit Cost	Item Cost
Earthworks Volume	m³	111	R 490.02	R 54,391.91
Revegetation Area	m²	1638	R 47.69	R 78,110.91
			TOTAL	**R 132,502.82**

5.9.15.2 Construction Notes

General construction notes as set out in **Appendix B** apply, along with all construction notes shown on design drawings.

5.10 Construction Environmental Management Plan Issues

The proposed rehabilitation is to be undertaken on municipal land and the project team should access the site and manage the site in accordance with the WfWet best management practices and specific requirements of the local chiefs. The implementation of these interventions must also take into account all relevant provisions of WfWet Best Management Practices and Construction Environmental Management Plan, the recommendations of the Basic Assessments submitted for Environmental Authorisation and the requirements of the Environmental Authorisation (Record of Decision) for the project.

The general construction notes, the CEMP are included as **Appendix B and F**.

5.11 Wetland Management Recommendations

The wetland is currently utilised by local communities for their livestock to graze as is evident from the high level of banks that have collapsed. Furthermore, grazing has had a marked effect on the hydrology of the system and multiple trampling has created preferential flow paths that have led to the formation of headcut erosion, channel incisions and gully erosion in some sections.

The grazing of cattle would thus need to be controlled and limited to winter months. It is therefore recommended that best management practise must be adopted in conjunction with the cattle owners which will include, amongst others, training on wetland functions and importance, the need to adopt a rotational grazing system and the associated benefits. A more practical approach may also be to create drinking points outside the wetland by abstracting water from the watercourse. In addition, fencing around the entire wetland area would also allow the wetland to reach its own equilibrium and stabilise.

5.12 Baseline M&E Data

5.12.1 Erosion Problems to be monitored

The erosion problems within the wetland area on site were recorded and their activity/severity recorded for the assessment of wetland integrity. The following erosion features were identified within the wetland:

A. Head-cuts:

Problem Number		1
Problem Description		Multiple Head-cuts erosion
Location DD	**Latitude**	26°18'51.21"
	Longitude	27°57'40.45"
Dimensions	**Height (m)**	2-3
	Width (m)	2-5
	Length (m)	N/A

Figure 26: Photograph indication active multiple headcut to be monitored on site post rehabilitation

Problem Number		7
Problem Description		Headcut erosion
Location DD	**Latitude**	26°18'23.16"
	Longitude	27°57'55.75"
Dimensions	**Height (m)**	0.5-1
	Width (m)	5-10 (pool)
	Length (m)	N/A

Figure 27: Photograph indication active headcut erosion to be monitored post rehabilitation on site.

B. Fixed point photography

Problem Number		FPP (Photo 1)
Problem Description		Photograph taken at the lower reaches just before confluence facing upward at a length of 1.6 km from the top of the delineated wetland area i.e. eastern tributary.
Location DD	**Latitude**	26°18'33.67"
	Longitude	27°57'46.81"

Figure 28: Photograph across the upper section of the wetland area.

5.12.2 Baseline WET-Health Data

The assessment of the current level of ecological integrity of the wetland system provides a baseline assessment for comparative assessments that would be carried out for monitoring purposes 3 years after completion of the wetland rehabilitation activities. The following WET-Health information was collected for the wetland in 2012. Tables below indicate health and impact categories to be used for successive monitoring of the wetland system.

Health Categories:

HGM Unit	Area (ha)	Hydro Health	Hydro Threat	Geo Health	Geo Threat	Vegetation Health	Vegetation Threat
VB	118.4	D	↓	B	↓	C	↓

Impact Scores:

HGM Unit	Area (ha)	Hydro Health	Hydro Threat	Geo Health	Geo Threat	Vegetation Health	Vegetation Threat
VB	118.4	6.0	-1	8.4	-1	6.4	-1

APPENDIX A – WETLAND ASSESSMENT REPORTS

Wetland Assessment Report

Province:	**Gauteng Province**
Project Name:	**Gauteng South**
WetlandPractitioner:	**Bhuti Dlamini (SACNASP: 200016/10)**
Wetland Name:	**Klipriviersberg:*C22D-04***
Report date:	**9 November 2012**

1. Introduction

Wetland Consulting Services (Pty) Ltd was appointed by Aurecon South Africa (Pty) Ltd to undertake a health and ecosystem services assessment of wetlands for the planning of rehabilitation within the Gauteng Province. The purpose of this assessment is to inform the rehabilitation needs, requirements and processes as part of the Expanded Public Works Project, Working for Wetlands. Rehabilitation refers to re-instating the driving ecological forces that underlie a wetland, so as to improve the wetland's health and the ecological services that it delivers. Effective rehabilitation planning therefore requires an assessment of how the following three processes have been threatened/ impacted upon:

- Hydrological;
- Geomorphological; and
- Ecological.

Furthermore, it requires an assessment of the predicted contribution that wetland rehabilitation will make to improving wetland health and ecosystem delivery through addressing the identified impacts/threats. Without these assessments, a wetland rehabilitation programme is unlikely to have a well-informed basis on which to improve the rehabilitation's "return on investment" (with return being measured in terms of wetland health and ecosystem services delivery).

2. Project Description

2.1 General Approach for specific category of the project

The approach and results for the assessment of wetland rehabilitation within the Gauteng South Project are outlined in this report. The wetland rehabilitation project forms part of a historic Category 3 project. Selected quaternary catchments were visually surveyed from a light aircraft in June 2007 and July 2008 to obtain a comprehensive overview of the catchment and identify wetlands and associated problem points that appeared to present suitable rehabilitation opportunities. Field surveys were undertaken to identify and verify problems and rehabilitation opportunities in the selected wetlands, after individual wetlands were ranked according to their perceived rehabilitation potential. This assessment is a continuation of previous assessed and rehabilitated wetland on site.

2.2 Project Description, Location, Category and Catchment Information

The Gauteng South Project is a combination of the Gauteng South and East project areas from the 2008 assessment, and portions of the City of Johannesburg and Ekurhuleni project areas from the 2007 assessment. For the 2009 assessment, wetland rehabilitation projects within Gauteng has been simplified into two project areas according to the continental divide (referring to a hydrological border) that separates the province in two near equal halves with the boundary running more or less from east to west through Johannesburg.

The Gauteng South Project incorporates all of the southern quaternary catchments that drain towards the Atlantic Ocean, predominately areas associated with the Klip, and Blesbokspruit Rivers

that form part of the Vaal River drainage network. Quaternary catchments considered part of the Gauteng South project area include C21A, C21C, C21E, C21F, C21G,C22A, C22C, C22D, C22E,C22F, C22H, and C22J. The investigated quaternary catchments inside the project area are all under increasing pressure from urbanisation, and are already exposed to varying degrees of development-related impacts. Catchments that have been specifically targeted as part of this year's assessments include C22D. Wetland rehabilitation work has already been implemented in Quaternary Catchment C22D, in the Palm Ridge Wetland (Wetland C22D-03). Existing rehabilitation work in the quaternary catchment will therefore be augmented by new rehabilitation initiatives in wetlands C22D-04 and C22D-05 as part of maintenance that forms part of the current Gauteng South Rehabilitation Plan.

Development-related impacts in wetland areas include concentrated stormwater outflows; roads, pipeline and railway line crossings; infrastructure encroachment (including formal and informal residential development); infestation of alien invader plant species; channelization, channel incision and headcut erosion; as well as dumping and mining. The potential of intact wetlands with intact catchments to improve low quality water conditions in receiving watercourses through dilution, and their ability to contribute to the maintenance of indigenous biodiversity, formed the two most important selection criteria for identifying suitable areas for rehabilitation in the project area.

Quaternary Catchment C22D (Figure 1) is characterized by 694.4 mm of mean annual precipitation (MAP) and in excess of 2170.8 mm of potential evapotranspiration (PET). The MAP/PET ration indicates that wetlands inside the catchment have a large susceptibility to alterations of water inputs, referring specifically to reduced water inputs.

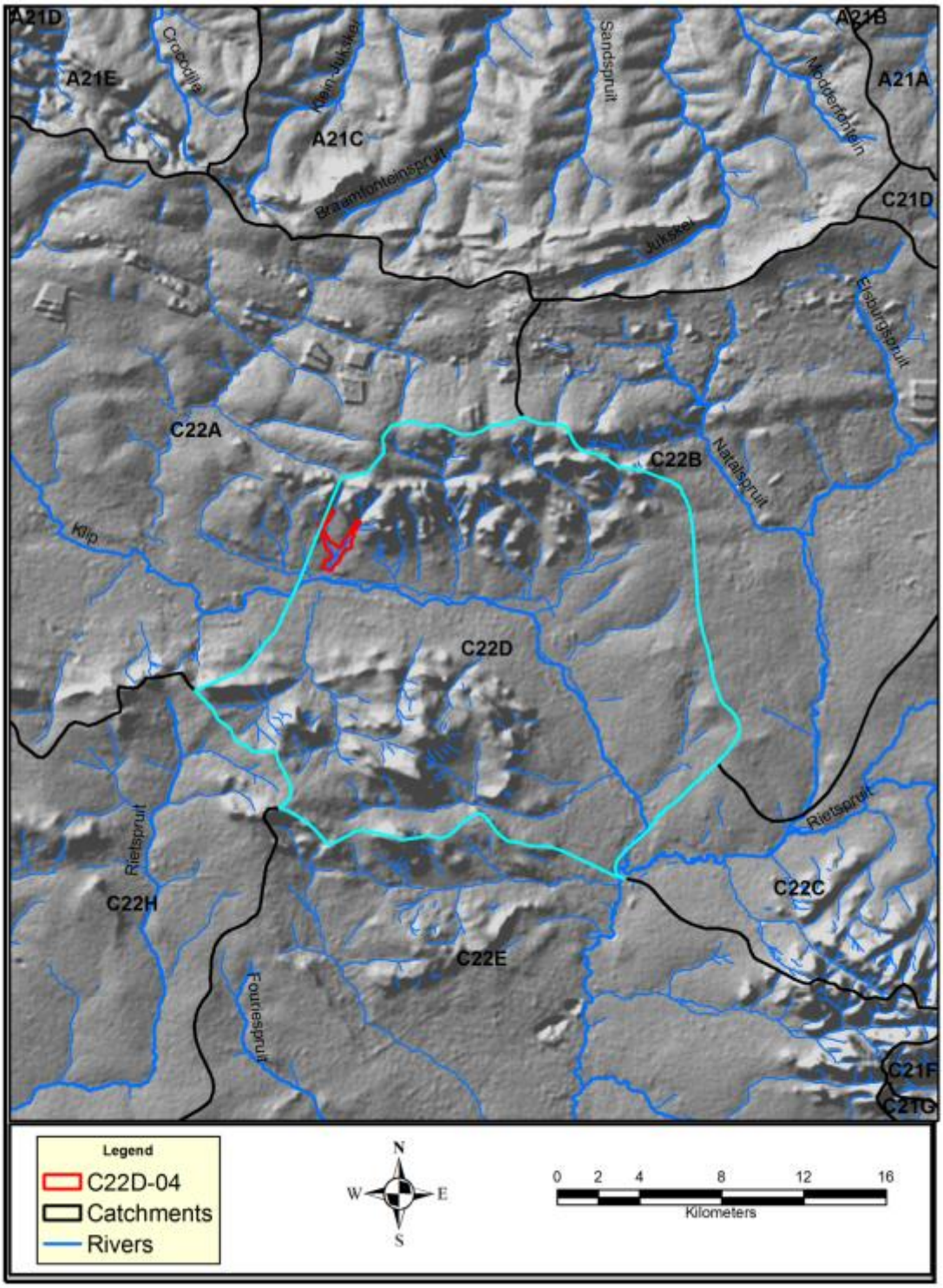

Figure 1 Regional location of the study site within the C22D sub-catchment area

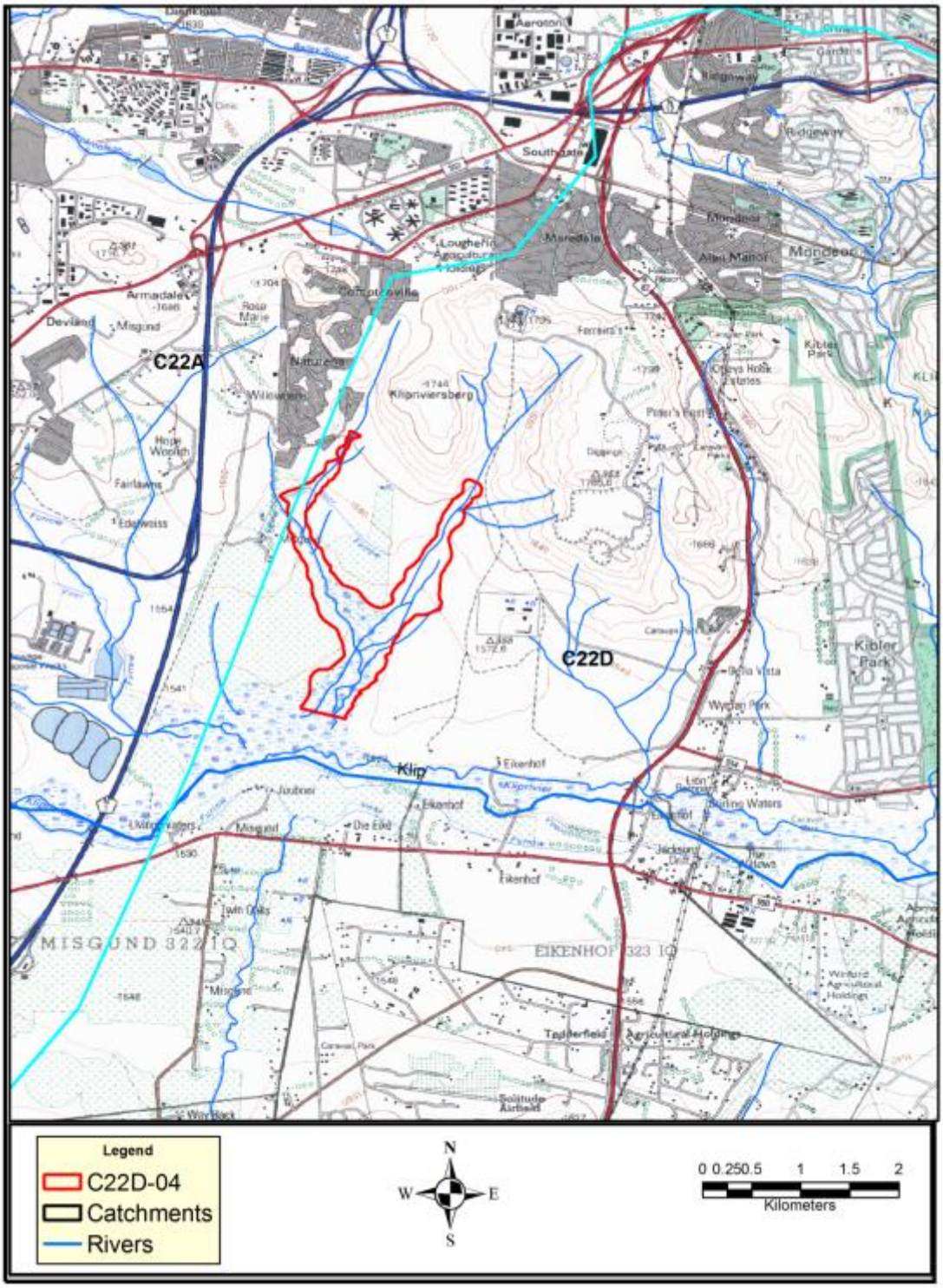

Figure 2 Locality of the assessed wetlands areas within the C22D sub-catchment

3. Method of Assessment

3.1 Methodology

Assess Impacts and Threats

The following steps were followed to assess the impacts and threats within each wetland system:

- Describe the hydro-geomorphic setting of the wetland according to Kotze et al. (2005).
- Describe the overall health of the wetland at a Level 1 using WET-Health (Macfarlane et al., 2006).
- Based on the above, identify specific impacts and/or threats to be addressed by structural rehabilitation and describe these at a Level 2. For example, for headcut erosion, the specific dimensions and level of activity of headcut are described.

Set rehabilitation objectives and choose appropriate measures for achieving the objectives[1]

Objectives are informed by the above assessment (e.g., if the primary threat to the wetland was identified as an erosion headcut threatening to propagate through the wetland then an appropriate rehabilitation objective would be to halt propagation of the erosion headcut)

Assess the likely contribution of rehabilitation intervention to wetland health and ecosystem delivery

The following steps were followed to assess the contribution of rehabilitation interventions within each wetland system:

- Identify the spatial area likely to be affected by the proposed intervention/s.
- Assess the benefits that are likely to result from achievement of the rehabilitation objective/s in terms of the integrity of the affected area of the wetland (using WET-Health) and the ecosystem services that the area delivers (using WET-Ecoservices: Kotze et al., 2005).

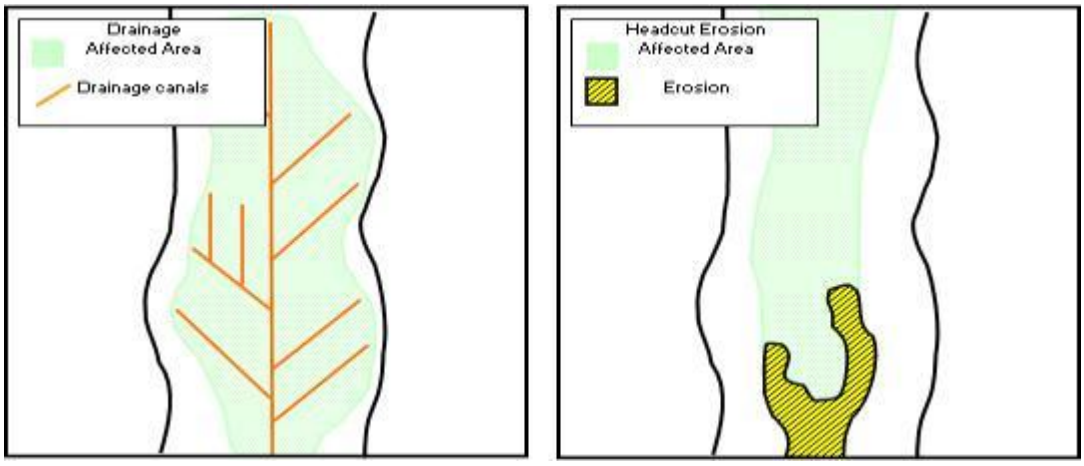

Figure 3: Determination of wetland areas affected by drainage canals or threatened by headcut erosion

The same approach and currency was used for the assessment of the different threats/impacts that are to be addressed through rehabilitation: the situation without rehabilitation (i.e. no intervention) was compared with the situation with rehabilitation. For health, both situations were scored on a scale of 0 (critically altered) to 10 (pristine), and this was undertaken for the

[1] This is dealt with in detail in the main document.

hydrology, geomorphology and vegetation components of health. The benefit achieved, would be the improvement in relation to the maximum score.

Example:

If the hydrological integrity without rehabilitation scored 3 owing to the desiccating effect of a network of drains and this was predicted to be improved to a score of 8 through the construction of rehabilitation plugs then the improvement would be (8-3=5)/10, i.e. an increase in the hydrological integrity of 50%. If the area rehabilitated was 60 ha, for example, then this would be equivalent to re-instating 30 ha (60 ha x 5/10) of wetland integrity. If, however, the score had only been increased from 3 to 5 (perhaps because of insufficient plugs) then this would be equivalent to re-instating 12 ha (60 ha x 2/10).

For areas threatened by head-cut erosion which are to be rehabilitated by halting the propagation of the head-cut, the benefits in terms of health would be determined based on the difference between the current health and the projected health if the head-cut proceeded to erode through the threatened area. In this case, halting the propagation of the head-cut was assumed to secure the current situation. Generally, written justification was provided of the rationale underlying the scores.

Ecological Importance and Sensitivity (EIS) of wetlands

Ecological Importance and Sensitivity is a concept introduced in the reserve methodology to evaluate a wetland in terms of:

- Ecological Importance;
- Hydrological Functions; and
- Direct Human Benefits

The scoring assessments for these three aspects of wetland importance and sensitivity have been based on the requirements of the National Water Act, 1998 (Act 36 of 1998) (NWA), the original Ecological Importance and Sensitivity assessments developed for riverine assessments (DWAF, 1999), and the work conducted by Kotze et al (2008) on the assessment of wetland ecological goods and services (the WET-EcoServices tool).

An ecological importance and sensitivity (EIS) assessment was conducted for the hydro-geomorphic wetland unit identified on site. This was done in order to establish a baseline of the current state of the wetlands and to provide an indication of the conservation value and sensitivity of the wetland in the study area. For the purpose of this study, the scoring system as described in the document "*Resource Directed Measures for Protection of Water Resources. Volume 4. Wetland Ecosystems*" (DWAF, 1999) was applied for the determination of the EIS.

Table 1 Table explaining the scoring system used for the EIS assessment (DWAF, 1999)

Ecological Importance and Sensitivity categories	Range of Median	Ecological Management Class
Very high Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these wetlands is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water of major rivers.	>3 and <=4	A
High Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these floodplains may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers.	>2 and <=3	B
Moderate Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these wetlands is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers.	>1 and <=2	C
Low/marginal Wetlands that is not ecologically important and sensitive at any scale. The biodiversity of these wetlands is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water of major rivers.	>0 and <=1	D

3.2 Assumptions and Limitations

3.2.1 DISCLAIMER

The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. The report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken and Wetland Consulting Services (Pty.) Ltd. and its staff reserve the right to modify aspects of the report including the recommendations if and when new information may become available from ongoing research or further work in this field, or pertaining to this investigation.

Although Wetland Consulting Services (Pty.) Ltd. exercises due care and diligence in rendering services and preparing documents, Wetland Consulting Services (Pty.) Ltd. accepts no liability, and the client, by receiving this document, indemnifies Wetland Consulting Services (Pty.) Ltd. and its directors, managers, agents and employees against all actions, claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with services rendered, directly or indirectly by Wetland Consulting Services (Pty.) Ltd. and by the use of the information contained in this document.

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part of a main report relating to this investigation or report, this report must be included in its entirety as an appendix or separate section to the main report.

3.2.2 ASSUMPTIONS AND LIMITATIONS

In compiling this report, the following has been assumed:

- The information provided in this report is based on site visits that have been undertaken by the project team (Environmental Assessment Practitioner, Engineer, Wetlander, SANBI Provincial Coordinator) and their subsequent input into the Reporting, which includes intervention design drawings, the wetland assessment, in addition to input from SANBI's Provincial Coordinators. It is understood that this information is sufficient for the authorisation processes and associated Phase 3 (Implementation phase). This data and relevant information has informed the findings and conclusions of this report.
- The level of planning carried out for each project area was dependant on the information contained in the Phase 1 reports (August 2010) and the Phase 2 site visits that were undertaken in October 2012. This document should therefore be read in conjunction with the 2010 & 2012Phase 1 Report.
- The Department of Environmental Affairs' requirement to increase the percentage of funding to be spent on labour within the WfWet programme has been taken into consideration by the project team during this prioritisation process for wetland rehabilitation.
- The labour intensive targets identified in this project are based on assumed productivity rates for various components of the construction process. This will vary in practise and will require regular monitoring to ensure that labour targets are attained.

4. Wetland C22D-04 (Klipriviersberg Wetland)

4.1 Description of Conditions

4.2.1 Wetland Description

The extent and location of the Klipriviersberg wetland (C22D-04) in the study site is indicated in Figure 4 below. The assessed portion of wetland is considered to be a channelled valley bottoms (characterized by cut off trenches, incised channel and erosion) in terms hydro-geomorphological characteristics, and are driven primarily by the lateral and overtopping of water from the channel (Table 2 and Figure 4). The majority of the wetland's catchment is characterized by livestock grazing, severe trampling in some areas and the top section towards Naturena Township, past cultivation contours and cut-off trenches were observed. The area is also used as dumping site and other activities include Rand Water treatment works within the area. Deterioration of water quality is also expected in some places due to eutrophication from livestock. The observed activities within and around the wetland area has resulted in uneven distribution of water across the wetland, leaving some areas marginally wet that used to be permanently wet due to flow confinement. The impacts have further resulted in changes to hydrology, morphology and structural diversity of the wetland area on site.

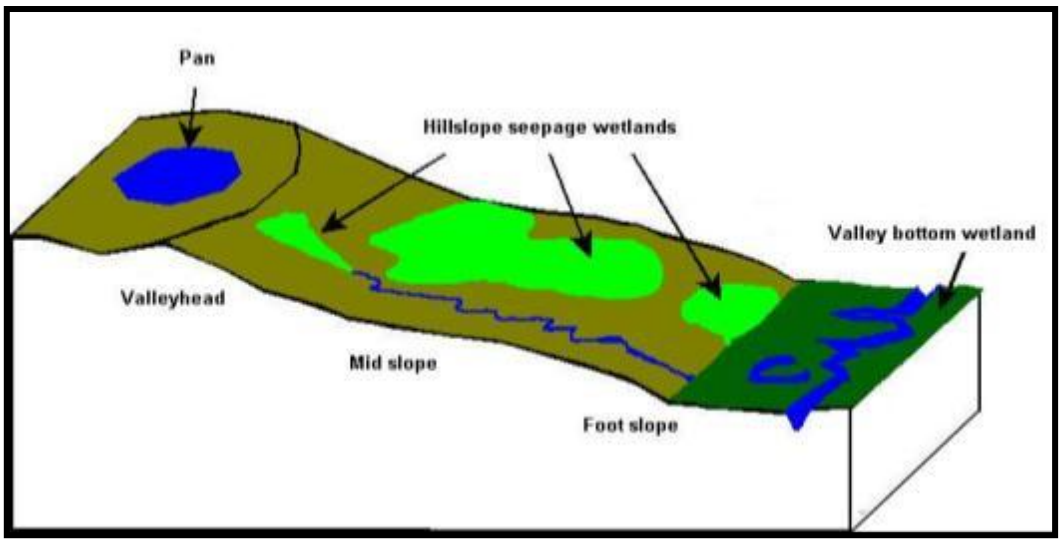


Figure 4: Schematic diagram illustrating the position of the various wetland types within the landscape (Copyright: Wetland Consulting Services (Pty) Ltd.)

Table 2: The definition of the different wetland units recorded during the study in relation to type, topographic setting and hydrological components (table and classification modified from Marneweck and Batchelor, 2002; Brinson, 1993).

LANDFORM SETTING	DEFINITION	HYDROLOGIC COMPONENTS		
		Inputs	Throughputs	Outputs
Valley bottom with a channel	Occur in the shallow valleys that drain the slopes. Are gently or steep sloped and characterised by the alluvial transport and deposition of material by water.	Receive water inputs from adjacent slopes via runoff and interflow. May also receive inputs from a channelled system. Interflow may be from adjacent slopes, adjacent hillslope seepage wetlands if these are present, or may occur longitudinally along the valley bottom.	Surface flow and interflow.	Variable but predominantly stream flow.

Figure 5: Map indicating distribution and extent of wetland areas assessed on site

Photographs below indicate aerial view of the wetland areas on site

Figure 6: Photographs showing wetland area assessed on site

4.2 Wetland Details

Wetland Name	Klipriviersberg Wetland
Wetland Number	C22D-04
GPS Location	27°57'40.28"E26°18'42.79"S
River System Name	Tributary of the Klip River
Land Use in Catchment	Nature reserve, Residential, Agriculture
Land Use in Wetland	Grazing open field and Residential areas upper reaches
No. of Properties Intersecting Wetland Area	1
Date of Wetland Assessment	29th& 30th October 2012
Wetland Assessor(s)	Bhuti Dlamini
Wetland Size	118.4 ha

4.2.2 Problems

The surveyed wetland areas on site have been subjected to a number of impacts such as channel incision, banks collapsing and erosion by overgrazing on site, which have led to the modification of the systems' hydrology. The primary concern is that a rapidly incising channel has formed in the wetland. The erosion causing a channel has been exacerbated by poor vegetation cover in the wetland as a result of overgrazing and generally poor management of the area. This degradation has resulted in the lowering of the water level (table) causing some sections of the wetland to be 'wetter' and/or drier than others. This is especially evident in the middle section of the drainage line and within the incised channel on site.

The combination of incision of the channel, caused especially by overgrazing, erosion and bank instability and collapsing has resulted in the uneven distribution of water across the wetland area

and has thus had a considerable impact on the integrity of the wetland. Without the implementation of rehabilitation interventions it is likely that the integrity of the system's hydrology and geomorphology will deteriorate further, especially with further incision and erosion.

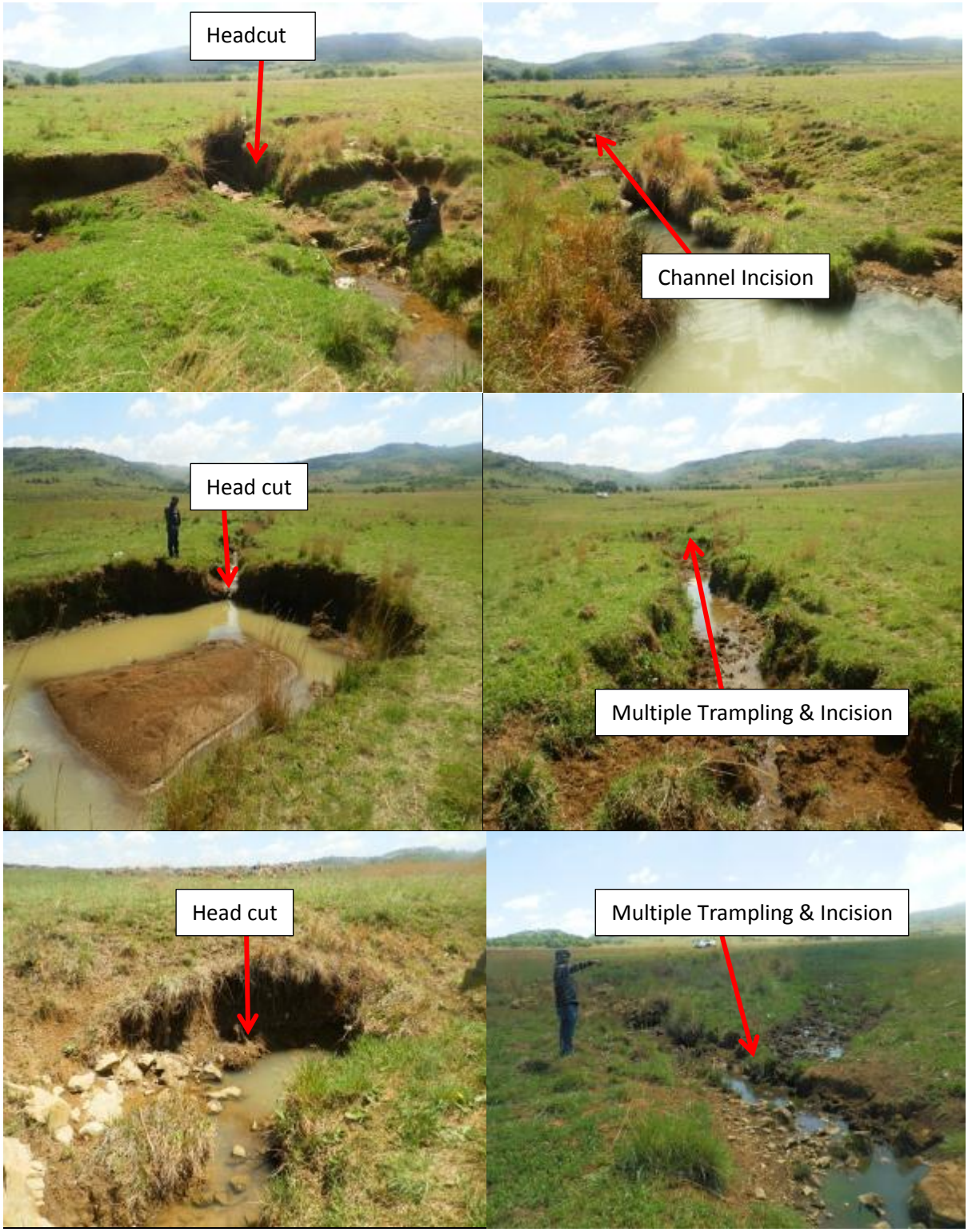


Figure 7: Photographs indicating some of the recorded problems on wetland on site.

4.3 Rehabilitation Objectives

Due to the nature and extent of the changes and impacts at this site, rehabilitation of the wetlands to conditions similar to the natural or reference conditions are not possible. Remediation and rehabilitation activities can, however, be undertaken to ameliorate the impacts at the site and improve some of the ecological and other functioning of the system. Several alternative approaches which could be adopted for this site are proposed below, and are discussed based on the primary objective behind each option. The following objectives are suggested to form part of the rehabilitation plan in order for the rehabilitation plan to address the problems on site:

- To prevent sedimentation of the downstream areas by deactivating and trapping sediments from the active gullies and head cuttings on site and reduce channel incision;
- Restoration of natural flow patterns and flooding in the wetland areas by distributing water through the entire wetland area to improve natural wetland vegetation and;
- Improve species richness and attract local wetland dependent biodiversity.

Currently the wetland system is desiccating due to head-cut erosion, cut off trenches and channel incision on site. The flow patterns within the wetland are confined within the incised channel, leading to gradual drying out of the original extent of the wetland's wetness front. The objectives for rehabilitation activities as set above will ameliorate the situation at this site. Several interventions are proposed on site within and around impacted areas as show in the figure below. These interventions will achieve the suggested objectives, since sediment would be deposited in the cut off trench upstream of the structures. Due to the proposed interventions water will be redirected to the entire wetland area which would most likely also promote sediment stabilization and further deposition and improve wetland species composition on site.

Risks:

Flooding of the area (creating more wetland area) without any proper livestock management and grazing plan will also have risks, as this will attract a lot livestock for grazing and drinking, resulting in more trampling and further erosion and channel incision of the area and further deterioration of water quality. Concentration of livestock, heavy grazing and hoof action are potential causes of excessive sediment, heat nutrients and pathogens (UCCE Rangeland Watershed Fact Sheets No. 3, 2009). In order to prevent this, a livestock management and grazing plan will need to be adopted and the area might need to be fenced off as part of the plan. Strict control of the number and timing of livestock grazing, as per the livestock management and grazing plan, will need to be implemented.

Figure 8 Locality of the proposed rehabilitation and stabilisation interventions within the sections of the wetland system on site

The areas that are marginally wet on site will be able to receive water that had been confined within the trench on site. The proposed rehabilitation will attempt to modify the flow patterns within the wetland system to promote the more diffuse flow across the entire wetland area.

4.4 HYDRO-GEOMORPHOLOGICAL (HGM) ASSESSMENT

As indicated in the above sections, assessed portion of wetland on site was considered to be channelled valley bottoms (characterized by cut off trenches, incised channel and erosion) in terms hydro-geomorphological characteristics, and are driven primarily by the lateral and overtopping of water from the channel.

C22D-04		
	km	m
Length of a wetland	2.96 2960	
Area	118.4 hectares	
Elevation (m)	Highest 1640	
	lowest 1520	
Slope	0.04	
Slope (%)	**4**	

The general condition of the wetlands at the site was assessed and the likely causes of degradation were noted. The wetland assessment tool "WET-Health" (MacFarlane et al., 2006) was applied at the site to develop an index of the condition of the wetland system. The proposed remediation measures for the wetlands were then evaluated in light of this information. WET-Health is a specialist tool that has been developed to assess the health of wetlands. The scoring system assigns health categories for the three modules, namely Hydrology, Geomorphology and Vegetation, which are used in the assessment (see attached spreadsheets for this particular wetland).

4.2.3 Eco-services

The setting of Wetland C22D-04, as well as its surrounding catchment and associated opportunities in terms of external influxes into the wetland, result in the system being considered to be of particular importance as a source of water quality improvement and as a potentially important habitat for biodiversity. In terms of water quality the wetland has the potential and opportunity to threat upstream water inputs (e.g. through microbial transformations and sedimentation behind obstructions) and thereafter releasing it into the Klip River which is a known water quality stressed aquatic system (McCarthy *et al*., 2007). With regard to biodiversity, the wetland is considered to provide a functional corridor for species movement between the Klip River and the surrounding terrestrial grasslands that remain largely undeveloped (albeit not completely intact). Ridges in the higher-lying portion of the wetland catchment are connected with the wetland through natural grassland habitat, and provide a virtually intact corridor to the nearby Klipriviersberg Nature Reserve towards the east.

As elaborated upon in WET-Rehab-Evaluate, a WET-Eco-services assessment is conducted for the "with rehabilitation" and the "without rehabilitation" situation, considering the predicted change in ecosystem health with and without rehabilitation respectively. However, for the purpose of planning, there is not enough time to carry out these two assessments, in which case, a more rapid assessment is conducted. This rapid assessment requires comparison of the area affected by rehabilitation compared to the same area without rehabilitation. It is anticipated that the rehabilitation of the wetland would contribute to improved levels of ecosystem functionality,

especially with regards to its ability to control erosion and trap sediment. The table below qualitatively illustrates the contribution of the proposed rehabilitation interventions to expected increases in ecosystem services associated with wetland systems in general. The scoring used in this assessment is given below in Table 3 below,

Table 3 Scores for ecosystem services if rehabilitation goes ahead (Wet Rehab-Evaluate, Cowden and Kotze, 2008)

Score	Description of impact or rehabilitation on Ecosystem Services
-2	Substantial loss anticipated
-1	Slight loss anticipated
0	No significant loss anticipated
1	Slight improvement anticipated
2	Substantial improvement anticipated

REDUCTION IN WATER INPUTS		
Ecosystem Service	**Score**	**Comments**
Flood Attenuation	Slight Positive Effect Anticipated	The proposed rehabilitation work will slightly improve the ability of the wetland to retain water after high flow events. Water will also be pushed back into the valley bottom during high flow events and thereby increase the frequency of flooding in the surrounding wetland.
Stream flow Regulation	No Effect Anticipated	The interventions will retain water and release it during normal flow periods, but the overall effect is regarded as insignificant.
Sediment Trapping	Large Positive Effect Anticipated	The gabion weir structures are expected to effectively trap sediment transported within the targeted (incised) gullies.
Phosphate Assimilation	Slight Positive Effect Anticipated	Increased flood attenuation and sediment trapping are expected to result in greater phosphate assimilation. Sources include the upstream residential area and cattle grazing in the wetland.
Nitrate Assimilation	Slight Positive Effect Anticipated	An increased retention time of water and improved rehydration of desiccated wetland habitat are

REDUCTION IN WATER INPUTS		
Ecosystem Service	**Score**	**Comments**
		expected to benefit from the removal of nitrates from the water body. Sources include the upstream residential area and cattle grazing in the wetland.
Toxicant Assimilation	Slight Positive Effect Anticipated	An increase in toxicant removal is expected through improved sedimentation and filtration capabilities brought about by the rehabilitation interventions.
Erosion Control	Large Positive Effect Anticipated	One of the primary aims of the rehabilitation work is aimed at stabilising actively eroding areas of wetland habitat.
Carbon Storage	Slight Positive Effect Anticipated	Rehydration of desiccated wetland habitat will contribute to improved carbon storage, by inducing anaerobic soil conditions for longer periods of time. Consequently a more favourable environment for organic carbon accumulation is created in the process.
Biodiversity Maintenance	No Effect Anticipated	The proposed rehab measures will not directly improve biodiversity, but will contribute to securing wetland habitat and thereby protecting wetland-associated biodiversity.
Water Supply for Human Use	No Effect Anticipated	No direct utilization of water for human use is present within the catchment.
Natural Resources	No Effect Anticipated	No natural resources are expected to be harvested from the wetland.
Cultivated Foods	No Effect Anticipated	No evidence were found of crop cultivation within the wetland at the time of the field survey.
Cultural Significance	No Effect Anticipated	No known cultural significance is associated with the wetland.
Tourism and Recreation	No Effect Anticipated	The wetland is not expected to be of specific value with regards to tourism and recreation. Again any such value provided by the system will be in part be secured by the proposed rehabilitation measures.

REDUCTION IN WATER INPUTS		
Ecosystem Service	**Score**	**Comments**
Education and Research	Slight Positive Effect Anticipated	The rehabilitation planning and assessment is expected to result in new information with regards to the wetland system.

Note: The hydrology, geomorphology and vegetation assessment tables are extracts from the Wet Health Assessment Tool. The extent of rating and Tables referenced in attached tables are explained in details in Wet Health Tool. The inclusion of these in this report is merely to indicate what was assessed and what factors taken into account when scoring of the integrity of the system assessed. The reader is advised to read this report together with the entire Wet Health Assessment tool to get explanation o f some of the terms indicated in the attached tables.

4.2.4 Hydrology

Surface flow will be concentrated in the discontinuous channel sections. Localised incised channel sections are expected to be associated with a lowering of the water table in close proximity to the channel and reduction in the flood frequency.

ASSESSMENT OF IMPACTS:

Changes to water distribution & retention patterns	**Table Reference**	**3.5**	**Any additional notes**
Changes to Water Input characteristics		**2.0**	
Combined Hydrology Impact Score	Table 5.12	**4.0**	Active erosion in sections, cut-trenches from past agricultural activities, development of preferential flow paths and incision and damming effect on the upper reaches of the wetland system

THREATS AND OPPORTUNITES:

Threat Type	Threat class	Extent (%)	Threat score	Area-weighted score	Rehabilitation Potential
Erosion and sediment loss	Rapidly deteriorate	20	-2	-0.4	High
Drainage/ trenches	Slowly deteriorate	5	-2	-0.1	High
			Overall weighted threat score	**-0.5**	
HGM Trajectory of Change score	Table 5.27			**-1**	

In the current scenario (no rehabilitation measures implemented) the wetland remains under threat from further erosion, especially in the form of headcut advancement through the remainder of the wetland area. Further erosion and desiccation may very well lead to the establishment of dense stands of invasive alien tree species, especially in areas where the soil profile has been disturbed (i.e. historically cultivated areas and erosion gullies). The proposed rehabilitation measures will however help to reduce these threats, especially in terms of head cut migration and channel expansion, while the establishment of alien trees would require monitoring over time, as the proposed rehabilitation work will have little influence in excluding alien trees.

4.2.5 Geomorphology

The geomorphological assessment indicated that erosion features in the form of active head cuts and incised channels were the most significant impacts on the geomorphology health component of the wetland. Headcut erosion features currently present inside the wetland appear to threaten upstream and lateral wetland habitat and are expected to continue to destroy wetland areas should the proposed rehabilitation interventions not be implemented. This threat is likely to be aggravated by grazing inside the system, but unlikely to result in rapid wetland deterioration.

ASSESSMENT OF IMPACTS:

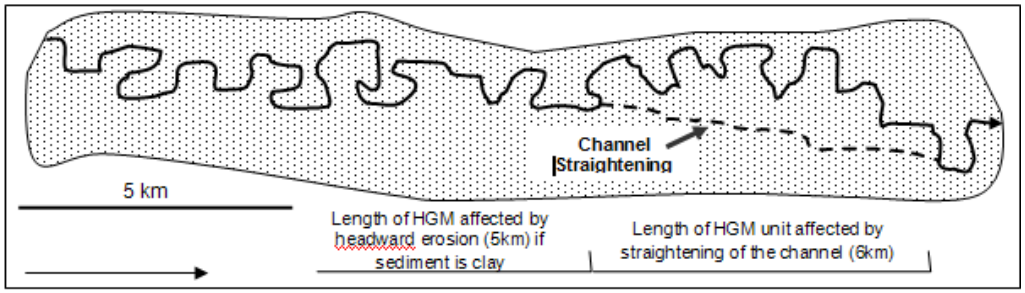
Impact type	Applicability to HGM type	Extent rating guidelines	Extent (%)[1]	Intensity rating guidelines	Intensity (0 - 10)	Magnitude [2]	Land-use factors contributing to impacts, and any additional notes
Daignostic component							
1. Upstream dams	Floodplain	See below [3]	6	Table 5.14	5	0.3	One dam on the upper reaches of the wetland system just below Naturena township and some impoundment from the road within the same tributary.
2. Stream diversion/shortening	Floodplain, Channelled VB	See below [4]	6	Table 5.15	7	0.4	Old cut off trenches below Naturena township from previous agricultural activities on site.
3. Infilling	Floodplain, Channelled VB	See below [5]	5	See below [5]	7	0.4	Around impoundments' wall and informal road crossing just below Naturena township.
4. Increased runoff	Non-floodplain HGMs	Table 5.16	5	Table 5.16	7	0.4	Minor additional flow from Naturena township upstream of the one tributary of the wetland system and incision was observed around this area.
Indicator-based component							
5. Erosional features	All non-floodplain HGMs	Table 5.17	20	Table 5.18	7	1.4	Channel incision and active bank collapsing observed on site; accounts for approximately 20% of the wetland area. There is also additional areas where cut-off trenches were dug presumably from previous agricultural activities on site.
6. Depositional features	All non-floodplain HGMs	Table 5.19	5	Table 5.20	7	0.4	Around impoundments' wall and informal road crossing just below Naturena township.
7. Loss of organic matter	All non-floodplain HGMs with peat	see below[6]	0	Table 5.21	0	0.0	None observed on site.
Combined Impact Score based on a sum of all magnitude scores[7]						**1.6**	

1 Extent refers to the extent of the HGM unit affected by the modification, expressed as a percentage of the total area of the HGM unit

2 Magnitude = Extent (%)/100 x Intensity

3 Extent is determined based upon the area of the HGM unit that is flooded (in the case of a dam in the HGM unit) and the area of the HGM unit area downstream of the dam (for a dam upstream of the HGM unit, this will be 100% of the HGM unit).

4 Extent of area affected by stream straightening is expressed by measuring the length of the wetland affected by stream straightening and expressing this as a percentage of the overall length of the HGM unit. Extent of the wetland affected by stream diversions is determined based upon a distance upstream of the point of diversion along the channel of 20 km if the sediment is sandy and 5 km if it is clayey (or to the upstream end of the HGM unit if this is less than the specified distance). The specified distances are given based on the fact that headward erosion in the stream channel advances much more readily through sand than through clay. Assume that in the example given below the sediment was clayey, then the length of wetland affected by diversion and straightening would be 5 + 6 km, which, expressed as a proportion of the total length of the wetland, would be 11/17 km= 65%.



5 Extent of area affected by infilling is based on the following guideline: for a small stream (i.e., 1st to 2nd order stream), filled area + 1 km upstream and downstream, and for a large stream (i.e. > 3rd order) 2 km upstream and downstream. Intensity of impact is based on the extent to which flow is blocked by embankments given as a percentage of the HGM width, divided by 10 to give a score ranging from 0 to 10. For example, if embankments block flow across 1.4 km of an HGM unit that is 2 km wide (70% of width) then intensity of impact is 70÷10=7.

6 Extent of the area affected by organic matter reduction is based on the extent of peat subject to desiccation, ground fires or extraction, expressed as a percentage of the HGM unit.

7 If no information on on-site indicators are available, this score is simply calculated as a sum of scores from the diagnostic assessment. Where information on both diagnostic & indicator assessments is available, the combined score is calculated by averaging the combined scores from each of these components.

Notes:

Trampling and grazing pressure necessitates the need to temporarily fence of any implemented rehabilitation structure inside the wetland to enable vegetation to establish and bind soil particles together for at least the first two years after construction. This step is regarded as an important management procedure that is likely to determine the long term success of implemented rehabilitation work. In addition each intervention point should be monitored to evaluate rehabilitation success and enable early problem detection.

THREATS AND OPPORTUNITES:

Threat Type	Threat class	Extent (%)	Threat score	Area-weighted score	Rehabilitation Potential
Erosion and gullies	Slowly deteriorate	20	-2	-0.4	High
Drainage/Trenches	Slowly deteriorate	5	-1	-0.1	High
			Overall weighted threat score	**-0.5**	
HGM Trajectory of Change score				Table 5.27	**-1**

4.2.6 Vegetation and Ecology

Loss of indigenous grassland-associated vegetation cover has probably been associated with the development of the incised channel. In the absence of the planned rehabilitation work, expansion of the incised channel and head cut advancement will lead to a slow deterioration of the vegetation health of the wetland. The risk of invasive alien tree species encroachment remains a threat and should ideally be monitored over time in association with implemented rehabilitation interventions.

Overgrazing on site caused displacement of indigenous vegetation by exotic species such as *Stoebe vulgaris* in some places and this reduced the level of confidence associated with information gathered during the in-field vegetation assessment. Hence, a greater emphasis was placed on desktop interpretations and the identification of indicators of vegetation transformations.

ASSESSMENT OF IMPACTS:

Disturbance Class	Extent (%)	Table references	Intensity [1] (0 - 10)	Magnitude [2]	Additional Notes
1. Infrastructure	5	Table 5.22 (Descriptions) & Table 5.23 (Typical intensity Scores)	10	0.5	Houses around and close to the wetland area (Naturena Township) and informal road crossings in the upper reaches below township.
2. Deep flooding by dams	0		10	0.0	None
3. Shallow flooding by dams	0		6	0.0	None
4. Crop lands	2		9	0.2	Abundant crops fields below Naturena township
5. Commercial plantations	0		9	0.0	None
6. Annual pastures	0		9	0.0	None
7. Perennial pastures	0		8	0.0	None
8. Dense Alien vegetation patches.	2		7	0.1	Kikuyu grassland below old agricultural fields around cut off trenches areas below Naturena township
9. Sports fields	0		9	0.0	None
10. Gardens	0		8	0.0	None
11. Areas of sediment deposition/ infilling & excavation	5		8	0.4	Around impoundments' wall and informal road crossing and cut off trenches just below Naturena township
12. Eroded areas	20		7	1.4	Channel Incision and active bank collapsing observed on site and accounts for about 20% of the wetland area. There are also additional areas where cut-off trenches were dug presumably from previous agricultural activities on site.
13. Old / abandoned lands (Recent)	5		7	0.4	Old cultivation fields currently not in used occurs on the upper reaches of one tributary just below Naturena township.
14. Old / abandoned lands (Old)	0		5	0.0	None
15. Seepage below dams	1		3	0.0	Minor seepages from the upstream dam within one tributary below Naturena township
16. Untransformed areas	60		1	0.6	Mosaic Grassland areas around wetland areas, some areas completely overgrazed
Overall weighted impact score [3]				**3.6**	

1 Default scores are provided which should be adjusted based on field investigations or local knowledge

2 Magnitude of impact score is calculated as extent / 100 x intensity of impact.

3 The overall magnitude of impact score for the HGM unit is the sum of magnitude cores for each disturbance class

THREATS AND OPPORTUNITES:

Threat Type	Threat class	Extent (%)	Threat score	Area-weighted score	Rehabilitation Potential
Erosion and Gullies	Slowly deteriorate	20	-2	-0.4	High
Drainage/Trenches	Slowly deteriorate	5	-1	-0.1	High
			Overall weighted threat score	**-0.5**	
HGM Trajectory of Change score				Table 5.27	**-1**

4.2.7 Wetland Health Assessment (PES)

The information below shows the current/pre-rehabilitation levels of integrity within the identified wetland system and the anticipated improvement in the system's integrity associated with the proposed rehabilitation. It is evident that the proposed long-term rehabilitation of the Klipriviersberg wetland is likely to improve the integrity of each component of the system. The costs and gain in wetland functioning and integrity associated with the proposed rehabilitation are quantified in the following section. The threats identified within the wetland system are generally associated with further incision of the cut off trench and the encroachment of alien invasive plant species. These threats were considered to be easily addressed with the implementation of rehabilitation activities. However, a great deal more emphasis must also be placed on the management and control of grazing.

Wetland No	Ha	Extent (%)	Hydrology		Geomorphology		Vegetation	
			Impact Score	Change Score	Impact Score	Change Score	Impact Score	Change Score
	118	100	4.0	-1	1.6	-1	3.6	-1
PES Categories			**D**	↓	**B**	↓	**C**	↓
Wetland Impact Score			**3.195714286**					
Wetland PES			**C**					

		Status Quo	Without rehabilitation	With Rehabilitation
Size of wetland (Ha)		118.4	118.4	118.4
Impact Scores	**Hydrology**	4.0	6.5	3.5
	Geomorphology	1.6	2.5	0.9
	Vegetation	3.6	4.3	2.4
	Overall	3.2	4.7	2.4
Ecological Category		**C**	**D**	**C**
Hectare equivalents		80.6	62.5	89.6

4.2.8 Wetland Importance and Sensitivity (EIS rating)

As indicated in the above sections, an ecological importance and sensitivity (EIS) assessment was conducted for the hydro-geomorphic wetland unit identified on site. This was done in order to establish a baseline of the current state of the wetlands and to provide an indication of the conservation value and sensitivity of the wetland in the study area. For the purpose of this study, the scoring system as described in the document "*Resource Directed Measures for Protection of Water Resources. Volume 4. Wetland Ecosystems*" (DWAF, 1999) was applied for the determination of the EIS.

Wetlands are regarded as important components of the landscape in which they occur as they are associated with a number of functions that are of value to society. Typically these functions include water quality improvement, flood attenuation, biodiversity support as well as products. Based on the EIS assessment, Klipriviersberg wetland C22D-04 is considered to be of Moderate Ecological Importance and Sensitivity.

Flood attenuation

Flood attenuation on the upper reaches of the wetland area is relatively low due to the slope and incision of the channel. The potential of a wetland to dissipate and diffuse flow is very small in these areas. However at the lower lying areas the system flattens out and extensive reed bed occur and this include depositional zone which promote further attenuation capacity of the wetland area. From area basis, flood attenuation capability within the entire wetland area is moderate. The larger section of the wetland area is characterised by channel incision and headcut erosion. The lower section shows signs of sediment build up and is characterised by reed bed consisting of diffuse flows and a depositional zone.

Sedimentation and water quality improvement

Depositional processes are a feature of unchannelled valley bottom wetlands, a function closely associated with flood attenuation. However given the situation described above of incision and erosion of the greater part of the wetland areas as well as its topography, the importance of this function is regarded as being moderately low and not regarded as being significant.

Biodiversity support: Ecological Importance and Sensitivity

Floodplains generally support biota which differs from that associated with other landscapes. As such they assist in contributing to the heterogeneity of landscapes, and thereby overall biodiversity support. The wetlands on site forms part of the important areas in terms of the Gauteng Conservation Plan as it consist of primary vegetation and it support variety habitat for different biodiversity species. The wetland itself consist of two types of grassland of which one is endangered and the other is least threatened. The combination of the two grassland species makes this wetland system important in terms of species migration and suitable habitat around the area. From a biodiversity point of view the system is of high importance and requires protection from changing land uses.

Direct human benefits

There was no direct utilization of water for human use present within the wetland and its catchment area with the exception of wetland used by livestock for drinking purposes. None of the natural resources were observed and/or are expected to be harvested from the wetland due to its overgrazed status. No crops were cultivated within the wetland during the time of the field survey. No known cultural significance is associated with the wetland. The wetland is not expected to be of specific value with regards to tourism and recreation. Again any such value provided by the system will be in part be secured by the proposed rehabilitation measures. The importance of this function is regarded as being moderately low and not regarded as being significant.

Table 4: A qualitative assessment of the importance of the valley bottom wetland system on site indicating its equal importance in influencing hydrology and sediment management, biodiversity and human benefits.

	Importance*
Ecological Importance & Sensitivity	2.33
Hydro-functional Importance	1.88
Direct Human Benefits	0.92

*Measured on a scale of 0 (None) to 4 (Very High).

OVERALL IMPORTANCE	**2.33**

The overall score indicates wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these wetlands are usually not sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers.

4.4 Rehabilitation Strategy

These proposed interventions address the wetland problems and achieve the rehabilitation objectives as follows:

Currently the wetland system is losing a lot of sediments (due to erosion and bank collapse) to downstream areas. The natural flow patterns within the wetland have altered. It is clear that most of the water flow is confined within the eroded incised channel, causing gradual drying out of the original extent of the wetland's wetness front. The objective for rehabilitation activities at this site is to prevent sedimentation within the tributary of the Klip River. The proposed interventions are to be placed within the eroded channel on site to raise the local water table and create a low velocity environment for sediment deposition. These interventions would achieve the suggested objective, since head-cut erosion would be stabilised and eroded sediment would be deposited upstream of the structures. Furthermore, the rehabilitated areas would most likely be colonised by sedges and hydrophytes grasses; promoting sediment stabilisation and deposition, as well as an improvement in wetland vegetation cover. The interventions proposed would also allow for the redistribution of water across the entire wetland front and minimise erosion that may occur during periods of high flows. This would also minimise the risk of the channel eroding further and becoming gully eroded main channels.

The assessments of the wetland functioning and integrity show that the rehabilitation of the wetland is likely to provide improvements in wetland functioning and integrity, but it is important to quantify the benefits of the proposed rehabilitation against the anticipated costs required to achieve the desired outcomes. Using hectare/functional equivalents of the wetland habitat allows the various scenarios regarding the management of the wetland habitat to be compared using the same currency. To allow comparisons to be made, the future situation without rehabilitation (i.e. no intervention) was compared with the future situation with rehabilitation. Using the hectare/functional equivalents it was possible to illustrate the loss or gain in functioning wetland habitat associated with and without the implementation of the proposed rehabilitation activities. Based on these derived hectare equivalents it is important to show the loss associated with the advancement of incision and lateral erosion and the gain associated with the deactivation drains and incised channels within the wetland system.

Estimated Cost of planned interventions	**R 4 704 144**
Hectare/Functional Equivalents of Wetland Habitat	
Future scenario with no intervention/s	62.5
Future scenario with intervention/s	89.6
Hectare/Functional Equivalents Gained or Lost	27.1
Cost per Hectare/Functional Equivalent	R 173 389
Cost-effectiveness	**Moderate**
Anticipated Maintenance Requirements	**Moderate**

4.5 Management Recommendations

The wetland is currently utilised by local communities for their livestock to graze and drink from as is evident from the high level of banks that have collapsed To date, grazing has had a marked effect on the hydrology of the system and multiple trampling has created preferential flow paths that have led to the formation of head-cut erosion, channel incisions and development of gully erosion in some sections.

The grazing of cattle would need to be controlled and limited to winter months to prevent damage to soil associated with cattle accessing vegetative matter during the wet season. It is therefore recommended that best management practise must be adopted in conjunction with the stock owners which will include among the others training on wetland functions and importance, the need to adopt a rotational grazing system and relevant benefits thereafter. A more practical approach may be to create drinking points outside the wetland by abstracting water from the watercourse and fences around the entire wetland area to allow it to reach its own equilibrium and stabilise.

4.6 Baseline M&E Data

4.6.1 Erosion Problems to be monitored

The erosion problems within the wetland area on site were recorded and their activity/severity recorded for the assessment of wetland integrity. The following erosion features were identified within the wetland:

Head-cuts:

Problem Number		1
Problem Description		Multiple Head-cuts erosion
Location DD	Latitude	-26.314225
	Longitude	27.961236
Dimensions	Height (m)	2-3
	Width (m)	2-5
	Length (m)	N/A

Figure 9: Photograph indication active multiple headcut to be monitored on site post rehabilitation

Problem Number		7
Problem Description		Headcut erosion
Location DD	Latitude	-26.306432
	Longitude	27.965487
Dimensions	Height (m)	0.5-1
	Width (m)	5-10 (pool)
	Length (m)	N/A

Figure 10: Photograph indication active headcut erosion to be monitored post rehabilitation on site.

Fixed point photograph

Problem Number		FPP (Photo 1)
Problem Description		Photograph taken at the lower reaches just before confluence facing upward at a length of 1.6 km from the top of the delineated wetland area i.e. eastern tributary
Location	Latitude	-26.309352
DD	Longitude	27.963004

Figure 11: Photograph across the upper section of the wetland area.

4.6.2 Baseline WET-Health Data

The assessment of the current level of ecological integrity of the wetland system provides a baseline assessment for comparative assessments that would be carried out for monitoring purposes 3 years after completion of the wetland rehabilitation activities. The following WET-Health information was collected for the wetland in 2012. Tables below indicate health and impact categories to be used for successive monitoring of the wetland system.

Health Categories:

HGM Unit	Area (ha)	Hydro Health	Hydro Threat	Geo Health	Geo Threat	Vegetation Health	Vegetation Threat
VB	118.4	D	↓	B	↓	C	↓

Impact Scores:

HGM Unit	Area (ha)	Hydro Health	Hydro Threat	Geo Health	Geo Threat	Vegetation Health	Vegetation Threat
VB	118.4	6.0	-1	8.4	-1	6.4	-1

4.7 Summary of proposed Interventions

The following new interventions are proposed for the wetland.

The implementation order indicates the timing order in which interventions should be implemented within the wetland (number 1 first). The priority indicates the relative importance of each intervention across the project as a whole – if interventions have to be omitted for any reason, those with the lowest priority (highest number) across the whole project should be omitted first.

Intervention Number	Intervention Structure Type	Implementation Order	Priority	Structure Cost (Excl. Vat)
C22D-04-201	MacMat-R	8	2	**R 52 593.12**
C22D-04-202	Gabion weir	1	1	**R 665 131.60**
C22D-04-203	MacMat-R	9	2	**R 22 126.75**
C22D-04-204	MacMat-R	12	3	**R 75 303.62**
C22D-04-205	Gabion weir with earth berms	10	2	**R 301 171.40**
C22D-04-206	MacMat-R	11	2	**R 6 464.63**
C22D-04-207	Gabion weir	2	1	**R 590 726.00**
C22D-04-208	Stone masonry weir	3	1	**R 350 025.41**
C22D-04-209	Rock fill	13	3	**R 9 938.49**
C22D-04-210	Gabion & earth bermsweir	4	1	**R 584 940.16**
C22D-04-211	Gabion weir	5	1	**R 725 066.49**
C22D-04-212	Gabion weir	6	1	**R 331 664.51**
C22D-04-213	Gabion weir	7	1	**R 524 883.98**
C22D-04-214	Earth works	14	3	**R 331 604.74**
C22D-04-215	Earth works	15	3	**R 132 502.82**
			Total	**R 4 704 143.72**

5. References

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8. Spatial information data sets that form part of the Gauteng Department of Agriculture, Conservation and Environment (GDACE) Conservation Plan Version 3.3(C-Plan 3).

9. UCCE Rangeland Watershed act Sheet No. 3, http://danr.ucop.edu/uccelr/h03.htm

APPENDIX B - GENERAL CONSTRUCTION NOTES

(Ignore notes which are not applicable)

1. **Occupational health and safety is a priority!** All necessary precautionary Measures must be undertaken to ensure safety of the team. Particular attention must be given to deep excavations where gentle sloping back of soil or shoring must be applied to prevent possible soil collapse. Where risks are foreseen, these must be reported to the Occupational Health and Safety Agent employed by SANBI, who may need to seek further advice. In addition, no excavated earth or other materials should be stockpiled within a distance of one metre from the edge of any excavation. The one metre wide strip along the edges of all sides of an excavation should at all times be kept clear of objects such as lumps of clay, rocks or tools that could injure workers in the excavation if they were to fall in.

2. Check all dimensions on site to determine if any amendments to the designs are necessary. Note the required final height of the structure relative to the original ground level. The responsible engineer must be consulted before any changes are made to dimensions.

3. Excavation must be carried out to the final levels. Soil must be placed in areas best suited for re-use, for example, when building an earthen diversion embankment, the soil excavated should be used immediately in building up the embankment (on condition the excavated soil is of suitable quality). The excavated soil should alternatively be stockpiled immediately upstream of the site of the proposed wall. The topsoil must be stockpiled separately from the subsoil.

4. Where soil is to be the foundation for non-soil structures (for example, gabions and rafted weirs), all sand deposits must be removed and the floor well compacted while the soil is at optimum moisture content.

5. In instances where the addition of lime has been specified for the amelioration of a dispersive soil, mixing must be carried out off site, after which it must be transported to the construction site.

6. When the final level of the soil construction has been reached the previously stockpiled topsoil must be added as an extra height and planted to suitable vegetation (unless other provision for protection of the structure has been specified).

7. When backfilling soil against concrete or gabion work, extra care must be taken to ensure that a waterproof join with the structure is, as far as possible, achieved. Compaction must be carried out in layers as specified by the engineer. Material containing organic matter must not be used for this backfilling purpose.

8. Ensure that the correct steel reinforcing, as specified, has been delivered to site. Ensure that the minimum cover, as specified by the engineer, is achieved at all times. All welded steel mesh joins must have an overlap of at least 200mm and must be securely tied with 2mm building wire. At least three rings at 150mm spacing are required. Where reinforcing bars are used, bars at joins must be overlapped as per the distance specified on the drawings. Particular attention must be paid to ensure

the correct placing of steel reinforcing (particularly steel mesh with different bar sizes).

9. Before placing concrete on a rock foundation, carefully chip away any loose surface layers and wash away all debris. New surfaces must be painted with a cement slurry prior to the placing of the concrete.

10. Ensure that all shuttering is strong and well supported. It is recommended that the concrete be placed in layers no greater than one metre per day. The shuttering must be well oiled on the inside to prevent the concrete from sticking. Spacers between shuttering must be placed every one metre, both vertically and horizontally, with a minimum of two in both directions.

11. Note that when mixing concrete it is preferable to use a full pocket of cement with each mix. The specified cement water ratio must be maintained at all times.

12. The poured concrete must be "rodded" to ensure proper compaction. Never add more than one metre height of concrete in any one day, and attempt to lay the concrete in even, horizontal layers throughout the length of any section. Check the specifications for any requirement of expansion joints. The shuttering should be left for at least two days before stripping. Wetting the concrete while it is curing will make for a strong construction. Backfilling of soil against the completed structure may only be done after a period of at least seven days.

13. The use of "plums" in concrete: in some instances it may be feasible and economic to reduce the amount of concrete in mass gravity structures, by replacing up to 33% of the volume of concrete by the judicious use of suitable hand sized quarried rock. Where this is specified the rocks (purchased as handstone) must be so placed that there is always a minimum cover of 50mm between the rock and the shuttering, as well as between any two adjacent rocks. This should only be done where it is stated on the drawings that is permissible.

14. The standard procedures for the opening up and wiring together of gabion baskets and mattresses are well documented, and supplied with every delivery of the products. They must be strictly adhered to in all respects. Ensure that the lids of the final (top) baskets are always folded down and wired in a downstream direction.

15. Where rock-filled gabion baskets are used for the construction of keywalls, the trenches must be dug wide enough so that sufficient access is available to properly backfill and compact all the way around them. Making the trench only wide enough to receive the baskets is not acceptable, as water will eventually find its way around the structures and cause problems.

16. Where structures are to be built in dispersive soils, the following should be noted:

    - Impermeable cut off wall (at least 500mm deep) to be constructed under spillway section of the structure
    - Key walls to be impermeable
    - Impermeable barriers to be constructed between key walls and spillway section of structures

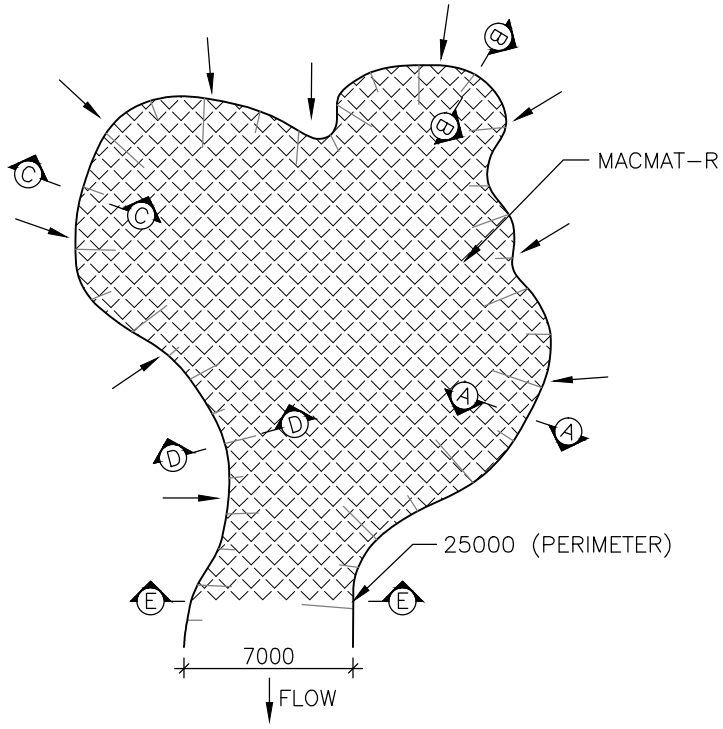
17. Sloping and vegetating gully banks where specified:

    Where the gully is no more than approximately 1.0 metre deep, and the catchment area small (say ten hectares), the topsoil of the site immediately adjoining the channel is removed and stockpiled in a safe place nearby. The subsoil thus laid bare is excavated at a slope not less than 1:3 (V:H) and deposited in the gully. This deposit is carefully compacted while in a moist state. The topsoil is now returned to the sloped area, and spread as evenly as possible over it. Vegetation suitable to the site is planted. The additional advantage to this idea is that, as the channel cross section is made shallower and wider and established to vegetation, so the chances of floodwaters overflowing into the adjacent flood area will be that much greater. Note that the base of the modified channel should be planted to strong, hydrophitic plants while the outer edges will require plants more suited to drier regimes. It must be emphasised that the stockpiling of the topsoil and its replacement is vital, especially where very erodible subsoil is present. Failure to do this will be tantamount to a waste of money and effort.

18. The orientation of all wetlands and interventions is to be taken facing downstream i.e. left bank and right bank are to be identified **facing downstream**.

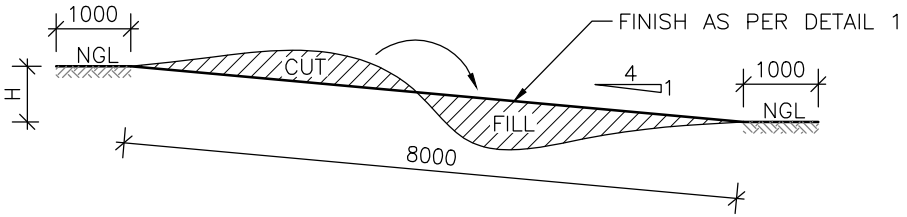
19. The Bill of Quantities for the various rehabilitation interventions only included revegetation in those instances where the engineer considered the re-vegetation of the denuded area as important due to the size of the area affected or due to the risk associated with scouring and erosion.

APPENDIX C – DESIGN DRAWINGS

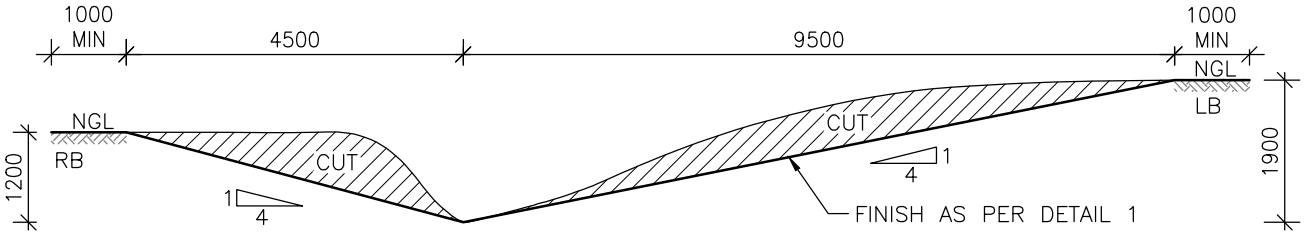


PLAN VIEW

SECTION	H(m)
A–A	1250
B–B	1900
C–C	1230
D–D	1480



SECTION A–A TO D–D



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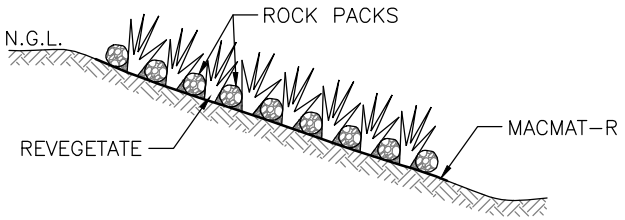

DETAIL 1

EARTHWORKS:

1. ALL CUT AND FILL SLOPES TO BE NOT STEEPER THAN 1:4, UNLESS OTHERWISE SPECIFIED.
2. ALL EXPOSED DISTURBED SURFACES TO BE REVEGETATED, UNLESS OTHERWISE SPECIFIED.
3. BACKFILL, PARTICULARLY ON BOTH SIDES OF KEYWALLS AND OUTSIDE SIDE WALLS, TO BE COMPACTED IN 100mm LAYERS AT OPTIMUM WATER CONTENT.

DISPERSIVE SOILS:
(ONLY APPLICABLE IN AREAS WITH DISPERSIVE SOILS):

4. IT IS CRITICAL TO ENSURE THAT THE FOUNDING SOIL NEVER DRIES OUT AND REMAINS AS UNDISTURBED AS POSSIBLE. THE BLINDING LAYER SHOULD THEREFORE BE CAST AS SOON AS A PORTION OF EXCAVATION HAS BEEN FINISHED.
5. FILL MATERIAL TO BE GOOD QUALITY, WELL–GRADED GRAVEL OR CLAY (NOT DISPERSIVE CLAY FOUND IN PARTS OF THE FLOOD PLAIN).
6. ALL MATERIAL THAT IS EXCAVATED FROM THIS SITE AND RE–USED FOR BACKFILL SHALL BE WELL MIXED WITH 100kg OF LIME PER CUBIC METRE OF SOIL, AND PLACED AND COMPACTED AT OPTIMUM MOISTURE CONTENT.

MACMAT–R

7. ALL MACMAT–R TO BE REINFORCED WITH GABION WIRE MESH IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.

NOTES

1. AURECON ACCEPTS RESPONSIBILITY FOR THE ENGINEERING DESIGN TO THE EXTENT THAT THIS IS BASED ON AVAILABLE INFORMATION. THE AVAILABLE INFORMATION IS LIMITED TO WHAT COULD BE INTERPRETED DURING A SINGLE SITE VISIT OF NO LONGER THAN A FEW HOURS. NO GEOTECHNICAL, TOPOGRAPHICAL, GEOMORPHOLOGIC AND OTHER ENGINEERING RELATED SURVEYS HAVE BEEN UNDERTAKEN TO INFORM THE DESIGN. THIS IS NON–STANDARD ENGINEERING PRACTICE AND THEREFORE AURECON IS INDEMNIFIED BY THE CLIENT AND DOES NOT ACCEPT RESPONSIBILITY FOR THE ASSOCIATED RISK OF FAILURE FROM THE ABOVE LIMITATIONS OR ANY DAMAGES THAT MAY OCCUR.
2. AURECON IS INDEMNIFIED AGAINST ANY ASSOCIATED DAMAGES AND ACCEPTS NO LIABILITY ASSOCIATED WITH THE CONSTRUCTION AND IMPLEMENTATION OF ENGINEERING INTERVENTIONS DUE TO AURECON BEING INSTRUCTED TO HAVE LIMITED CONTACT WITH THE IMPLEMENTER DURING THE CONSTRUCTION PHASE RESULTING IN OUR INABILITY TO DILIGENTLY SUPERVISE AND ASSESS ANY PROGRESS.

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Cape Town

PROJECT
WORKING FOR WETLANDS
GAUTENG
GAUTENG SOUTH

DRAWING DESCRIPTION
MACMAT–R, ROCK PACKS & REVEGETATION

DATE	JUNE 2012
DRAWN BY	A.MOHAMED
DRAWING CHECKED	D.TOWNSHEND
DESIGNED BY	C.BLAAUW
DESIGN CHECKED	
SCALE	NOT TO SCALE

DRAWING No.	REV No.
C22D–04–201–00/01	A

NOT FOR CONSTRUCTION. SUBJECT TO EVALUATION OF SITE CONDITIONS BY THE ENGINEER AT SETTING OUT STAGE.

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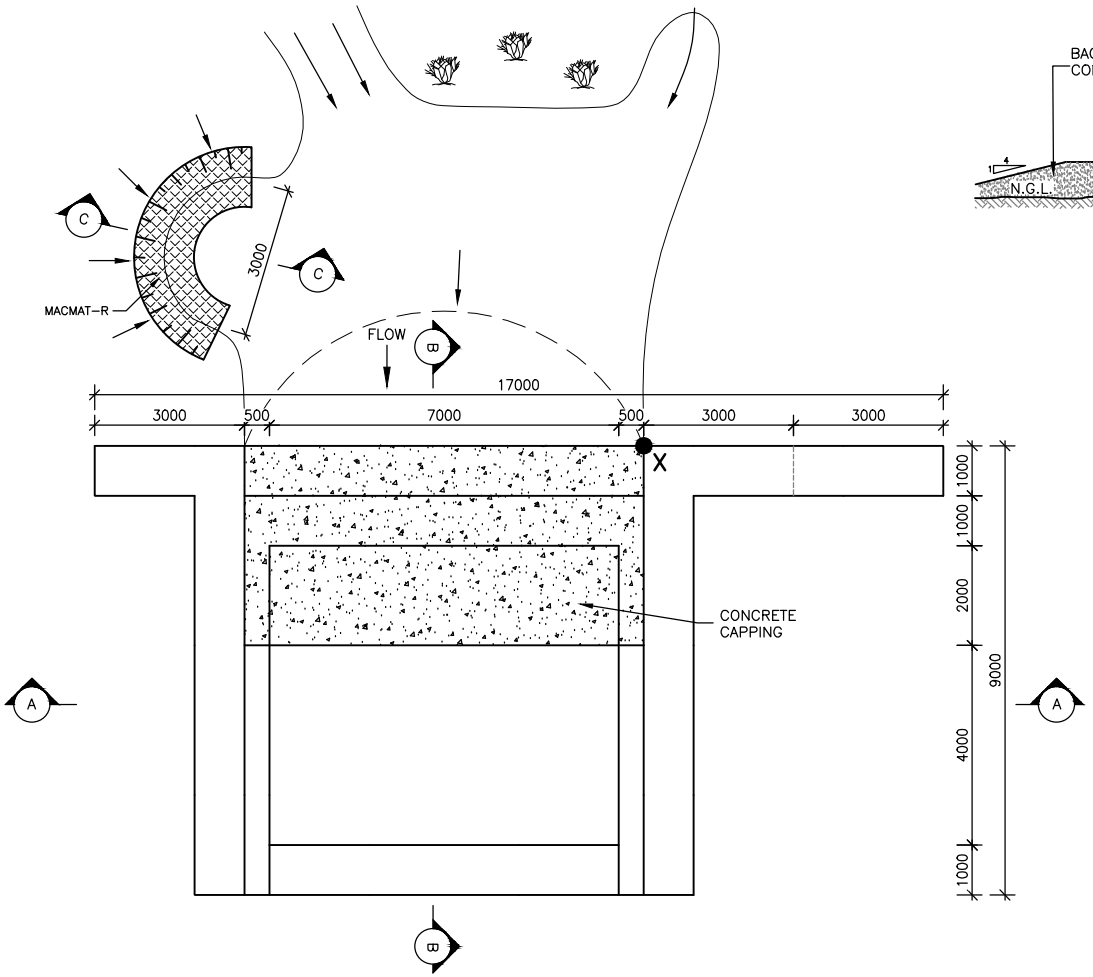
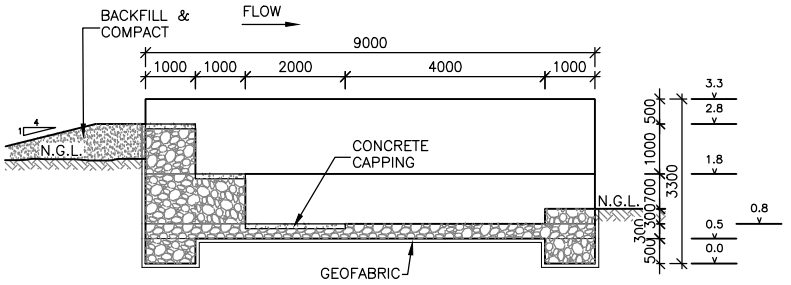
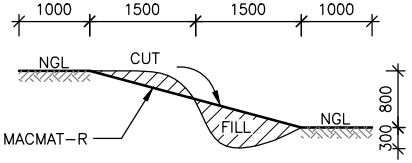


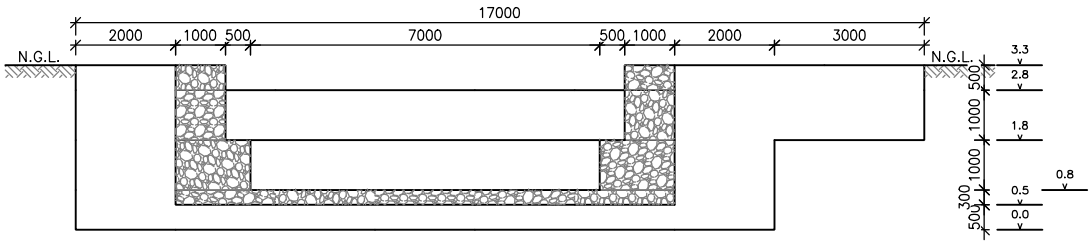
PLAN VIEW



SECTION B–B



SECTION C–C



SECTION A–A

NOT FOR CONSTRUCTION. SUBJECT TO EVALUATION OF SITE CONDITIONS BY THE ENGINEER AT SETTING OUT STAGE.

NOTES

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GAUTENG
GAUTENG SOUTH

DRAWING DESCRIPTION
GABION WEIR

DATE	JULY 2012
DRAWN BY	D.RAJNA
DRAWING CHECKED	D.TOWNSHEND
DESIGNED BY	C.BLAAUW
DESIGN CHECKED	
SCALE	NOT TO SCALE

DRAWING No.	REV No.
C22D-04-202-00/01	A

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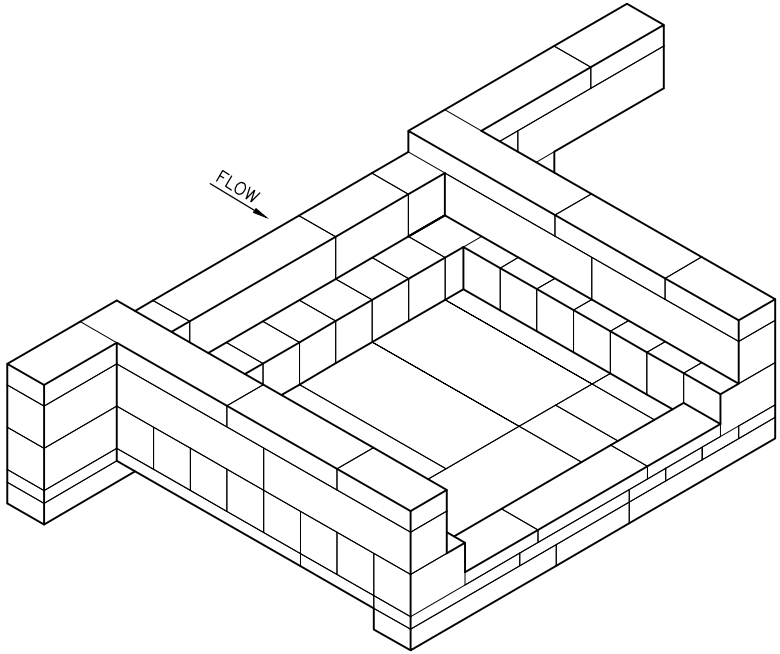
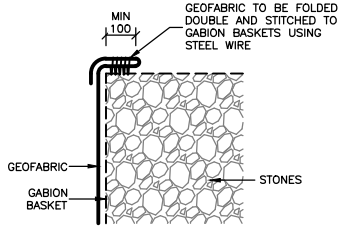


3D VIEW

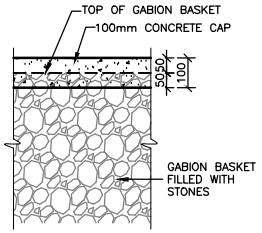
GABION QUANTITIES	
CODE	NO. BASKETS
B	14
C	9
D	1
E	9
G	5
H	5
J	6
K	4
L	7
P	6

GABION & RENO MATTRESS SIZES

CODE	SIZE
A	1.0 x 1.0 x 1.0m
B	1.5 x 1.0 x 1.0m
C	2.0 x 1.0 x 1.0m
D	3.0 x 1.0 x 1.0m
E	4.0 x 1.0 x 1.0m
F	2.0 x 0.5 x 0.5m
G	2.0 x 1.0 x 0.5m
H	3.0 x 1.0 x 0.5m
J	4.0 x 1.0 x 0.5m
K	2.0 x 1.0 x 0.3m
L	3.0 x 1.0 x 0.3m
M	6.0 x 2.0 x 0.17m
N	6.0 x 2.0 x 0.23m
P	6.0 x 2.0 x 0.3m



TYPICAL DETAIL FOR TYING OF GEOFABRIC TO GABIONS & RENO MATTRESSES



TYPICAL DETAIL OF CONCRETE CAPPING FOR GABIONS & RENO MATTRESSES

GABIONS:

1. GABION BASKETS AND RENO MATTRESSES TO BE CONSTRUCTED OF DOUBLE TWISTED, HEXAGONAL, PVC COATED, GALVANISED WIRE MESH OF NOMINAL DIAMETER 80mm MESH, WITH 3.4mm o/d FRAME WIRE AND 2.7mm o/d MESH WIRE WITH PARTITIONS AT 1m CENTRES.
2. GEOFABRIC TO BE NON-WOVEN, NOT LESS THAN 195g/m². e.g. AG200.
3. 100mm – 200mm STONE TO BE USED IN ALL GABIONS AND RENO MATTRESSES. STONE FILL MUST BE NON-FRIABLE & INSOLUBLE e.g. GRANITE, BASALT, LIMESTONE OR SANDSTONE.
4. ALL GABIONS AND RENO MATTRESSES TO COMPLY WITH SANS-1200-DK.
5. CONCRETE CAPPING TO BE MINIMUM 15MPa & MIX:
   1 BAG CEMENT
   125L SAND
   120L STONE
   30L WATER
6. GEOFABRIC TO BE INSERTED AT ALL SOIL/MESH INTERFACES UNLESS OTHERWISE SPECIFIED.
7. GEOFABRIC TO HAVE WEEPHOLES PUNCHED THROUGH USING 10mm STEEL ROD AT APPROXIMATELY 4 HOLES/m².

EARTHWORKS:

8. ALL CUT AND FILL SLOPES TO BE NOT STEEPER THAN 1:4, UNLESS OTHERWISE SPECIFIED.
9. ALL EXPOSED DISTURBED SURFACES TO BE REVEGETATED, UNLESS OTHERWISE SPECIFIED.
10. BACKFILL, PARTICULARLY ON BOTH SIDES OF KEYWALLS AND OUTSIDE SIDE WALLS, TO BE COMPACTED IN 100mm LAYERS AT OPTIMUM WATER CONTENT.
11. BACKFILL TO BOTH SIDES OF ALL WALLS TO BE DONE EQUALLY SO THAT ONE SIDE IS NEVER MORE THAN 1m ABOVE THE OTHER SIDE.

DISPERSIVE SOILS:
(ONLY APPLICABLE IN AREAS WITH DISPERSIVE SOILS):

12. IT IS CRITICAL TO ENSURE THAT THE FOUNDING SOIL NEVER DRIES OUT AND REMAINS AS UNDISTURBED AS POSSIBLE. THE BLINDING LAYER SHOULD THEREFORE BE CAST AS SOON AS A PORTION OF EXCAVATION HAS BEEN FINISHED.
13. FILL MATERIAL TO BE GOOD QUALITY, WELL-GRADED GRAVEL OR CLAY (NOT DISPERSIVE CLAY FOUND IN PARTS OF THE FLOOD PLAIN).
14. ALL MATERIAL THAT IS EXCAVATED FROM THIS SITE AND RE-USED FOR BACKFILL SHALL BE WELL MIXED WITH 100kg OF LIME PER CUBIC METRE OF SOIL, AND PLACED AND COMPACTED AT OPTIMUM MOISTURE CONTENT.

MACMAT-R

15. ALL MACMAT-R TO BE REINFORCED WITH GABION WIRE MESH IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.

NOT FOR CONSTRUCTION. SUBJECT TO EVALUATION OF SITE CONDITIONS BY THE ENGINEER AT SETTING OUT STAGE.

NOTES

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PROJECT
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GAUTENG
GAUTENG SOUTH

DRAWING DESCRIPTION
GABION WEIR

DATE	JULY 2012
DRAWN BY	D.RAJNA
DRAWING CHECKED	D.TOWNSHEND
DESIGNED BY	C.BLAAUW
DESIGN CHECKED	
SCALE	NOT TO SCALE

DRAWING No.	REV No.
C22D-04-202-00/02	A

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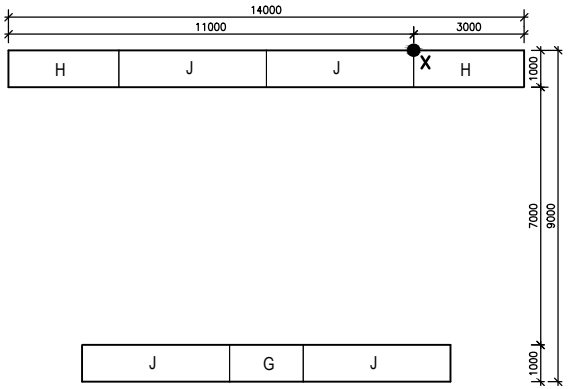

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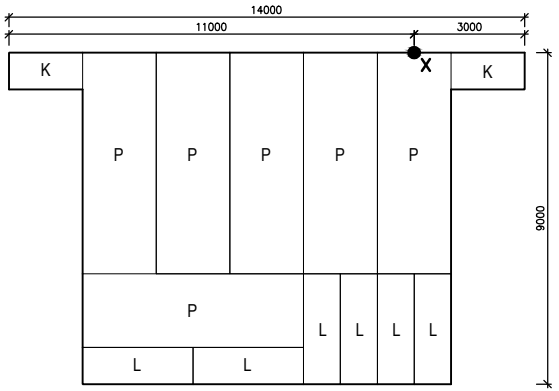

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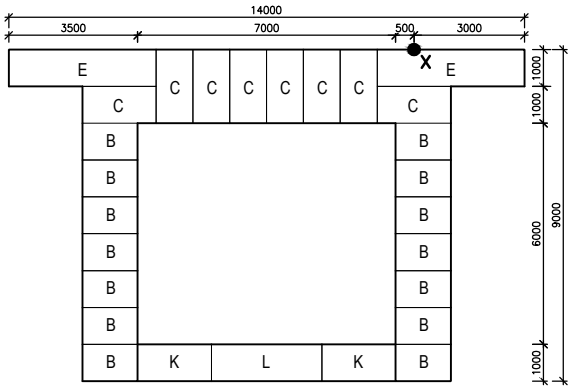

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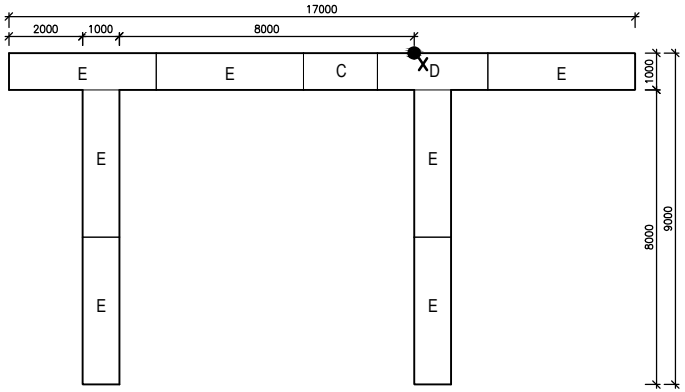

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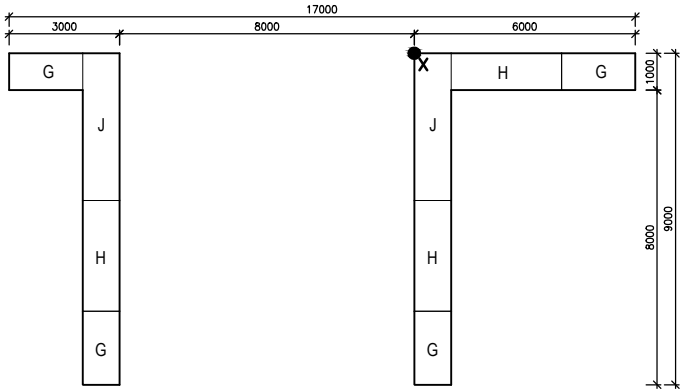

LEVEL 3.3m

NOT FOR CONSTRUCTION. SUBJECT TO EVALUATION OF SITE CONDITIONS BY THE ENGINEER AT SETTING OUT STAGE.

NOTES

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Working for Wetlands

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GAUTENG
GAUTENG SOUTH

DRAWING DESCRIPTION
GABION WEIR

DATE	JULY 2012
DRAWN BY	D.RAJNA
DRAWING CHECKED	D.TOWNSHEND
DESIGNED BY	C.BLAAUW
DESIGN CHECKED	
SCALE	NOT TO SCALE

DRAWING No.	REV No.
C22D-04-202-00/03	A

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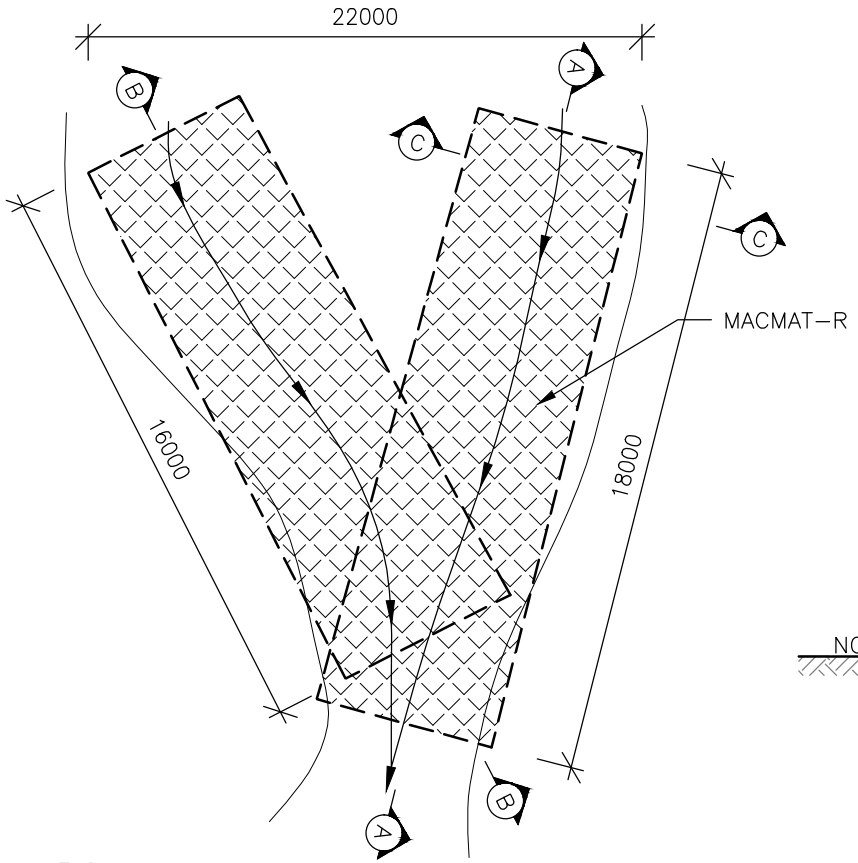
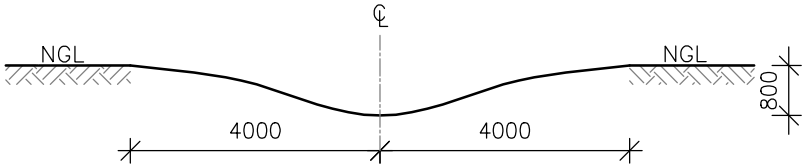
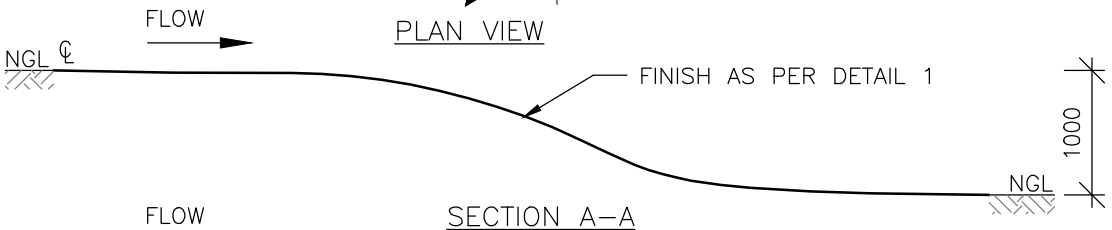


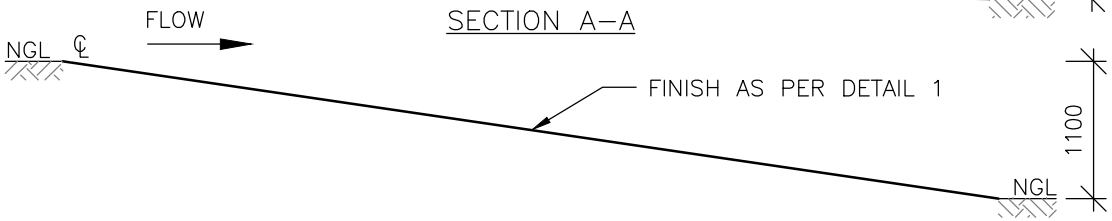
PLAN VIEW



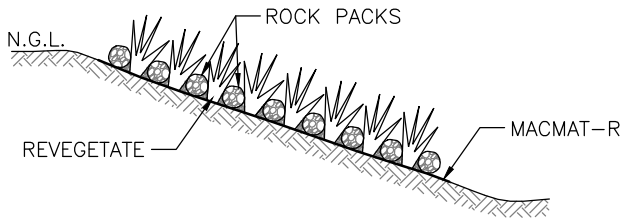
SECTION C–C



SECTION A–A



SECTION B–B



DETAIL 1

EARTHWORKS:

1. ALL CUT AND FILL SLOPES TO BE NOT STEEPER THAN 1:4, UNLESS OTHERWISE SPECIFIED.
2. ALL EXPOSED DISTURBED SURFACES TO BE REVEGETATED, UNLESS OTHERWISE SPECIFIED.
3. BACKFILL, PARTICULARLY ON BOTH SIDES OF KEYWALLS AND OUTSIDE SIDE WALLS, TO BE COMPACTED IN 100mm LAYERS AT OPTIMUM WATER CONTENT.

DISPERSIVE SOILS:
(ONLY APPLICABLE IN AREAS WITH DISPERSIVE SOILS):

4. IT IS CRITICAL TO ENSURE THAT THE FOUNDING SOIL NEVER DRIES OUT AND REMAINS AS UNDISTURBED AS POSSIBLE. THE BLINDING LAYER SHOULD THEREFORE BE CAST AS SOON AS A PORTION OF EXCAVATION HAS BEEN FINISHED.
5. FILL MATERIAL TO BE GOOD QUALITY, WELL–GRADED GRAVEL OR CLAY (NOT DISPERSIVE CLAY FOUND IN PARTS OF THE FLOOD PLAIN).
6. ALL MATERIAL THAT IS EXCAVATED FROM THIS SITE AND RE–USED FOR BACKFILL SHALL BE WELL MIXED WITH 100kg OF LIME PER CUBIC METRE OF SOIL, AND PLACED AND COMPACTED AT OPTIMUM MOISTURE CONTENT.

MACMAT–R

7. ALL MACMAT–R TO BE REINFORCED WITH GABION WIRE MESH IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.

NOTES

1. AURECON ACCEPTS RESPONSIBILITY FOR THE ENGINEERING DESIGN TO THE EXTENT THAT THIS IS BASED ON AVAILABLE INFORMATION. THE AVAILABLE INFORMATION IS LIMITED TO WHAT COULD BE INTERPRETED DURING A SINGLE SITE VISIT OF NO LONGER THAN A FEW HOURS. NO GEOTECHNICAL, TOPOGRAPHICAL, GEOMORPHOLOGIC AND OTHER ENGINEERING RELATED SURVEYS HAVE BEEN UNDERTAKEN TO INFORM THE DESIGN. THIS IS NON–STANDARD ENGINEERING PRACTICE AND THEREFORE AURECON IS INDEMNIFIED BY THE CLIENT AND DOES NOT ACCEPT RESPONSIBILITY FOR THE ASSOCIATED RISK OF FAILURE FROM THE ABOVE LIMITATIONS OR ANY DAMAGES THAT MAY OCCUR.
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Working for Wetlands

aurecon
Cape Town

PROJECT
WORKING FOR WETLANDS
GAUTENG
GAUTENG SOUTH

DRAWING DESCRIPTION
MACMAT–R WITH REVEGETATE & ROCK PACK

DATE	JUNE 2012
DRAWN BY	A.MOHAMED
DRAWING CHECKED	D.TOWNSHEND
DESIGNED BY	C.BLAAUW
DESIGN CHECKED	
SCALE	NOT TO SCALE

DRAWING No.	REV No.
C22D–04–203–00/01	A

NOT FOR CONSTRUCTION. SUBJECT TO EVALUATION OF SITE CONDITIONS BY THE ENGINEER AT SETTING OUT STAGE.

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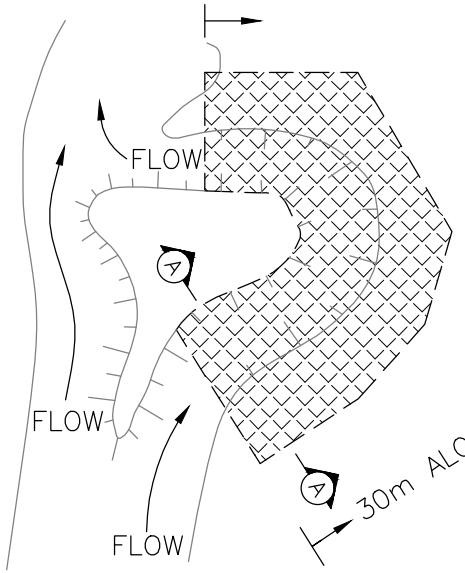
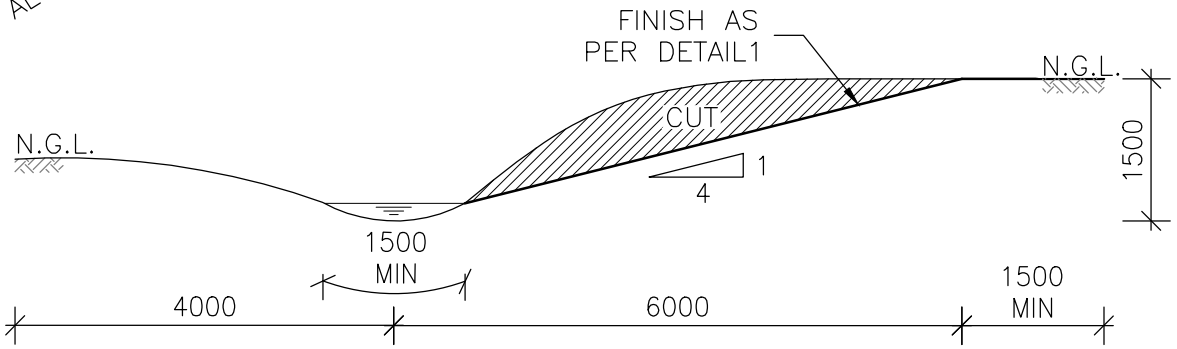
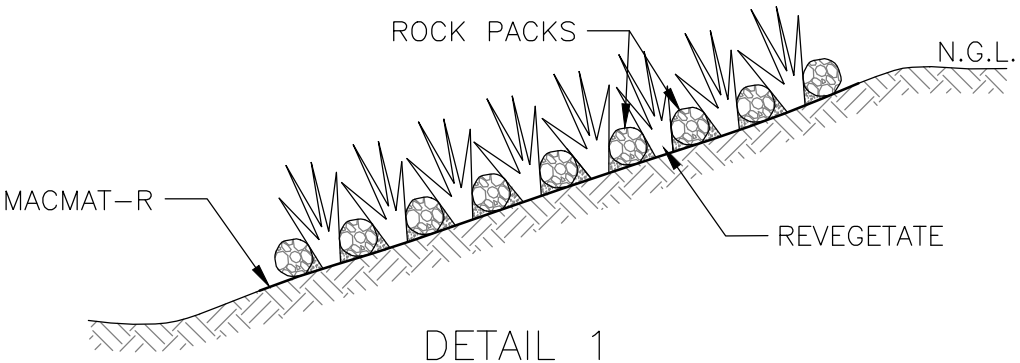


PLAN VIEW



SECTION A–A



DETAIL 1

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Working for Wetlands

aurecon
Cape Town

PROJECT
WORKING FOR WETLANDS
GAUTENG
GAUTENG SOUTH

DRAWING DESCRIPTION
MACMAT–R, ROCK PACKS & REVEGETATION

DATE	JUNE 2012
DRAWN BY	A.MOHAMED
DRAWING CHECKED	D.TOWNSHEND
DESIGNED BY	C.BLAAUW
DESIGN CHECKED	
SCALE	NOT TO SCALE

DRAWING No.	REV No.
C22D–04–204–00/01	A

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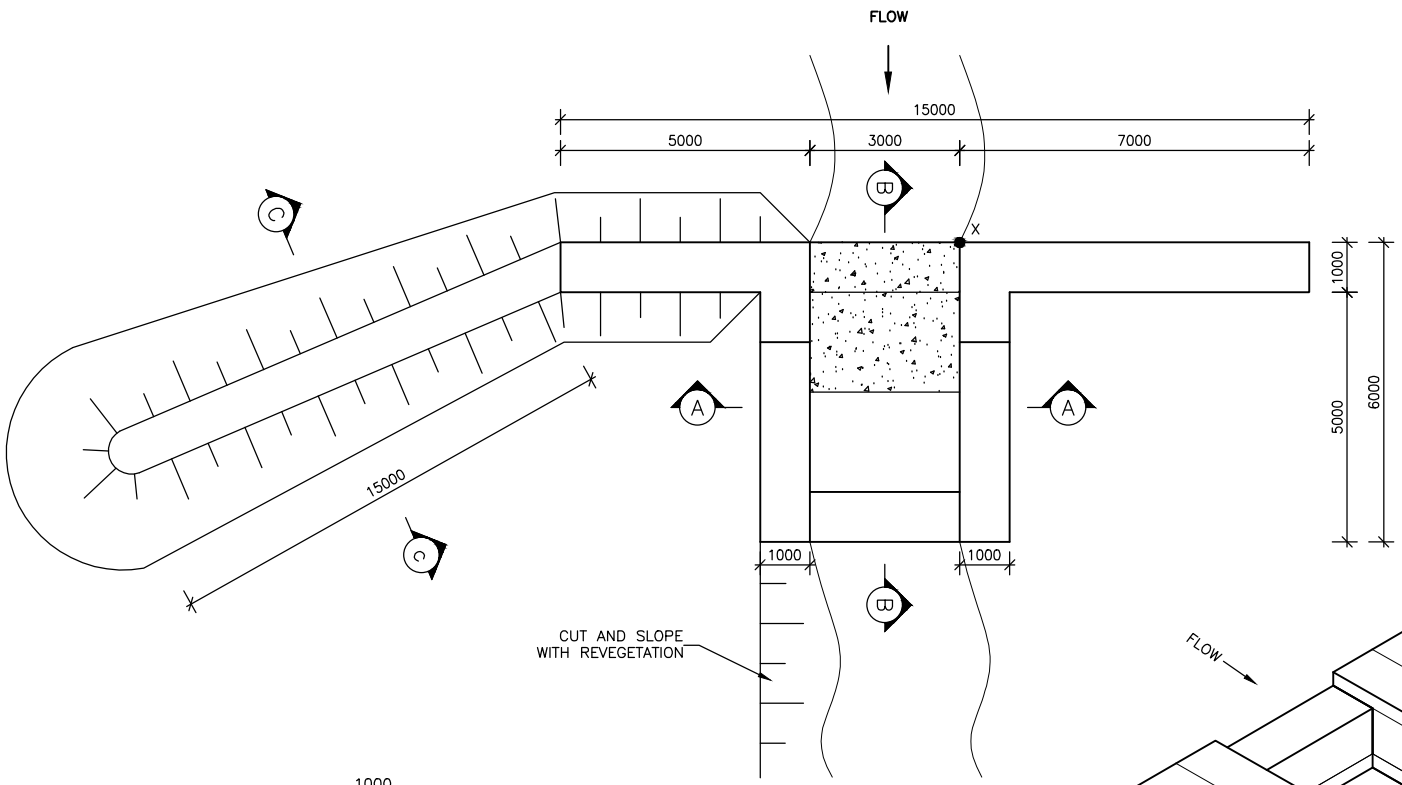

PLAN VIEW

GABION QUANTITIES	
CODE	NO. BASKETS
C	2
D	3
E	3
G	1
H	2
J	3
K	11
L	12
P	2

NOTES

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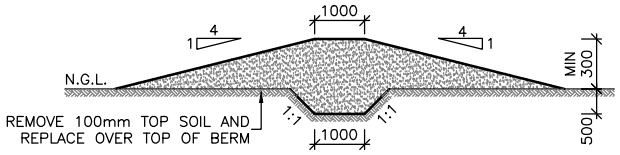
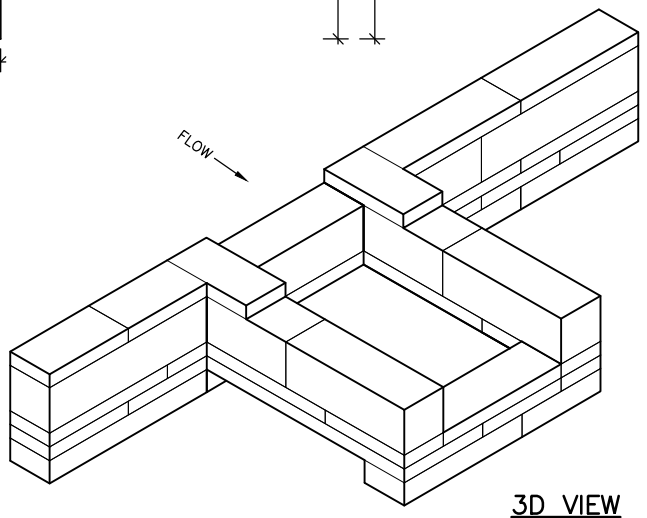
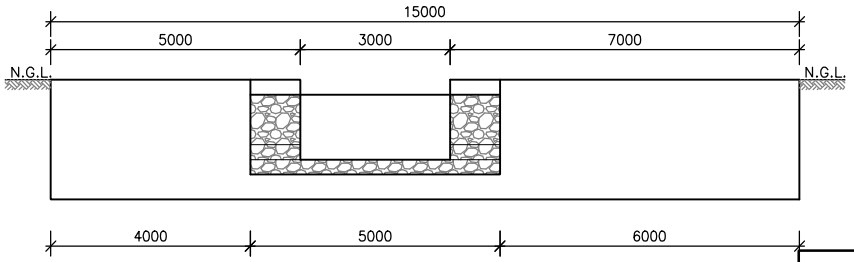


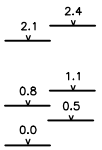
SECTION C–C

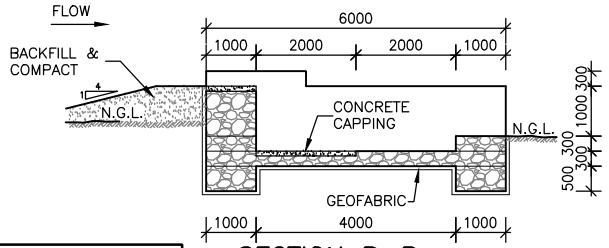


3D VIEW



SECTION A–A





SECTION B–B

NOT FOR CONSTRUCTION. SUBJECT TO EVALUATION OF SITE CONDITIONS BY THE ENGINEER AT SETTING OUT STAGE.

Working for Wetlands

aurecon

PROJECT
WORKING FOR WETLANDS
GAUTENG
GAUTENG SOUTH

DRAWING DESCRIPTION
GABION WEIR:
LEVELS & DETAILS

DATE	JULY 2012
DRAWN BY	D.RAJNA
DRAWING CHECKED	D.TOWNSHEND
DESIGNED BY	C.BLAAUW
DESIGN CHECKED	
SCALE	NOT TO SCALE

DRAWING No.	REV No.
C22D-04-205-00/01	A

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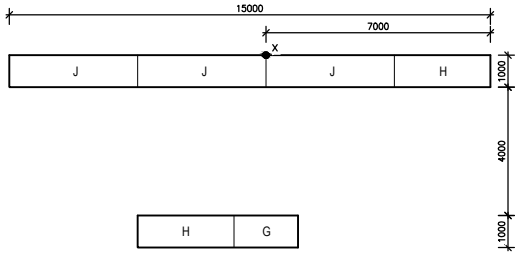
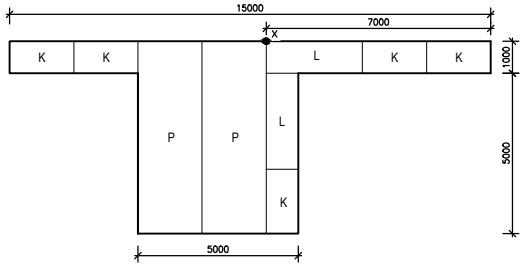
NOT FOR CONSTRUCTION. SUBJECT TO EVALUATION OF SITE CONDITIONS BY THE ENGINEER AT SETTING OUT STAGE.

GABION & RENO MATTRESS SIZES

CODE	SIZE
A	1.0 x 1.0 x 1.0m
B	1.5 x 1.0 x 1.0m
C	2.0 x 1.0 x 1.0m
D	3.0 x 1.0 x 1.0m
E	4.0 x 1.0 x 1.0m
F	2.0 x 0.5 x 0.5m
G	2.0 x 1.0 x 0.5m
H	3.0 x 1.0 x 0.5m
J	4.0 x 1.0 x 0.5m
K	2.0 x 1.0 x 0.3m
L	3.0 x 1.0 x 0.3m
M	6.0 x 2.0 x 0.17m
N	6.0 x 2.0 x 0.23m
P	6.0 x 2.0 x 0.3m



LEVEL 0.5m



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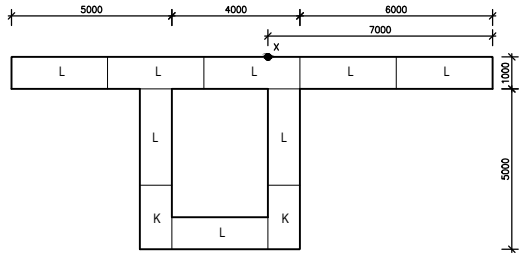
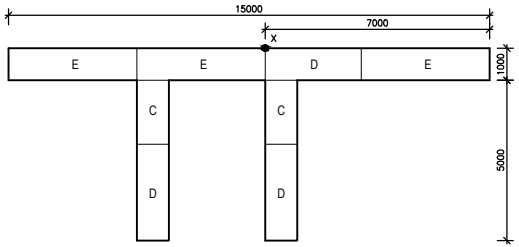
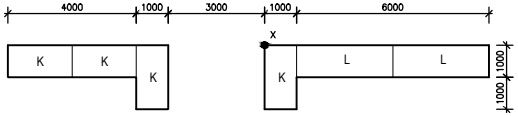


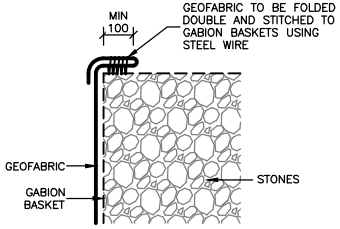
LEVEL 1.1m



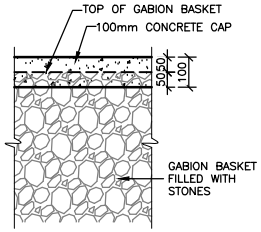
LEVEL 2.1m



LEVEL 2.4m



TYPICAL DETAIL FOR TYING OF GEOFABRIC TO GABIONS & RENO MATTRESSES



TYPICAL DETAIL OF CONCRETE CAPPING FOR GABIONS & RENO MATTRESSES

GABIONS:

1. GABION BASKETS AND RENO MATTRESSES TO BE CONSTRUCTED OF DOUBLE TWISTED, HEXAGONAL, PVC COATED, GALVANISED WIRE MESH OF NOMINAL DIAMETER 80mm MESH, WITH 3.4mm o/d FRAME WIRE AND 2.7mm o/d MESH WIRE WITH PARTITIONS AT 1m CENTRES.
2. GEOFABRIC TO BE NON-WOVEN, NOT LESS THAN 195g/m². e.g. AG200.
3. 100mm – 200mm STONE TO BE USED IN ALL GABIONS AND RENO MATTRESSES. STONE FILL MUST BE NON-FRIABLE & INSOLUBLE e.g. GRANITE, BASALT, LIMESTONE OR SANDSTONE.
4. ALL GABIONS AND RENO MATTRESSES TO COMPLY WITH SANS-1200-DK.
5. CONCRETE CAPPING TO BE MINIMUM 15MPa & MIX:
   1 BAG CEMENT
   125L SAND
   120L STONE
   30L WATER
6. GEOFABRIC TO BE INSERTED AT ALL SOIL/MESH INTERFACES UNLESS OTHERWISE SPECIFIED.
7. GEOFABRIC TO HAVE WEEPHOLES PUNCHED THROUGH USING 10mm STEEL ROD AT APPROXIMATELY 4 HOLES/m².

EARTHWORKS:

8. ALL CUT AND FILL SLOPES TO BE NOT STEEPER THAN 1:4, UNLESS OTHERWISE SPECIFIED.
9. ALL EXPOSED DISTURBED SURFACES TO BE REVEGETATED, UNLESS OTHERWISE SPECIFIED.
10. BACKFILL, PARTICULARLY ON BOTH SIDES OF KEYWALLS AND OUTSIDE SIDE WALLS, TO BE COMPACTED IN 100mm LAYERS AT OPTIMUM WATER CONTENT.
11. BACKFILL TO BOTH SIDES OF ALL WALLS TO BE DONE EQUALLY SO THAT ONE SIDE IS NEVER MORE THAN 1m ABOVE THE OTHER SIDE.

DISPERSIVE SOILS:
(ONLY APPLICABLE IN AREAS WITH DISPERSIVE SOILS):

12. IT IS CRITICAL TO ENSURE THAT THE FOUNDING SOIL NEVER DRIES OUT AND REMAINS AS UNDISTURBED AS POSSIBLE. THE BLINDING LAYER SHOULD THEREFORE BE CAST AS SOON AS A PORTION OF EXCAVATION HAS BEEN FINISHED.
13. FILL MATERIAL TO BE GOOD QUALITY, WELL-GRADED GRAVEL OR CLAY (NOT DISPERSIVE CLAY FOUND IN PARTS OF THE FLOOD PLAIN).
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Working for Wetlands

aurecon

PROJECT
WORKING FOR WETLANDS
GAUTENG
GAUTENG SOUTH

DRAWING DESCRIPTION
GABION WEIR:
LEVELS & DETAILS

DATE	JULY 2012
DRAWN BY	D.RAJNA
DRAWING CHECKED	D.TOWNSHEND
DESIGNED BY	C.BLAAUW
DESIGN CHECKED	
SCALE	NOT TO SCALE

DRAWING No.	REV No.
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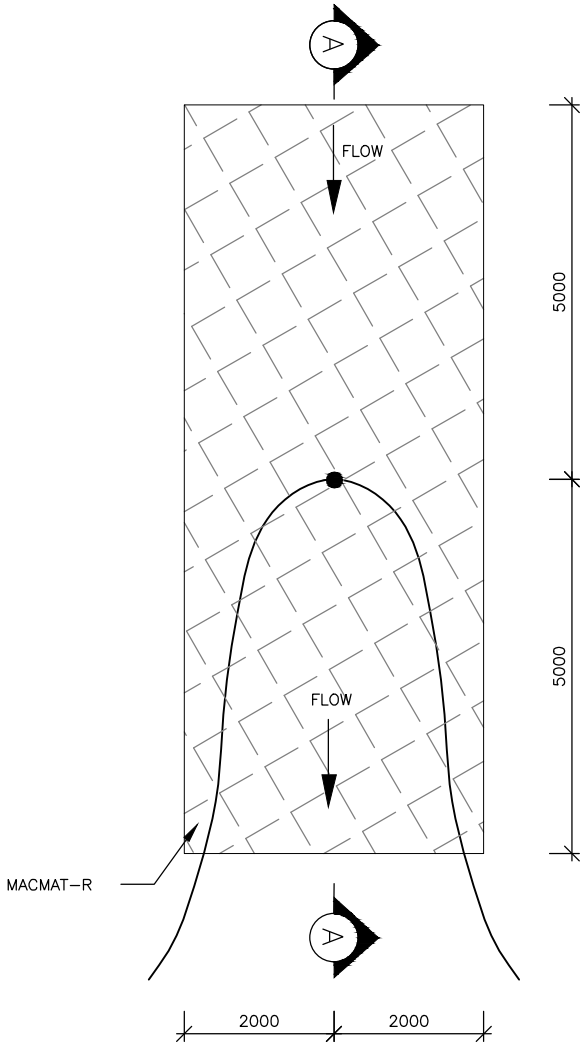
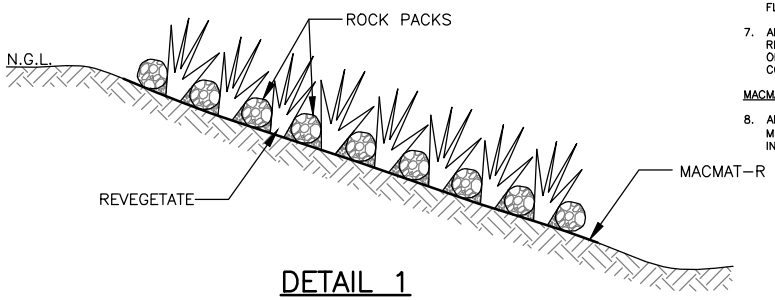
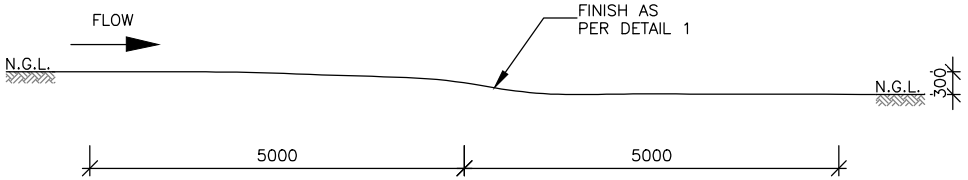


PLAN VIEW



DETAIL 1



SECTION A–A

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NOT FOR CONSTRUCTION. SUBJECT TO EVALUATION OF SITE CONDITIONS BY THE ENGINEER AT SETTING OUT STAGE.

PROJECT
WORKING FOR WETLANDS
GAUTENG
GAUTENG SOUTH

DRAWING DESCRIPTION
MACMAT–R WITH REVEGETATION

DATE	JULY 2012
DRAWN BY	B.MCCAROGHER
DRAWING CHECKED	D.TOWNSHEND
DESIGNED BY	C.BLAAUW
DESIGN CHECKED	
SCALE	NOT TO SCALE

DRAWING No.	REV No.
C22D–04–206–00/01	A

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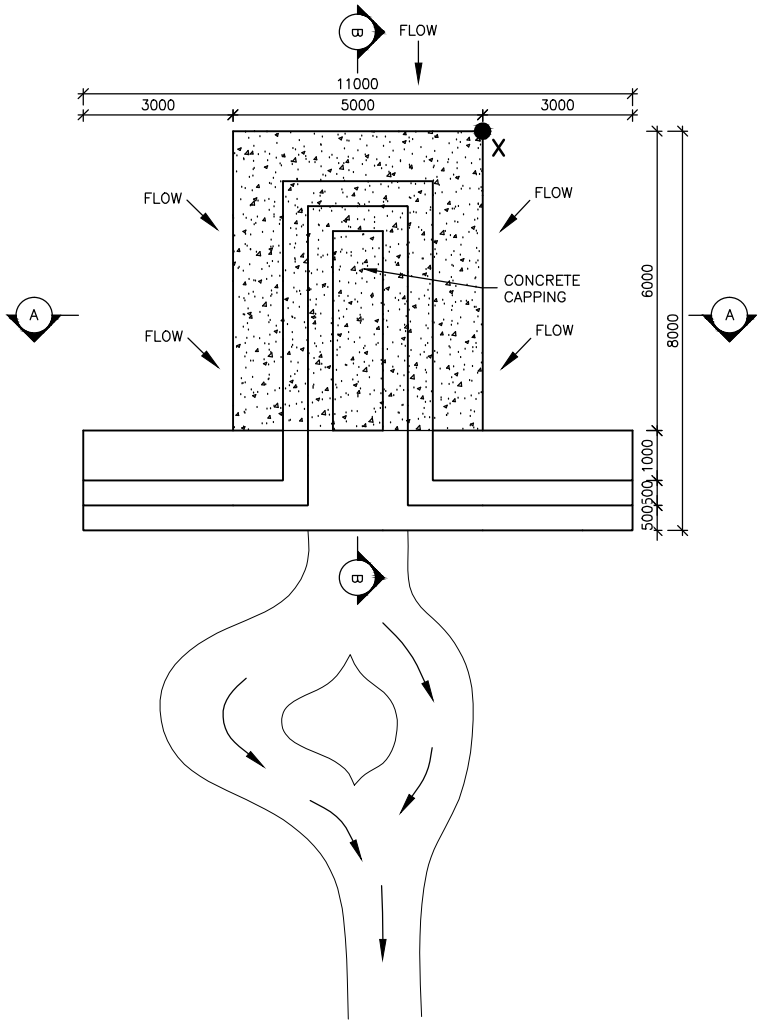
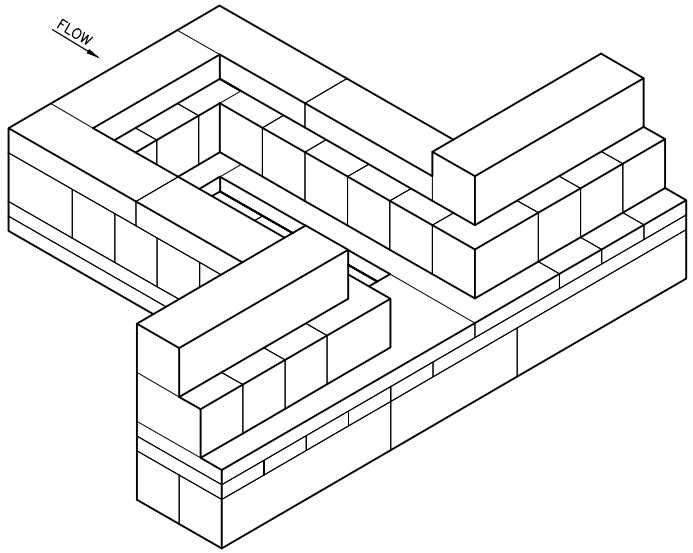
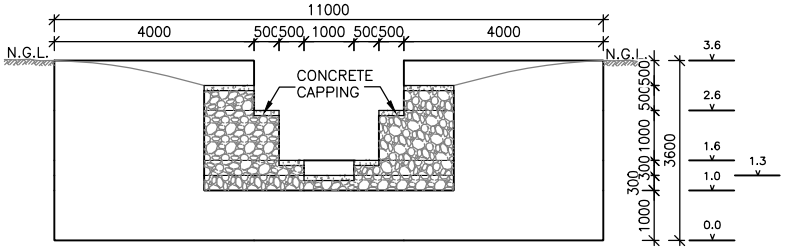
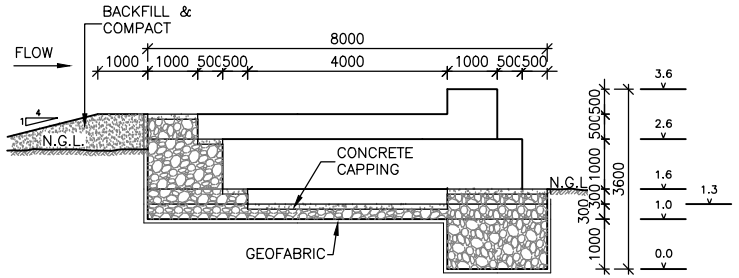


PLAN VIEW





SECTION A–A



SECTION B–B

NOT FOR CONSTRUCTION. SUBJECT TO EVALUATION OF SITE CONDITIONS BY THE ENGINEER AT SETTING OUT STAGE.

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Working for Wetlands

aurecon

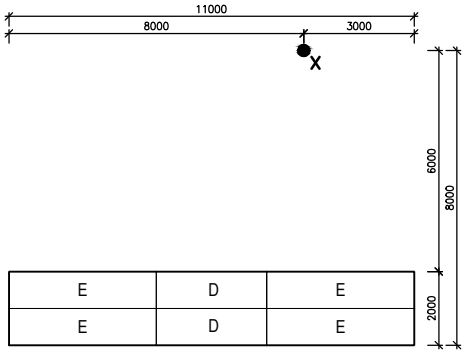
PROJECT
WORKING FOR WETLANDS
GAUTENG
GAUTENG SOUTH

DRAWING DESCRIPTION
GABION WEIR

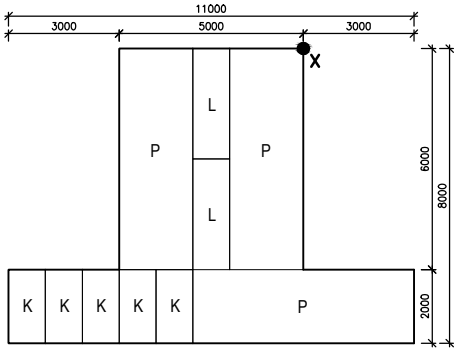
DATE	JULY 2012
DRAWN BY	D.RAJNA
DRAWING CHECKED	D.TOWNSHEND
DESIGNED BY	C.BLAAUW
DESIGN CHECKED	
SCALE	NOT TO SCALE

DRAWING No.	REV No.
C22D-04-207-00/01	A

P:\PROJECTS\107406\ENGINEERING\13-INTERVENTIONS\C22D-04\C22D-04-207-00\2012_3_REHAB\DRAWINGS\C22D-04-207-00_01_REVA.DWG



LEVEL 1.0m



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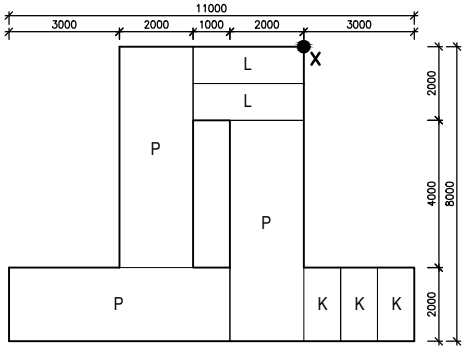
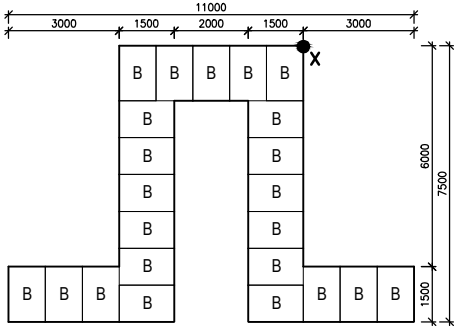


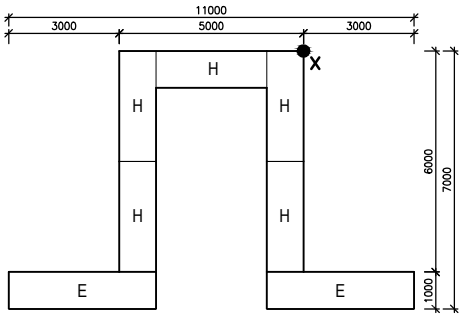
LEVEL 1.6m



LEVEL 2.6m

GABION & RENO MATTRESS SIZES

CODE	SIZE
A	1.0 x 1.0 x 1.0m
B	1.5 x 1.0 x 1.0m
C	2.0 x 1.0 x 1.0m
D	3.0 x 1.0 x 1.0m
E	4.0 x 1.0 x 1.0m
F	2.0 x 0.5 x 0.5m
G	2.0 x 1.0 x 0.5m
H	3.0 x 1.0 x 0.5m
J	4.0 x 1.0 x 0.5m
K	2.0 x 1.0 x 0.3m
L	3.0 x 1.0 x 0.3m
M	6.0 x 2.0 x 0.17m
N	6.0 x 2.0 x 0.23m
P	6.0 x 2.0 x 0.3m



LEVEL 3.6m

GABION QUANTITIES

CODE	NO. BASKETS
B	23
D	2
E	6
H	5
K	8
L	4
P	6

GABIONS:

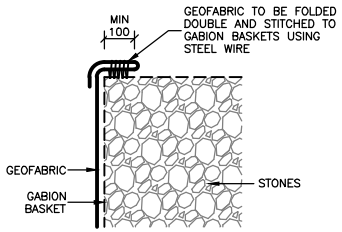
1. GABION BASKETS AND RENO MATTRESSES TO BE CONSTRUCTED OF DOUBLE TWISTED, HEXAGONAL, PVC COATED, GALVANISED WIRE MESH OF NOMINAL DIAMETER 80mm MESH, WITH 3.4mm o/d FRAME WIRE AND 2.7mm o/d MESH WIRE WITH PARTITIONS AT 1m CENTRES.
2. GEOFABRIC TO BE NON-WOVEN, NOT LESS THAN 195g/m². e.g. AG200.
3. 100mm – 200mm STONE TO BE USED IN ALL GABIONS AND RENO MATTRESSES. STONE FILL MUST BE NON-FRIABLE & INSOLUBLE e.g. GRANITE, BASALT, LIMESTONE OR SANDSTONE.
4. ALL GABIONS AND RENO MATTRESSES TO COMPLY WITH SANS-1200-DK.
5. CONCRETE CAPPING TO BE MINIMUM 15MPa & MIX:
   1 BAG CEMENT
   125L SAND
   120L STONE
   30L WATER
6. GEOFABRIC TO BE INSERTED AT ALL SOIL/MESH INTERFACES UNLESS OTHERWISE SPECIFIED.
7. GEOFABRIC TO HAVE WEEPHOLES PUNCHED THROUGH USING 10mm STEEL ROD AT APPROXIMATELY 4 HOLES/m².

EARTHWORKS:

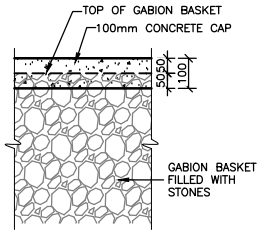
8. ALL CUT AND FILL SLOPES TO BE NOT STEEPER THAN 1:4, UNLESS OTHERWISE SPECIFIED.
9. ALL EXPOSED DISTURBED SURFACES TO BE REVEGETATED, UNLESS OTHERWISE SPECIFIED.
10. BACKFILL, PARTICULARLY ON BOTH SIDES OF KEYWALLS AND OUTSIDE SIDE WALLS, TO BE COMPACTED IN 100mm LAYERS AT OPTIMUM WATER CONTENT.
11. BACKFILL TO BOTH SIDES OF ALL WALLS TO BE DONE EQUALLY SO THAT ONE SIDE IS NEVER MORE THAN 1m ABOVE THE OTHER SIDE.

DISPERSIVE SOILS:
(ONLY APPLICABLE IN AREAS WITH DISPERSIVE SOILS):

12. IT IS CRITICAL TO ENSURE THAT THE FOUNDING SOIL NEVER DRIES OUT AND REMAINS AS UNDISTURBED AS POSSIBLE. THE BLINDING LAYER SHOULD THEREFORE BE CAST AS SOON AS A PORTION OF EXCAVATION HAS BEEN FINISHED.
13. FILL MATERIAL TO BE GOOD QUALITY, WELL-GRADED GRAVEL OR CLAY (NOT DISPERSIVE CLAY FOUND IN PARTS OF THE FLOOD PLAIN).
14. ALL MATERIAL THAT IS EXCAVATED FROM THIS SITE AND RE-USED FOR BACKFILL SHALL BE WELL MIXED WITH 100kg OF LIME PER CUBIC METRE OF SOIL, AND PLACED AND COMPACTED AT OPTIMUM MOISTURE CONTENT.



TYPICAL DETAIL FOR TYING OF GEOFABRIC TO GABIONS & RENO MATTRESSES



TYPICAL DETAIL OF CONCRETE CAPPING FOR GABIONS & RENO MATTRESSES

NOT FOR CONSTRUCTION. SUBJECT TO EVALUATION OF SITE CONDITIONS BY THE ENGINEER AT SETTING OUT STAGE.

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Working for Wetlands

aurecon

PROJECT
WORKING FOR WETLANDS
GAUTENG
GAUTENG SOUTH

DRAWING DESCRIPTION
GABION WEIR

DATE	JULY 2012
DRAWN BY	D.RAJNA
DRAWING CHECKED	D.TOWNSHEND
DESIGNED BY	C.BLAAUW
DESIGN CHECKED	
SCALE	NOT TO SCALE

DRAWING No.	REV No.
C22D-04-207-00/02	A

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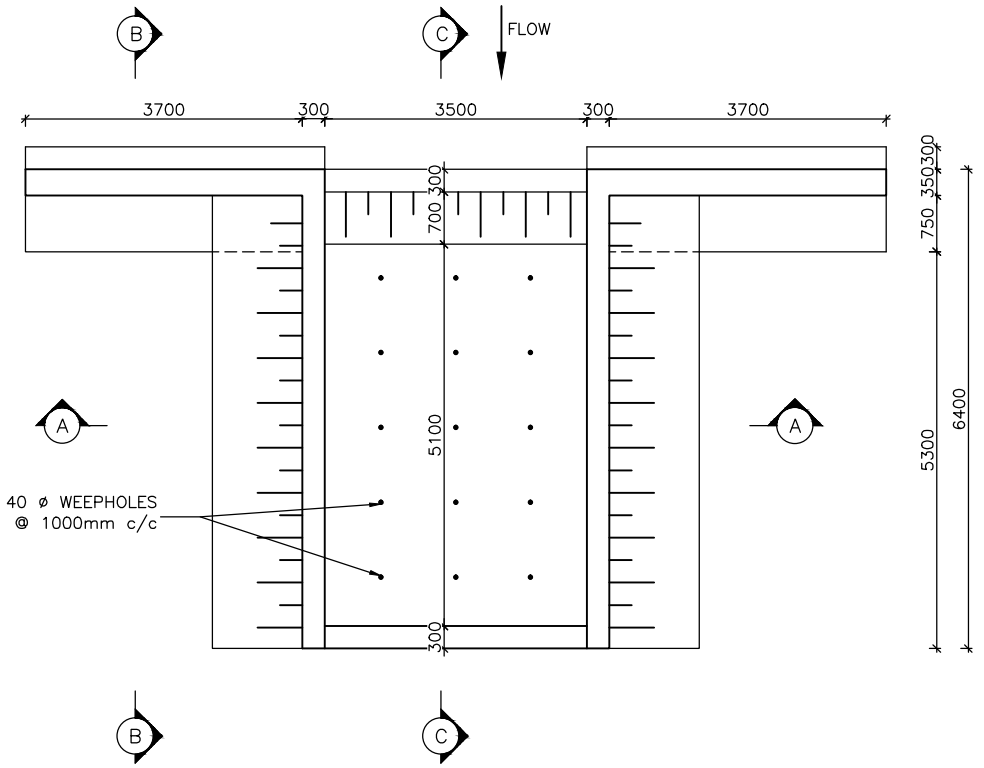
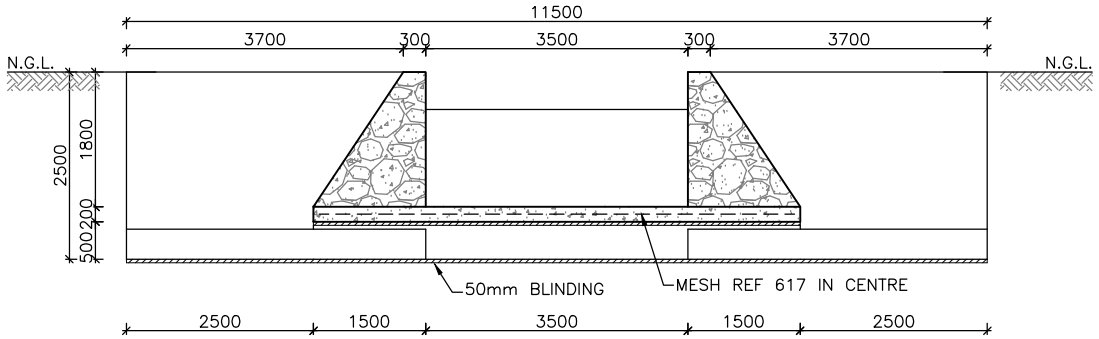


PLAN



SECTION A–A

EARTHWORKS:

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STONE MASONRY:

8. SPILLWAY WALL AND SIDE WALLS TO BE CONSTRUCTED OF STONE MASONRY USING 1:5 CEMENT/SAND MORTAR.
9. ALL OTHER COMPONENTS TO BE OF MINIMUM 20 MPa CONCRETE MIX:
   1 BAG CEMENT
   95L SAND
   100L STONE
   27L WATER
10. NOMINAL SIZE OF STONE AGGREGATE TO BE SIZE 19–26mm.

PLASTIC:

11. JOINS IN PLASTIC SHEETS TO OVERLAP BY A MIN OF 1000mm.

THIS DRAWING REFERS TO THE FOLLOWING STANDARD DETAILS ON DWG. No. 105782–STD–01 :

DETAIL No.	SHEET No.	DESCRIPTION
–	SHEET 2	STANDARD NOTES FOR CONCRETE WEIRS
–	SHEET 2	TYPICAL CONSTRUCTION JOINT DETAIL
–	SHEET 2	TYPICAL WEEPHOLE DETAIL
–	SHEET 3	REBAR TABLE
1c	SHEET 4	KEYWALL DETAIL
5a	SHEET 9	CUT–OFF WALL DETAIL

NOT FOR CONSTRUCTION. SUBJECT TO EVALUATION OF SITE CONDITIONS BY THE ENGINEER AT SETTING OUT STAGE.

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Working for Wetlands

aurecon

PROJECT
WORKING FOR WATER
GAUTENG
GAUTENG SOUTH

DRAWING DESCRIPTION
STONE MASONRY WEIR

DATE	JULY 2012
DRAWN BY	A.BARADIEN
DRAWING CHECKED	D.TOWNSHEND
DESIGNED BY	C.BLAAUW
DESIGN CHECKED	
SCALE	NOT TO SCALE

DRAWING No.	REV No.
C22D–04–208–00/01	A

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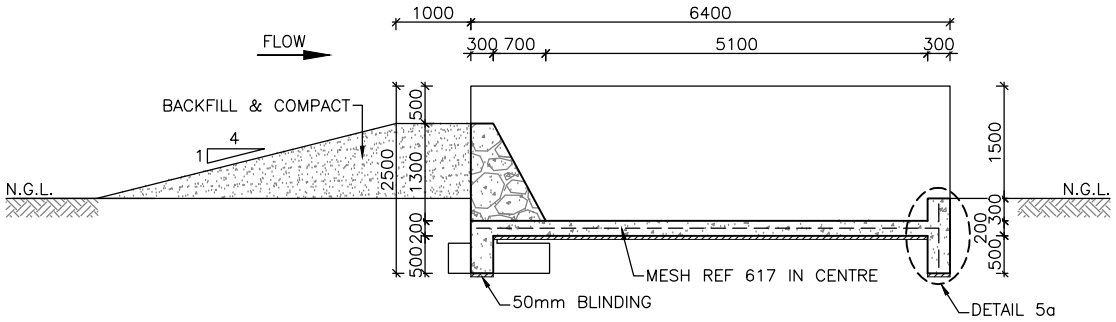
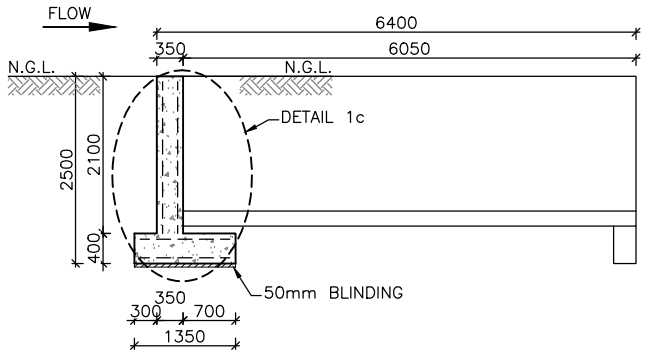


SECTION B–B



SECTION C–C

NOT FOR CONSTRUCTION. SUBJECT TO EVALUATION OF SITE CONDITIONS BY THE ENGINEER AT SETTING OUT STAGE.

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Working for Wetlands

aurecon

PROJECT
WORKING FOR WATER
GAUTENG
GAUTENG SOUTH

DRAWING DESCRIPTION
STONE MASONRY WEIR

DATE	JULY 2012
DRAWN BY	A.BARADIEN
DRAWING CHECKED	D.TOWNSHEND
DESIGNED BY	C.BLAAUW
DESIGN CHECKED	
SCALE	NOT TO SCALE

DRAWING No.	REV No.
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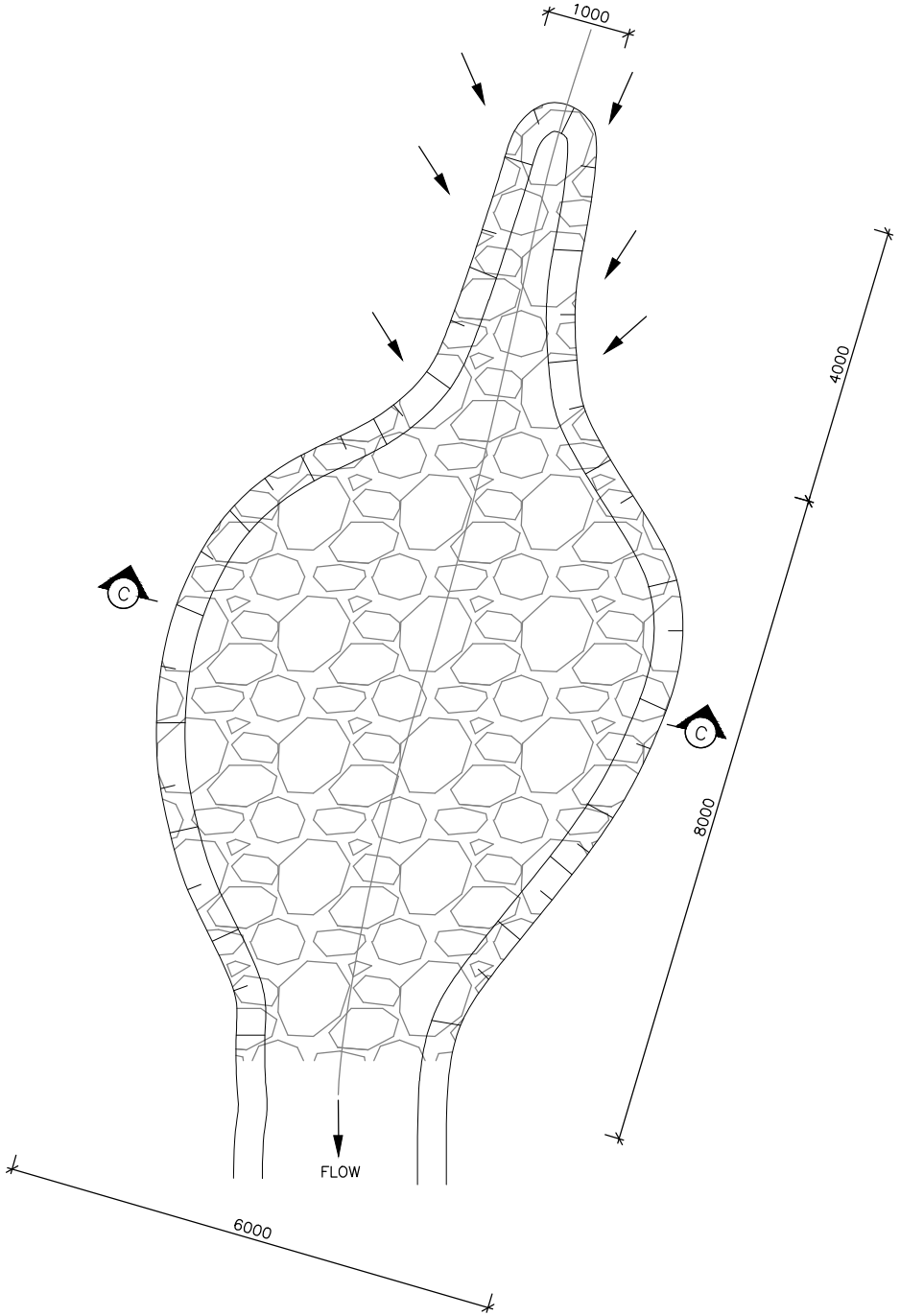
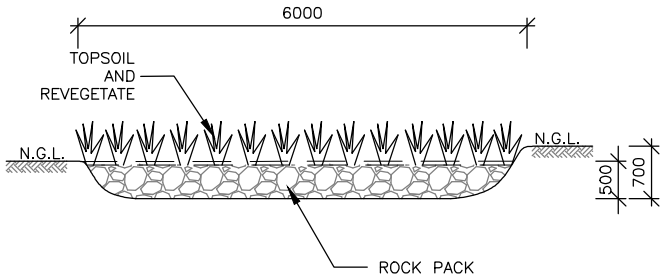


PLAN VIEW



SECTION A–A

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PROJECT
WORKING FOR WETLANDS
GAUTENG
GAUTENG SOUTH

DRAWING DESCRIPTION
ROCK PACKS WITH REVEGETATION

DATE	JULY 2012
DRAWN BY	B.MCCAROGHER
DRAWING CHECKED	D.TOWNSHEND
DESIGNED BY	C.BLAAUW
DESIGN CHECKED	
SCALE	NOT TO SCALE

DRAWING No.	REV No.
C22D–04–209–00/01	A

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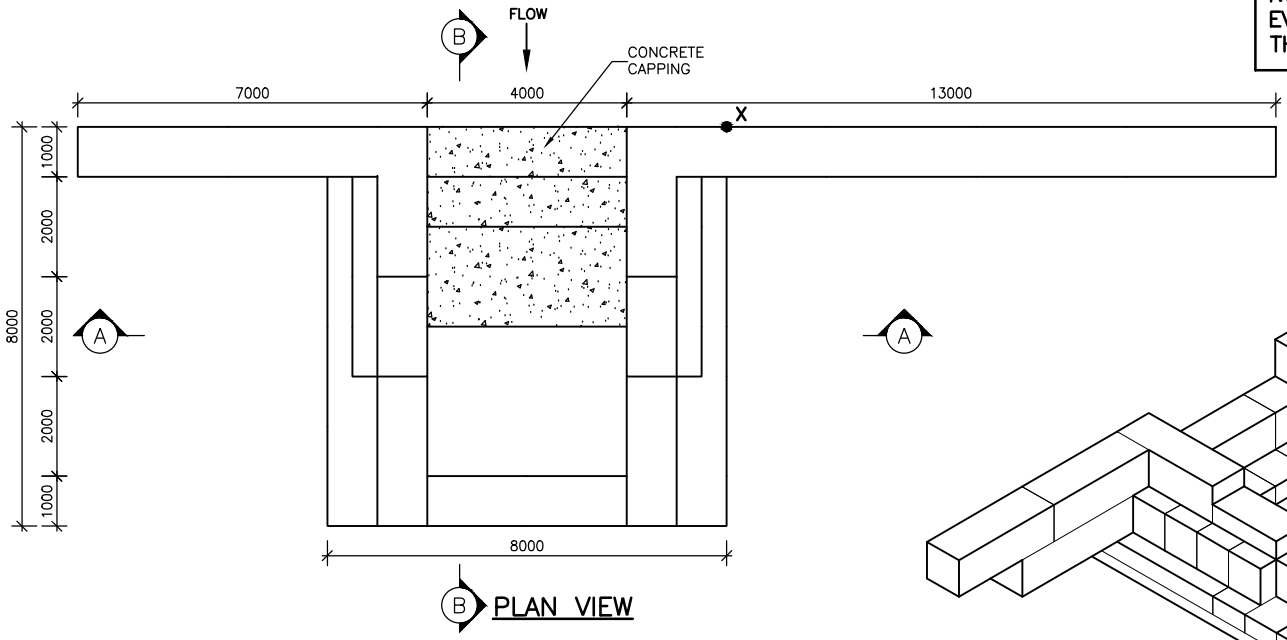
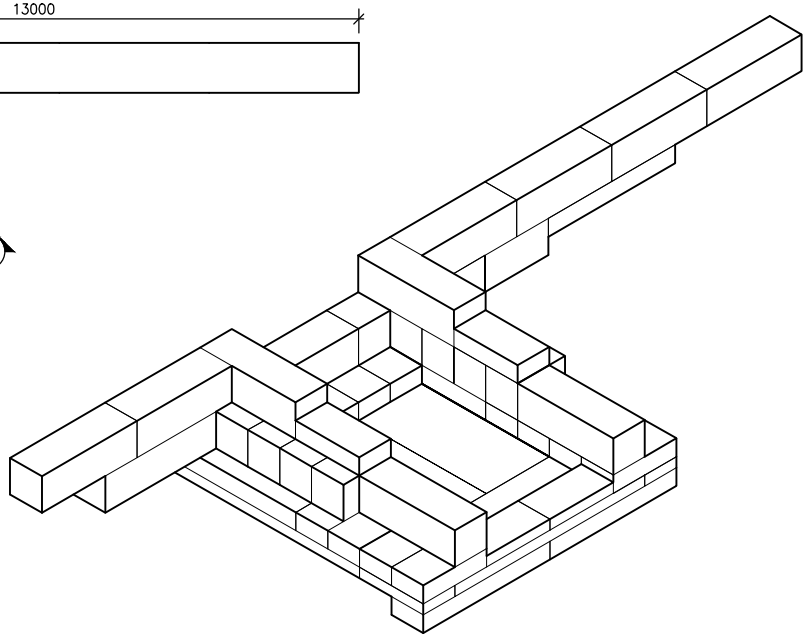
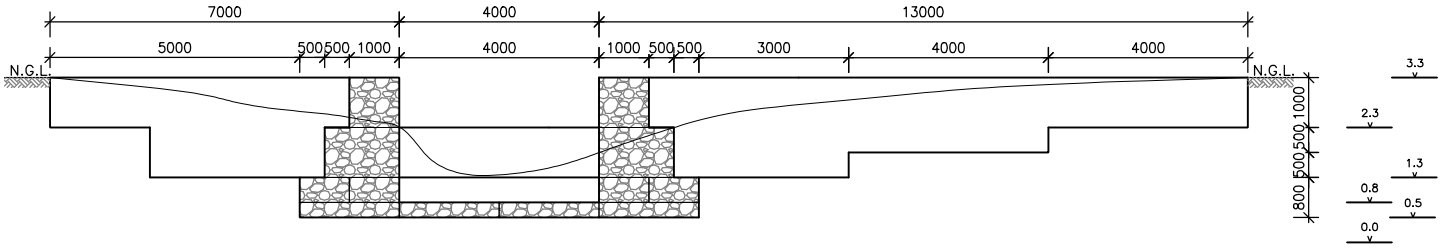


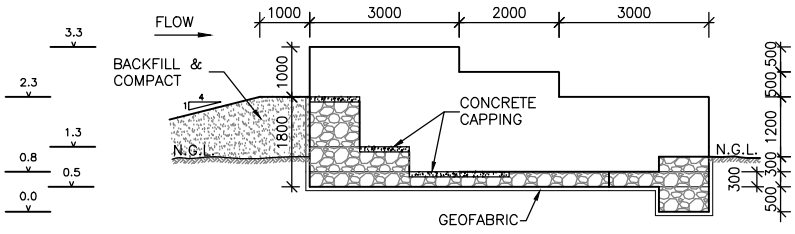


3D VIEW



SECTION A–A

GABION QUANTITIES	
CODE	NO. BASKETS
B	8
C	1
D	10
E	3
G	14
J	7
K	4
P	5



SECTION B–B

NOTES

1. AURECON ACCEPTS RESPONSIBILITY FOR THE ENGINEERING DESIGN TO THE EXTENT THAT THIS IS BASED ON AVAILABLE INFORMATION. THE AVAILABLE INFORMATION IS LIMITED TO WHAT COULD BE INTERPRETED DURING A SINGLE SITE VISIT OF NO LONGER THAN A FEW HOURS. NO GEOTECHNICAL, TOPOGRAPHICAL, GEOMORPHOLOGIC AND OTHER ENGINEERING RELATED SURVEYS HAVE BEEN UNDERTAKEN TO INFORM THE DESIGN. THIS IS NON-STANDARD ENGINEERING PRACTICE AND THEREFORE AURECON IS INDEMNIFIED BY THE CLIENT AND DOES NOT ACCEPT RESPONSIBILITY FOR THE ASSOCIATED RISK OF FAILURE FROM THE ABOVE LIMITATIONS OR ANY DAMAGES THAT MAY OCCUR.
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Working for Wetlands

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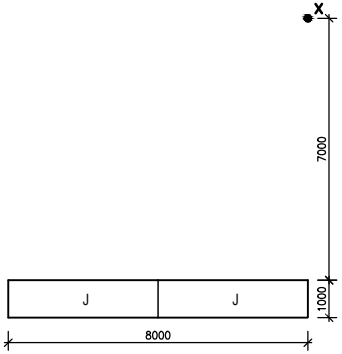
PROJECT
WORKING FOR WETLANDS
GAUTENG
GAUTENG SOUTH

DRAWING DESCRIPTION
GABION WEIR:
LEVELS & DETAILS

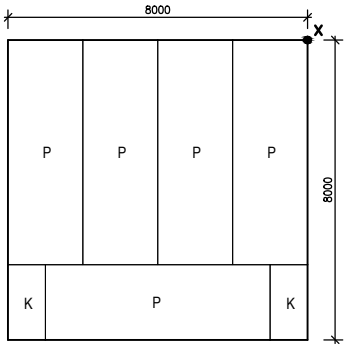
DATE	JULY 2012
DRAWN BY	D.RAJNA
DRAWING CHECKED	D.TOWNSHEND
DESIGNED BY	C.BLAAUW
DESIGN CHECKED	
SCALE	NOT TO SCALE

DRAWING No.	REV No.
C22D-04-210-00/01	A

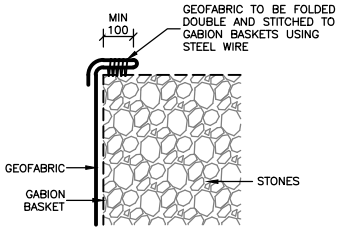
P:\PROJECTS\107406\ENGINEERING\13-INTERVENTIONS\C22D-04\C22D-04-210-00\2012_3_REHAB\DRAWINGS\C22D-04-210-00_01_REVA.DWG



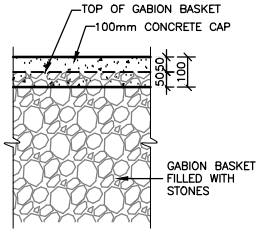
LEVEL 0.5m



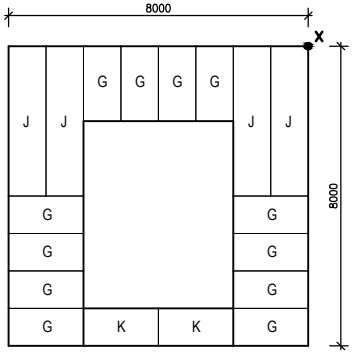
LEVEL 0.8m



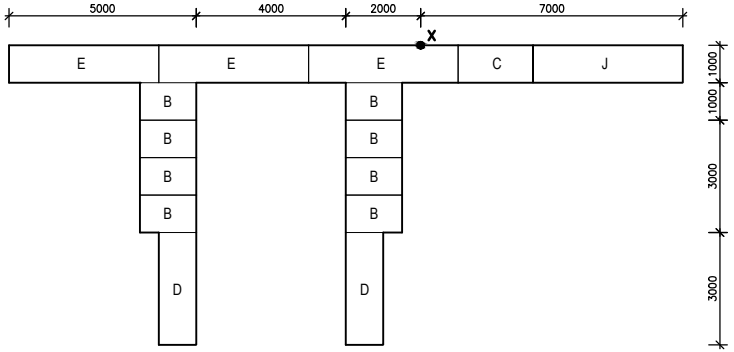
TYPICAL DETAIL FOR TYING OF GEOFABRIC TO GABIONS & RENO MATTRESSES



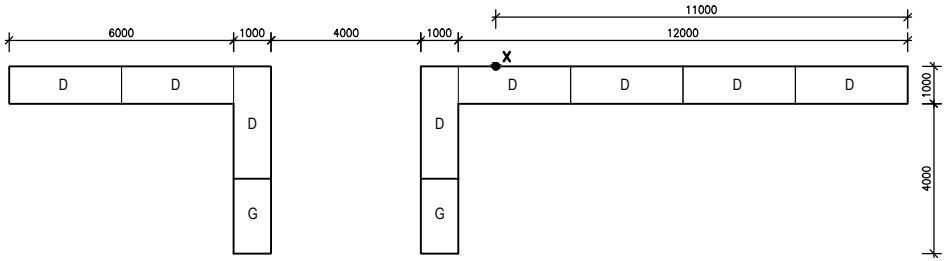
TYPICAL DETAIL OF CONCRETE CAPPING FOR GABIONS & RENO MATTRESSES



LEVEL 1.3m



LEVEL 2.3m



LEVEL 3.3m

NOT FOR CONSTRUCTION. SUBJECT TO EVALUATION OF SITE CONDITIONS BY THE ENGINEER AT SETTING OUT STAGE.

GABIONS:

1. GABION BASKETS AND RENO MATTRESSES TO BE CONSTRUCTED OF DOUBLE TWISTED, HEXAGONAL, PVC COATED, GALVANISED WIRE MESH OF NOMINAL DIAMETER 80mm MESH, WITH 3.4mm o/d FRAME WIRE AND 2.7mm o/d MESH WIRE WITH PARTITIONS AT 1m CENTRES.
2. GEOFABRIC TO BE NON-WOVEN, NOT LESS THAN 195g/m². e.g. AG200.
3. 100mm – 200mm STONE TO BE USED IN ALL GABIONS AND RENO MATTRESSES. STONE FILL MUST BE NON-FRIABLE & INSOLUBLE e.g. GRANITE, BASALT, LIMESTONE OR SANDSTONE.
4. ALL GABIONS AND RENO MATTRESSES TO COMPLY WITH SANS-1200-DK.
5. CONCRETE CAPPING TO BE MINIMUM 15MPa & MIX:
   1 BAG CEMENT
   125L SAND
   120L STONE
   30L WATER
6. GEOFABRIC TO BE INSERTED AT ALL SOIL/MESH INTERFACES UNLESS OTHERWISE SPECIFIED.
7. GEOFABRIC TO HAVE WEEPHOLES PUNCHED THROUGH USING 10mm STEEL ROD AT APPROXIMATELY 4 HOLES/m².

EARTHWORKS:

8. ALL CUT AND FILL SLOPES TO BE NOT STEEPER THAN 1:4, UNLESS OTHERWISE SPECIFIED.
9. ALL EXPOSED DISTURBED SURFACES TO BE REVEGETATED, UNLESS OTHERWISE SPECIFIED.
10. BACKFILL, PARTICULARLY ON BOTH SIDES OF KEYWALLS AND OUTSIDE SIDE WALLS, TO BE COMPACTED IN 100mm LAYERS AT OPTIMUM WATER CONTENT.
11. BACKFILL TO BOTH SIDES OF ALL WALLS TO BE DONE EQUALLY SO THAT ONE SIDE IS NEVER MORE THAN 1m ABOVE THE OTHER SIDE.

DISPERSIVE SOILS:
(ONLY APPLICABLE IN AREAS WITH DISPERSIVE SOILS):

12. IT IS CRITICAL TO ENSURE THAT THE FOUNDING SOIL NEVER DRIES OUT AND REMAINS AS UNDISTURBED AS POSSIBLE. THE BLINDING LAYER SHOULD THEREFORE BE CAST AS SOON AS A PORTION OF EXCAVATION HAS BEEN FINISHED.
13. FILL MATERIAL TO BE GOOD QUALITY, WELL-GRADED GRAVEL OR CLAY (NOT DISPERSIVE CLAY FOUND IN PARTS OF THE FLOOD PLAIN).
14. ALL MATERIAL THAT IS EXCAVATED FROM THIS SITE AND RE-USED FOR BACKFILL SHALL BE WELL MIXED WITH 100kg OF LIME PER CUBIC METRE OF SOIL, AND PLACED AND COMPACTED AT OPTIMUM MOISTURE CONTENT.

GABION & RENO MATTRESS SIZES

CODE	SIZE
A	1.0 x 1.0 x 1.0m
B	1.5 x 1.0 x 1.0m
C	2.0 x 1.0 x 1.0m
D	3.0 x 1.0 x 1.0m
E	4.0 x 1.0 x 1.0m
F	2.0 x 0.5 x 0.5m
G	2.0 x 1.0 x 0.5m
H	3.0 x 1.0 x 0.5m
J	4.0 x 1.0 x 0.5m
K	2.0 x 1.0 x 0.3m
L	3.0 x 1.0 x 0.3m
M	6.0 x 2.0 x 0.17m
N	6.0 x 2.0 x 0.23m
P	6.0 x 2.0 x 0.3m

NOTES

1. AURECON ACCEPTS RESPONSIBILITY FOR THE ENGINEERING DESIGN TO THE EXTENT THAT THIS IS BASED ON AVAILABLE INFORMATION. THE AVAILABLE INFORMATION IS LIMITED TO WHAT COULD BE INTERPRETED DURING A SINGLE SITE VISIT OF NO LONGER THAN A FEW HOURS. NO GEOTECHNICAL, TOPOGRAPHICAL, GEOMORPHOLOGIC AND OTHER ENGINEERING RELATED SURVEYS HAVE BEEN UNDERTAKEN TO INFORM THE DESIGN. THIS IS NON-STANDARD ENGINEERING PRACTICE AND THEREFORE AURECON IS INDEMNIFIED BY THE CLIENT AND DOES NOT ACCEPT RESPONSIBILITY FOR THE ASSOCIATED RISK OF FAILURE FROM THE ABOVE LIMITATIONS OR ANY DAMAGES THAT MAY OCCUR.
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Working for Wetlands

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PROJECT
WORKING FOR WETLANDS
GAUTENG
GAUTENG SOUTH

DRAWING DESCRIPTION
GABION WEIR:
LEVELS & DETAILS

DATE	JULY 2012
DRAWN BY	D.RAJNA
DRAWING CHECKED	D.TOWNSHEND
DESIGNED BY	C.BLAAUW
DESIGN CHECKED	
SCALE	NOT TO SCALE

DRAWING No.	REV No.
C22D-04-210-00/02	A

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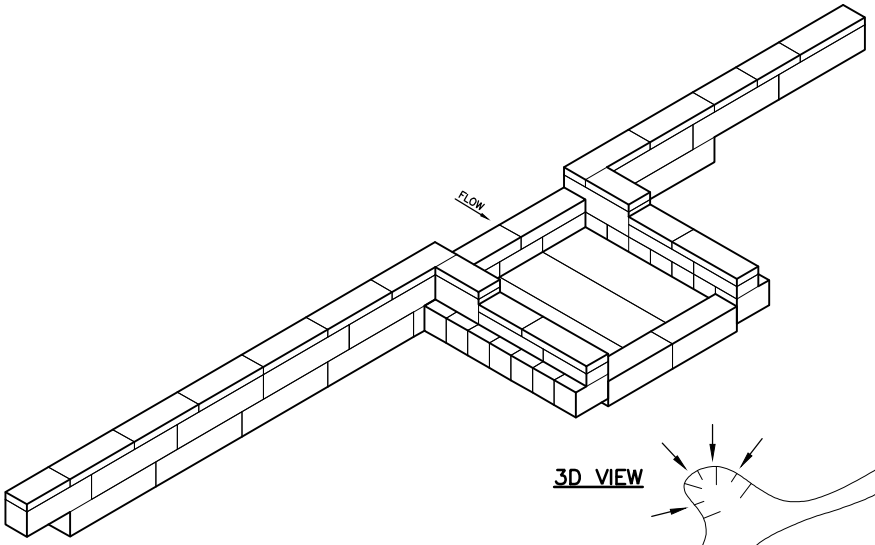
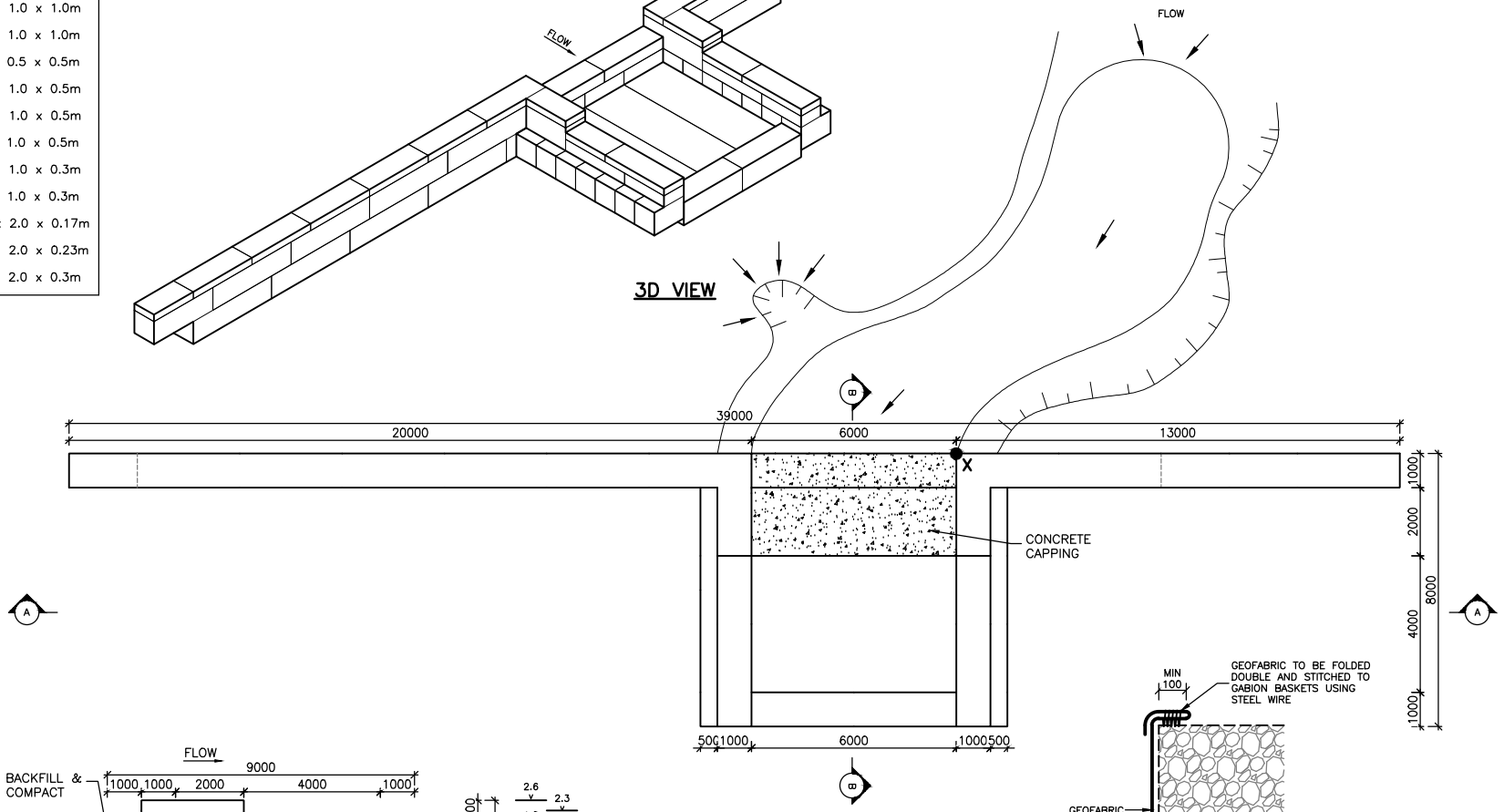
GABION & RENO MATTRESS SIZES

CODE	SIZE
A	1.0 x 1.0 x 1.0m
B	1.5 x 1.0 x 1.0m
C	2.0 x 1.0 x 1.0m
D	3.0 x 1.0 x 1.0m
E	4.0 x 1.0 x 1.0m
F	2.0 x 0.5 x 0.5m
G	2.0 x 1.0 x 0.5m
H	3.0 x 1.0 x 0.5m
J	4.0 x 1.0 x 0.5m
K	2.0 x 1.0 x 0.3m
L	3.0 x 1.0 x 0.3m
M	6.0 x 2.0 x 0.17m
N	6.0 x 2.0 x 0.23m
P	6.0 x 2.0 x 0.3m

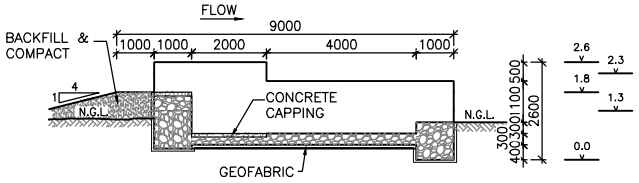
NOT FOR CONSTRUCTION. SUBJECT TO EVALUATION OF SITE CONDITIONS BY THE ENGINEER AT SETTING OUT STAGE.



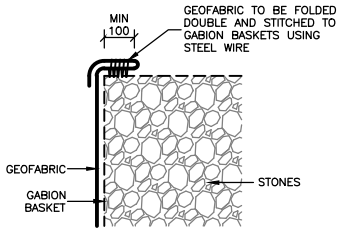
3D VIEW



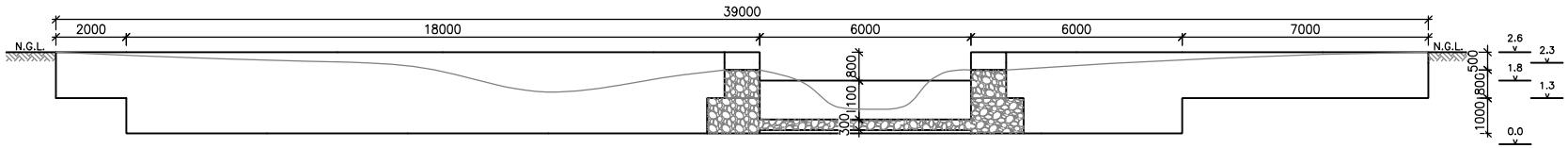
PLAN VIEW



SECTION B–B



TYPICAL DETAIL FOR TYING OF GEOFABRIC TO GABIONS & RENO MATTRESSES



SECTION A–A

NOTES

1. AURECON ACCEPTS RESPONSIBILITY FOR THE ENGINEERING DESIGN TO THE EXTENT THAT THIS IS BASED ON AVAILABLE INFORMATION. THE AVAILABLE INFORMATION IS LIMITED TO WHAT COULD BE INTERPRETED DURING A SINGLE SITE VISIT OF NO LONGER THAN A FEW HOURS. NO GEOTECHNICAL, TOPOGRAPHICAL, GEOMORPHOLOGIC AND OTHER ENGINEERING RELATED SURVEYS HAVE BEEN UNDERTAKEN TO INFORM THE DESIGN. THIS IS NON-STANDARD ENGINEERING PRACTICE AND THEREFORE AURECON IS INDEMNIFIED BY THE CLIENT AND DOES NOT ACCEPT RESPONSIBILITY FOR THE ASSOCIATED RISK OF FAILURE FROM THE ABOVE LIMITATIONS OR ANY DAMAGES THAT MAY OCCUR.
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Working for Wetlands

aurecon

PROJECT
WORKING FOR WETLANDS
GAUTENG
GAUTENG SOUTH

DRAWING DESCRIPTION
GABION WEIR

DATE	JULY 2012
DRAWN BY	D.RAJNA
DRAWING CHECKED	D.TOWNSHEND
DESIGNED BY	C.BLAAUW
DESIGN CHECKED	
SCALE	NOT TO SCALE

DRAWING No.	REV No.
C22D-04-211-00/01	A

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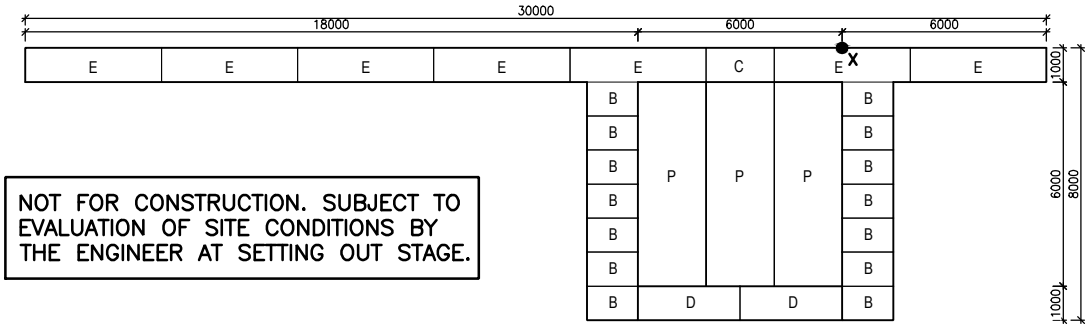
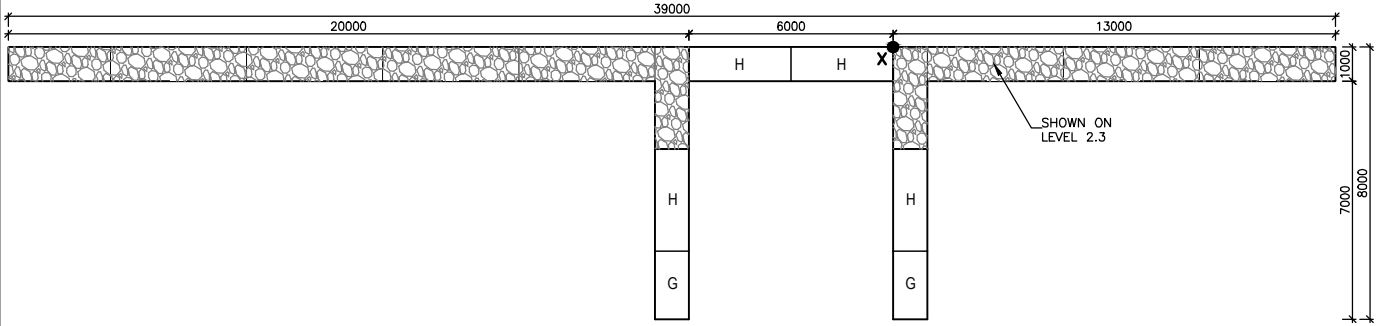
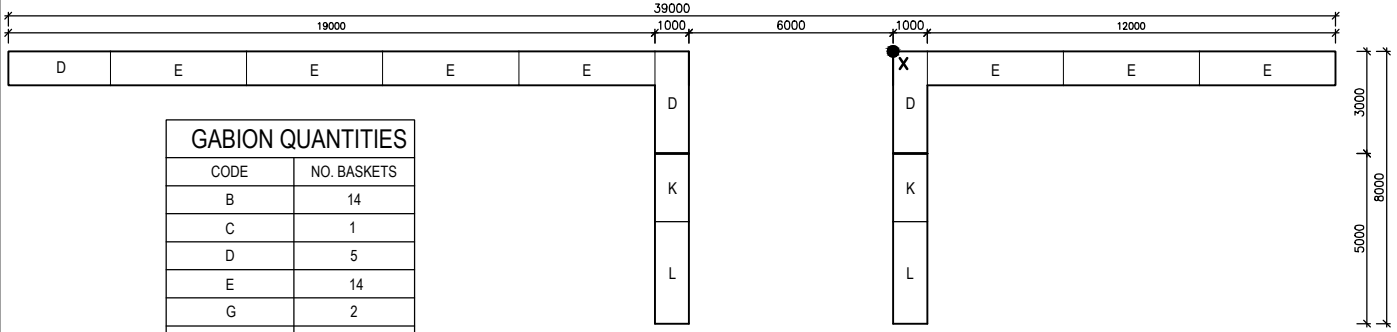
NOT FOR CONSTRUCTION. SUBJECT TO EVALUATION OF SITE CONDITIONS BY THE ENGINEER AT SETTING OUT STAGE.



LEVEL 1.3m

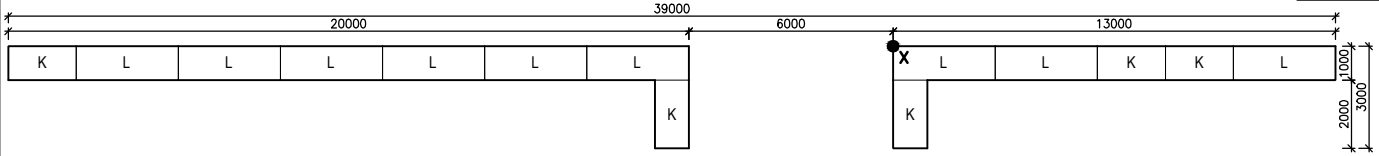


LEVEL 1.8m



LEVEL 2.3m

GABION QUANTITIES	
CODE	NO. BASKETS
B	14
C	1
D	5
E	14
G	2
H	4
K	7
L	11
P	3



LEVEL 2.6m

GABIONS:

1. GABION BASKETS AND RENO MATTRESSES TO BE CONSTRUCTED OF DOUBLE TWISTED, HEXAGONAL, PVC COATED, GALVANISED WIRE MESH OF NOMINAL DIAMETER 80mm MESH, WITH 3.4mm o/d FRAME WIRE AND 2.7mm o/d MESH WIRE WITH PARTITIONS AT 1m CENTRES.
2. GEOFABRIC TO BE NON-WOVEN, NOT LESS THAN 195g/m². e.g. AG200.
3. 100mm – 200mm STONE TO BE USED IN ALL GABIONS AND RENO MATTRESSES. STONE FILL MUST BE NON-FRIABLE & INSOLUBLE e.g. GRANITE, BASALT, LIMESTONE OR SANDSTONE.
4. ALL GABIONS AND RENO MATTRESSES TO COMPLY WITH SANS-1200-DK.
5. CONCRETE CAPPING TO BE MINIMUM 15MPa & MIX:
   1 BAG CEMENT
   125L SAND
   120L STONE
   30L WATER
6. GEOFABRIC TO BE INSERTED AT ALL SOIL/MESH INTERFACES UNLESS OTHERWISE SPECIFIED.
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DISPERSIVE SOILS:
(ONLY APPLICABLE IN AREAS WITH DISPERSIVE SOILS):

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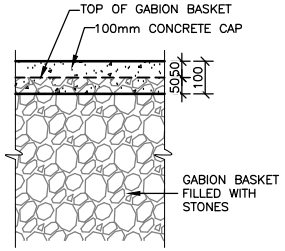
14. ALL MATERIAL THAT IS EXCAVATED FROM THIS SITE AND RE-USED FOR BACKFILL SHALL BE WELL MIXED WITH 100kg OF LIME PER CUBIC METRE OF SOIL, AND PLACED AND COMPACTED AT OPTIMUM MOISTURE CONTENT.



TYPICAL DETAIL OF CONCRETE CAPPING FOR GABIONS & RENO MATTRESSES

NOTES

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Working for Wetlands

aurecon

PROJECT
WORKING FOR WETLANDS
GAUTENG
GAUTENG SOUTH

DRAWING DESCRIPTION
GABION WEIR

DATE	JULY 2012
DRAWN BY	D.RAJNA
DRAWING CHECKED	D.TOWNSHEND
DESIGNED BY	C.BLAAUW
DESIGN CHECKED	
SCALE	NOT TO SCALE

DRAWING No.	REV No.
C22D-04-211-00/02	A

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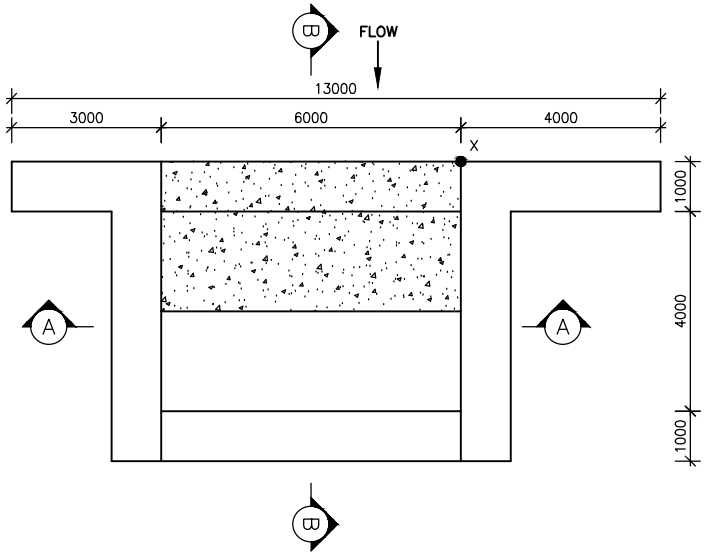
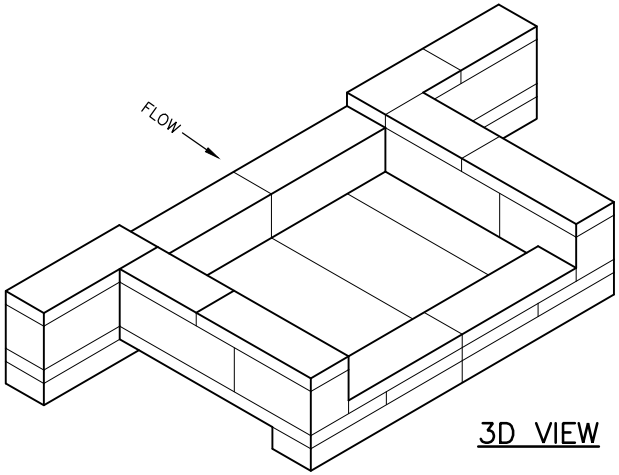
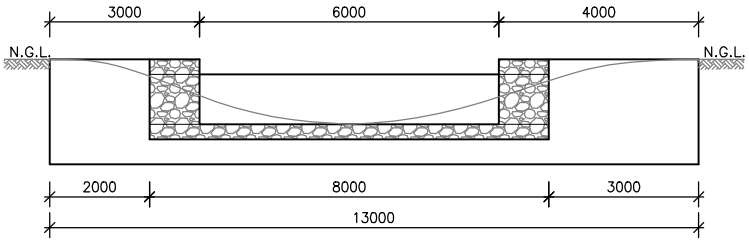
GABION QUANTITIES	
CODE	NO. BASKETS
C	3
D	3
E	2
G	1
H	1
J	4
K	5
L	6
P	4



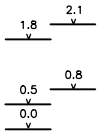
PLAN VIEW

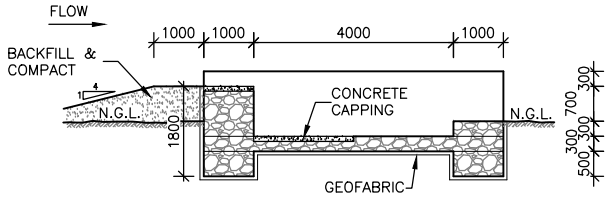


3D VIEW



SECTION A–A





SECTION B–B

NOTES

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Working for Wetlands

aurecon

PROJECT
WORKING FOR WETLANDS
GAUTENG
GAUTENG SOUTH

DRAWING DESCRIPTION
GABION WEIR:
LEVELS & DETAILS

DATE	JULY 2012
DRAWN BY	D.RAJNA
DRAWING CHECKED	D.TOWNSHEND
DESIGNED BY	C.BLAAUW
DESIGN CHECKED	
SCALE	NOT TO SCALE

DRAWING No.	REV No.
C22D-04-212-00/01	A

NOT FOR CONSTRUCTION. SUBJECT TO EVALUATION OF SITE CONDITIONS BY THE ENGINEER AT SETTING OUT STAGE.

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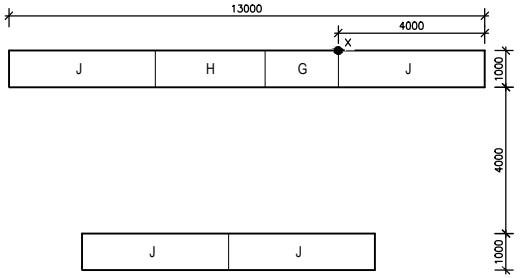
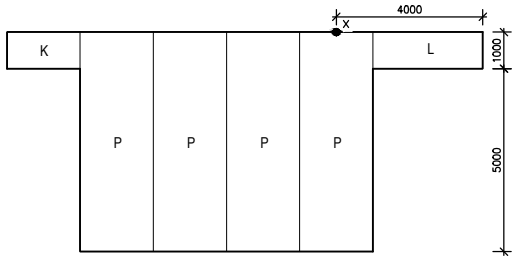


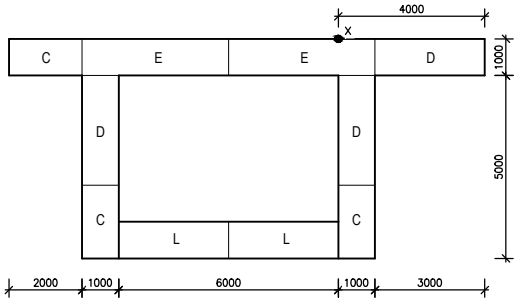
LEVEL 0.5m

GABION & RENO MATTRESS SIZES

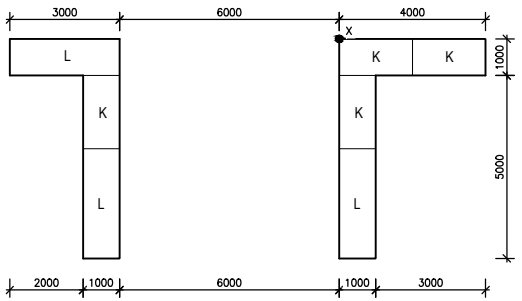
CODE	SIZE
A	1.0 x 1.0 x 1.0m
B	1.5 x 1.0 x 1.0m
C	2.0 x 1.0 x 1.0m
D	3.0 x 1.0 x 1.0m
E	4.0 x 1.0 x 1.0m
F	2.0 x 0.5 x 0.5m
G	2.0 x 1.0 x 0.5m
H	3.0 x 1.0 x 0.5m
J	4.0 x 1.0 x 0.5m
K	2.0 x 1.0 x 0.3m
L	3.0 x 1.0 x 0.3m
M	6.0 x 2.0 x 0.17m
N	6.0 x 2.0 x 0.23m
P	6.0 x 2.0 x 0.3m



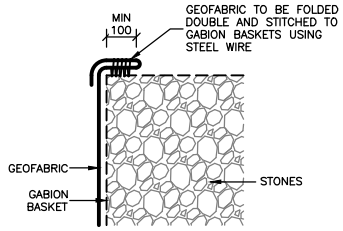
LEVEL 0.8m



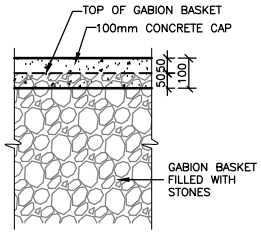
LEVEL 1.8m



LEVEL 2.1m



TYPICAL DETAIL FOR TYING OF GEOFABRIC TO GABIONS & RENO MATTRESSES



TYPICAL DETAIL OF CONCRETE CAPPING FOR GABIONS & RENO MATTRESSES

GABIONS:

1. GABION BASKETS AND RENO MATTRESSES TO BE CONSTRUCTED OF DOUBLE TWISTED, HEXAGONAL, PVC COATED, GALVANISED WIRE MESH OF NOMINAL DIAMETER 80mm MESH, WITH 3.4mm o/d FRAME WIRE AND 2.7mm o/d MESH WIRE WITH PARTITIONS AT 1m CENTRES.
2. GEOFABRIC TO BE NON-WOVEN, NOT LESS THAN 195g/m². e.g. AG200.
3. 100mm – 200mm STONE TO BE USED IN ALL GABIONS AND RENO MATTRESSES. STONE FILL MUST BE NON-FRIABLE & INSOLUBLE e.g. GRANITE, BASALT, LIMESTONE OR SANDSTONE.
4. ALL GABIONS AND RENO MATTRESSES TO COMPLY WITH SANS-1200-DK.
5. CONCRETE CAPPING TO BE MINIMUM 15MPa & MIX:
   1 BAG CEMENT
   125L SAND
   120L STONE
   30L WATER
6. GEOFABRIC TO BE INSERTED AT ALL SOIL/MESH INTERFACES UNLESS OTHERWISE SPECIFIED.
7. GEOFABRIC TO HAVE WEEPHOLES PUNCHED THROUGH USING 10mm STEEL ROD AT APPROXIMATELY 4 HOLES/m².

EARTHWORKS:

8. ALL CUT AND FILL SLOPES TO BE NOT STEEPER THAN 1:4, UNLESS OTHERWISE SPECIFIED.
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10. BACKFILL, PARTICULARLY ON BOTH SIDES OF KEYWALLS AND OUTSIDE SIDE WALLS, TO BE COMPACTED IN 100mm LAYERS AT OPTIMUM WATER CONTENT.
11. BACKFILL TO BOTH SIDES OF ALL WALLS TO BE DONE EQUALLY SO THAT ONE SIDE IS NEVER MORE THAN 1m ABOVE THE OTHER SIDE.

DISPERSIVE SOILS:
(ONLY APPLICABLE IN AREAS WITH DISPERSIVE SOILS):

12. IT IS CRITICAL TO ENSURE THAT THE FOUNDING SOIL NEVER DRIES OUT AND REMAINS AS UNDISTURBED AS POSSIBLE. THE BLINDING LAYER SHOULD THEREFORE BE CAST AS SOON AS A PORTION OF EXCAVATION HAS BEEN FINISHED.
13. FILL MATERIAL TO BE GOOD QUALITY, WELL-GRADED GRAVEL OR CLAY (NOT DISPERSIVE CLAY FOUND IN PARTS OF THE FLOOD PLAIN).
14. ALL MATERIAL THAT IS EXCAVATED FROM THIS SITE AND RE-USED FOR BACKFILL SHALL BE WELL MIXED WITH 100kg OF LIME PER CUBIC METRE OF SOIL, AND PLACED AND COMPACTED AT OPTIMUM MOISTURE CONTENT.

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Working for Wetlands

aurecon

PROJECT
WORKING FOR WETLANDS
GAUTENG
GAUTENG SOUTH

DRAWING DESCRIPTION
GABION WEIR:
LEVELS & DETAILS

DATE	JULY 2012
DRAWN BY	D.RAJNA
DRAWING CHECKED	D.TOWNSHEND
DESIGNED BY	C.BLAAUW
DESIGN CHECKED	
SCALE	NOT TO SCALE

DRAWING No.	REV No.
C22D-04-212-00/02	A

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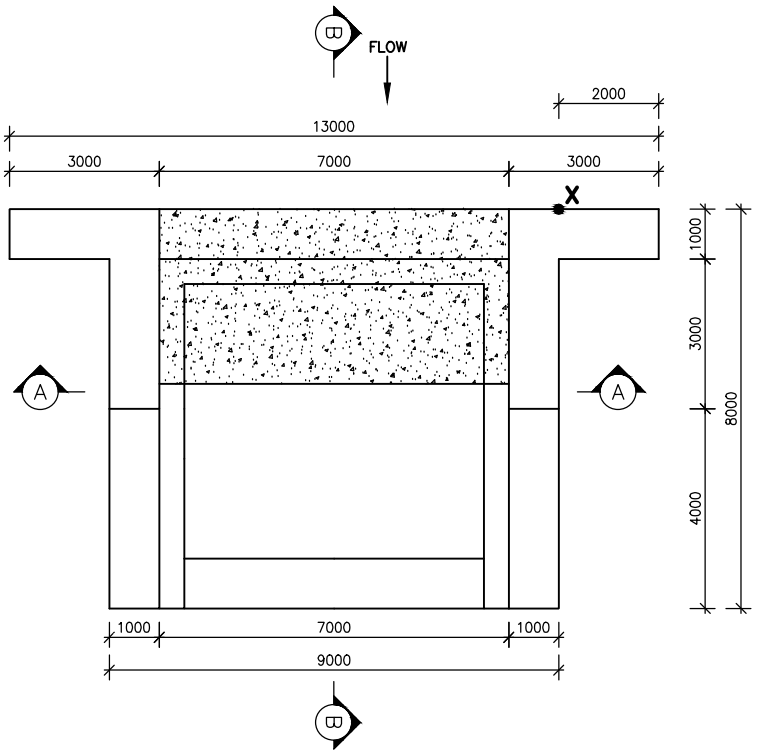
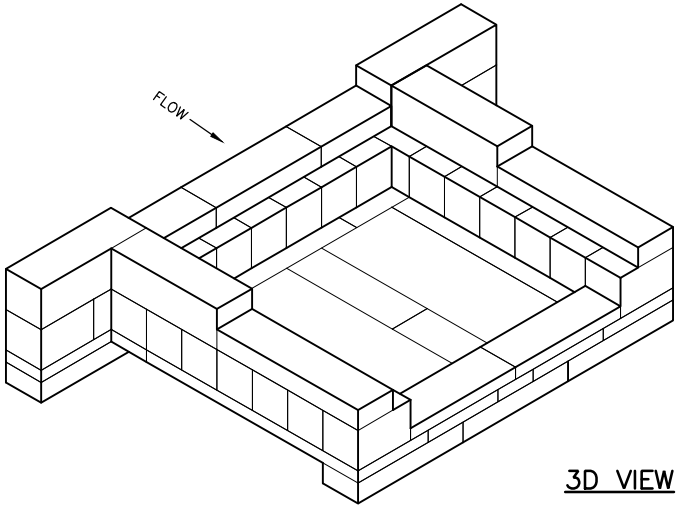
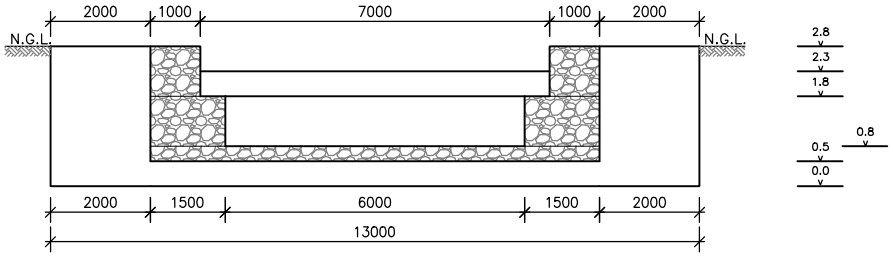


PLAN VIEW

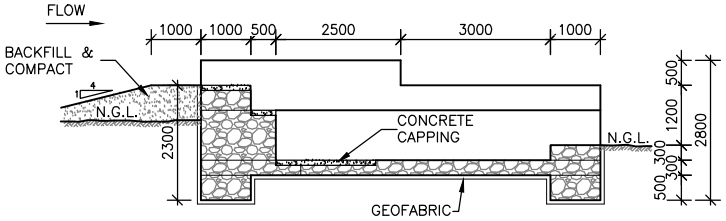
GABION QUANTITIES	
CODE	NO. BASKETS
B	22
C	2
D	4
G	3
H	5
J	4
K	2
L	6
P	5



3D VIEW



SECTION A–A



SECTION B–B

NOTES

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GAUTENG
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GABION WEIR:
LEVELS & DETAILS

DATE	JULY 2012
DRAWN BY	D.RAJNA
DRAWING CHECKED	D.TOWNSHEND
DESIGNED BY	C.BLAAUW
DESIGN CHECKED	
SCALE	NOT TO SCALE

DRAWING No.	REV No.
C22D-04-213-00/01	A

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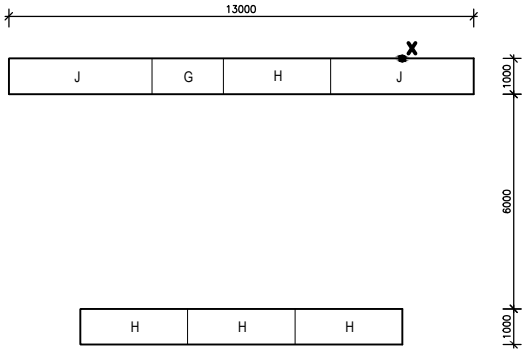
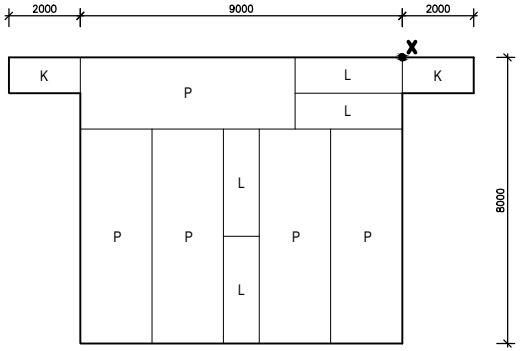
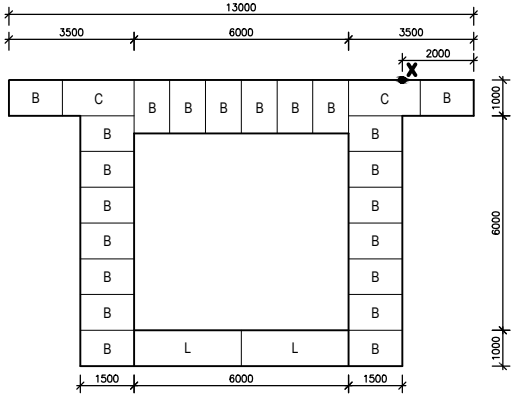


LEVEL 0.5m



LEVEL 0.8m



LEVEL 1.8m

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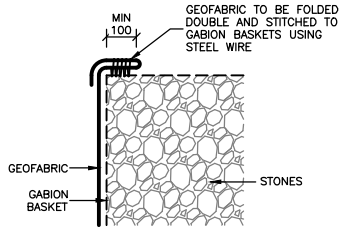

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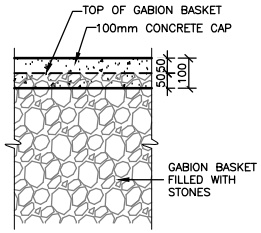

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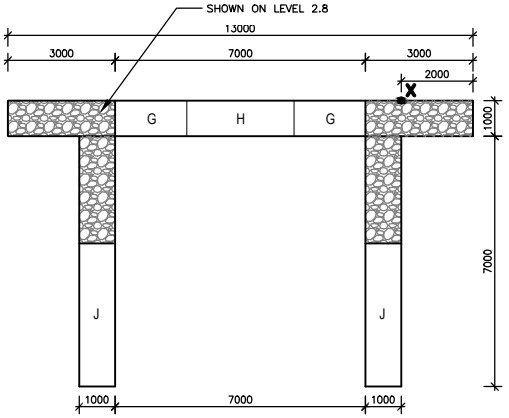
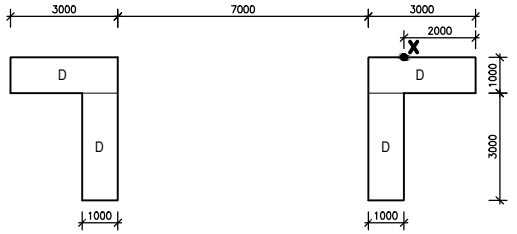


LEVEL 2.3m



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Working for Wetlands

aurecon

PROJECT
WORKING FOR WETLANDS
GAUTENG
GAUTENG SOUTH

DRAWING DESCRIPTION
GABION WEIR:
LEVELS & DETAILS

DATE	JULY 2012
DRAWN BY	D.RAJNA
DRAWING CHECKED	D.TOWNSHEND
DESIGNED BY	C.BLAAUW
DESIGN CHECKED	
SCALE	NOT TO SCALE

DRAWING No.	REV No.
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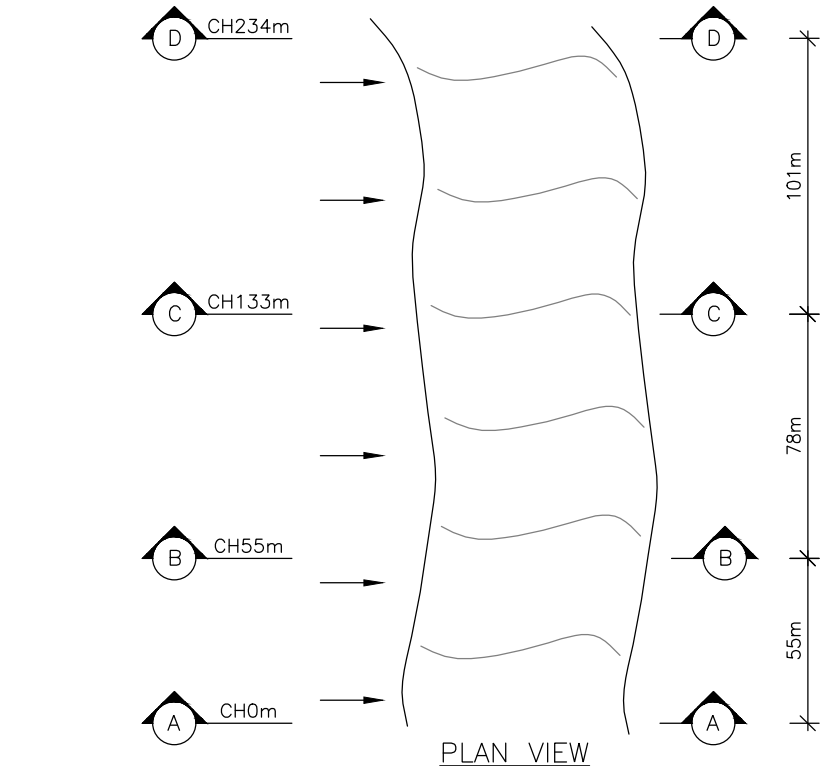
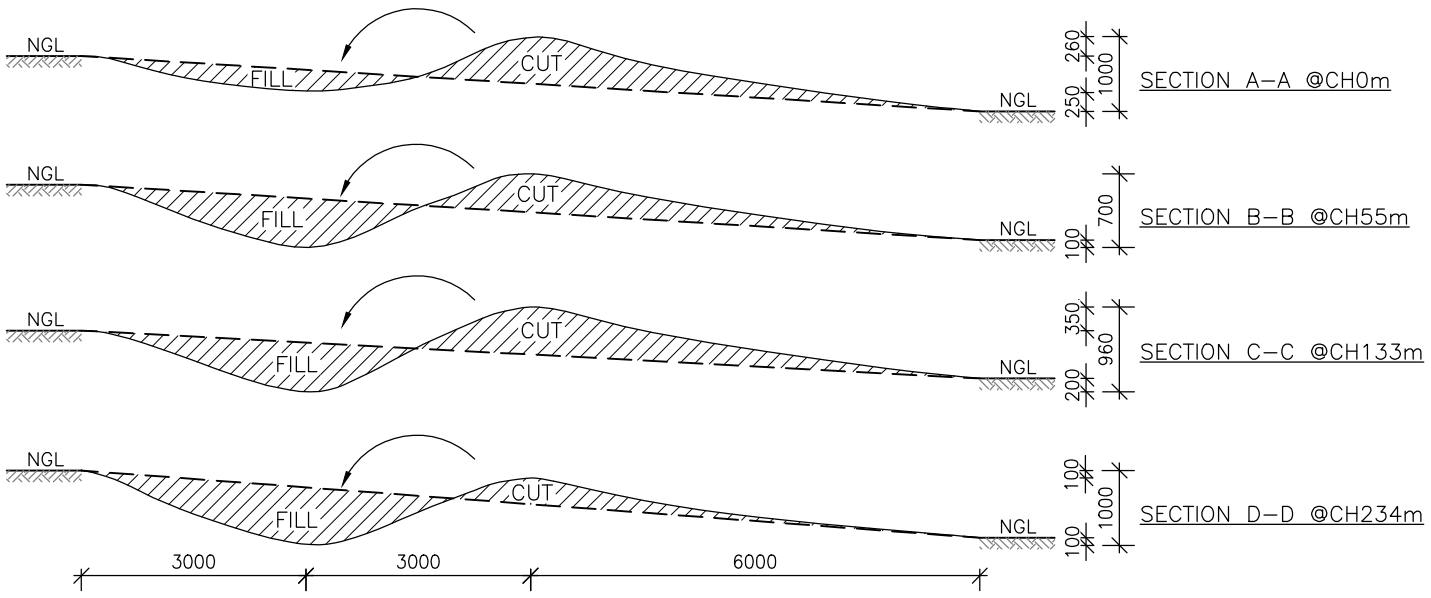


PLAN VIEW



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Working for Wetlands

aurecon
Cape Town

PROJECT
WORKING FOR WETLANDS
GAUTENG
GAUTENG SOUTH

DRAWING DESCRIPTION
CUT & FILL SLOPE TO N.G.L

DATE	JUNE 2012
DRAWN BY	A.MOHAMED
DRAWING CHECKED	D.TOWNSHEND
DESIGNED BY	C.BLAAUW
DESIGN CHECKED	
SCALE	NOT TO SCALE

DRAWING No.	REV No.
C22D-04-214-00/01	A

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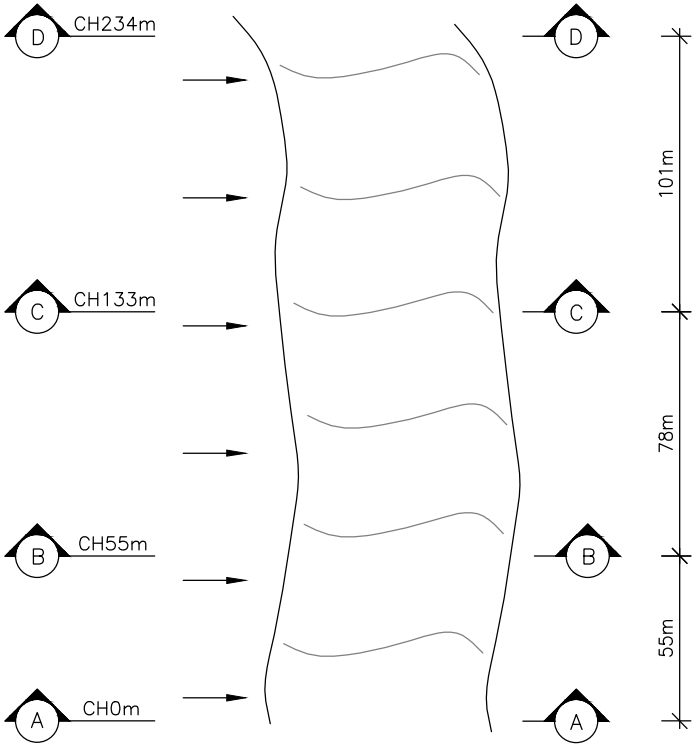
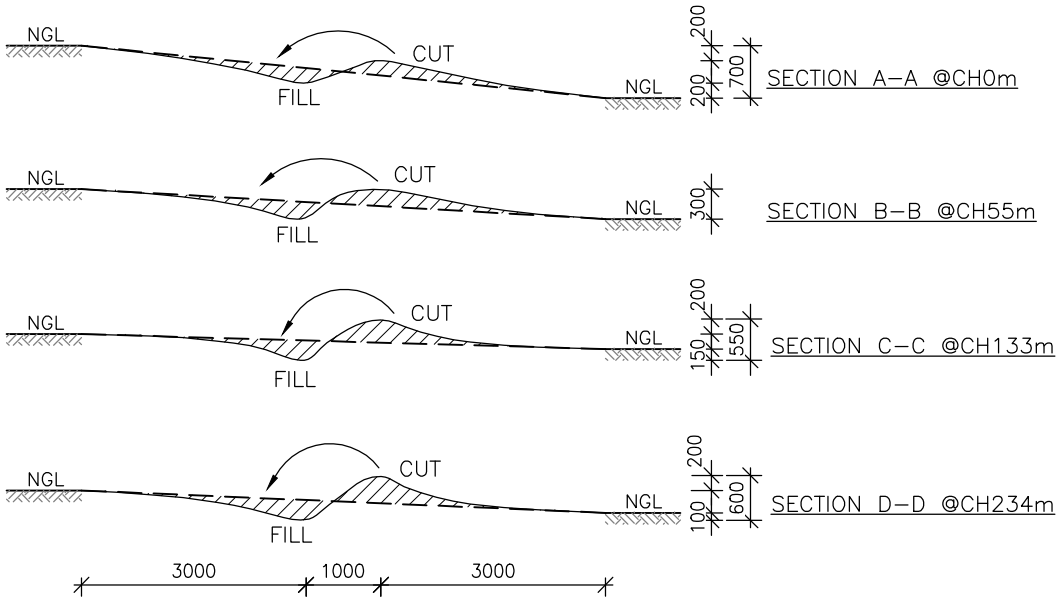


PLAN VIEW



EARTHWORKS:

1. ALL CUT AND FILL SLOPES TO BE NOT STEEPER THAN 1:4, UNLESS OTHERWISE SPECIFIED.
2. ALL EXPOSED DISTURBED SURFACES TO BE REVEGETATED, UNLESS OTHERWISE SPECIFIED.
3. BACKFILL, PARTICULARLY ON BOTH SIDES OF KEYWALLS AND OUTSIDE SIDE WALLS, TO BE COMPACTED IN 100mm LAYERS AT OPTIMUM WATER CONTENT.

DISPERSIVE SOILS:
(ONLY APPLICABLE IN AREAS WITH DISPERSIVE SOILS):

4. IT IS CRITICAL TO ENSURE THAT THE FOUNDING SOIL NEVER DRIES OUT AND REMAINS AS UNDISTURBED AS POSSIBLE. THE BLINDING LAYER SHOULD THEREFORE BE CAST AS SOON AS A PORTION OF EXCAVATION HAS BEEN FINISHED.
5. FILL MATERIAL TO BE GOOD QUALITY, WELL-GRADED GRAVEL OR CLAY (NOT DISPERSIVE CLAY FOUND IN PARTS OF THE FLOOD PLAIN).
6. ALL MATERIAL THAT IS EXCAVATED FROM THIS SITE AND RE-USED FOR BACKFILL SHALL BE WELL MIXED WITH 100kg OF LIME PER CUBIC METRE OF SOIL, AND PLACED AND COMPACTED AT OPTIMUM MOISTURE CONTENT.

NOTES

1. AURECON ACCEPTS RESPONSIBILITY FOR THE ENGINEERING DESIGN TO THE EXTENT THAT THIS IS BASED ON AVAILABLE INFORMATION. THE AVAILABLE INFORMATION IS LIMITED TO WHAT COULD BE INTERPRETED DURING A SINGLE SITE VISIT OF NO LONGER THAN A FEW HOURS. NO GEOTECHNICAL, TOPOGRAPHICAL, GEOMORPHOLOGIC AND OTHER ENGINEERING RELATED SURVEYS HAVE BEEN UNDERTAKEN TO INFORM THE DESIGN. THIS IS NON-STANDARD ENGINEERING PRACTICE AND THEREFORE AURECON IS INDEMNIFIED BY THE CLIENT AND DOES NOT ACCEPT RESPONSIBILITY FOR THE ASSOCIATED RISK OF FAILURE FROM THE ABOVE LIMITATIONS OR ANY DAMAGES THAT MAY OCCUR.
2. AURECON IS INDEMNIFIED AGAINST ANY ASSOCIATED DAMAGES AND ACCEPTS NO LIABILITY ASSOCIATED WITH THE CONSTRUCTION AND IMPLEMENTATION OF ENGINEERING INTERVENTIONS DUE TO AURECON BEING INSTRUCTED TO HAVE LIMITED CONTACT WITH THE IMPLEMENTER DURING THE CONSTRUCTION PHASE RESULTING IN OUR INABILITY TO DILIGENTLY SUPERVISE AND ASSESS ANY PROGRESS.

Working for Wetlands

aurecon
Cape Town

PROJECT
WORKING FOR WETLANDS
GAUTENG
GAUTENG SOUTH

DRAWING DESCRIPTION
CUT & FILL SLOPE TO N.G.L

DATE	JUNE 2012
DRAWN BY	A.MOHAMED
DRAWING CHECKED	D.TOWNSHEND
DESIGNED BY	C.BLAAUW
DESIGN CHECKED	
SCALE	NOT TO SCALE

DRAWING No.	REV No.
C22D-04-215-00/01	A

NOT FOR CONSTRUCTION. SUBJECT TO EVALUATION OF SITE CONDITIONS BY THE ENGINEER AT SETTING OUT STAGE.

P:\PROJECTS\107406\ENGINEERING\13-INTERVENTIONS\C22D-04\C22D-04-215-00\2012_3_REHAB\DRAWINGS\C22D-04-215-00_01_REVA.DWG

Wetland: Cluny's Farm
Maintenance

New Intervention number	Old Intervention number	Province	Project	Lat / Long	Structure Type	Material type to be used	Description of work	Quantity	Units	Unit Cost	Item Cost
A21C-10-201-00	**A21C-01-201M**	Gauteng South	Cluny's Farm	S25 57 21.8 E28 03 45.3	Gabion	Reno (Gabion)	Raise K.Walls & splash walls by adding 0,3m Rer	2.4	m³	R 4,815.00	R 11,556.00
						Earth Works	Earth Works to fill cavities around structure (Est. SUM)	1.0	m³	R 490.02	R 490.02
				S25 57 22.2 E28 03 45.0	MacMat-R	MacMat-R	Place MacMat-R to NGL to prevent erosion	35.0	m²	R 107.80	R 3,773.00
						Re-Vegetate	Re-Vegetate area to stabilise	35.0	m²	R 47.69	R 1,669.15
A21C-10-202-00	**A21C-01-202**	Gauteng South	Cluny's Farm	S25 57 21.6 E28 03 46.0	Gabion	Concrete	Add 0,1m Concrete Capping on spillway section	0.27	m³	R 6,737.74	R 1,819.19
						Earth Works	Earth Works to fill cavities around structure (Est. SUM)	1.0	m³	R 490.02	R 490.02
A21C-10-203-00	**A21C-01-203M**	Gauteng South	Cluny's Farm	S25 57 24.1 E28 03 50.0	Gabion	Concrete	Add 0,2m Concrete Capping on spillway section	0.2	m³	R 6,737.74	R 1,078.04
						Earth Works	Earth Works to fill cavities around structure (Est. SUM)	1.0	m³	R 490.02	R 490.02
A21C-10-204-00	**A21C-01-204M**	Gauteng South	Cluny's Farm	S25 57 21.0 E28 03 47.4	Gabion	Reno (Gabion)	Raise K.Walls by adding 0,2m Reno's	0.8	m³	R 4,815.00	R 3,852.00
						Concrete	Add 0,1m Concrete Capping on spillway section	0.4	m³	R 6,737.74	R 2,695.10
						Earth Works	***Remove*** *0,5m off height on spillway section first.*	4.0	m³	R 490.02	R 1,960.08
						Concrete	Seal off U/S (deep - 1,5m, Thick - 0,1m, Long - 4m)	0.6	m³	R 6,737.74	R 4,042.64
A21C-10-205-00	**A21C-01-205M**	Gauteng South	Cluny's Farm	S25 57 20.7 E28 03 47.7	Gabion	Concrete	Add 0,1m Concrete Capping on spillway section	0.2	m³	R 6,737.74	R 1,347.55
A21C-10-206-00	**A21C-01-206M**	Gauteng South	Cluny's Farm	S25 57 20.6 E28 03 48.5	Gabion	Earth Works	Earth Works to fill cavities around structure (Est. SUM)	10.0	m³	R 490.02	R 4,900.20
						Geo-Fabric	Redo U/S Geo-Fabric to re-seal	16.0	m³		R -
						Concrete	Add 0,1m Concrete Capping on spillway section	0.2	m³	R 6,737.74	R 1,347.55
A21C-10-207-00	**A21C-01-207M**	Gauteng South	Cluny's Farm	S25 57 20.4 E28 03 49.9	Gabion	Earth Works	Earth Works to fill cavities around structure (Est. SUM)	7.0	m³	R 490.02	R 3,430.14
						Geo-Fabric	Redo U/S Geo-Fabric to re-seal	12.0	m³		R -
						Concrete	Add 0,1m Concrete Capping on spillway section	0.4	m³	R 6,737.74	R 2,695.10
A21C-10-208-00	**A21C-01-208M**	Gauteng South	Cluny's Farm	S25 57 19.0 E28 03 50.2	Gabion	Earth Works	Earth Works to fill cavities around structure (Est. SUM)	11.0	m³	R 490.02	R 5,390.22
						Geo-Fabric	Redo U/S Geo-Fabric to re-seal	20.0	m³		R -
						Concrete	Add 0,1m Concrete Capping on spillway section	0.60	m³	R 6,737.74	R 4,042.64
A21C-10-209-00	**A21C-01-209M**	Gauteng South	Cluny's Farm	S25 57 19.4 E28 03 51.2	Gabion	Concrete	Add 0,1m Concrete Capping on spillway section	0.40	m³	R 6,737.74	R 2,695.10
A21C-10-210-00	**A21C-01-210M**	Gauteng South	Cluny's Farm	S25 57 18.8 E28 03 51.8	Gabion	Concrete	Add 0,1m Concrete Capping over spillway (Incl. K.Wall sides)	0.18	m³	R 6,737.74	R 1,212.79

Estimated total quantities per material type:		**Costing:**
Concrete	3.4 m³	R 22,975.69
Earth Works	35 m³	R 17,150.70
Geo-Fabric	48 m²	R 0.00
MacMat-R	35 m²	R 3,773.00
Reno (Gabion)	3.2 m³	R 15,408.00
Re-Vegetate	35 m²	R 1,669.15
	TOTAL COST:	**R 60,976.54**

Wetlands C22D-04 C22D-05
Maintenance

New Intervention number	Old Intervention number	Province	Project	Lat / Long	Structure Type	Material type to be used	Description of work	Quantity	Units	Unit Cost	Item Cost
C22D-04-216-00	**C22D-04-001**	Gauteng South	Klipriviersberg	S26 18 51.3 E27 57 39.5	Gabion	Concrete	Add 0,2m Concrete Capping on spillway section	1.8	m³	R 490.02	R 882.04
						Earth Works	Earth Works to fill cavities U/S of structure (Est. SUM)	8.5	m³	R 490.02	R 4,165.17
C22D-04-217-00	**C22D-04-002**	Gauteng South	Klipriviersberg	S26 18 50.0 E27 57 38.9	Gabion	Concrete	Add 0,1m Concrete Capping on spillway section	0.6	m³	R 6,737.74	R 4,042.64
						Earth Works	Earth Works to fill cavities U/S of structure (Est. SUM)	6.0	m³	R 490.02	R 2,940.12
						Earth Works	Cut & Slope D/Stream embankments to 1:4 slope (Est. SUM)	10.0	m³	R 490.02	R 4,900.20
C22D-04-218-00	**C22D-04-006**	Gauteng South	Klipriviersberg	S26 18 44.0 E27 57 39.3	Gabion	Gabion	Raise Spillway, K.Walls & splash walls by adding 0,5m gabion onto all	6.5	m³	R 4,815.00	R 31,297.50
						Concrete	Add 0,1m Concrete Capping on spillway section	0.3	m³	R 6,737.74	R 2,021.32
C22D-04-219-00	**C22D-04-007**	Gauteng South	Klipriviersberg	S26 18 43.9 E27 57 38.9	Gabion	Gabion	Raise Spillway by adding 0,5m gabion onto it	1.5	m³	R 4,815.00	R 7,222.50
						Gabion	Raise K.Walls & splash walls by adding 1,0m gabion onto all	10.0	m³	R 4,815.00	R 48,150.00
						Concrete	Add 0,1m Concrete Capping on spillway section	0.3	m³	R 6,737.74	R 2,021.32
C22D-04-220-00	**C22D-04-010**	Gauteng South	Klipriviersberg	S26 18 49.1 E27 57 40.4	Gabion	Gabion	***Remove*** *0,5m off height on spillway section first.*	*2.0*	*m³*	R 4,815.00	R 9,630.00
						Reno (Gabion)	Raise K.Walls, spillway & Splash walls by adding 0,3m Reno's	4.2	m³	R 4,815.00	R 20,223.00
						Concrete	Add 0,1m Concrete Capping on spillway section	0.4	m³	R 6,737.74	R 2,695.10
C22D-05-201-00	**C22D-05-002**	Gauteng South	Klipriviersberg	S26 18 49.6 E27 58 44.3	Gabion	Gabion	LB-Add 0,0 to 0,5 basket to level out top of K.Wall & create freeboard	2.0	m³	R 4,815.00	R 9,630.00
						Gabion	Add 8,0m long K.Wall to RB to equal height of new LB K.Wall top.	12.0	m³	R 4,815.00	R 57,780.00
C22D-05-202-00	**C22D-05-003**	Gauteng South	Klipriviersberg	S26 18 52.3 E27 58 48.8	Gabion	Earth Structure	Add 13,0m berm (0,3m min. high, top 1,0m wide and 1:4 slope) to LB K.Wall	6.5	m³	R 490.02	R 3,185.13
C22D-05-203-00	**C22D-05-004**	Gauteng South	Klipriviersberg	S26 18 52.8 E27 58 49.8	Gabion	Gabion	Raise K.Walls & splash walls by adding 0,5m gabion onto all	5.0	m³	R 4,815.00	R 24,075.00
						Concrete	Add 0,1m Concrete Capping on spillway section	0.3	m³	R 6,737.74	R 2,021.32
						Earth Works	Earth Works to fill cavities around structure (Est. SUM)	2.0	m³	R 490.02	R 980.04
C22D-05-204-00	**C22D-05-006**	Gauteng South	Klipriviersberg	S26 18 54.3 E27 58 50.9	Gabion	Reno (Gabion)	Raise K.Walls & Splash walls by adding 0,3m Reno's	3.0	m³	R 4,815.00	R 14,445.00
						Gabion	Add gabion basket (1,0x1,0m) D/S of Spillway as "step"	4.0	m³	R 4,815.00	R 19,260.00
						Gabion	Extend LB K.Wall with 2,0m to LB to new K.Wall top level	4.0	m³	R 4,815.00	R 19,260.00
						Concrete	Add 0,1m Concrete Capping on spillway section & D/S "Step"	0.4	m³	R 6,737.74	R 2,695.10
						Concrete	Seal off U/S (deep - 1,5m, Thick - 0,1m, Long - 6m)	0.9	m³	R 6,737.74	R 6,063.97
						Earth Works	Cut & Slope D/Stream embankments at toe end	2.0	m³	R 490.02	R 980.04
						Earth Works	Earth Works to fill cavities U/S of structure (Est. SUM)	2.0	m³	R 490.02	R 980.04
C22D-05-205-00	**C22D-05-009**	Gauteng South	Klipriviersberg	S26 18 57.1 E27 58 54.2	Gabion	Earth Works	Cut & Slope D/Stream Left embankment for 8m (1:4 Slope)	23.0	m³	R 490.02	R 11,290.06
C22D-05-206-00	**C22D-05-010**	Gauteng South	Klipriviersberg	S26 18 58.8 E27 58 55.7	Gabion	Earth Works	Cut & Slope approach to bridge on L&R banks (1:10 Slope)	4.8	m³	R 490.02	R 2,352.10
C22D-05-207-00	**C22D-05-013**	Gauteng South	Klipriviersberg	S26 18 57.1 E27 58 57.2	Gabion	Earth Works	Remove excess mounts of building/ excavated soil from site (Est. SUM)	3.0	m³	R 490.02	R 1,470.06
						Re-Vegetate	Re-Vegetate area to stabilise (Est. SUM)	15.0	m³	R 47.69	R 715.35
C22D-05-208-00	**C22D-05-014**	Gauteng South	Klipriviersberg	S26 18 58.4 E27 58 56.9	Gabion	Gabion	Remove and redo LB K.Wall & Splash wall to correct level	9.0	m³	R 4,815.00	R 43,335.00
						Reno (Gabion)	Raise LB K.Wall & Splash wall by adding 0,3m Reno's	1.8	m³	R 4,815.00	R 8,667.00
						Earth Works	Remove excess mounts of building/ excavated from site (Est. SUM)	4.0	m³	R 490.02	R 1,960.08
						Re-Vegetate	Re-Vegetate area to stabilise (Est. SUM)	20.0	m³	R 47.69	R 953.80
C22D-05-209-00	**C22D-05-016**	Gauteng South	Klipriviersberg	S26 19 03.6 E27 59 03.9	Gabion	Gabion	Fill gaps on inside of splash walls between baskets (Est. SUM)	0.7	m³	R 4,815.00	R 3,129.75
						Reno (Gabion)	Raise K.Walls & Splash walls by adding 0,3m Reno's	3.6	m³	R 4,815.00	R 17,334.00
C22D-05-210-00	**C22D-05-017**	Gauteng South	Klipriviersberg	S26 19 04.0 E27 59 03.4	Gabion	Reno (Gabion)	Raise Spillway, K.Walls & Splash walls by adding 0,3m Reno's	2.7	m³	R 4,815.00	R 13,000.50
C22D-05-211-00	**C22D-05-018**	Gauteng South	Klipriviersberg	S26 19 14.6 E27 59 08.9	Gabion	Gabion	Raise LB Splash wall by adding 0,5m baskets	1.0	m³	R 4,815.00	R 4,815.00
						Reno (Gabion)	Raise LB&RB K.Walls RB Splash wall by adding 0,3m Reno's	1.8	m³	R 4,815.00	R 8,667.00
						Earth Works	Earth Works to fill cavities U/S of structure (Est. SUM)	3.0	m³	R 490.02	R 1,470.06
C22D-05-212-00	**C22D-05-019**	Gauteng South	Klipriviersberg	S26 19 13.9 E27 59 10.4		Earth Works	Remove excess building/ excavated soil from D/S area (Est. SUM)	2.5	m³	R 490.02	R 1,225.05
C22D-05-213-00	**C22D-05-020**	Gauteng South	Klipriviersberg	S26 19 18.0 E27 59 12.8	Gabion	Earth Works	Earth Works to fill/ re-compact area US of structure (Est. SUM)	11.3	m³	R 490.02	R 5,512.73
						Geotextile	Redo U/S Geo-Fabric to re-seal	25.5	m²		R -

Estimated total quantities per material type:		**Costing:**
Concrete	5.0 m³	R 22,442.80
Earth Structure	6.5 m³	R 3,185.13
Earth Works	82.1 m³	R 40,225.74
Gabion	57.7 m²	R 277,584.75
Geo-Fabric	0.0 m²	R 0.00
Reno (Gabion)	17.1 m³	R 82,336.50
Re-Vegetate	35 m²	R 1,669.15
	TOTAL COST:	**R 427,444.08**

APPENDIX D – ENVIRONMENTAL AUTHORISATION RECORD OF DECISION

Note: this is a draft document for public comment. The Record of Decision will only be available once the final document has been submitted to the Department of Environmental Affairs and they have made a decision on the application for authorization.

APPENDIX E – LANDOWNER TERMS AND CONDITIONS AGREEMENT

Note: The Landowner Terms and Conditions Agreement will be made available in the Final Rehabilitation Reports.

APPENDIX F – CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN AND INSPECTION REPORT

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PROGRAMME (CEMP) FOR WORKING FOR WETLANDS PROJECTS

September 2010
CEMP Version: 1

***Prepared by*:**
Working for Wetlands programme
Planning, Monitoring and Evaluation Section

DOCUMENT CONTROL

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REVISION AND AMENDMENTS

DATE	NO.	DESCRIPTION OF REVISION OR AMENDMENT

TABLE OF CONTENTS

1 INTRODUCTION

1.1 Context

This Construction Environmental Management Programme (CEMP) has been compiled as a guideline for the mitigation and management measures to be implemented during construction for the proposed wetlands rehabilitation projects in South Africa. **THIS CEMP MUST BE READ IN CONJUNCTION WITH THE FOLLOWING DOCUMENTS:**

- **BASIC CONDITIONS OF EMPLOYMENT ACT, 1997: CODE OF GOOD PRACTICE FOR EMPLOYMENT AND CONDITIONS OF WORK FOR SPECIAL PUBLIC WORKS PROGRAMMES (Annex 1) AND;**
- **BASIC ASSESSMENT REPORT (Annex 2)**

1.2 Background to the request for the CEMP

The Department of Environmental Affairs (DEA) requested the compilation of a CEMP after the evaluation and authorisation of the Basic Assessment Report (BAR) applications for rehabilitation of wetlands in South Africa. The CEMP is based on Impacts Assessments, Public Participation input and Environmental Practitioner's experience.

The purpose of this document is to ensure that all projects implemented under the Working for Wetlands programme adopt an effective and appropriate approach to wetland rehabilitation and that all activities are compliant with relevant legislation. This includes, as top priority, ensuring that the safety of people involved in the projects is not compromised at any time, that rehabilitation interventions are sustainable and that the objectives of the Expanded Public Works Programme (EPWP) and Working for Wetlands are maximised through the projects.

This document forms part of the agreement between the South African National Botanical Institute (SANBI) and each project implementer. This document outlines areas in which compliance is required and serves as a reference against which practices shall be audited. Given that each project operates under specific conditions, innovation by the implementers, and modification of the CEMP, where appropriate, are encouraged within the framework of the prescripts in Section 2.

1.3 Site description

1.3.1 Proposed project and associated construction and operational activities

Refer to the attached Basic Assessment Report appendix A and D

1.3.2 Affected biophysical, economic and social environment

Refer to the attached Basic Assessment Report appendix A and D

1.3.3 Potential Issues Identified during the Impact Assessment in BAR

Refer to the attached Basic Assessment Report appendix A and D

2 PRESCRIPTS

2.1 Expanded public works programme

2.1.1 Compliance with the requirements of the Expanded Public Works Programme

All projects shall comply with:

- The Ministerial Determination on Special Public Works Programmes (Government Notice No. R 63, 25 January 2002)
- The Code of Good Practice for Employment and Conditions of Work for Special Public Works Programmes (Government Notice No. R 64, 25 January 2002)

2.1.2 Employment

The implementer shall not employ any contractor or staff member who has been dismissed from any other project or expanded public works programme. The implementer shall ensure representivity with respect to race and gender in the selection of staff.

2.1.3 Target groups

Projects shall work towards the following targets in all occupational categories, with respect to employment:

- 60 % women
- 20 % youth (18 to 25 years)
- 2% disabled

Where these targets are not immediately realized, a transformation plan shall be put in place to achieve them. The plan will include targets and reasonable timeframes. Progress will be evaluated annually.

2.1.4 Remuneration

All work must be task based. Written approval from the Regional Coordinator is required when this is not possible. Workers are to be paid on the basis of the number of tasks completed.

Employers will pay workers rates provided for in the approved PIP guideline for the current financial year

Contractors shall pay the workers the wage agreed for the task. All production bonuses shall be distributed equitably amongst team members when production targets are achieved.

2.1.5 Employment contracts

Contractors shall have an employment contract with each of their workers. Workers shall have the contents of the contract explained to them, and shall indicate that they understand its contents and the grievance procedure and disciplinary code shall be available to all workers

2.1.6 Management structure

The implementer's management organogram shall be made available to Working for Wetlands upon request.

Project management capacity shall be adequate to deal with the size of project. Each contractor may only have one team.

The implementer and his/her staff shall not have any financial involvement with contractors outside of the formal tender agreements

2.2 Health and safety

2.2.1 Medical examinations

Prior to employment, all employees shall undergo a medical examination performed by a registered occupational health practitioner. Specific job classes shall have annual medical examinations or other tests as specified in the Occupational Health and Safety (OHS) Act.

Records of all medical examinations shall be kept by the implementer.

2.2.2 First aid kit

An adequately equipped first aid kit shall be easily accessible at all work sites. The first aid kit shall be kept fully stocked according to the stock list.

All first aid treatment and usage of stock shall be recorded in the dressing book kept on site.

The first aid kit shall be under control of a trained and competent first aid officer with a current certificate. Each team shall have at least one trained first aid officer and one alternate

2.2.3 Personal protective equipment and clothing (PPE)

The PPE prescribed in the agreement between the implementer and contractor shall be worn at all times during work. PPE shall meet the minimum prescribed standards of quality (SABS approved). PPE shall be replaced when it becomes ineffective through wear and tear.

In order to maintain consistency within the programme, Working for Wetlands shall provide designs to be used on the t-shirts worn by the workers

2.2.4 Occupational health and safety

Each project manager and contractor shall have a copy of the OHS Act. All relevant OHS standards will be fully implemented.

In terms of the OHS Act, the provincial director shall be notified of planned construction work.

The designated health and safety officer shall also be appointed as the construction safety officer. The appointment letter shall be available on site.

Incident reports shall be up to date and available. All incidents shall be reported within 24 hours to the Regional Coordinator. All incidents shall be investigated by a trained incident investigator within 7 days of the incident. All near misses shall be reported to the Regional Coordinator on a quarterly basis.

Health and safety meetings shall be held for all implementers at the quarterly national implementers' forum.

The programme manager, technical advisors and regional coordinators of Working for Wetlands shall intervene to suspend operations at projects where clear violations of health and safety legislation and the best management practices are observed, and where these violations constitute a clear health and safety risk.

2.2.5 Compensation for Injuries and diseases

It is the responsibility of the employers (contractors) to arrange for all persons employed on a Special Public Works Programme (SPWP) to be covered in terms of the Compensation for Occupational Injuries and Diseases Act, 130 of 1993. The employer (contractor) shall pay a worker who is unable to work because of an injury caused by an accident at work 75% of their earnings for up to three months. The employer shall be refunded this amount by the Compensation Commissioner. This does NOT apply to injuries caused by accidents outside the workplace such as road accidents or accidents at home.

2.2.6 Water quality

In wetlands with a high risk of pollution, such as those in urban areas, the project manager shall take steps to ensure that he/she is aware of changes in water quality. If water quality is found to be so poor that it is a threat to health, the following steps shall be taken:

- Workers shall be made aware of it immediately.
- If unable to supply appropriate PPE, work shall stop.
- Workers shall be encouraged not to drink water directly from the wetland.
- Technical Advisors shall be informed of poor water quality.

2.2.7 Water and flooding

Teams working near open water shall have life jackets on site. Consideration shall be given to the safety of team members working near water who are unable to swim.

Given the nature of the work, project managers and contractors shall be sensitive to the potential dangers of floods. A highly risk averse approach shall be followed whenever dealing with an actual or potential flood event. Rainfall in the catchment above the wetland, and flow within the wetland shall continually be visually monitored by project managers and contractors. In high rainfall events where there is an increased risk of sudden floods, workers shall be withdrawn from the site.

2.2.8 Substance abuse

The use of any narcotic substances is not allowed on sites.

The implementer and contractors shall ensure that workers do not perform their duties under the influence of any narcotic or alcoholic substances. Workers who are under the influence during work hours shall be dealt with in terms of the appropriate disciplinary procedures

2.3 Transport

2.3.1 Compliance of vehicles

All vehicles (including trailers) used by projects shall comply with all legal requirements in terms of roadworthiness and licensing and shall display a valid license at all times. The following vehicles shall display a valid Certificate of Fitness:

- Any truck, bus or minibus where the gross vehicle mass exceeds 3500 kg. Any vehicle designed or adapted to convey 12 persons or more, including the driver.
- Vehicles used in transporting persons for reward.

Vehicle size shall be suitable for the number of passengers to be transported. For bakkies, the minimum space required per person translates to the following capacity, including driver and passengers in the front and back:

- Short wheelbase bakkie 0,25m^2 per person standing = 15 persons 0,35m^2 per person seated = 11 persons
- Long wheelbase bakkie 0,25m^2 per person standing = 17 persons 0,35m^2 per person seated = 13 persons.

Minibus taxis shall not carry more than the number of people for which they are certified.

Retreads shall not be fitted to the front wheels of vehicles used for carrying passengers. Wheels on the same axle must be of the same size and be fitted with the same type of tyre.

2.3.2 Daily vehicle checklist

A daily pre-trip vehicle check shall be done and recorded by the driver on a suitable checklist. The checklist shall be up to date and kept in the vehicle. Trailers shall form part of the daily checklist. The project manager shall verify and sign the checklists weekly.

Faults affecting the roadworthiness of the vehicle shall be repaired immediately or alternative transport used.

2.3.3 Driver's licenses and permits

All drivers shall have a valid driver's license for the vehicle category used. The competence of all drivers shall be verified by the implementer. All contractor drivers shall be in possession of a valid appropriate Professional Driving Permit (PDP) for the category of vehicle.

Drivers shall undergo an annual medical check and the results shall be filed with the project manager.

Driver's licenses shall be verified annually by the local traffic authority or by telephoning 012 303 2718.

2.3.4 Passenger safety

Vehicles used for transporting workers shall have suitable passenger facilities, including as a minimum:

- Sufficiently strong railings to a height of 350mm above seat surface or 1000mm above standing surface.
- If installed, benches shall be properly secured
- If installed, canopies or tarpaulins shall be properly secured and ventilated.
- Tools, equipment and containers shall be suitably secured and isolated from passengers.
- Workers and materials, such as rock, cement etc., shall not be transported in the same vehicle at the same time.
- Bakkie-drawn trailers may under no circumstances be used for transporting people.

3 ADMINISTRATION

3.1 Contractor's documents

The contract between the implementer and the contractor shall be readily accessible to project managers and contractors. The project manager must ensure that the contractor and workers understand the contract.

Each contract shall be allocated a unique identity number.

The following shall form part of the contract between the implementer and contractors:

- Rehabilitation specifications
- Technical drawings of the structures, including a list of the material required.
- Environmental management plan
- Site plans

3.2 Records, data and quality control

Each contractor shall maintain an up to date timesheet of daily worker attendance. Details of new appointments shall be submitted to the implementer. Timesheets shall be available for inspection by any Working for Wetlands staff member. A record shall be kept of equipment and consumables issued against the contract document. A quality control sheet completed by the implementer shall record on-going quality checks and the final check before payment. This shall certify that work done complies with contract specifications.

3.3 Payments

The implementer shall ensure that the contractors' workers have been paid on time and in the amount to which they are entitled. Proof of such payment, signed by all team members, shall be submitted to Working for Wetlands on request.

Disabled team members shall be paid the same amount for the days worked as other workers, and the contractor shall claim the half disabled wage back from the implementer.

In situations where tasks are completed before the expected time period, workers shall still be paid for the original number of days quoted. For example, if a team planned to take 15 days to complete a task that is subsequently accomplished in 10 days, the contractor shall still pay the workers for the full 15 days.

Each worker shall receive a payment advice that complies with the requirements of the EPWP documents listed in Section 1. A copy of all contracts and documentation relating to payments to workers shall be retained by the contractor and implementer. This documentation shall provide proof of receipt of payment by workers, and shall be made available to Working for Wetlands on request.

4 GENERAL ENVIRONMENTAL GUIDELINES FOR CONSTRUCTION

4.1 Introduction

As requested by the DEA, this document serves as a guideline for the management of the site by the Environmental Control Officer (ECO). Duties of the ECO shall be carried out by the Provincial Coordinator (PC) via monthly inspections in order to minimise adverse environmental impacts and effects. The PC shall be informed of incidents and accidents on site by the Implementer and His/her staff.

The CEMP provides specifications and regulations that shall in all instances be adhered to. However, it is the responsibility of all people involved to commit themselves to the implementation of the CEMP in all phases of the project or in those instances where specific instructions are provided. The implementer shall be responsible for ensuring compliance of the contractors with the CEMP and shall rely on regular monitoring for compliance. The contractor shall monitor his/her employees to ensure their compliance with the provisions of the CEMP. The contractors shall receive copies of the CEMP from the client at which time he/she will be given the opportunity to resolve any misconceptions and uncertainties. The CEMP shall form part of the contract and will therefore be a legally binding document. In the event of discrepancy with regard to environmental matters or environmental specifications this document shall take precedence.

4.1.1 Environmental Control Officer (ECO)

The contractor shall direct all his/her queries regarding any environmental issues or aspects to the ECO. The ECO shall discuss the matter with the DEA as required and give feedback to the contractor. The ECO shall be responsible for evaluating compliance of all aspects of the CEMP. Monthly site audits shall be undertaken by the ECO and a detailed report submitted to the SANBI for review prior to the following audit. An annual overview report shall be submitted to the DEA. If queries or problems arise for issues that cannot be proficiently addressed by the ECO, the ECO shall seek advice from the Project Manager who shall seek assistance from a person or persons that are educated and experienced in the relevant field.

4.1.2 Feedback to the DEA

Any problems or areas of non-compliance with regard to the CEMP shall be communicated to the Contractor by the ECO, in addition to informing the DEA, who will decide on appropriate action.

4.1.3 Failure to comply with the Environmental Considerations

The ECO shall order the contractor to suspend part or all of the works if the contractor causes damage to the environment by not adhering to the specifications set in the CEMP. The suspension shall be enforced until such time as the offending party/ies' actions, procedure and/or equipment are corrected. No extension of time shall be granted for such delays and all costs shall be borne by the Implementer.

The programme manager, technical advisors and regional coordinators of Working for Wetlands shall intervene to suspend operations at projects where clear violations of the environmental management plan and the best management practices are observed, and where these violations are having or have the potential to cause a significant environmental impact

4.1.4 Environmental training programme

The ECO, with the assistance of the contractor, shall communicate all aspects of the CEMP to the site staff (i.e. from site agents to labourers) prior to commencement of excavation or any other environmentally disturbing activity. Basic environmental awareness training shall be carried out for all employees and shall be included in safety training. A copy of the CEMP shall always be made available on site.

4.1.5 Progress / site meetings

Environmental issues shall be put on the agenda as a discussion point during progress/site meetings. The Implementer, or a designated person involved with environmental issues on the project, shall attend the progress and/or site meetings on a regular basis to provide feedback on any outstanding or contentious environmental matter.

4.2 Public participation

Public participation was undertaken as a component of the BAR. The links to the community that have been established shall be maintained and utilised to the mutual benefit of all parties. The ECO is responsible for addressing any environmental problems or queries that are raised by the community and therefore shall maintain close contact with the representatives of the immediate community. This CEMP shall be made available, on request, for the public to peruse.

5 SITE ESTABLISHMENT

5.1 Site plan

The project manager shall design a site plan for each site that identifies suitable locations for all work, storage, parking, toilet, processing and other areas prior to site establishment. The Contractor shall erect and maintain temporary boundary markers of the type and in the locations directed by the Engineer. Such markers, such as danger tape or suitable equivalent, shall be erected before undertaking designated activities.

5.2 Site clearance

The Contractor shall ensure that the clearance of vegetation is restricted to that required to facilitate the execution of the Works. Site clearance shall occur in a planned manner, and cleared areas shall be stabilised as soon as possible. The detail of vegetation clearing shall be to the Engineer's approval. All cleared vegetation shall either be mulched and mixed into the topsoil stockpiles or disposed of at an approved disposal site. The disposal of vegetation by burying or burning is prohibited without the requisite permit from the local authority.

The Contractor shall strip the Top-material within the working areas. The Top-material shall be stockpiled separately from subsoil and used for subsequent rehabilitation and revegetation. Top-material stockpiles shall not be compacted.

Should fauna be encountered during site clearance, earthworks shall cease until fauna have been safely relocated.

5.3 "No-go" areas

The construction site shall be contained in an area required to undertake the works. Any area beyond shall be considered "no go" areas. The Contractor shall ensure that, insofar as she/he has the authority, no unauthorised

entry, stockpiling, dumping or storage of equipment or materials shall be allowed within the demarcated “no go” areas.

“No go” areas shall be clearly demarcated with commercially available danger tape or suitable equivalent. The Contractor shall maintain the construction site boundary for the duration of construction and ensure that the danger tape does not become dislodged.

5.4 Waste currently on site

The site shall be cleared of all litter/waste prior to any construction related activities and the waste shall be disposed of at a registered waste disposal facility. This is to ensure that no waste is incorporated into the environment during the construction process. Recycling of waste material shall be encouraged.

5.5 Vegetation clearing

Vegetation on the site shall be removed prior to commencement of construction activities. However, care shall be taken to confine removal of vegetation during construction activities to within the boundaries of the development area. The removal, damage or disturbance of any flora and fauna outside the construction area shall not be permitted unless specifically authorised by the ECO.

No areas may remain cleared (bare soil exposed) for longer than 3 weeks. Efficient construction planning must ensure that all relevant materials, construction equipment and manpower are available upon commencement of construction in an area. Thereafter, the cleared areas must be suitably re-vegetated (refer to Section 12).

5.6 Biodiversity

Disturbance of indigenous plants and animals shall be minimised. Collection of indigenous plants, parts of plants or animals may only take place with the appropriate permits.

Level 2 and 3 structures shall take into consideration the migration of fish species.

Bio-engineering methods that involve re-vegetation will, as far as possible, use individuals of local species taken from surrounding areas, in order to avoid or reduce genetic pollution. Collection must not lead to habitat destruction. Alien species may not be used for re-vegetation unless approved by the Provincial Coordinator.

5.7 Removal of top-material

Prior to the commencement of construction activities top-material (up to a maximum of 30 cm) shall be removed from the work area and stockpiled for re-use in subsequent rehabilitation and landscaping activities. The top-material shall be stockpiled separately from the subsoil and construction materials. The contractor shall ensure that no remnants of stockpiles are left in positions or states that may be eroded during and after construction.

5.8 Defacement of natural features

Trees, natural vegetation, or any other natural features outside the work area, which will not be cleared for construction purposes, shall not be defaced or painted for benchmarks. No damage is permissible, not even for survey purposes. The latter shall only be undertaken if agreed to by the ECO. Any feature defaced by the contractor shall be reinstated to the satisfaction of the ECO.

Should any Red Data species be encountered, *in situ* conservation shall be undertaken if at all possible. Should this not be considered possible then a specialist shall be consulted for possible relocation.

In addition, any bird nests encountered should not be interfered with. If impact is unavoidable the nest shall be relocated by a suitably qualified individual.

No pesticides of any description shall be used during the construction phase. Pesticides should also be discouraged from use during the operational phase of the project.

For the conservation of wildlife, should any be found, species may not be killed or otherwise deliberately disturbed. It is anticipated that as a result of the construction wildlife species will take shelter in neighbouring areas and reserves. Although highly unlikely, construction workers should be advised not to catch or kill any wild animals in the area, including snakes.

5.9 Heritage sites and features

No archaeological or heritage sites have been identified on site. If archaeological or heritage sites are exposed during construction work all activities shall be halted and the incident shall immediately be reported the appropriate provincial heritage authority[1] for investigation and evaluation of the find. Old burial grounds (if found) will be reported to the ECO who will advise the contractor as to the mode of action, which will include informing the South African Police Service (SAPS) and the South African Heritage Resources Agency (SAHRA).

5.10 Stabilizing of steep slopes

The disturbance of steep slopes, for example by the removal of vegetation, may result in slope instability and erosion by rain and surface runoff. All slopes that are disturbed during construction shall immediately be stabilised to prevent erosion. The rehabilitation measures listed in Section 12 must be implemented in the rehabilitation.

5.11 Removal of alien vegetation

The contractor shall ensure that invasive alien vegetation is cleared from the entire site prior to the commencement of construction activities. Any species that are declared invasive species [according to the Conservation of Agricultural Resources Act (Act 43 of 1983)] must be removed from site. Follow up clearing may be necessary if the species re-establish following the initial clearing. No trees within environmentally sensitive areas may be removed, whether alien species or not, unless permitted by the ECO.

Other alien species (non-listed) occurring on site shall not be used for landscaping activities and shall be removed from site where possible.

5.12 Revegetation

Once construction is complete, rehabilitation (i.e. the planting of indigenous vegetation) of disturbed areas shall be undertaken immediately in order to restore the aesthetic and ecological value of the area. Only locally appropriate indigenous vegetation shall be utilised. Rehabilitation shall be undertaken according to the following schedule:

- Infilling of all excavation work. Subsoil shall be filled in first to ensure that topsoil is present on the surface to secure a suitable plant growth medium. Substrate that is not suitable for plant growth should not be used for infilling of excavations unless it is used at a suitable depth e.g. deeper than 2 m.
- Removal of all construction rubble from the site, including substances that cannot be used for infilling of excavations, shall be undertaken.

[1] If no provincial heritage authority in place then the South African Heritage Resources Agency (SAHRA) shall be contacted.

- Steep and unstable slopes shall have stabilising measures put in place to prevent collapse of the slopes or soil erosion. Slope stabilisation and soil erosion prevention measures include the placement of silt fences, staked grass sods and rows of sawdust filled onion bags.
- The exposed ground should be seeded and mulched with an appropriate stabilising grass mixture. A good stabilising grass seed mix should include:
    - *Andropogon eucomus* (Snowflake Grass)
    - *Aristida congesta* (Tassel Three-awn)
    - *Cenchrus ciliaris* (Foxtail Buffalo Grass)
    - *Cynodon dactylon* (Kweek/Couch grass)
    - *Digitaria eriantha* (Common Finger Grass)
    - *Eragrostis curvula* (Weeping Love Grass)
    - *Imperata cylindrical* (Cottonwool Grass)
    - *Melinis repens* (Natal Red Top)

The site shall be watered following seeding and mulching, and continued on a regular basis, the frequency depending on the amount of rainfall received. Should germination not occur within one month of planting, the site should be reseeded and mulched.

6 ENVIRONMENTAL PLANNING

The implementation of wetland rehabilitation activities has potential impacts on the wetland site and the downstream habitat. The implementation of these activities shall take into consideration the following potential impacts.

6.1 Hydrological impacts

The construction of interventions within watercourses is likely to have difficulties associated with the presence of water, under both normal and wet conditions. In the event that the planned interventions are located within the seasonal and permanent zones of the wetland, diversions may need to be put in place to temporarily divert water away from the work site.

In order to reduce the requirements to divert water from the construction site, implementation of the rehabilitation activities within seasonal and permanent wetness zones shall take place within the dry season:

- Winter rainfall areas - November to March
- Summer rainfall areas - May to September

In those cases where working in wet conditions is unavoidable the following shall be implemented:

- Water shall be diverted away from the intervention site during the implementation of rehabilitation activities
- Diversions shall be temporary in nature (e.g. sand bags, eco-logs)
- Upon completion of the rehabilitation activities at the site, the diversions shall be removed to restore natural flow patterns
- In those instances where the impact of the diversions are negligible and removal may result in further disturbance, diversions structures shall be left *in situ* (this shall be decided in consultation with Working for Wetlands)

Water courses are subject to unanticipated flooding and adequate precautions shall be taken to avoid damage to facilities, equipment and wetland habitat:

- Ensure storage areas are located outside of floodable areas
- Minimise the extent of disturbed/exposed areas to reduce extensive damage during flood events

6.2 Disturbances

6.2.1 Vegetation

Disturbance of indigenous plants within the wetland and surrounding catchment shall be minimised. In the event that vegetation needs to be removed during construction, the vegetation shall be stored in a shaded and moist area, or at the Peninsula project's nursery site, for use in revegetation. Re-vegetation of all exposed soil must be done before the team leaves the site.

Bio-engineering methods involving the re-vegetation or planting of specified areas shall, as far as possible, use local plant species obtained from the following sources:

- vegetation removed during excavation,
- local 'borrow' sites, or
- naturally sourced seed mixes

This should limit the threat of introducing genetically-modified and genetically different species into the area. Non-invasive alien plant species shall not be used for re-vegetation unless approved by the Working for Wetlands (e.g. Vetiver grass)

The collection of indigenous plant or parts thereof shall only take place if the following guidelines are followed:

- Obtain the required collection permits
- Limit habitat destruction
- Implement 'mosaic' collection to ensure limited disturbance and adequate recovery of the 'borrow' site.

6.2.2 Faunal species

Disturbance of faunal species within the wetland and surrounding catchment shall be minimised. This includes minimising:

- disruptions to the movements/migration of species;
- interruptions of breeding activities and behaviour;
- disturbance of feeding and breeding sites.

The presence of species of conservation importance shall be known prior to the commencement of rehabilitation activities. In those instances where these species are present, work shall be scheduled to reduce the impacts on the abovementioned activities. This information shall be determined by means of consultation with specialists.

The construction of interventions within wetlands and watercourses necessitates the planning of these interventions taking into consideration the migration of fish species where applicable.

6.2.3 Local resources

In some instances locally available resources may be utilised in the implementation of wetland rehabilitation activities. This would primarily be rocks for the construction of gabion structures. Prior approval of the technical advisor shall be obtained, with respect to:

- suitable rock types,
- suitable areas for collection, and
- appropriate collection methods

All purchased rock shall be from registered and approved crushers. Copies of the certificates shall be kept on file by the implementer. Any rock that is collected from old quarries or mine dumps shall have the necessary documentation from the land owner.

6.3 Compaction

The storage of materials and access to the site is likely to result in the compaction of the soil around the site. This increases the risk of erosion and sediment generation originating from the site.

All impacted areas shall be rehabilitated (loosen soil and re-vegetate) once work has been completed and prior to the team leaving the site. These activities shall include the closure and rehabilitation of temporary access routes and addressing any potential erosion risks.

6.4 Sediment mobilisation

The construction of interventions within watercourses is likely to have impacts on downstream habitat associated with the presence of sediment within runoff water. In order to reduce impacts associated with sediment from the construction site, implementation of the rehabilitation activities should take place within the dry season:

- Winter rainfall areas - November to March
- Summer rainfall areas - May to September

In those instances where the toes of structures are designed to be flooded by the downstream structures work shall commence from the top of the system down. This shall ensure that work occurs in drier conditions and less sediment would be mobilised during excavation. The impacts associated with sediment generated during earthworks shall be minimised by constructing temporary sediment traps downstream, preferably at the location of the next intervention, to reduce disturbance footprints.

In those instances where structures are not designed to be flooded by downstream structures, the interventions shall be constructed from the bottom of the system up, so that each structure then serves as a sediment trap for the construction upstream.

Further measures to reduce sediment generated from construction activities include ensuring that soil is not deposited into a watercourse and the re-vegetation of the exposed areas as soon as possible as per Section 10.2.

7 CONSTRUCTION SITE

7.1 Restriction to working area

It is important that activities are conducted within a limited area so as to facilitate control and to minimise the impact on the existing natural environment and disturbance to the neighbouring communities. Working areas are defined as those areas required by the contractor to undertake the works as agreed with the ECO.

7.2 Contractor's camp

An area to be approved by the ECO shall be taped off for the purpose of temporary staff accommodation facilities during the construction period. . The contractor's camp, offices and storage facilities shall be located within the site boundaries. No person shall be allowed to stay on the neighbouring site. Any temporary structures erected during construction will be restricted to the construction campsite. The taped area shall include that of a 10 m buffer zone between the site and the 1:100 year floodline of any watercourse and/or dam.

All staff remaining on site shall be supplied (by the contractor) with adequate protective clothing, water and refuse facilities (with regular collection) and facilities for cooking and heating. No open fires shall be permitted.

The contractor shall provide water and/or washing facilities at the construction camp for the site staff.

All contractor vehicles shall be stored in a location where an oil trap shall be installed to prevent soil pollution. The ECO shall advise the contractor on a suitable area on the site.

7.3 Stores and workshops

Stores buildings and containers shall be secure and provide safe storage space where equipment and materials will not deteriorate.

All stores and workshops shall comply with the OHS Act and shall show a high standard of housekeeping.

7.4 Refuse

Refuse refers to all solid waste, including construction debris (cement bags, wrapping material, timber, cans, wire, nails, etc.), waste and surplus food, food packaging, organic waste etc. The contractor shall be responsible for the establishment of a refuse control and removal system that prevents the spread of refuse within and beyond the construction site.

The contractor shall ensure that all refuse is disposed of by him/her and his/her sub-contractors' employees in refuse bins which he/she shall supply and arrange to be emptied on a daily basis. These bins shall all have lids and shall be adequate in number and accessibility.

Waste shall be separated as follows:

- Hazardous waste, consisting of substances that may be harmful to the receiving environment, and therefore require precautionary measures when handled. Examples include (but not limited to) oil, paint, diesel etc., (in addition, refer to Section 7.7 and 10.8).

- General waste, consisting of non-hazardous substances and substances that cannot be recycled. Examples include (but not limited to) construction rubble, excess construction materials that cannot be reused, and food waste.
- Reusable construction material, which can be used at other construction sites.
- Where possible, glass and metal waste should be separated and removed from site for recycling purposes

Refuse bins shall be watertight, wind-proof and scavenger proof and shall be appropriately placed throughout the site and shall also be conspicuous (e.g. painted bright yellow). Refuse shall also be protected from rain, which may cause pollutants to leach out. Particular caution shall be exercised with regards to handling of hazardous waste, to ensure that it does not spill or leak from the waste collection containers. The utmost care shall be taken to ensure that no waste is able to enter wetlands and/or dams on or near to the site.

The contractor or the appointed Waste Removal Company shall truck refuse collected out of the construction site. Refuse shall be disposed of at a Department of Water Affairs (DWA) registered site on a needs-scheduled basis. The disposal site shall also be approved of by the contractor and the local authority. Refuse shall not be burned or buried on or near the site.

The contractor shall ensure that the contractor's camp and construction site is cleaned on a daily basis. These areas shall then be inspected by the contractor to ensure compliance with this requirement. A litter patrol around the construction area shall take place twice weekly to ensure that all litter is cleared up.

The contractor shall be warned, in writing, by the ECO of any infringement and shall be expected to clear the litter within 24 hours of the notification.

The contractor shall be responsible for cleaning the contractor's camp and construction site of all structures, equipment, residual litter and building materials at the end of the contract and where necessary and appropriate, the ground scarified, topsoil restored and indigenous vegetation re-established.

The contractor will be responsible for removal of rubbish, which may wash into watercourses as a result of litter. The contractor will also be responsible for any litter in the sensitive areas, which is dumped or left there by the construction crew.

7.5 Ablution facilities

The contractor shall be responsible for provision of sanitation for his/her and the sub-contractor's staff. Where possible, a minimum of one pit latrine shall be provided per 15 persons. Toilets may not be situated within 50 metres of a watercourse. Should toilets be needed elsewhere, their location shall first be approved by the ECO. The ECO is responsible for ensuring that any toilets placed are suitably situated and comply with requirements stated below.

The toilets shall be provided with doors and locks and shall be secured to prevent them from falling over. Toilets shall be placed outside areas susceptible to potential flooding. The contractor shall supply toilet paper at all toilets at all times. The contractor shall ensure that the labourers make use of the toilets provided.

The contractor shall be responsible for the cleaning, maintenance and servicing of the toilets. The contractor shall ensure that the toilets are protected from vandals. No litter or general waste shall be placed in the toilets.

Upon completion of the contract the pit latrines shall be filled in and all structures shall be removed from site.

Washing areas with soap and sufficient clean water shall be provided for hand washing after ablutions. .

7.6 Eating areas

The contractor shall, in conjunction with the ECO, designate restricted areas for eating. The contractor shall provide adequate refuse bins that must be cleaned on a daily basis.

The feeding, or leaving of food, for stray or other animals in the area is strictly prohibited.

7.7 Fuel and chemical management

The contractor shall ensure that fuels and chemicals (e.g. drums of fuel, grease, oil, brake fluid, hydraulic fluid) are stored and handled carefully so as to prevent spillage. In the event of a spill, appropriate steps shall be undertaken to prevent widespread pollution. These liquids shall be confined to specific and secured areas within the contractor's camp and shall be clearly marked. The liquids shall be stored in a bunded area with adequate containment (at least 1.5 times the volume of the fuel) with an impermeable floor beneath them for potential spills or leaks, in such a way that does not pose any danger of pollution even during times of high rainfall.

In addition, the contractor shall ensure that workers do not smoke or take part in any activity that may result in sparks in the vicinity of fuels and other flammable substances to prevent ignition.

Refuelling of vehicles shall only take place at a predetermined area, where adequate pollution prevention measures are in place to such as a smooth impermeable floor (concrete or 250 µm plastic covered in sand). Appropriate signage shall be erected indicating the refuelling and storage areas. Mixing of lubricants will be on the non-pervious layer at least 20m from the wetland edge.

A specialist waste contractor shall dispose of any hazardous waste off-site at a licensed hazardous waste disposal site.

The contractor shall be responsible for ensuring that any party delivering potentially dangerous chemicals and oil to site is aware of the appropriate storage and drop-off locations and procedures. Transfer of hazardous chemicals and other potentially hazardous substances shall be carried out so as to minimise the potential leakage and prevent spillage onto the soil.

7.7.1 Equipment

Drip trays shall be put in place in relevant locations (inlets, outlets, points of leakage, etc.) so as to prevent spillage or leakage during transfer. The contractor shall stand any equipment that may leak, and does not have to be transported regularly on watertight drip trays to catch any pollutants. The drip trays shall be of a size that the equipment can be placed inside it. Drip trays shall be cleaned regularly and shall not be allowed to overflow. Substances, which cannot be reused, shall be disposed of according to the relevant waste disposal procedure. The ECO shall inform and advise the contractor as to the best waste disposal procedure.

If fuel is dispensed from 200 litre drums, only empty externally clean drums may be stored on the bare ground. All empty externally dirty drums shall be stored on an area where the ground has been protected. The proper dispensing equipment shall be used, and the drum shall not be tipped in order to dispense fuel. The dispensing mechanism of the fuel storage drum shall be stored in a waterproof container when not in use.

7.7.2 Spill procedure

The contractor shall keep the necessary materials and equipment on site to deal with spillage of the relevant hazardous substances present on site. The contractor shall set up a procedure for dealing with spills, which will include notifying the ECO and the relevant authorities immediately following the spillage event. These procedures must be developed with consultation and approval by the appointed ECO.

The clean up of spills caused as a result of the construction activities, and any damage to the environment, shall be for the contractor's own account. A record must be kept of all spills and the corrective action taken.

7.8 Vehicles

Site vehicles shall only permitted within the demarcated construction camp, as required, to complete their specific task.

All construction vehicles shall be in a good working order to reduce possible noise pollution. Local and Provincial Noise Regulations shall be complied with at all times.

On-site vehicles shall be limited to approved access routes and areas (including turning circles and parking) on the site so as to minimise excessive environmental disturbance to the soil and vegetation on site. Servicing and maintenance of vehicles on-site shall be avoided as far as possible.

Construction shall be limited to normal working hours (as described in Section 10.1), in order to limit disturbance from vehicles and construction activity.

7.9 Hand tools

Hand tools will be suited to the nature of the work. Tools will have correct, properly secured handles and will be in safe working order. Tools will be properly maintained and sharpened regularly. Tools will be used in the correct and safe manner.

7.10 Concrete mixers, compactors and other machinery

All machinery will have the required machine guards. All nip points, pulleys, fan belts and revolving parts will be suitably enclosed. Power take offs will be provided with suitable covers in good condition. Covers will be chained to non-revolving machinery.

Only trained operators may operate machinery, and will wear the required PPE. Workers, other than machine operators, will not be within two spade lengths of operating machinery

Concrete mixers may only operate on a stable, level site.

Machinery will be in good working order. If owned by the implementer or contractor there will be a maintenance schedule and record for the machinery. Machinery will be used safely and efficiently at all times.

7.11 Stockpiling of materials

The contractor shall temporarily stockpile excavated materials (e.g. soils and rocks) and construction materials in such a way that the spread of materials is minimised. The stockpiles may only be placed within the demarcated stockpile area, which must fall within the demarcated construction area. The contractor shall, where possible, avoid stockpiling materials in vegetated areas that will not be cleared. Stockpiles of construction materials must be clearly separated from topsoil stockpiles in order to limit any contamination of the topsoil. Stockpiles shall be located away from sensitive hydrological features (including but not limited to dams, wetlands, watercourses, ponds, pans, drainage channels, etc.). Stockpiles shall be less than 2 metres in height.

Storm water runoff from the stockpile sites and surrounding areas shall be directed into the storm water system and shall not run freely into the surrounding environment, or create "ponding" or accumulation of water.

Stockpiles shall be stabilised if signs of erosion are visible. Erosion control measures such as silt fences must be placed around the stockpiles.

7.12 Stock control

The receipt and issue of all equipment and supplies will be adequately controlled. All issues and receipts will be recorded. The balance of stock recorded will correspond at all times with stock in the stores. Designated managers will verify stock periodically and on a bi-annual basis, stocktaking will be done. The proper procedures will be followed in disposing of unserviceable or surplus items.

Where contractors cannot make use of proper dedicated stores, all equipment and supplies will be safely and securely stored with controlled access.

7.13 Temporary fencing

The contractor shall ensure that the construction camp is demarcated with danger tape, or suitable equivalent, for the duration of the construction period.

The tape shall serve to prevent public access to the camp, for public safety and security reasons. Tape shall be placed around the sensitive hydrological features buffer no-go areas on site.

The contractor must maintain the tape for the duration of the construction period. All tape must be removed and the site restored on completion of the project.

8 METHOD OF WORK

8.1 Verification of work

Actual work done (volumes and areas) shall be verified and recorded by the implementer, who is responsible for ensuring that contractors' invoices correspond to actual production. The implementer shall verify a minimum of 5% of work completed during the month. On completion of an intervention, a certificate of completion shall be submitted to the regional coordinator by the implementer.

8.2 Corrective action for sub-standard work

Payment shall not be made for work that does not comply with contract specifications. A record shall be kept of non-compliance to standards and poor performance. Copies of instructions issued to contractors to correct deficiencies shall be kept.

8.3 Minimum standards for construction

8.3.1 Gabions

Gabion work shall be done according to design specifications.

Minimum 2.5mm double galvanised wire shall be used, with a mesh size that is appropriate to the size of the rock being used. Support and binding wire shall be a minimum 2.2 mm. Lacing will be done according to specification. Support wires shall be in place (bracing). All adjoining baskets shall be laced together. Geotextile shall line all faces of the gab ion baskets that are exposed to earth and certain water exposed sides.

Water corrosivity shall be determined at each site; if necessary PVC coated gabions shall be used.

Soil dispersivity shall be determined at each site. If dispersive soils are detected, the technical advisor shall be contacted.

Density of fill material shall satisfy the gabion design. Clay bricks, weathered rock and sandstone and shale shall not be used as fill material. Any unconventional fill material shall be approved by the technical advisor. Fill material shall not be smaller than mesh size. Where fill material is hauled to its point of placement by means of wheelbarrows, the haul distance shall not be greater than 150m.

Workers shall be trained in gabion construction by an accredited organisation.

8.3.2 Cement and concrete batching

Concrete mix shall be according to specifications and correct MP A concrete must be used. Manufacturer's directions for mixing, consistency and treatment after pouring will be complied with.

Cement shall be stored in dry conditions for no longer than six weeks after delivery. When cement is stored temporarily infield it shall be kept on a dry waterproof base with a waterproof cover.

A demarcated site at least 20m away from water/wetland edge shall be used for cement mixing. No batching activities shall occur directly on unprotected ground. The batching plant shall be located on a smooth impermeable surface (concrete or 250 µm plastic covered with 5 cm of sand). The area shall be bunded and sloped towards a sump to contain spillages of substances. All wastewater resulting from batching of concrete shall be disposed of via a contaminated water management system and shall not be discharged into the

environment. Contaminated water storage areas shall not be allowed to overflow and appropriate protection from rain and flooding shall be implemented

Empty cement bags shall be stored in weather proof containers to prevent windblown cement dust and water contamination. Empty cement bags shall be disposed of on a regular basis via the solid waste management system, and shall not be used for any other purpose. Unused cement bags shall be stored so as not to be affected by rain or runoff events. In this regard, closed steel containers shall be used for the storage of cement powder and any additives. The Contractor shall ensure that sand, aggregate, cement or additives used during the mixing process are contained and covered to prevent contamination of the surrounding environment.

The Contractor shall take all reasonable measures to prevent the spillage of cement/ concrete during batching and construction operations. During pouring, the soil surface shall be protected using plastic and all visible remains of concrete shall be physically removed on completion of the cement/ concrete pour and appropriately disposed of. All spoiled and excess aggregate/ cement/ concrete shall be removed and disposed of via the solid waste management system.

Construction using shuttering shall not take place at more than 1m height increments. Reinforcing shall be used according to specification. Concrete will be mixed and used on the same day. Where sand, stone and cement are hauled to their point of placement by means of wheel barrows; the haul distance may not be greater than 150m.

Where applicable, the location of the batching plant (including the location of cement stores, sand and aggregate stockpiles) shall be as approved by the Engineer. The concrete/cement batching plant shall be kept neat and clean at all times.

8.3.3 Geo cells

Geo cells shall not be used in conditions that exceed their design specifications. Geo cell material shall be UV resistant. Geo cells shall be anchored in by the "trench" method and in such a way that prevents undermining of the cells. Fill material shall conform to the design specifications. The following general rules shall be applied:

- If soil is used to fill the cells, it shall be re-vegetated immediately,
- If concrete is used to fill the cells, some degree of permeability of the structure shall be permitted. If concrete is used as fill, concrete baffles shall be inserted. Rock is not suitable for this purpose.

8.3.4 Earth works

Excavations may not exceed 1.5m depth without shoring and reinforcement. Excavation and compaction must comply with design specifications. The technical advisor must be consulted for work undertaken in dispersive, unstable and organic soils. Backfilling in trenches must be done in layers of thickness not exceeding 100mm before compaction. Each layer shall be compacted using hand compactors. Where excavation material is hauled by means of wheelbarrows, the haul distance may not be greater than 150m.

All earthworks shall be undertaken in such a manner so as to minimise the extent of any impacts caused by such activities, particularly with regards to erosion and dust generation. No equipment associated with earthworks shall be allowed outside of the Site and defined access routes unless expressly permitted by the Engineer.

9 TRAINING

9.1 Training entitlement

In compliance with EPWP requirements, each worker shall be entitled to a minimum of two days training for every 22 days worked.

All training funded through the Department of Labour shall be planned in conjunction with the department's provincial representatives. A minimum of 30% of all training shall be accredited, and all first aid and health and safety training shall be accredited.

9.2 Wetland awareness

All project personnel shall be trained in basic wetland awareness, including a basic understanding of the components of wetlands, how wetlands function, the benefits they provide, why they need to be conserved and used sustainably, and the importance of rehabilitation in contributing to wetland conservation and sustainable use. Training shall take place as a minimum once a month.

9.3 Wildlife

Where work takes place in areas containing dangerous game, especially nature reserves and national parks, workers shall receive training in basic animal behaviour. In these areas, before work commences each day, the site shall be checked for dangerous animals.

A person trained in dangerous animal behaviour shall be present and suitably equipped to deal with such threats at all times. Wherever possible, first aid training shall include treatments for snakebites.

9.4 Environmental induction training

Within seven days of the commencement date, the Contractor's site staff including foremen and site management staff shall attend an environmental awareness training course, of approximately one-hour duration. The Contractor shall liaise with the Engineer prior to the Commencement Date to fix a date and venue for the course. The Contractor shall provide a suitable venue with facilities and ensure that the specified employees attend the course.

No more than 20 people shall attend each course and the Contractor shall allow for sufficient sessions to train all personnel. Subsequent sessions shall be run for any new personnel coming onto site.

The environmental awareness training course shall be held in the morning during normal working hours. Any new employees coming on to site after the initial training course and the Contractor’s suppliers and subcontractors shall also attend the course. Provision should also be made for quarterly refreshers courses to be undertaken during the course of the Contract. The Contractor shall ensure that all attendees sign an attendance register, and shall provide the Engineer with a copy of the attendance register the day after each course.

9.5 Health and safety training

The following minimum levels of training are required with respect to health and safety:

- All workers and contractors must successfully complete phase 1 health and safety training.
- All project managers must successfully complete phase 2 health and safety training.

9.6 First aid training

Two first aid officers will be trained per team.

9.7 Training records

Training attendance records shall be kept by the implementer. The implementer will be responsible for obtaining all contractor and worker training information.

9.8 Fire fighting training

All workers shall receive basic fire fighting training in areas where this is appropriate

10 ENVIRONMENTAL CONTROL MEASURES

10.1 Control of working hours

Working hours for all operations shall be limited to between 08h00 and 17h00 on weekdays. No work shall take place on a Saturday, Sunday and or Public Holidays. Any deviations to these work hours shall be cleared with the ECO prior to implementation.

10.2 Control of runoff that could cause pollution

Pollution may result from the release, accidental or otherwise, of chemicals, oils, fuels, sewage, wastewater containing organic kitchen waste, detergents, solid waste, litter and other such substances. The contractor shall ensure that rainwater does not run into areas containing cement, oil, diesel and other such substances as this could result in a pollution threat to sensitive environmental areas. Storage areas for these substances shall be placed on high lying ground and contain a bunded area in case of a spill. The bunded area shall be covered if deemed appropriate by the ECO.

Berms must be constructed to direct all runoff into the storm water system. The engineers shall prepare temporary storm water channels for unexpected rains during construction. Erosion control measures shall be placed in areas where runoff concentrates in order to detain the sediment load and slow down the runoff. Erosion controls shall be put in place on all drainage channels that drain into water resources. These measures shall include, but not be limited to, silt fences, brushwood and rows of sawdust-filled onion bags. No wastewater shall run freely into any of the surrounding environment. Runoff containing high sediment loads shall not to be released directly into natural or municipal drainage systems or nearby water resources. Should sediment occur in runoff, an attenuation pond shall be constructed to allow solids to settle out prior to leaving the site.

Runoff from the site itself shall be free from oil, waste and litter before joining the storm water system or streams. This shall be ensured by securing any hazardous substances containers in order to prevent runoff and by cleaning up any refuse and construction material from the site on a regular basis.

Litter management in the storm water system or channels that lead to streams and or wetland shall be implemented. It is outside the scope of this document to prescribe litter trap designs, but the important aspect is that it shall be incorporated into the design of the development. Litter traps shall prevent solid waste from entering the storm water system.

The contractor shall only be allowed to draw water from the source/s designated by the client and the ECO. The client shall ensure that the contractor is aware of the designated water sources, and the ECO shall ensure that this is adhered to. Personnel shall not use natural hydrological features for any purpose, including recreation. These areas shall be considered “no-go” areas.

In the event of any pollution entering an environmentally sensitive area and/or buffer zone as a result of the contractor’s actions, the contractor shall be responsible for all costs incurred to assist in pollution control and/or to clean up the polluted area. Damage to the wetland as a result of the project operations shall be for the contractor’s account. The responsibility of the remediation of the pollution/erosion event will ultimately lie with the contractor.

10.3 Pollution control

The contractor/s shall ensure that pollution of surface and/or groundwater does not occur as a result of site activities.

In the event of pollution caused as a result of construction activities, the contractor, according to Section 20 of the National Water Act (Act No. 36 of 1998), shall be responsible for all costs incurred by organisations called to assist in pollution control and/or to clean up polluted areas. The public shall not call upon any organisation to assist with clean-up activities before the matter has been discussed with the contractor. The ECO shall be notified immediately following any pollution event.

The ECO shall ensure that the contractors are aware that shallow groundwater is susceptible to contamination from spills. Therefore good management practices (in accordance with local bylaws) are required to reduce the impact of the waste generation potential.

Builders' rubble and other debris shall be confined to the building site and shall not be stored/discarded on any open space outside the development area. The status of the hydrological features on or near to the site shall be monitored by the ECO to ensure that pollution does not occur in these areas.

10.4 Erosion control

The contractor shall take reasonable measures (to the satisfaction of the ECO) to prevent erosion caused by work, operations and activities undertaken during excavation and construction activities. The contractor shall ensure that disturbance on steep slopes is kept to a minimum, thus reducing the potential for erosion. The contractor is responsible for rehabilitating all disturbed areas in such a way that no future erosion will occur.

Erosion may occur in the event of rain during the excavation and construction period. Any erosion that occurs during a heavy rainfall event shall be remediated at the expense of the project budget. This shall include clean-up of the silt deposited and filling up of erosion channels that may form. Construction in sensitive areas shall be undertaken during the dry season if possible.

10.5 Dust control

The contractor shall take into consideration that there may be residential areas surrounding the building site and that dust could be a major disturbance, especially during the dry season.

The contractor shall take appropriate and reasonable measures to minimise the generation of dust as a result of his/her works, operations and activities. Particular attention shall be given to preventing dust generation during excavation and stockpiling activities. The contractor shall be responsible for educating the employees to report any excessively dusty conditions to the contractor, the ECO or responsible representative.

Corrective and preventative measures shall include (but not be limited to) regular and effective treatment of working areas using water sprays and appropriate scheduling of dust-generating activities.

The contractor shall ensure that transported materials do not escape from the construction vehicles by providing adequate covering for all load beds.

10.6 Noise control

Probably the two most important concepts in the regulation of noise are those of *disturbing noise* and *noise nuisance*.

A disturbing noise is one that exceeds the zone sound level set by the local authority. A noise nuisance means any sound, which disturbs or impairs or may disturb or impair the convenience or peace of persons.

Some of the activities that could constitute a noise nuisance are power tools, driving, loading and hooters. All of these elements could be connected with building activities.

Each province has its own noise regulations such as Gauteng Province promulgated new noise regulations in 1999 published in Provincial Notice 5479 of 1999 (Gauteng Noise Regulations). The contractor shall obtain and familiarise him/her with these regulations and ensure that he/she abides by these regulations at all times. The contractor shall familiarise him/herself with, and adhere to, any by-laws and regulations regarding the control of noise in their municipal areas.

Every effort shall be made to limit exceedingly noisy activities. Construction vehicles shall be in good working order such that they do not create a noise nuisance. Appropriate directional and intensity settings shall be maintained on all hooters and sirens, and the Contractor shall provide and use suitable and effective silencing devices for pneumatic tools and other plant. .

No amplified music shall be allowed on site. The use of radios, tape recorders, compact disc players, television sets etc. shall not be permitted unless the volume is kept sufficiently low as to avoid any intrusion on members of the public within range. The Contractor shall not use sound amplification equipment on Site unless in emergency situations.

10.7 Hazardous materials control

All relevant national, regional and local legislation with regard to the transport, use and disposal of hazardous materials shall be strictly complied with. The contractor shall obtain the advice of the manufacturer (Material Data Sheets) with regard to the safe handling of hazardous materials.

The contractor shall ensure that there is an emergency procedure in place to deal with accidents and incidents (e.g. spills) arising from hazardous substances.

The contractor shall ensure that all personnel on site are properly trained concerning the proper use, handling and disposal of hazardous substances.

The contractor shall report incidents to the ECO immediately. Any spill incidents shall be cleaned up immediately in according with the emergency procedure.

The contractor shall supply the ECO with a list of all hazardous materials that would be present on site during the construction period. The same applies to any sub-contractor who shall provide the contractor with this information.

10.8 Blasting control

Any blasting required on site shall only occur during official working hours. Blasting shall only be undertaken where absolutely necessary.

In the event that excessive blasting is required the contractor shall ensure that potential claims from neighbouring properties in respect of damages to houses, towers and bridges (cracked walls, etc.) are valid. It is recommended that a survey be conducted to determine the pre-blasting condition of all houses in the area that could be affected by blasting activities.

The contractor shall distribute a list of dates (and times) during which blasting shall occur on site as well as place notices in appropriate areas. This shall ensure that the immediate surrounding residents are aware of the timing of blasting and thus would be in a position to prepare for the event. Emergency services shall be notified in

writing, a minimum of 24 hours prior to blasting taking place. In the event that deviations from the original planned dates are perceived, the contractor shall notify the surrounding residents well in advance (a minimum of 24 hours).

Blasting activities shall only occur under controlled conditions, whereby safety precautions are adhered to, and only authorised personnel may take part in these activities. The contractor shall inform all construction workers of dates and times when blasting will take place and the necessary safety steps shall be taken to prevent any injuries.

11 EFFLUENT AND STORMWATER MANAGEMENT

11.1 Introduction

Any effluent flowing out from the site shall be free from any pollution hazard, as this waste will invariably enter the surrounding environment. Section 10.2 and 10.4 outlines the procedures to follow in order to ensure that pollution and/or erosion resulting from construction activities do not result in damage to the surrounding areas.

All pipelines used on site shall be constructed of suitable materials such as wheolite, which reduces the risk of cracking from soil movements.

11.2 Storm water

Natural (storm water) runoff shall be diverted away from the construction area towards the storm water drains or channels. In addition, it shall be ensured that storm water is not allowed to collect to form ponds or excessively muddy conditions.

Special care shall be taken in areas susceptible to erosion, e.g. steep slopes. The contractor shall ensure that excessive quantities of sand, silt and silt-laden water do not enter the storm water system. Design of the storm water drainage system so as not to contaminate the natural drainage system is important. Appropriate measures, e.g. erection of silt traps, or drainage retention areas, to prevent silt and sand entering drainage lines or watercourses shall be taken.

The contractor shall clear any partial or complete blockage of the storm water drainage system as a result of construction activities at his own expense.

11.3 Discharge of construction water (effluent)

The contractor shall ensure that polluted runoff (excluding silt pollution) such as runoff from the construction camp where equipment is cleaned and/or serviced, is not discharged overland. Such runoff shall be directed into the local sewer main or suitable alternative agreed upon with the local authority.

Silt-laden water may be disposed overland. This water may be allowed to filter into the ground provided that this action does not cause a pollution or erosion threat.

Water from washing concrete-mixing equipment (mixers and the like) shall not be discharged overland. As describe in Section 11.2 above, such water shall be collected (possibly in conservatory tank) and removed from the site and disposed of at a registered waste disposal site. It is suggested that such water be reused for washing other concrete-mixing equipment to minimise the amount of wastewater requiring removal from site.

Trucks delivering concrete shall not be washed or rinse their chutes on the site.

12 SITE REHABILITATION

All working areas shall be rehabilitated once work has been completed and before the team leaves the site. This includes closure and rehabilitation of temporary access routes. All foreign material not utilised in the rehabilitation activities shall be removed from the site. Re-vegetation of all exposed soil shall be done before the team leaves the site. Any potential erosion risks shall be addressed before the team leaves the site

Any areas that the Engineer believes may have been impacted upon or disturbed, shall be rehabilitated to the satisfaction of the Engineer, which includes all areas where Top material has been stripped. Once construction is complete the Contractor shall clear everything from the Site not forming part of the Permanent Works. The area to be rehabilitated shall first be landscaped to match the topography of the surrounding area as it was prior to construction. The composition of vegetation to be used for any rehabilitation shall be as specified in Section 5.12.

The Contractor shall not use herbicides, pesticides, fertilisers or other poisonous substances for the rehabilitation process unless otherwise agreed with the Engineer.

All rehabilitated areas shall be considered “no go” areas and the Contractor shall ensure that none of his staff or equipment enters these areas.

The Contractor shall undertake to remove all alien vegetation re-establishing on the area and shall implement the necessary temporary or permanent measures to combat soil erosion.

12.1 Removal of materials

After construction, any area cleared or disturbed (as a result of the activity) within and outside the boundaries of the construction site shall be rehabilitated to a state as agreed by the DEA and according to the specifications of the ECO.

All construction equipment and excess aggregate, gravel, stone, concrete, bricks, temporary fencing and the like shall be removed from the site upon completion of the work. No discarded materials of any nature shall be buried on the site, or on any vacant or open land in the area and shall only be disposed of at the appropriate registered waste disposal site.

12.2 Control of alien vegetation

Where project activities include the eradication of invasive alien plants, Working for Water guidelines and policies shall be adhered to. Any invasive alien plant clearing undertaken through Working for Wetlands projects shall be registered on the Working for Water Information Management System.

12.3 Landscaping and preparation for planting

Topmaterial that is disturbed or removed during construction and excavation shall be replaced, preferably using topsoil stockpiled prior to excavation activities, or with topsoil sourced from another reputable source. However, where possible, soils from different areas should not be mixed. Care shall be taken not to mix the topsoil with the subsoil during shaping operations.

Indigenous plants shall be used in the landscaping of the site. Plants that are proclaimed as problem plants or noxious weeds are to be excluded from the landscaping plan and these should be removed immediately, should they occur on site.

Species recommended for landscaping of the public areas include:

Trees and shrubs:

- *Buddleja saligna* (False olive)
- *Buddleja salviifolia* (Sagewood)
- *Celtis africana* (White stinkwood)
- *Diospyros lycoides* (Bluebush)
- *Dombeya rotundifolia* (Wild pear)
- *Gymnosporia buxifolia* (Common spike-thorn)
- *Olea europaea* (Wild olive)
- *Rhus lancea* (Karee)
- *Rhus leptodictya* (Mountain Karee)

Bulbs and forbs

- *Agapanthus* species (Agapanthus)
- *Albuca* species
- *Barleria obtusa*
- *Ceratotheca triloba* (Wild foxglove)
- *Chlorophytum* species
- *Crinum species* (Orange River Lily/Graslelie)
- *Felicia muricata*
- *Gazania krebsiana* (Botterblom)
- *Gerbera* species (Barberton Daisy)
- *Leonotis* species (Wild dagga)
- *Nemesia* species
- *Trachyandra* species
- *Watsonia* species (Watsonia)

The relevant landscaping contractors and excavation contractor shall be in consultation with each other and the ECO so as to prevent misunderstandings and therefore prevent potential negative environmental impacts.

An ecological approach to landscaping is recommended. Plants introduced into the project sites shall be guided by ecological rather than horticultural principles. For example ecological communities of indigenous plants provide more biodiversity and habitat opportunities and would blend with natural vegetation. This approach is also less costly to maintain and is sustainable in the long term.

13 EMERGENCY PROCEDURES

13.1 Introduction

The contractor shall ensure that all emergency procedures are in place prior to commencing work. Emergency procedures shall include, but are not limited to, fire, spills, contamination of the ground, accidents to employees, use of hazardous substances and materials, etc.

The contractor shall ensure that lists of all emergency telephone numbers/contact persons (including fire control) are kept up to date and that all numbers and names are posted at relevant and visible locations throughout the duration of the construction period.

13.2 Fire

The contractor shall take all reasonable measures to ensure that fires are not started as a result of construction activities on site, and shall also ensure that their operations comply with the Occupational Health and Safety Act (Act No. 85 of 1993). Open fires shall not be allowed on work sites and no exceptions should be made.

Basic functional fire fighting equipment shall be made available at each work site (1 back pack and at least 5 beaters), in forestry areas there must be 2 rake hoes per team.

Where fuels and machines are used on site, the prescribed fire extinguishers in working condition will be available.

Sparks generated during welding, cutting of metal or gas cutting can result in fires. Every possible precaution shall therefore be taken when working with this equipment near potential sources of combustion. Such precautions shall include having an approved fire extinguisher immediately available at the site of any such activities. The contractor shall ensure that there is basic fire fighting equipment available on site at all times. The contractor shall appoint a member of his staff to be responsible for the installation and inspection of this equipment. The contractor shall ensure that he/she has the contact details of the nearest fire station in case of an emergency.

Where projects fall within fire protection areas, the following will be applicable:

- The project will form part of the local Fire Protection Association
- The Project Manager will attend all FPA meetings
- The project will form part of the local FPA notification of the daily FOI (Fire Danger Index)
- In case of a red classification warning for the day extreme caution shall be applied.
- As soon as the actual FOI reaches a red classification all teams shall be withdrawn from affected areas.

13.3 Accidental leaks and spillages

The Contractor shall ensure that his employees are aware of the emergency procedure(s) to be followed for dealing with spills and leaks, which shall include notifying the Engineer and the relevant authorities. The Contractor shall ensure that the necessary materials and equipment for dealing with spills and leaks is available on Site at all times. Treatment and remediation of the spill areas shall be undertaken to the reasonable satisfaction of the Engineer.

In the event of a hydrocarbon spill, the source of the spillage shall be isolated, and the spillage contained. The area shall be cordoned off and secured. The Contractor shall ensure that there is always a supply of absorbent material readily available to absorb/ breakdown and where possible be designed to encapsulate minor hydrocarbon spillage. The quantity of such materials shall be able to handle a minimum of 200 ℓ of hydrocarbon liquid spill.

13.4 Safety

The contractor must ensure:

- Compliance with the Occupational Health and Safety Act (Act No. 85 of 1993);
- That reasonable measures are taken to ensure the safety of all site staff;
- That all construction vehicles using public roads are in a roadworthy condition, that drivers adhere to the speed limits, that loads are secured and that all local, provincial and national regulations are adhered to; and
- That all accidents and incidents are recorded and reported to the ECO.

The contractor is to ensure that he/she has the contact details of the nearest emergency rooms (hospitals) to the site, of both private and public hospitals.

13.5 Communication

13.5.1 Community relations

The Contractor shall, during site establishment, erect and maintain information boards in the position, quantity, design and dimensions specified. Such boards shall include contact details for complaints by members of the public in accordance with details provided by the Engineer.

The Contractor shall keep a "Complaints Register" on Site. The Register shall contain all contact details of the person who made the complaint, and information regarding the complaint itself.

13.5.2 Implementers forum

A representative from each implementer is required to attend quarterly meetings of the implementers' forum. The purpose of these meetings is to share information, develop links between projects and enhance communication between Working for Wetlands and its implementers. Venues for these meetings will rotate between projects. A national health and safety meeting will form part of this forum.

13.5.3 Working for Wetlands logo

Working for Wetlands encourages its implementers to use the programme's logo in promoting the programme and wetland conservation and sustainable use in general. However, written permission shall be obtained from the programme manager before the logo is used on anything other than the prescribed signage or workers' t-shirts.

13.5.4 Signage

Each project shall erect at least one gate board per property on which work is done and one billboard in a prominent position. The basic designs for this signage will be those prescribed by Working for Wetlands, with provision for the addition of project-specific information.

13.6 Hazard identification and risk assessment (HIRA)

In terms of the OHS Act, the HIRA document shall be available on site and be understood by every manager and contractor. An emergency evacuation plan shall be available for each work site.

13.7 Erosion and sedimentation control

As stipulated in Section 10.4 the Contractor shall take all reasonable measures to limit erosion and sedimentation due to the construction activities. Where erosion and/or sedimentation, whether on or off the site, occurs despite the Contractor complying with the foregoing, rectification shall be carried out in accordance with details specified by the Engineer. Where erosion and/or sedimentation occur due to the fault of the Contractor, rectification shall be carried out to the reasonable requirements of the Engineer.

Any runnels or erosion channels developed during construction or during the defects liability period shall be backfilled and compacted. Stabilisation of cleared areas to prevent and control erosion shall be actively managed. Consideration and provision shall be made for various methods, namely, brushcut packing, mulch or chip cover, straw stabilising (at a rate of one bale/ 20 m^2 and rotovated into the top 100 mm of the completed earthworks), watering, soil binders and anti-erosion compounds, mechanical cover or packing structures (e.g. Hessian cover).

Traffic and movement over stabilised areas shall be restricted and controlled, and damage to stabilised area shall be repaired and maintained to the satisfaction of the Engineer.

14 SOCIAL DEVELOPMENT

14.1 Primary health

An HIV / Aids information session will be held with each team in conjunction with an approved institution at least once every six months. There will be a minimum of one HIV / Aids peer educator per team.

Measures aimed at reducing the spread of HIV / Aids, including condoms, literature and posters, should be available to all workers.

Access of workers to local clinics should be facilitated wherever possible. Training will, where possible, include other aspects of primary health, including nutrition, reproductive health and hygiene,

14.2 World wetlands day

World Wetlands Day should be celebrated in an appropriate way by each implementer and include all project personnel

14.3 Open day

Each project will hold at least one open day per year, targeting surrounding communities, stakeholders and project partners

14.4 Active employee and contractor participation in project management

Workers will have a formalised forum through which they can make inputs into the overall management of the project (e.g. a workplace committee).

14.5 Active forums for public participation in projects (Advisory Committees)

Each project shall have a functional advisory committee, based on the guidelines provided by Working for Wetlands. Where possible and appropriate these committees shall form part of existing Working for Water advisory committees. Advisory committees shall represent all communities from which workers are drawn and in which work is being done.

Meetings will be run according to the Working for Wetlands guidelines for advisory committees. Minutes of advisory committee meetings will be made available to Working for Wetlands on request

Advisory committees will assist in the identification of potential contractors and target groups for employment. Community-based forums should participate in advisory committees in order to contribute to the prioritisation and implementation of social development activities

15 MANAGEMENT AND MONITORING

This section focuses on the systems and procedures required to ensure that the environmental specifications contained in the CEMP are effectively implemented, monitored and recorded.

15.1 Location of the construction environmental management plan

All contractors on site shall at all times have a copy of the CEMP in their respective site office (located in the construction camp).

15.2 General monitoring and reporting

The ECO and contractors on site are responsible for ensuring compliance with the CEMP. Monthly site audits shall be undertaken by the ECO and a Project Inspection Report submitted to the SANBI for review prior to the following audit. Refer to Annexure B for the Project Inspection Report.

A Compliance Audit Report shall be submitted to the DEA collating the year's completed checklists. It is the responsibility of the ECO to report any non-compliance, which is not correctly rectified to the DEA.

Interested and Affected Parties must be allowed access to the CEMP document. They have the right to monitor specific aspects of the CEMP (e.g. noise regulations, working hours stipulated) in conjunction with the contractor in a reasonable and formal manner without unreasonably disrupting construction activities. However, no member of the public shall enter the building site without prior approval from the contractor.

The contractor shall keep a record of all complaints received from the community in a complaints register and communicate them to the ECO. These complaints shall be addressed and mitigated within reason. Records relating to the compliance/non-compliance with the conditions of the CEMP as well as audits reports, shall be kept in good order and shall be made available to the DEA within seven days after a written request has been

received. It is suggested that all records be kept for at least two years following construction activities for reference purposes.

1.1.1 Fixed-point photography

Monthly fixed-point photography monitoring information shall be undertaken by the project management for each problem site.

Locating photo-points

The following guidelines should be followed when locating photographic points across the wetland system for fixed-point photographs:

- photo-points should be selected at various locations throughout the rehabilitation site and at points that will be easily accessible at all times
- record the geographical co-ordinates of each point, with a mapping grade Global Positioning System (GPS), accurate to less than 2 metres. This provides any individual with the information required to navigate to the exact location of each photo point
- a permanent field marker must be placed in the ground at each point, to ensure that photos are always taken from exactly the same point. If possible the orientation of the photo at the point should be recorded on the marker

Fixed-point photographs

The following guidelines should be followed when implementing fixed-point photography for monitoring purposes:

- the orientation of the photographer should be recorded
- use the same camera, lens and zoom each time. If this is not possible, record the settings used. The camera should preferably be located on a tripod at a fixed height
- when the frequency of monitoring increases to an annual interval, photographs should be taken at roughly the same time of year and at the same time of the day, and under similar weather conditions. This would limit the variability of the wetland habitat associated with vegetative and hydrological changes linked to seasons
- a standard object, such as a soil auger or a metre rule should be included in the photograph as a reference for scale
- record relevant information about factors that may influence features in the photograph (e.g. a recent fire, late or early rains, etc.), especially those relating to the appearance of the site

15.3 Specific roles and responsibilities

The roles of the responsible people on site are included below:

The SANBI is the ultimate responsible party for the development and all aspects and phases thereof. The SANBI or an appointed representative shall communicate all issues raised in this CEMP with all personnel undertaking any work on the site. Should any non-compliance with this CEMP take place, SANBI shall ultimately be held liable. SANBI shall include the CEMP as a specific condition within any contract that is to be signed between him/her and any other party involved in the construction of the development. The SANBI is responsible for identifying which local / provincial environmental authority has jurisdiction over the project.

The Contractor is responsible for complying with the CEMP during the construction phase of the development. The Contractor is responsible for ensuring that his/her contractors, employees and sub-contractors appointed by

him/her are familiar with the CEMP and that they abide by it. The Contractor shall be responsible for any non-compliance with the CEMP and shall pay for any remedial work that may result from non-compliance resulting directly from his/her negligence.

The ECO is responsible for communicating environmental issues associated with the site to the Contractor. Should any non-compliance with the CEMP take place, the ECO shall communicate this with the party responsible for the non-compliance as well as the Contractor and the SANBI. If the non-compliance continues after written request by the ECO to rectify the situation, the ECO must inform the DEA in writing. The ECO is responsible for the explanation of environmental issues contained in this CEMP to anyone working on the site. Should any issues arise on the site of an environmental nature or concern, the ECO shall be responsible for taking the appropriate action.

The Project Manager is responsible for communicating any issues or concerns of the surrounding community regarding the development to the SANBI PC or other responsible party and *visa-versa.*

The DEA is responsible for taking action against any non-compliance with the CEMP by the Contractor and or any of his/her subcontractors. The DEA may request a compliance audit to be undertaken on the site at any time during or after the construction phase of the project.

15.4 GUIDELINES

The following guidelines and recommended templates will be made available to all implementers:

1. Guidelines for completing Working for Wetlands business plans and project implementation plans
2. Working for Wetlands risk assessment framework
3. Project management tools:
    - Daily attendance register
    - Vehic1e check sheet
    - Production sheet
    - Project manager's inspection sheet
    - Implementer's inspection sheet
    - Incident report for near misses
    - Format for toolbox talk minutes
    - Receipt of goods
    - Consumables used sheet
    - Pay sheet
    - Personnel update sheet
    - Contractor's invoice
    - Filing of information
    - Safety plan and emergency numbers
    - Tender document
    - Contractor safety policy
    - Risk assessment

- Registration form for Compensation for Occupational Injuries and Diseases Act
- OHS Act notification of construction work
- Construction supervisor appointment letter
- Health and safety construction representative appointment letter
- First aid officer appointment letter
- First aid kit contents
- Training matrix
- Record of completed training
- Grievance procedure and grievance form
- PPE matrix
- Record of PPE issued
- Disciplinary procedure
- Contractor and worker contracts

Annexure A

BASIC CONDITIONS OF EMPLOYMENT ACT, 1997: CODE OF GOOD PRACTICE FOR EMPLOYMENT AND CONDITIONS OF WORK FOR SPECIAL PUBLIC WORKS PROGRAMMES

GOVERNMENT NOTICES

DEPARTMENT OF LABOUR

No. R. 63
25 January 2002

BASIC CONDITIONS OF EMPLOYMENT ACT, 1997: MINISTERIAL DETERMINATION SPECIAL PUBLIC WORKS PROGRAMMES

I, Membathisi Mphumzi Shepherd Mdladlana, Minister of Labour, hereby in teens of section 50 of the Basic Conditions of Employment Act, 1997, make a Ministerial Determination establishing conditions of employment for employees in Special Public Works Programmes, South Africa, in the Schedule hereto and determine the second Monday after the date of publication of this notice as the date from which the provisions of the said Ministerial Determination shall become binding.

M.M.S. MDLADLANA
Minister of Labour

SCHEDULE

MINISTERIAL DETERMINATION NO: 3: SPECIAL PUBLIC WORKS PROGRAMMES

Index

1. Definitions

1.1 In this determination -

"special public works programme" means a programme to provide public assets through a short-term, non-permanent, labour intensive programme initiated by government and funded from public resources.

1.2 Without limiting subsection (1), the following programmes constitute special public works programmes:

(a) Working for Water

(b) Community based public works

(c) Coastal Care

(d) Sustainable Rural Development (DPLG)

(e) Landcare

(f) Community Water & Sanitation

(g) Arts & Culture poverty relief projects

2. Application

This Determination applies to all employers and employees engaged in public works programmes.

3. The following provisions of the Basic Conditions of Employment Act do not apply to public works programmes -

3.1 Section 10(2)	**Overtime rate**
3.2 Section 11	**Compressed working week**
3.3 Section 14(3)	**Remuneration required for meal intervals of longer than 75 minutes**
3.4 Section 16	**Pay for work on Sundays**
3.5 Section 17(1) & (2)	**Payment of night shift allowance and supply of transportation**
3.6 Section 20	**Annual leave**
3.7 Section 21	**Pay for annual leave**
3.8 Section 22	**Sick leave**
3.9 Section 25(2) & (3)	**Commencement of maternity leave and return to work**
3.10 Section 26(2)	**Alternative work for pregnant women**
3.11 Section 27	**Family responsibility leave**
3.12 Section 29(h) to (p)	**Written particulars of employment**
3.13 Section 30	**Display of employee's rights**
3.14 Section 33(1)(g)	**Information about remuneration**
3.15 Section 34(1)(a)	**Deduction by individual agreement**
3.16 Section 34(2) & (3)	**Deduction of damages caused by employee**
3.17 Section 37	**Notice of termination**
3.18 Section 38	**Payment instead of notice**
3.19 Section 39	**Notice for employees in employer supplied accommodation**
3.20 Section 40	**Payments of outstanding amounts on**

termination

3.21 Section 41 **Severance pay**

3.22 Section 42(c) **Certificate of service**

3.23 Sections 51 - 58 **Sectoral Determinations**

3.24 Section 84 **Duration of employment**

4. Conditions

As set out in the ANNEXURE:

ANNEXURE

CONDITIONS OF EMPLOYMENT FOR SPECIAL PUBLIC WORKS PROGRAMMES

1. Introduction

1.1 This document contains the standard terms and conditions for workers employed in elementary occupations on a Special Public Works Programme (SPWP). These terms and conditions do NOT apply to persons employed in the supervision and management of a SPWP.

1.2 In this document -

(a) "department" means any department of the State, implementing agent or contractor;

(b) "employer" means any department, implementing agency-or contractor that hires workers to work in elementary occupations on a SPWP;

(c) "worker" means any person working in an elementary occupation on a SPWP;

(d) "elementary occupation" means any occupation involving unskilled or semi-skilled work;

(e) "management" means any person employed by a department or implementing agency to administer or execute an SPWP;

(f) "task" means a fixed quantity of work;

(g) "task-based work" means work in which a worker is paid a fixed rate for performing a task;

(h) "task-rated worker" means a worker paid- on the basis of the number of tasks completed;

(i) "time-rated worker" means a worker paid on the basis of the length of time worked.

2. Terms of Work

2.1 Workers on a SPWP are employed on a temporary basis:

2.2 A worker may NOT be employed for longer than 24 months in any five-year cycle on a SPWP.

2.3 Employment on a SPWP does not qualify as employment as a contributor for the purposes of the Unemployment Insurance Act 30 of 1966.

3. Normal Hours of Work

3.1 An employer may not set tasks or hours of work that require a worker to work

(a) more than forty hours in any week;

(b) on more than five days in any week; and

(c) for more than eight hours on any day.

3.2 An employer and worker may agree that a worker will work four days per week. The worker may then work up to ten hours per day.

3.3 A task-rated worker may not work more than a total of 55 hours in any week to complete the tasks allocated (based on a 40-hour week) to that worker.

4. Meal Breaks

4.1 A worker may not work for more than five hours without taking a meal break of at least thirty minutes duration.

4.2 An employer and worker may agree on longer meal breaks.

4.3 A worker may not work during a meal break. However, an employer may require a worker to perform duties during a meal break if those duties cannot be left unattended and cannot be performed by another worker. An employer must take reasonable steps to ensure that a worker is relieved of his or her duties during the meal break.

4.4 A worker is not entitled to payment for the period of a meal break. However, a worker who is paid on the basis of time worked must be paid if the worker is required to work or to be available for work during the meal break.

5. Special Conditions for Security Guards

5.1 A security guard may work up to 55 hours per week and up to eleven hours per day.

5.2 A security guard who works more than ten hours per day must have a meal break of at least one hour or two breaks of at least 30 minutes each.

6. Daily Rest Period

Every worker is entitled to a daily rest period of at least eight consecutive hours. The daily rest period is measured from the time the worker ends work on one day until the time the worker starts work on the next day.

7. Weekly Rest Period

Every worker must have two days off every week. A worker may only work on their day off to perform work which must be done without delay and cannot be performed by workers during their ordinary hours of work ("emergency work").

8. Work on Sundays and Public Holidays

8.1 A worker may only work on a Sunday or public holiday to perform emergency or security work.

8.2 Work on Sundays is paid at the ordinary rate of pay.

8.3 A task-rated worker who works on a public holiday must be paid -

(a) the worker's daily task rate, if the worker works for less than four hours;

(b) double the worker's daily task rate, if the worker works for more than four hours.

8.4 A time-rated worker who works on a public holiday must be paid -

(a) the worker's daily rate of pay, if the worker works for less than four hours on the public holiday;

(b) double the worker's daily rate of pay, if the worker works for more than four hours on the public holiday.

9. Sick Leave

9.1 Only workers who work four or more days per week have the right to claim sick-pay in terms of this clause.

9.2 A worker who is unable to work on account of illness or injury is entitled to claim one day's paid sick leave for every full month that the worker has worked in terms of a contract.

9.3 A worker may accumulate a maximum of twelve days' sick leave in a year.

9.4 Accumulated sick-leave may not be transferred from one contract to another contract.

9.5 An employer must pay a task-rated worker the worker's daily task rate for a day's sick leave.

9.6 An employer must pay a time-rated worker the worker's daily rate of pay for a day's sick leave.

9.7 An employer must pay a worker sick pay on the worker's usual payday.

9.8 Before paying sick-pay, an employer may require a worker to produce a certificate stating that the worker was unable to work on account of sickness or injury if the worker is -

(a) absent from work for more than two consecutive days; or

(b) absent from work on more than two occasions in any eight-week period.

9.9 A medical certificate must be issued and signed by a medical practitioner, a qualified nurse or a clinic staff member authorised to issue medical certificates indicating the duration and reason for incapacity.

9.10 A worker is not entitled to paid sick-leave for a work-related injury or occupational disease for which the worker can claim compensation under the Compensation for Occupational Injuries and Diseases Act.

10. Maternity Leave

10.1 A worker may take up to four consecutive months' unpaid maternity leave.

10.2 A worker is not entitled to any payment or employment-related benefits during maternity leave.

10.3 A worker must give her employer reasonable notice of when she will start maternity leave and when she will return to work.

10.4 A worker is not required to take the full period of maternity leave. However, a worker may not work for four weeks before the expected date of birth of her child or for six weeks after the birth of her child, unless a medical practitioner, midwife or qualified nurse certifies that she is fit to do so.

10.5 A worker may begin maternity leave -

(a) four weeks before the expected date of birth; or

(b) on an earlier date

(i) if a medical practitioner, midwife or certified nurse certifies that it is necessary for the health of the worker or that of her unborn child; or

(ii) if agreed to between employer and worker; or

(c) on a later date, if a medical practitioner, midwife or certified

nurse has certified that the worker is able to continue to work without endangering her health.

10.6 A worker who has a miscarriage during the third trimester of pregnancy or bears a stillborn child may take maternity leave for up to six weeks after the miscarriage or stillbirth.

10.7 A worker who returns to work after maternity leave, has the right to start a new cycle of twenty-four months employment, unless the SPWP on which she was employed has ended.

11. Family responsibility leave

11.1 Workers, who work for at least four days per week, are entitled to three days paid family responsibility leave each year in the following circumstances -

(a) when the employee's child is born;

(b) when the employee's child is sick,

(c) in the event of a death of

(i) the employee's spouse or life partner;

(ii) the employee's parent, adoptive parent, grandparent, child, adopted child, grandchild or sibling.

12. Statement of Conditions

12.1 An employer must give a worker a statement containing the following details at the start of employment -

(a) the employer's name and address and the name of the SPWP;

(b) the tasks or job that the worker is to perform; and

(c) the period for which the worker is hired or, if this is not certain, the expected duration of the contract;

(d) the worker's rate of pay and how this is to be calculated;

(e) the training that the worker will receive during the SPWP.

12.2 An employer must ensure that these terms are explained in a suitable language to any employee who is unable to read the statement.

12.3 An employer must supply each worker with a copy of these conditions of employment.

13. Keeping Records

13.1 Every employer must keep a written record of at least the following -

(a) the worker's name and position;

(b) in the case of a task-rated worker, the number of tasks completed by the worker;

(c) in the case of a time-rated worker, the time worked by the worker;

(d) payments made to each worker.

13.2 The employer must keep this record for a period of at least three years after the completion of the SPWP.

14. Payment

14.1 An employer must pay all wages at least monthly in cash or by cheque or into a bank account.

14.2 A task-rated worker will only be paid for tasks that have been completed.

14.3 An employer must pay a task-rated worker within five weeks of the work being completed and the work having been approved by the manager or the contractor having submitted an invoice to the employer.

14.4 A time-rated worker will be paid at the end of each month.

14.5 Payment must be made in cash, by cheque or by direct deposit into a bank account designated by the worker.

14.6 Payment in cash or by cheque must take place

(a) at the workplace or at a place agreed to by the worker;

(b) during the worker's working hours or within fifteen minutes of the start or finish of work,

(c) in a sealed envelope which becomes the property of the worker.

14.7 An employer must give a worker the following information in writing

(a) the period for which payment is made;

(b) the numbers of tasks completed or hours worked;

(c) the worker's earnings;

(d) any money deducted from the payment;

(e) the actual amount paid to the worker.

14.8 If the worker is paid. in cash or by cheque, this information must be recorded on the envelope and the worker must acknowledge receipt of

payment by signing for it.

14.9 If a worker's employment is terminated, the employer must pay all monies owing to that worker within one month of the termination of employment.

15. Deductions

15.1 An employer may not deduct money from a worker's payment unless the deduction is required in terms of a law.

15.2 An employer must deduct and pay to the SA Revenue Services any income tax that the worker is required to pay.

15.3 An employer who deducts money from a worker's-pay for payment to another person must pay the money to that person within the time period and other requirements specified in the-agreement law, court order or arbitration award concerned.

15.4 An employer may not require or allow a worker to -

(a) repay any payment except an overpayment previously made by the employer by mistake:

(b) state that the worker received a greater amount of money than the employer actually paid to the worker; or

(c) pay the employer or any-other person for having been employed.

16. Health and Safety

16.1 Employers must take all reasonable steps to ensure that the working environment Is healthy and safe.

16.2 A worker must -

(a) work in a way that does not endanger his/her health and safety or that of any other person;

(b) obey any health and safety instruction;

(c) obey all health and safety rules of the SPWP;

(d) use any personal protective equipment or clothing issued by the employer;

(e) report any accident, near-miss incident or dangerous behaviour by another person to their employer or manager.

17. Compensation for Injuries and Diseases

17.1 It is the responsibility of the employers (other than a contractor) to arrange for all persons employed on a SPWP to be covered in terms of the Compensation for Occupational Injuries and Diseases Act, 130

of 1993.

17.2 A worker must report any work-related injury or occupational disease to their employer or manager.

17.3 The employer must report the accident or disease to the Compensation Commissioner.

17.4 An employer must pay a worker who is unable to work because of an injury caused by an accident at work 75% of their earnings for up to three months. The employer will be refunded this amount by the Compensation Commissioner. This does NOT apply to injuries caused by accidents outside the workplace such as road accidents or accidents at home.

18. Termination

18.1 The employer may terminate the employment of a worker for good cause after following a fair procedure.

18.2 A worker will not receive severance pay on termination.

18.3 A worker is not required to give notice to terminate employment. However, a worker who wishes to resign should advise the employer in advance to allow the employer to find a replacement.

18.4 A worker who is absent for more than three consecutive days without informing the employer of an intention to return to work will have terminated the contract. However, the worker may be re-engaged if a position becomes available for the balance of the 24-month period.

18.5 A worker who does not attend required training events, without good reason, will have terminated the contract. However, the worker may be re-engaged if a position becomes available for the balance of the 24-month period.

19. Certificate of Service

19.1 On termination of employment, a worker is entitled to a certificate stating

(a) the worker's full name,

(b) the name and address of the employer;

(c) the SPWP on which the worker worked;

(d) the work performed by the worker;

(e) any training received by the worker as part of the SPWP;

(f) the period for which the worker worked on the SPWP;

(g) any other information agreed on by the employer and worker.

Annexure B

Project Inspection Report

Annexure B

Project Inspection Report

Project Inspection Report

Jump to: Project Contact Person Conducting Inspection Reference Forms Used People Spoken To Financial Checks Fixed Assets Registers Progress: Deliverables Project Management Health and Safety Environmental Management Risk Management General Key Inspection Dates Problems and Proposed Solutions Author Details

dd/mm/yyyy

Valid date of report:

Project Manager	SANBI Ref No	
Project	Project Inspection Report	1

Project Name

Project Period / Description

System Ref No:

Estimated Duration

	dd/mm/yyyy		dd/mm/yyyy		
Start Date		Completion Date		Estimated Duration:	

Note:*This Period will be used to generate the Cash Flow.*

Project Description (What are you going to do)

Project Group (Office Use Only)

Main Wetland

Province

District Municipality
Local Municipality

Wetland Name	Indicate if this wetland was visited during this inspection (Y/N)

Project Contact

PROJECT MANAGER			
Contact Organization			
Contact Person			
Title: Surname:		Initials:	Position

PM Organization Address			
Physical Address		**Postal Address** (if different from Physical)	
Email Address		Fax	
		Tel (Office)	

PM Person's Address			
Physical Address		**Postal Address** (if different from Physical)	
Email Address		Fax	
Cellular		Tel (Office)	

Person Conducting Inspection

Name and Contact			
Department / Firm / Organisation			
Contact Person			
Title: Surname:		Initials:	Position

Address			
Email Address			
Cellular		Tel (Office)	

Reference Forms Used

Date of Project Implementation Plan used	
Date	

Date of Project Progress Report used	
Date	

Remember to take copies of e.g. Business Plan, Cash Flow / Expenditure reports, Procurement procedures, previous Inspection Report

People Spoken To

List people spoken to, contact details and subjects discussed

Financial Checks

Is the expenditure according to cash flow?	Y/N	
Does the expenditure seem in line with milestones reached?	Y/N	
If response is no, describe actions to ensure compliance (within 14 days)		
Comment		

Fixed Assets

Are there or will there be fixed assets on this project?	Y/N	
Is the asset register available?	Yes / No / N/A	
Are assets registered in the name of the owning agency?	Yes / No / N/A	
Are assets kept safely when not in use?	Yes / No / N/A	
If response is no, describe actions to ensure compliance (within 14 days)		
Comment		

Registers

a. Wage Registers		
Does the project keep a wage register, worker's timesheets and proof of payment?	Y/N	
Are the wage registers, worker's timesheets and proof of payments up to date?	Y/N	
Are they keeping track of Women/Youth/Disabled/Local?	Y/N	
Are the workers present reflected in today's register?	Y/N	
What is the total person-days reflected in the Wage Register?		
Person-days		
What is the minimum daily wage reflected in the Wage Register?		
Minimum daily wage		
Does this information tally with the Progress Report?	Y/N	
Does expenditure on wages correspond with the number of person days reported?	Y/N	
If response is no, describe actions to ensure compliance (within 14 days)		
Comment		
b. Training Registers		
Does the project have a Training Register?	Y/N	

Is the Training Register up to date?	Y/N	
Does this information tally with the Progress Report?	Y/N	
Have induction, H&S and first aid training been completed?	Y/N	
Does expenditure on training correspond with the no. of training days reported?	Y/N	
Comment on Training (including accreditation)		
Comment		
If response is no, describe actions to ensure compliance (within 14 days)		
Comment		
c. SMME		
Are they keeping records of SMME's used?	Y/N	
How many SMME's are on record?		
Number of SMMEs on record		
How many SMME's are being used at present?		
Number currently being used		
Does this information tally with the Progress Report?	Y/N	
If response is no, describe actions to ensure compliance (within 14 days)		
Comment		

Progress: Deliverables

"In Compliance" means "Are the Deliverables in Compliance with the Rehabilitation Plan?"

Deliverable	Intervention Number	Description	% Complete	In Compliance Y/N

Is progress against Deliverables OK?	Y/N	
Do deliverables reported in the Project Progress Report correspond with actuals?	Y/N	
If response is no, describe actions to ensure compliance (within 14 days) Comment		

Project Management

a. Project Advisory Committee		
Is there a formally constituted and active Project Advisory Committee?	Y/N	
What was the date of the last meeting of the Project Advisory Committee? dd/mm/yyyy		
Does composition of PAC comply with Best Management Practices?	Y/N	
Are there proper minutes of Project Advisory Committee meetings?	Y/N	

If response is no, describe actions to ensure compliance (within 14 days)
Comment

b. Project Implementation Plan

Is the project achieving the intent of the Project Implementation Plan?	Y/N	

Are monthly Progress and Financial Reports being submitted? If not, why not?	Y/N	

If response is no, describe actions to ensure compliance (within 14 days)
Comment

c. Communication and Marketing

Has communication with other stakeholders happened?
Comment

Is signage in place?	Is signage in place?	

If response is no, describe actions to ensure compliance (within 14 days)
Comment

Health and Safety

Is there a First Aid box present?	Y/N	

Is there a First Aid person present?	Y/N	
Are workers wearing the required personal protective equipment?	Y/N	
Are records of near misses / incidents kept?	Y/N	
Are there proper minutes of H & S meetings?	Y/N	
Are Toolbox Talks happening?	Y/N	
General comment on Health and Safety Comment		
Are workers wearing Working for Wetlands t-shirts?	Y/N	
If response is no, describe actions to ensure compliance (within 14 days) Comment		

Environmental Management

Has an environmental training course in compliance with the CEMP been undertaken within seven days of the commencement date of construction?	Y/N	
When:		
As part of site establishment, has the working area been clearly defined with danger tape or other clearly visible markers?	Y/N	
Has the topsoil (up to 30 cm) been cleared from site and stored separately? If not, why?	Y/N	
Comment:		
Are no-go areas being adhered to?	Y/N	
If response is no, describe actions to ensure compliance (within 14 days)		
Comment		
If the wetland is a peat wetland, are the specific requirements pertaining to working within peat areas being implemented and enforced?	Y/N/ N/A	
If response is no, describe actions to ensure compliance:		
Comment		

Does the project have effective sanitation arrangements?	Y/N
If response is no, describe actions to ensure compliance:	
Comment	
Have the following issues been addressed in compliance with the CEMP?	
• Contractor's camp in compliance with the site plan?	Y/N
• All stores and materials stockpiled adequately/ secured?	Y/N
• Waste Bins and other waste storage receptacles in place?	Y/N

• Fuel storage and management?	Y/N
• Hazardous material management?	Y/N
• Dust management?	Y/N
• Stormwater and erosion protection?	Y/N
• Batching facilities lined and runoff contained?	Y/N

Is on-site rehabilitation effective?	Y/N	

If response is no, describe actions to ensure compliance (within 14 days)		
Comment		
Has revegetation been undertaken, especially in exposed and unstable areas?	Y/N	
If response is no, describe actions to ensure compliance:		
General comments on environmental management and CEMP compliance:		
Comment		

Risk Management

Is fire fighting equipment present and in working order?	Y/N	
Are there adequate facilities for storage of materials and equipment?	Y/N	
If response is no, describe actions to ensure compliance (within 14 days)		
Comment		

General

a. Transport		
How many contractor's vehicles are there on site?	Number	
How many project vehicles are there on site?	Number	
Do vehicles comply with the Best Management Practices standards and CEMP requirements?	Y/N	
If response is no, describe actions to ensure compliance (within 14 days) Comment		

b. Comments		
Does the Quality of Work appear acceptable? Substantiate your answer	Y/N	
Is the work in compliance with Best Management Practices?	Y/N	
If response is no, describe actions to ensure compliance (within 14 days) Comment		

Key Inspection Dates

Effective Date of this Inspection	
Effective Date	

Target Date for next Inspection	
Target Date (dd/mm/yy)	

Problems and Proposed Solutions

Categories: Financial Checks, Assets, Progress, Special Conditions, Management, General

Problem and Proposed Solution	Category	Initial Target Date	Revised / Actual Date	% Progress

Please take photos and email to HO with date, location and title

Author Details

Person completing this form

Department / Firm / Organization

Contact Person

Title: Surname: Initials: Position

Address			
Email Address		Fax	
Cellular		Tel (Office)	

APPENDIX G – NATIONAL STAKEHOLDERS

TITLE	INITIAL/NAME	SURNAME	ORGANISATION
NATIONAL			
Ms	Jackie	Jay	Department of Water Affairs
Mr	David	Kleyn	Department of Agriculture Forestry & Fisheries
Mr	Christo	Marais	Department of Water Affairs
Ms	Kerryn	Morrison	Endangered Wildlife Trust
Ms	Naomi	Fourie	Department of Water Affairs
Ms	Valerie	du Plessis	Department of Water Affairs
Mr	Guy	Preston	Department of Water Affairs
Ms	Fulufhelo	Mafelatshuma	Department of Water Affairs : RQS
Ms	Wilma	Lutsch	Department of Environmental Affairs
Mr	Bonani	Madikizela	Water Research Commission
Mr	Tambubzani	Mulaudzi	Department of Environmental Affairs: Directorate: Sensitive Environments
Ms	Linda	Poll-Jonker	Department of Environmental Affairs

APPENDIX H – PROVINCIAL STAKEHOLDERS

Gauteng IBAR DatabaseP Database
November 2012

TITLE	INITIAL/NAME	SURNAME	ORGANISATION
NATIONAL AUTHORITIES			
Ms	Jackie	Jay	Department of Water Affairs
Mr	David	Kleyn	Department of Agriculture Forestry & Fisheries
Mr	Christo	Marais	Department of Water Affairs
Ms	Kerryn	Morrison	Endangered Wildlife Trust
Ms	Naomi	Fourie	Department of Water Affairs
Ms	Valerie	du Plessis	Department of Water Affairs
Mr	Guy	Preston	Department of Water Affairs
Ms	Fulufhelo	Mafelatshuma	Department of Water Affairs : RQS
Ms	Wilma	Lutsch	Department of Environmental Affairs
Mr	Bonani	Madikizela	Water Research Commission
Mr	Tambubzani	Mulaudzi	Department of Environmental Affairs: Directorate: Sensitive Environments
Ms	Linda	Poll-Jonker	Department of Environmental Affairs
PROVINCIAL AUTHORITIES			
	Nhlanhla	Makhathini	GDACE
	Florah	Mamabolo	DWA Regional Representative WMA 8
	Rens	Botha	Department of Water Affairs - Gauteng
Mr	Grant	Botha	Gauteng Provincial Heritage Resources Agency
Mr	Siyabonga	Buthelezi	GDARD
Mr	Harmen	den Dulk	GDARD
Mr	Ian	Engelbrecht	GDACE
Mr	Marius	Keet	Department of Water Affairs - Gauteng
Mr	Kelvin	Legge	Department of Water Affairs
Mr	Justice	Maluleke	DWA: Gauteng
Mr	Mike	Mokgwabone	DWA: Gauteng
Mr	Christopher	Nemalili	Department of Water Affairs
Ms	Maphata	Ramphele	Gauteng Provincial Heritage Resources Agency
Mr	Ernst	Seamark	GDACE
Mr	Ramogale	Sekwale	Department of Water Affairs
Mr	H. A.	Smit	DWA: Chief Director: Gauteng
LANDOWNERS			
	The Municipal Manager		City of Johannesburg
WORKING FOR WETLANDS			
Mr	Umesh	Bahadur	SANBI: Planning, Monitoring & Evaluation Manager
Mr	John	Dini	SANBI: Programme Manager
Mr	B huti	Dlamini	Wetland Consulting Services (Pty) Ltd
Mr	Eric	Munzhedzi	SANBI:Implementation & Aftercare Manager
Mr	Thilivhali	Nyambeni	SANBI; Provincial Coordinator
MUNICIPALITIES			
Ms	Jane	Eagle	City of Johannesburg
Mr	John	Kruger	Johannesburg City Parks
Ms	Linda	Kuhn	City of Johannesburg
Mr	Freddie	Letsoko	City of Johannesburg
Ms	Maishe	Makwela	City of Johannesburg
Mr	Simphiwe	Mbuli	City of Johannesburg
Ms	Cebo	Mhlongo	Johannesburg City Parks
Mr	Sydney	Nkosi	Johannesburg City Parks
Mr	Ralf	Bittkau	DA - Democratic Alliance
Mr	David	Dewes	DA — Democratic Alliance
	Marian	Kemp	DA - Democratic Alliance

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TITLE	INITIAL/NAME	SURNAME	ORGANISATION
	Busisiwe Sylvia	Khanyile	ANC - African National Congress
Mr	Martin	Louw	DA - Democratic Alliance
	Jackie	Matladi	DA — Democratic Alliance
	Maureen	Scheemann	ANC - African National Congress
Mr	Mike	Tonkin	DA — Democratic Alliance
WETLAND FORUM/OTHER			
Mr	Lemson	Betha	WESSA
Mr	Marc	de Fontein	Rand Water Foundation
Mr	Freddie	Letsoko	Gauteng Wetland Forum
Mr	Khayi	Mabasa	Rand Water Foundation
Mr	William	Mabota	Rand Water Foundation
	Linda	Mabuza	Working for Water: Gauteng
Mr	LC	Malan	Little Gnomes Landscaping
Ms	Karen	Marx	WESSA
Mr	Bismark	Mashau	Gauteng Wetland Forum
Mr	Terrence	Mccarthy	Wits University
Mr	Irvin	Molepo	SANBI: Walter Sisulu
Ms	Lufuno	Mugwena	Mbonelkaphanda Civils