APPENDIX 1

ABBREVIATIONS.
GLOSSARY OF TERMS.

ABBREVIATIONS.

AVHRR	Advanced Very High Resolution Radiometer
ATSR	Along Track Scanning Radiometer
CIR	Colour Infrared
DEM	Digital Elevation Model
DMSV	Digital Multi-Spectral Video
ERS	European Remote Sensing Satellite
ETM	Enhanced Thematic Mapper
GIS	Geographic Information System
GPS	Global Positioning System
IRVI	Infrared Vegetation Index
MODIS	Moderate Resolution Imaging Spectroradiometer
MAS	MODIS Airborne Simulator
MSS	Multi Spectral Scanner
NASA	National Aeronautics and Space Administration
NDVI	Normalised Difference Vegetation Index
NIR	Near Infrared
NOAA	National Oceanic and Atmospheric Administration
PCA	Principal Component Analysis
RGB	True colour
RS	Remote Sensing
SPOT	Systeme Pour L'Observation de la Terre
TC	Tasseled Cap Spectral Index
Terra MODIS	Moderate Resolution Imaging Spectroradiometer
TM	Thematic Mapper

GLOSSARY OF TERMS.

Aerobic:

Having molecular oxygen (O_2) present.

Anaerobic:

Not having molecular oxygen (O_2) resent.

Biodiversity:

The variety of life in an area, including the number of different species, the genetic wealth within each species, and the natural areas where they are found.

Bogs:

A mire (i.e. a peat accumulating wetland) that is hydrologically isolated, meaning that it is only fed by water falling directly on it as rain or snow and does not receive any water from a surrounding catchment.

Catchment:

All the land area from mountaintop to seashore, which is drained by a single river and its tributaries.

Delineation (wetland):

To determine the boundary of a wetland based on soil, vegetation, and/or hydrological indicators, usually on a map.

Estuary:

Where the river and sea meet and the fresh water from the river mixes with the seawater.

Fens:

A mire (i.e. a peat accumulating wetland) that receives some drainage from mineral soil in the surrounding catchment.

Geomorphic:

Shape or surface configuration / structure of a landscape.

Ground truthing:

To determine features by direct measurement in the field.

Groundwater:

Subsurface water in the zone in which permeable rocks, and often the overlying soil, are saturated.

Groundwater table:

The upper limit of the groundwater.

Hydrology:

A study of water, particularly the factors affecting its movement on land.

Hydrophyte:

Any plant that grows in water or in soil that is at least periodically anaerobic as a result of saturation; plants typically found in wet habitats.

Marsh:

A wetland which is seasonally or permanently flooded / ponded, with soils which remain semi-permanently or permanently saturated, and which is usually dominated by tall (usually > 1.5 m) emergent herbaceous vegetation, such as the common reed (*Phragmites australis*).

Mire:

A peat accumulating wetland, including both bogs and fens.

Monitoring:

The systematic acquisition of data on biotic and abiotic components of an ecosystem over a time range.

Mottles:

Soils with variegated colour patterns are described as being mottled, with the "background colour" referred to as the matrix and the spots or blotches of colour referred to as mottles.

Orthorectified:

Corrected to the actual geo-referenced points on the ground.

Palustrine (System):

The palustrine system groups together vegetated wetlands traditionally called marshes, swamps, bogs, fens and vleis, which are found throughout South Africa. Palustrine wetlands may be situated shoreward of river channels, lakes or estuaries; on river floodplains; in isolated catchments; or on slopes. They may also occur as islands in lakes or rivers.

Panchromatic:

Sensitive to all colours.

Peatlands:

Wetlands with very high organic matter accumulation, which is referred to as peat. Wetlands with peat soils are referred to as bogs or fens.

Rehabilitation:

Rehabilitation is used primarily to indicate improvements of a visual nature to a natural resource; putting back the natural resource into good condition or working order.

Remote sensing (RS):

A general term for techniques that are used for imaging the earth surface from an airborne or space borne sensor.

Permanently wet soil:

Soil, which is flooded or waterlogged to the soil surface throughout the year, in most years.

Resolution:

Spatial resolution of a remote sensing sensor, is an indication of how well a sensor can record spatial detail.

Restoration:

Restoration is returning a site to approximately its condition before alteration, including its predisturbance function and related physical, chemical, and biological characteristics; full restoration is the complete return of a site to its original state.

Riparian:

The area of land adjacent to a stream or river that is influenced by stream-induced or related processes. Riparian areas, which are saturated or flooded for prolonged periods, would be considered wetlands and could be described as riparian wetlands.

Runoff:

Total water yield from a catchment including surface and subsurface flow.

Seasonally wet soil:

Soil, which is flooded or waterlogged to the soil surface for extended periods (>1 month) during the wet season, but is predominantly dry during the dry season.

Sedges:

Grass-like plants belonging to the family Cyperaceae, sometimes referred to as nutgrasses. Papyrus is a member of this family.

Seep:

Wetland areas where groundwater is discharging are often referred to as seepage wetlands because they are places where the water seeps slowly out onto the soil surface.

Supervised classification:

A classification method that uses statistics based on sample training to classify an image.

Temporarily wet soil:

The soil close to the soil surface (i.e. within 40 cm) is occasionally wet for periods > 2 weeks during the wet season in most years. However, it is seldom flooded or saturated at the surface for longer than a month.

Unsupervised classification:

A classification method that involves algorithms that examine a large number of unknown pixels and divide them into a number of classes based on natural groupings.

Vlei:

A colloquial South African term for a wetland.

Wet grassland:

An area, which is usually temporarily wet and supports a mixture of plants common to non-wetland areas and hydrohytic plants (predominantly grasses).

Wetland:

Land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water and which under normal circumstances supports or would support vegetation typically adapted to life in saturated soil (Water Act 36 of 1998); land where an excess of water is the dominant factor determining the nature of the soil development and the types of plants and animals living at the soil surface.

Wet meadow:

An area, which is usually seasonally wet and dominated by hydrophytic sedges and grasses, which are common only to wetland areas.

Wetland signatures:

Contrasting colours and shades of colour or black and white that are indicative of hydric conditions associated with wetlands.

APPENDIX 2

LONGTERM AVERAGE RAINFALL DATA FOR THE WETLAND SITES.

LONGTERM AVERAGE RAINFALL DATA

Supplied by ISCW, Agromet section.

KROMME

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
51.2	49.9	59.6	57.8	53.8	52.3	54.3	68.4	59.4	68.7	64.4	53.8	693.7

MBONGOLWANE

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
138.5	134.5	110.8	57.6	40.4	25.1	25.7	38.2	70.3	106.3	124.6	126.6	998.6

WILGE

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
136.05	123.3	98.9	46.7	22.3	10.1	10.1	21.2	37.6	80.6	102.8	119.3	809.1

SEEKOEIVLEI

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
136.9	119.6	81.1	40.9	18	9	8.8	16.3	36.7	85.9	109.4	125.7	788.6

ZOAR

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
141.6	110.7	86.9	45.6	18.3	10.4	8.8	13.9	35.2	93.8	126.4	144.1	835.8

RIETVLEI

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
122.9	102.5	84.5	38.9	18	6.7	6.2	8.7	20.3	46.3	110.5	115.5	680.6

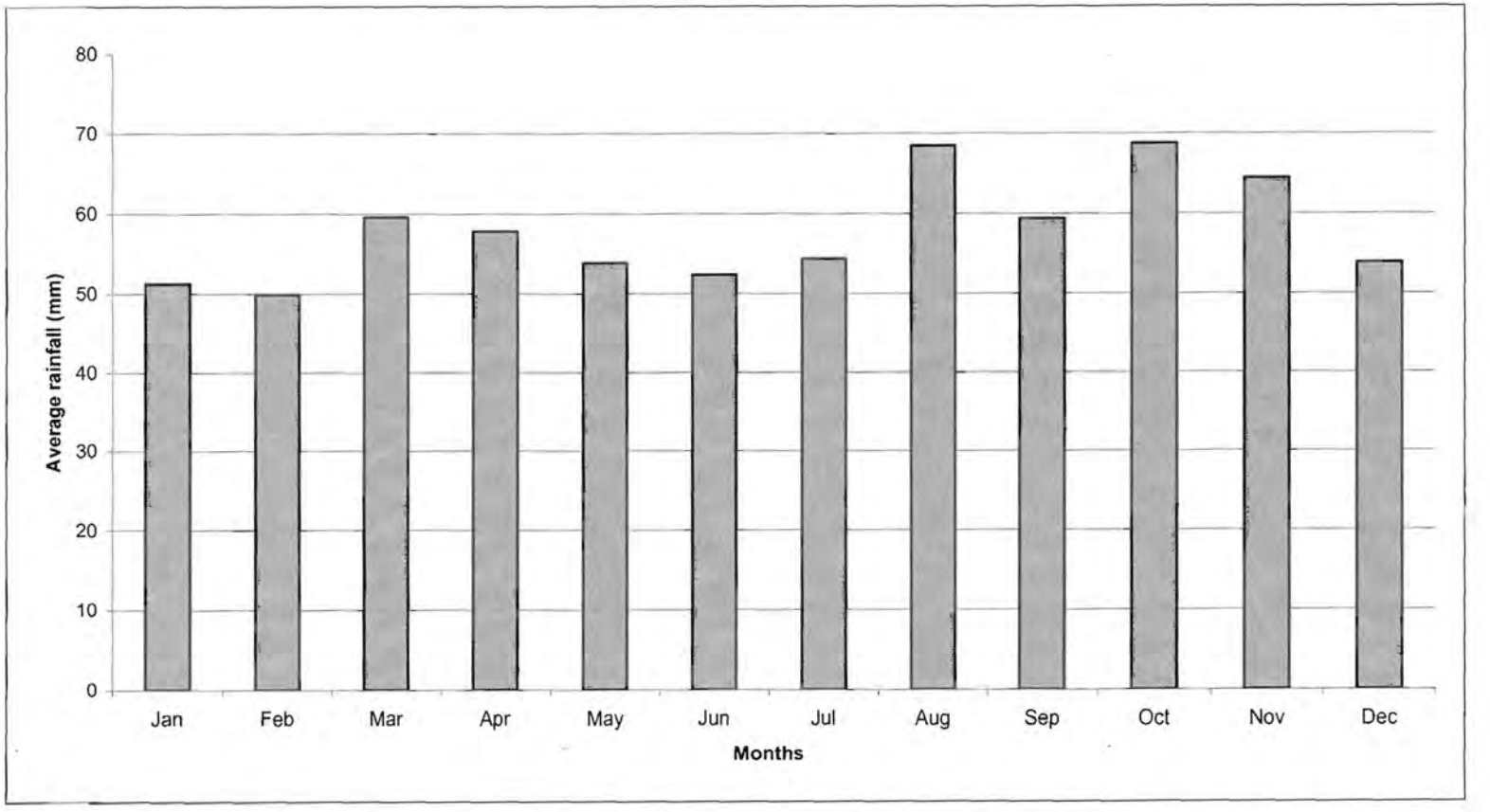

Figure a: Longterm average rainfall data in the Kromme River Wetland area indicate that the maximum rainfall occurs in August, October and November.

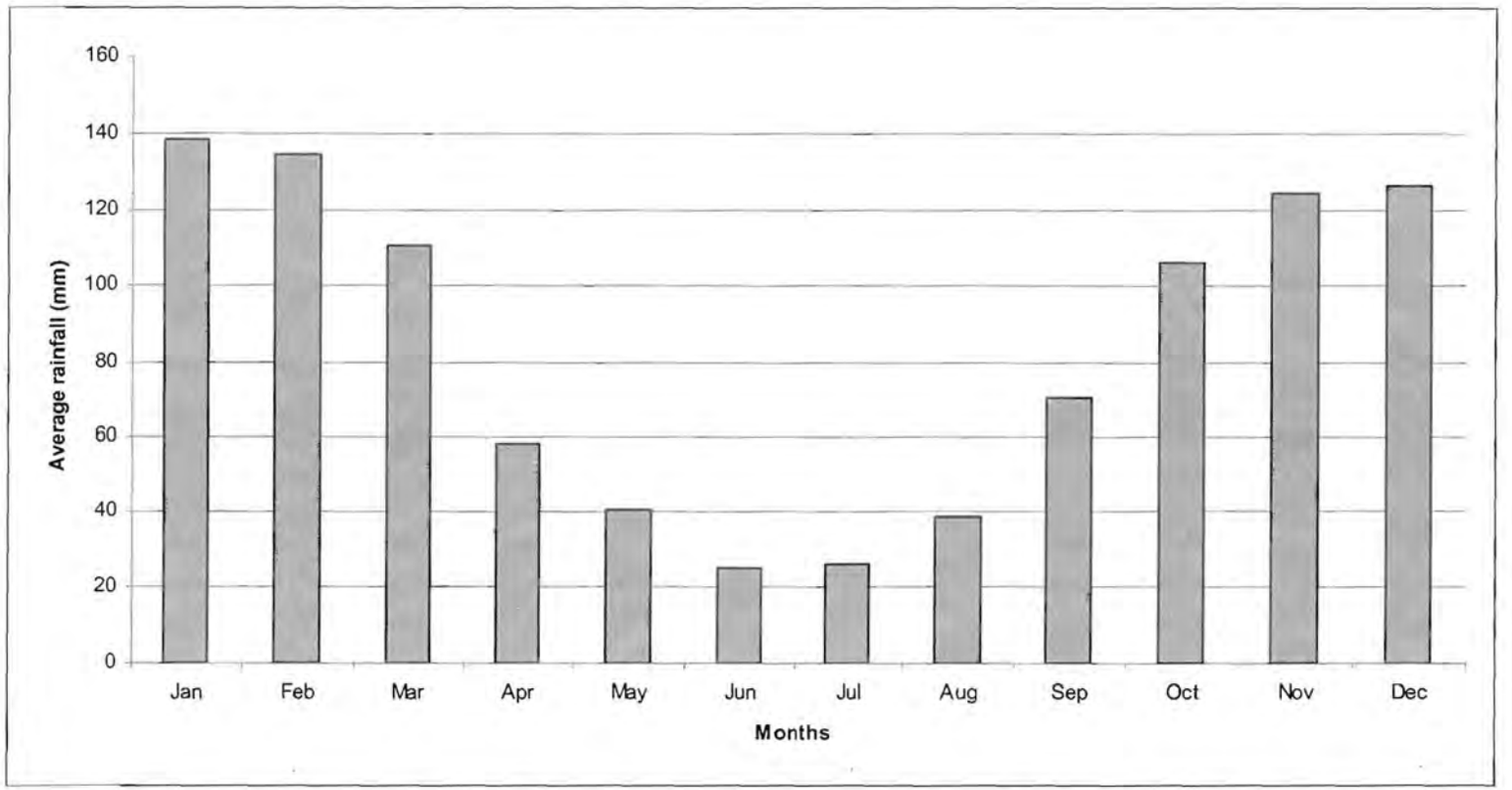

Figure b: Longterm average rainfall data in the Mbongolwane Wetland area indicate that the maximum rainfall occurs in December, January and February.

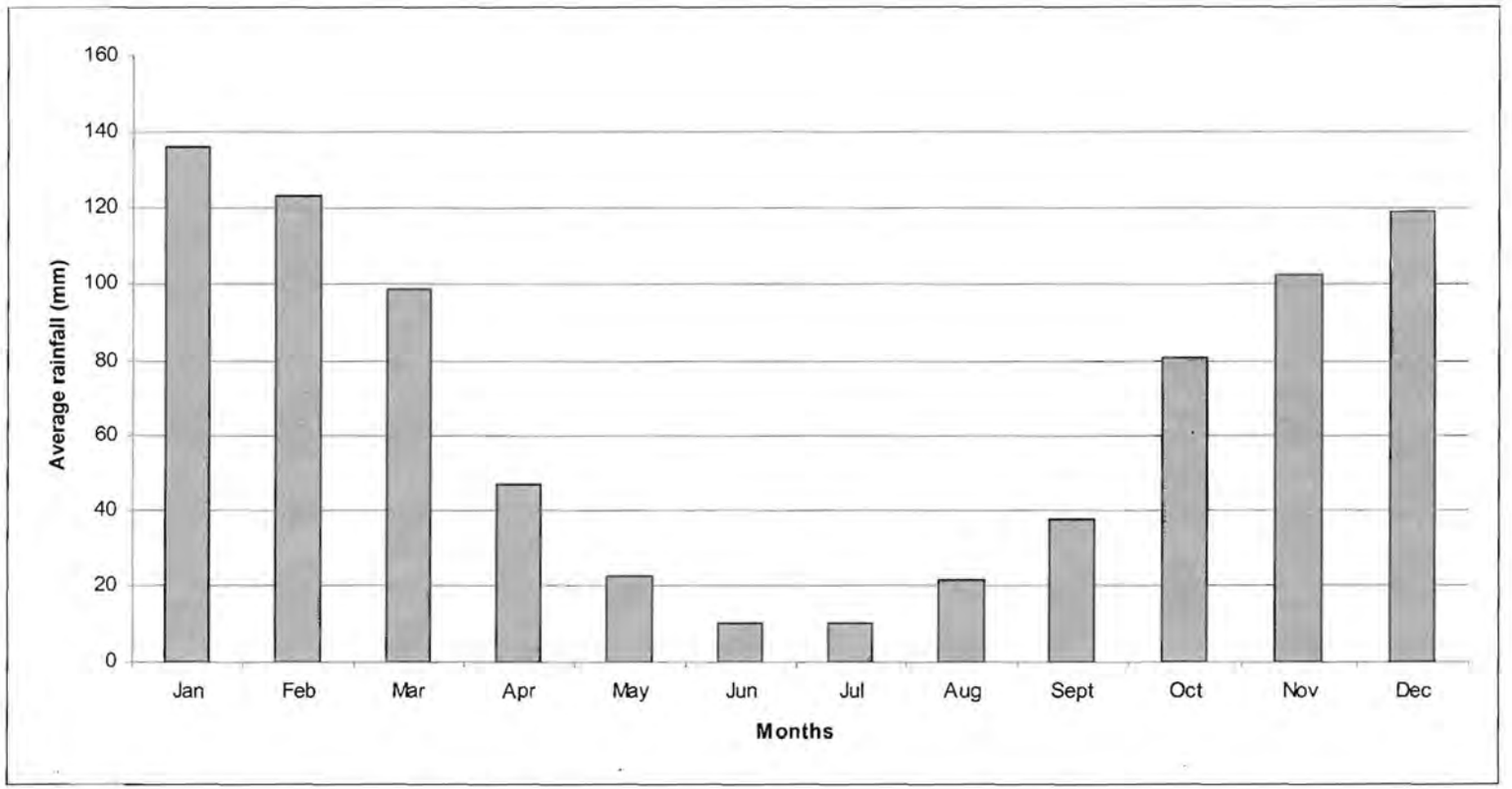

Figure c: Longterm average rainfall data in the Wilge River Wetland area indicate that the maximum rainfall occurs in December, January and February.

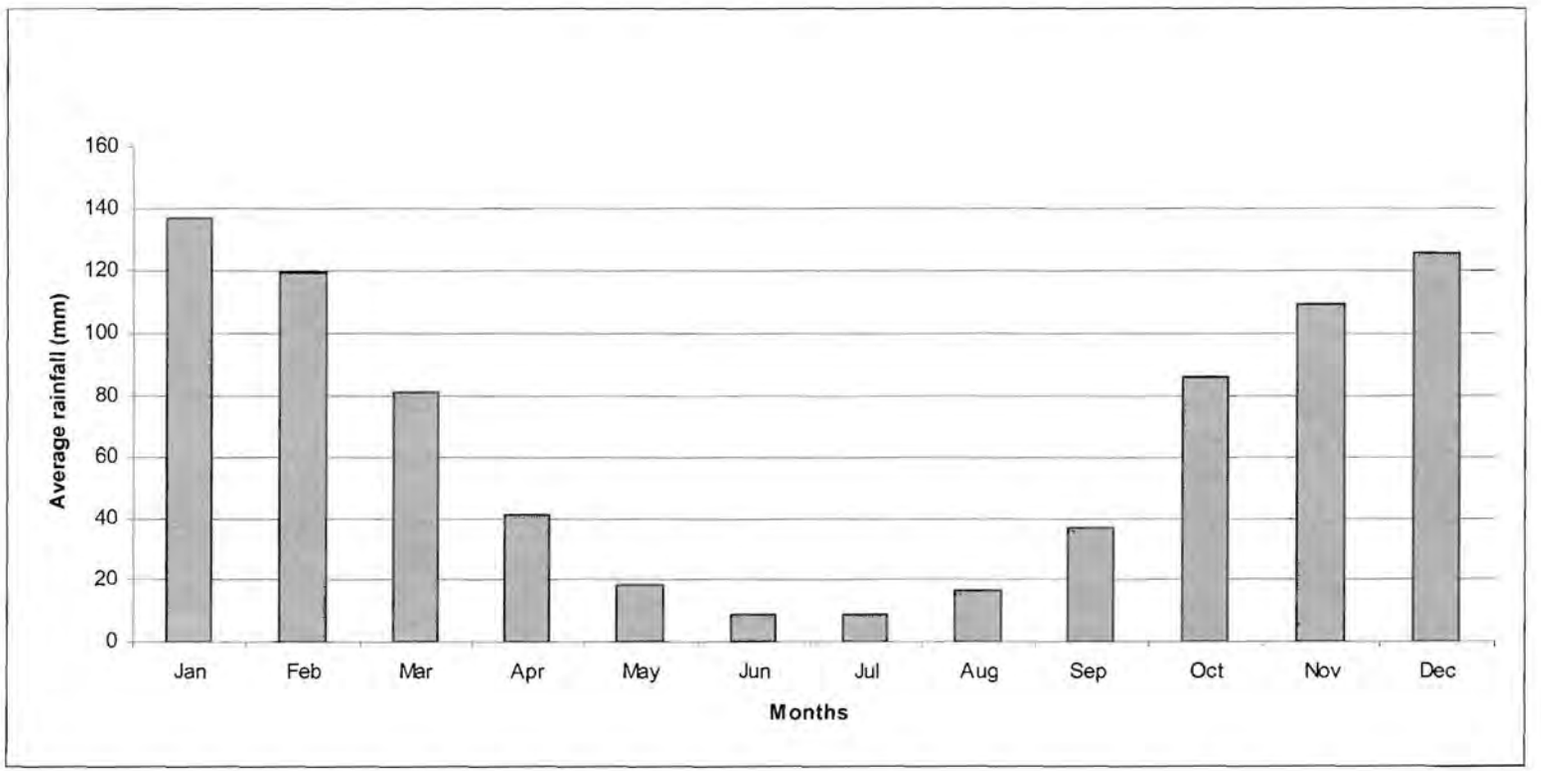

Figure d: Longterm average rainfall data in the Seekoeivlei Wetland area indicate that the maximum rainfall occurs in December, January and February.

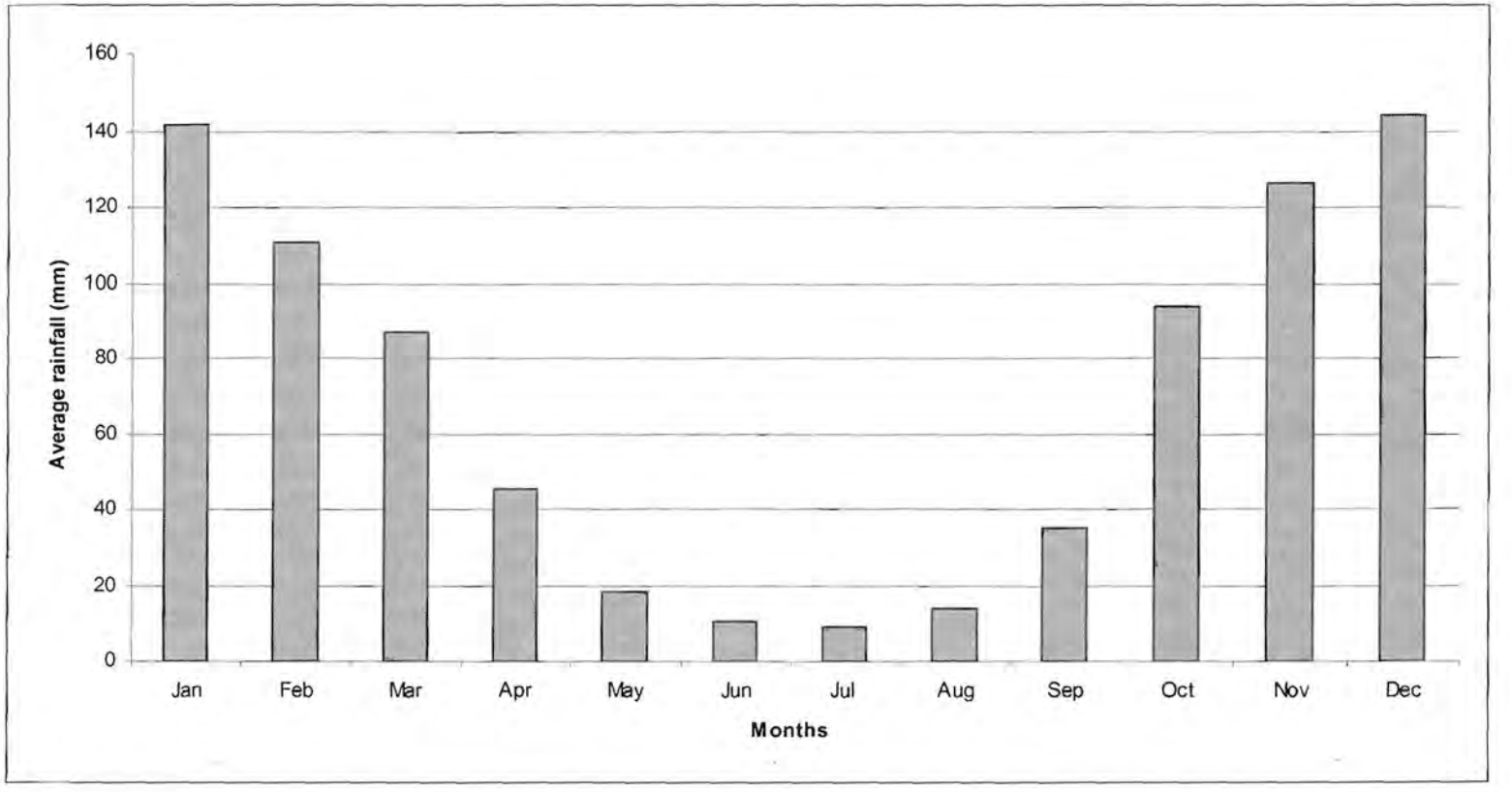

Figure e: Longterm average rainfall data in the Zoar Wetland area indicate that the maximum rainfall occurs in November, December and January.

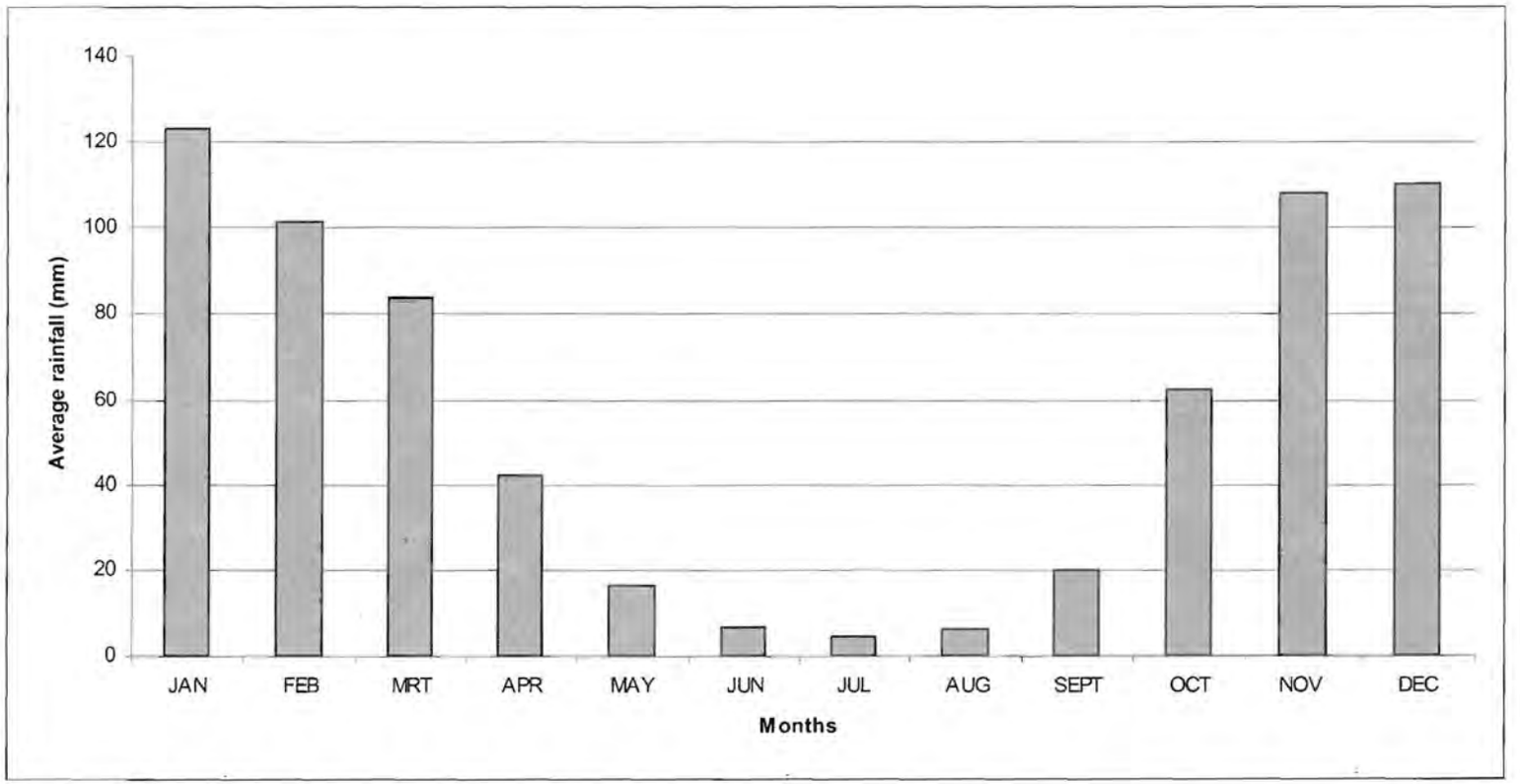

Figure f: Longterm average rainfall data in the Rietvlei Wetland area indicate that the maximum rainfall occurs in November, December and January.

APPENDIX 3

REHABILITATION MEASURES.

Rehabilitation measures applicable to the study.

(From notes prepared by Mr. Bill Russel (Haigh, 2002).

1. **Earth structures.**
   - **Earth plugs.**
     This method is to plug the gully or drain with soil plugs, thereby diverting concentrated water into the wetland. To prevent the runoff water to side-cut the gully / drain, the plugs have to be sited fairly close together in order to keep the water level in the gully / drain fairly high (Figure 1).

Figure 1: Water ponding behind clay plugs at the Zoar wetland after heavy rain. Photo: David Lindley.

- **Grass bales (Figure 2).**
  Cheap and effective way to stop erosion at low energy levels.

Figure 2: Grass bales used at the Rietvlei wetland.

- **Slope donga / gully sides (Figure 3 & 4)**
  Donga / gully sides need to be sloped and vegetated to halt lateral erosion by lowering the energy levels of the water (Haigh, 2002).

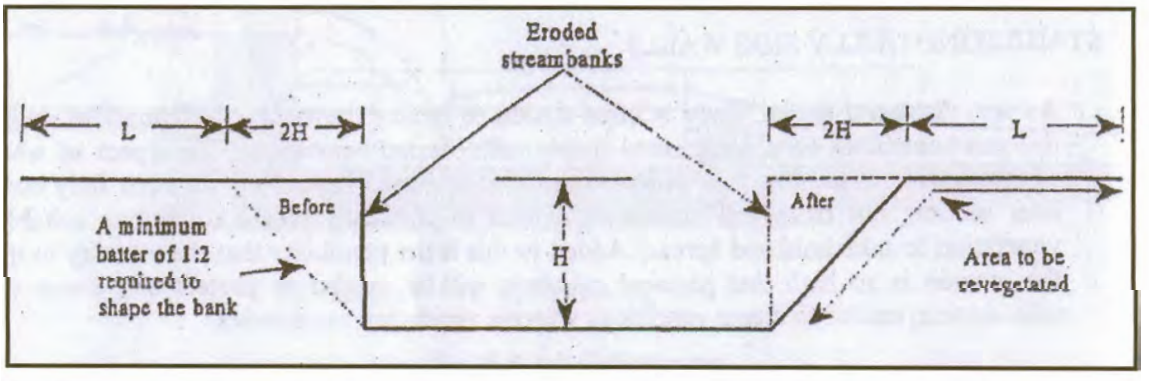

Figure 3: Sketch indicating the sloping of the donga sides and the area to be revegetated (Haigh, 2002).

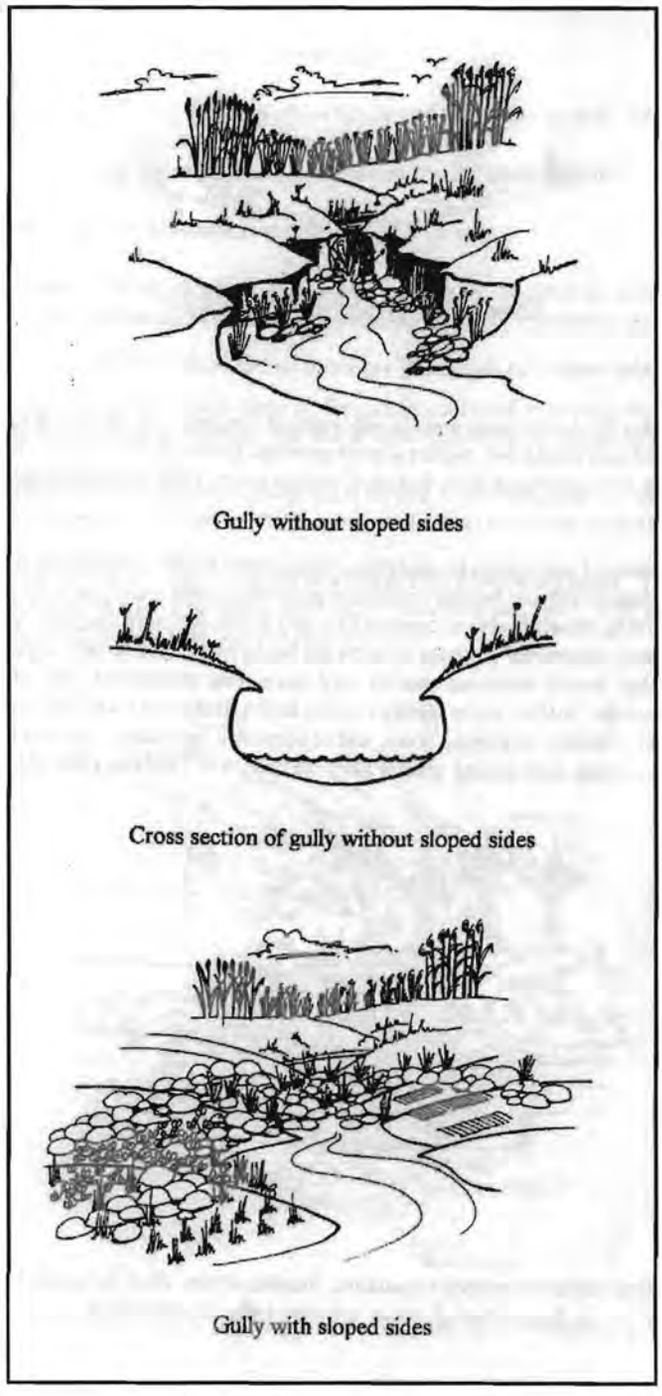

Figure 4: Sloping sides of a gully (Haigh, 2002).

- **Earthen embankment (Soil berm) (Figure 5).**

The roll of an earthen embankment is to:

1) Ensure that the floodwaters are forced through a constructed spillway;
2) Cut off floodwaters from large areas of the wetland and cause changes in its functioning unless special provision is made downstream.

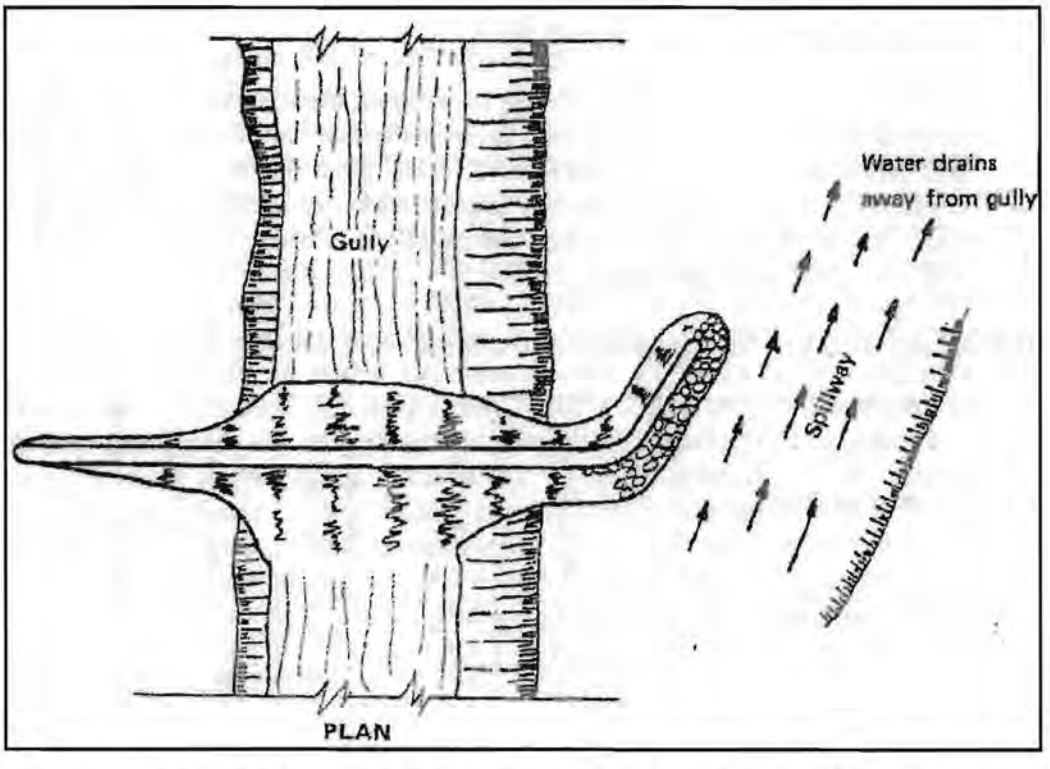

Figure 5: Earthen embankment diverting floodwaters (Haigh, 2002).

2. **Gabion structures (Figure 6 & 7).**
   - **gabion / reno energy dissipaters.**
     Gully control structures that keep floodwaters within the confines of the watercourse are required to cause both the deposition of sediment upstream and also to slow down the velocity of floodwaters downstream (Haigh, 2002).

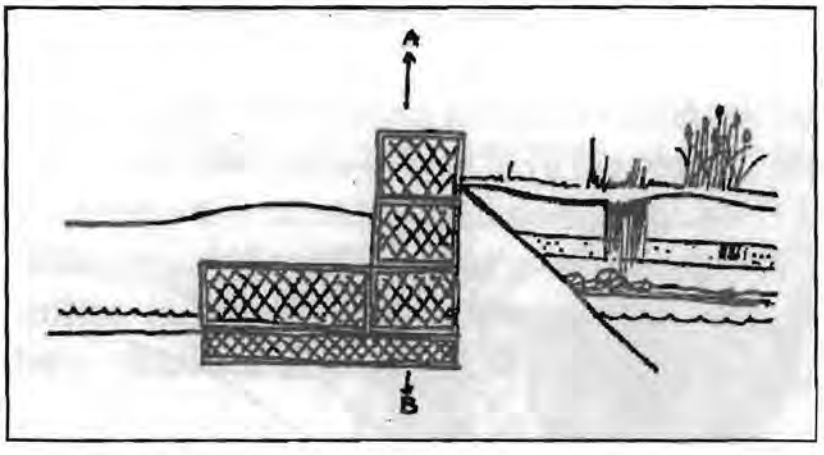

Figure 6: Cross section of recently constructed gabion structure (Haigh, 2002).

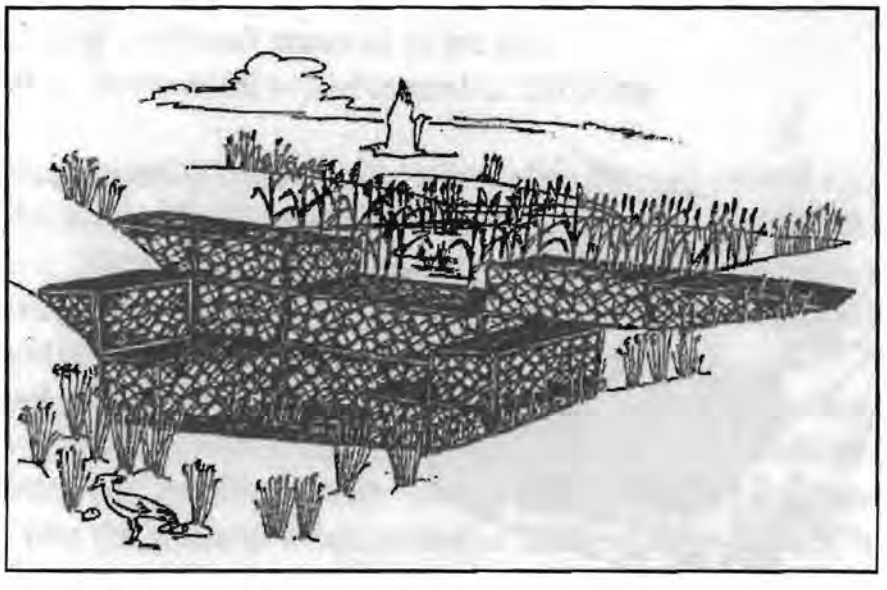

Figure 7: Suitably vegetated gabion structure (Haigh, 2002).

3. **Concrete structures.**
   - **Chute (Figure 8).**
     Chute structures may be defined as open canals with a steep slope (1:5 to 1:3) in which high energy water flows through a constructed spillway at super critical speed. They are used in areas where runoff has to enter a gully bed at a head- or side cut or as a spillway for an earthen dam (Haigh, 2002).

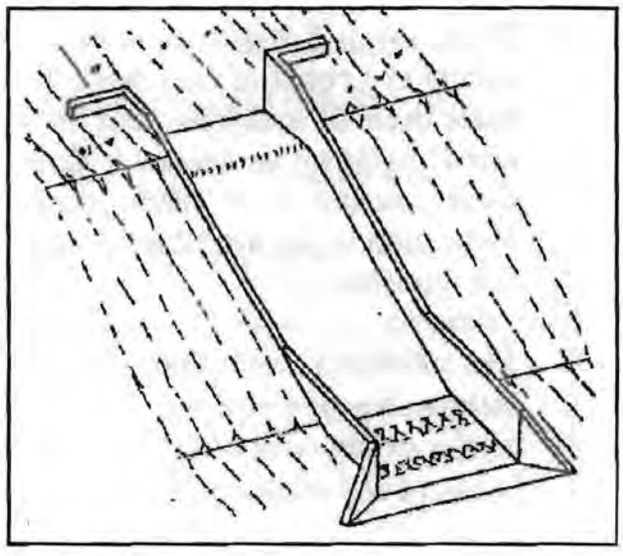

Figure 8: Chute design (Haigh, 2002).

   - **Groyne (Figure 9).**
     Stabilizing river and gully side-walls. Material that can be used:
     1. Sandbags
     2. Concrete

Figure 9: Groynes (Haigh, 2002).

- **Geo-cell (Figure 10 and 11).**
  Lining materials such as rubber compound tyres, rock-filled wire mattresses, gabion baskets or concrete cellular mattresses such as Geocell (Hyson cell), Armalite or inter-locking blocks could be considered if there is a concern that the topsoil and plantings will be washed away (Haigh, 2002).

Figure 10: Geocell lining at the Wilge wetland structure.

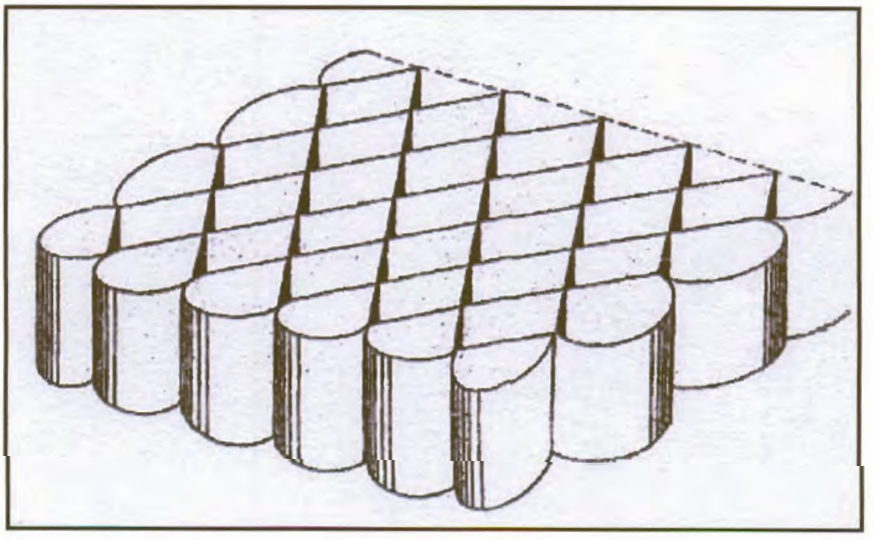

Figure 11: Sketch of Geocell (Hyson-cell) lining (Haigh, 2002).

- **Buttress weir (Figure 12).**
  These structures are made entirely of poured concrete and therefore need strong, durable rock slab foundation material on which to bond and greater skill in the construction (Haigh, 2002).

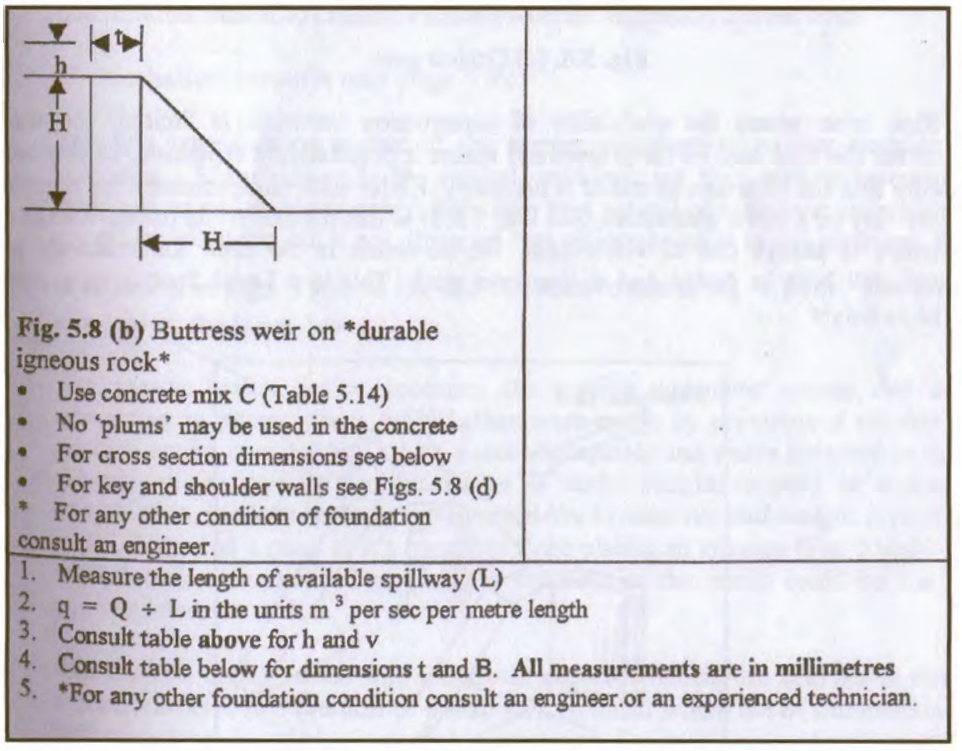

Fig. 5.8 (b) Buttress weir on *durable igneous rock*

- Use concrete mix C (Table 5.14)
- No 'plums' may be used in the concrete
- For cross section dimensions see below
- For key and shoulder walls see Figs. 5.8 (d)

* For any other condition of foundation consult an engineer.

1. Measure the length of available spillway (L)
2. q = Q ÷ L in the units m^3 per sec per metre length
3. Consult table **above** for h and v
4. Consult table below for dimensions t and B. **All measurements are in millimetres**
5. *For any other foundation condition consult an engineer.or an experienced technician.

Figure 12: Buttress weir design (Haigh, 2002).

4. **Revegetation of desiccated areas (Figure 13 & 14).**
Wetland vegetation is generally good at controlling erosion by reducing wave and current energy; binding and stabilizing the soil; and recovers rapidly from flood damage (Kotze, 2000).

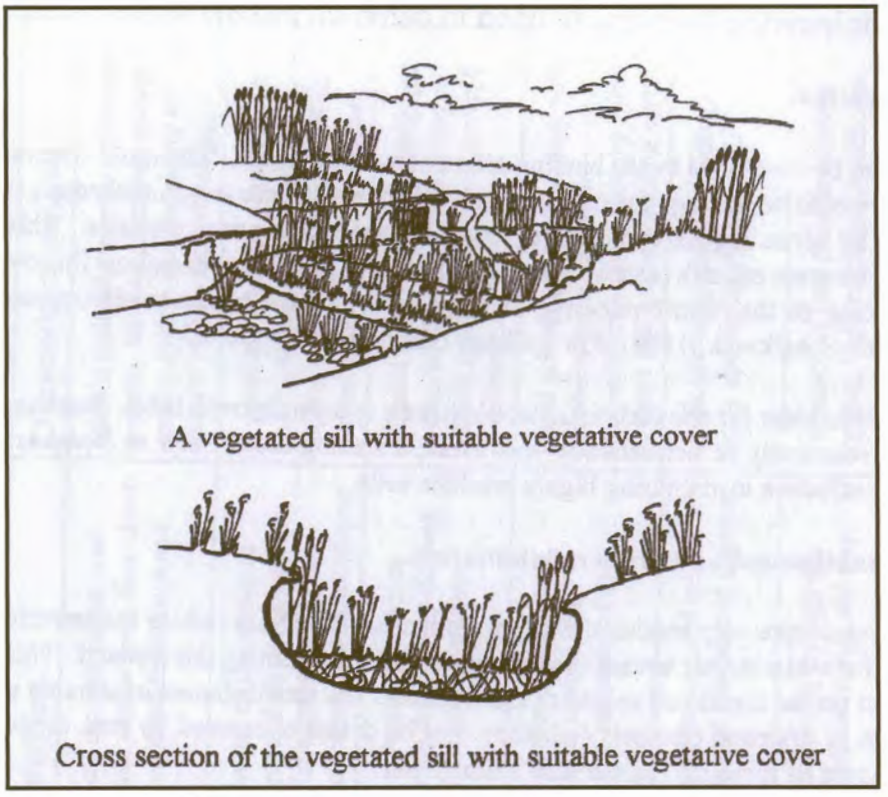

Figure 13: Sketch illustrating bioengineering (Haigh, 2002).

Figure 14: Bioengineering at the Wilge wetland structure.

APPENDIX 4

FIELD VISIT AND PROGRESS REPORT.

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

THE EVALUATION OF VARIOUS REMOTE SENSING SYSTEMS FOR USE IN THE AUDITING AND MONITORING OF REHABILITATED WETLANDS IN FIVE STUDY AREAS

FIELD VISIT- AND PROGRESS REPORT

(June - September 2002)

Compiled for Department of Agriculture:
Directorate Land and Resources Management

By

The Agricultural Research
Council: Institute for Soil, Water and Climate

And

Ihlaphosi Enviro Services cc

ARC • LNR

Report No: GW/A/2002/128

Project Leader: Chris Kaempffer

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1) INTRODUCTION.

Working for Wetlands (WfWetlands) is a public private partnership between the Working for Water Programme, the Departments of Environmental Affairs and Tourism; National Department of Agriculture and the Mondi Wetland Project (an NGO). The core function of WfWetlands is to rehabilitate wetlands with the added benefits of poverty alleviation and creating wetland awareness. WfWetlands is the only major wetland initiative presently active in South Africa and it is important to measure and assure its success. This project is an ideal platform to evaluation various appropriate remote sensing systems on rehabilitated wetlands to test whether they could be used as management tools in the auditing and monitoring processes.

2) RESEARCH OBJECTIVES.

a) Identify various indicators that can be used to audit and monitor the impacts of rehabilitation in wetlands.
b) The evaluation of high resolution remotely sensed data such as DMSV (Near infrared), EROS, Kodak DCS 420 (Near infrared) and SPOT 5 images.
c) Recommendations are to be made regarding the most cost effective procedure for the auditing and monitoring of rehabilitated wetlands.

3) CURRENT STATUS OF THE PROJECT.

The current status of the project will be discussed in terms of each phase in which the project has been divided (refer to the Terms of reference).

a) PHASE 1:

i) Identifying local wetland authorities.

After numerous phone calls and e-mails the contact details and persons responsible for work done on each wetland were identified. (Appendix 1)

ii) Established contact with local authority and organized a meeting during field visit with them, yourselves, ISCW and NDA. Identify the time of field visit.

Contact was made with all the key-persons identified to inform them about the project. They were requested to provide any available baseline data and information. A date was confirmed to meet with them during the preliminary field visit (1-10 July 2002). Examples of these letters are presented in Appendix 2. All the relevant authorities were approached regarding permission to visit the wetland sites.

iii) Identify the most suitable time of image collection for the different wetlands with reference to most suitable date – and time frame and based on ecological parameters indicating the time when the info required, is most spectrally distinguishable.

After some discussions with the various wetland and remote sensing experts (Mr. Dirk Pretorius, Mrs. Eliria H. Haigh, Dr. Donovan Kotze, Mr. Mark Thompson, Mr. David Lindley, Ms. René Glen, Lesley Gibson and Nacelle Collins) concerning the ideal time for image collection it was concluded that there is no fixed date for each wetland. However, expert opinion suggests the windows of opportunity for each wetland as listed in Table 1.

Table 1: Image collection

Wetland	System	Time frame	Indicators
Kromme River – 25 200ha (Eastern Cape - Kareedouw)	Aerial photos Kodak DCS 420 (Near infrared) SPOT 5	Oct – mid Nov.	• Stabilization of erosion at various head cuts • Extent of the sedimentation • Restoration of wetland vegetation • Open water damming behind structures • Change in wet surface area • Cultivation
Mbongolwane – 1 400 ha (KwaZulu Natal – Eshowe)	Aerial photos DMSV (Near infrared) EROS	Dec Cultivation of Amadumbe (wetland plant) It gives good cover in December.	• Stabilisation of erosion • Restoration of wetland vegetation • Wetland zones • Open water damming behind structures – rewetting of the wetland area. • Cultivated areas
Seekoeivlei – 3 000ha (Free State – Memel)	EROS image LANDSAT	Jan- Feb	• Stabilization of erosion • Restoration of wetland vegetation • Open water damming behind structures • Change in wet surface area (Look at Oxbows)
Wilge River - 650ha (Free State - Harrismith)	DMSV (Near infrared)	Jan -Feb	• Stabilisation of erosion at head cut • Restoration of wetland vegetation
Zoar – 5 000ha (Mpumalanga – Piet Retief)	DMSV (Near infrared)	Dec, Jan and Feb	• Stabilisation of erosion • Restoration of wetland vegetation • Wetland zones • Open water damming behind structures – rewetting of the wetland area.
Rietvlei – 300 ha (Gauteng – Pretoria)	Aerial photos DMSV (Near infrared)	Dec, Jan and Feb Image collecting will only take place when funding is available.	• Stabilisation of erosion • Restoration of wetland vegetation • Rewetting of the wetland area.

For the purpose of wetland delineation, it is important to take photos 2-3 weeks after the start of the rainy season. (National Wetland Inventory, March 2002). The area adjacent to the wetland will still be relatively dry where as the wetland area will be wetter and thus more visible. The ideal time to observe and to collect images for, the different wetland zones and cultivated areas would be after the rainy season when the vegetation is in full bloom. It will thus be necessary to collect the rainfall data for each wetland area from previous years in order to form an opinion regarding the window of opportunities for the different wetlands.

Landsat images are available from National Department of Agriculture for each wetland. It will be used in the recommendations to be made regarding the most cost effective procedure for the auditing and monitoring of rehabilitated wetlands. To prevent double image collecting of an area, Mr. Mark Thompson was willing to check in the Geospace database if images were available for the different wetlands. Unfortunately, only images close to the wetlands were available that did not cover the wetlands.

Aerial photos are available for Mbongolwane, Kromme and Rietvlei wetlands.

(1) The reasoning behind the remote sensing systems chosen.

(a) Kromme River:

The wetland is a long linear feature in the Eatern Cape. To make it cost effective for the projects budget it was decided to make use of the Kodak DCS420 (Near infrared). Dr. Tony Palmer, who is stationed at Grahmstown, operates this system. At first SPOT 5 imagery was not listed as one of the remote sensing systems to be evaluated but if the budget would allow it, it would be a good exercise to compare the two systems on the same wetland. The interaction of all the indicators needs to be observed in this wetland.

(b) Mbongolwane:

At Mbongolwane it will be necessary to look at the different vegetation zones, cultivated areas and the two rehabilitation structures. For this wetland it was decided to use EROS and DMSV (Near infrared).

(c) Seekoeivlei:

The interaction of all the indicators needs to be observed in this wetland and therefore decided on EROS to look at the entire wetland system on the Seekoeivlei Nature Reserve as a whole.

(d) Wilge River:

The main reason for choosing DMSV (Near infrared) is because this wetland only has one rehabilitation structure at the headcut.

(e) Zoar:

By using DMSV (Near infrared) the entire wetland system and the different vegetation zones would be observed and the two remote system techniques compared for the same wetland.

(f) Rietvlei:

The Rietvlei wetland in the Rietvlei Nature Reserve is regarded as a rare asset in Pretoria (Gauteng). Initially not part of the project but due to its uniqueness it was included. To make it cost effective for the projects budget it was decided to make use of the DMSV (Near infrared) system of the Institute Soil Climate and Water witch is based in Pretoria.

iv) Deliverables.

A field visit- and progress report to be handed in on the 03 October 2002. (Hard copy + digital format).

v) Limitations to the report

- Between 17 and 22 July 2002 heavy, out of seasonal rainfalls were experienced at Mbongolwane. Flood damage occurred at two of the rehabilitation sites (Amatigulu and Uvova). The structures are still under construction and ought to be completed in November 2002. This can have a negative effect on image collecting if the structures are not completed.
- Rietvlei funding – a project proposal for Rietvlei was developed at the IMCG Symposium in France (13 – 23 July 2002) to apply for funding from the Global Peat Initiative (GPI) – sponsored by the Netherlands. We had to make changes to the proposal, and supply an endorsement letter from NDA plus the banking details of the ISCW. We are still waiting to hear if the proposal was successful or not. Decision expected by end of October 2002.

b) **PHASE 2:**

i) A desktop study on available general literature, maps and other data pertaining to the aims of the project.

The desktop study and a report will include the following:

- Baseline data known for each site.
- Image processing techniques known to be suitable for wetland monitoring (including satellite and remote sensing images available).
- Identifying and listing of provisional list of indicators, which could be used or identified by using remote sensing applications and techniques.

This part of the project already commenced with a literature search and the collection of baseline data for each wetland as well as the compiling of a list of indicators.

There is a reasonable amount of background information available on Mbongolwane, Kromme River and Rietvlei wetlands, including a few sets of aerial photos.

ii) Deliverables.

A baseline data report to be handed in on 11 November 2002.

iii) Limitations to the report.

- Baseline data for Zoar still unavailable. Various phone calls and follow-up have not yet delivered any results. However results are expected soon.
- The South African Wetland Action Group (SAWAG) meeting is to be held 28, 29 and 30 October in Cape Town. All prominent role players on wetlands will meet, as well as relevant parties for the identified projects. Baseline data and other information lacking for the report will be discussed (Appendix 3)
- Literature search involves inquiries that take time to respond to. Information gathered in German and French needs to be translated as well as each report and article needs to be evaluated.

c) **PHASE 3:**

i) The preliminary field visit.

(1) Kromme River, Mbongolwane, Seekoeivlei, Wilge River, Zoar.

The preliminary field visit for the five wetlands took place 1-5 and 8-10 July 2002. Representatives of the NDA, ISCW, and key persons of each wetland were part of the group. The itinerary for the preliminary field visit is attached in Appendix 4.

ISCW completed a project file in Arcview linking the following data gathered during the preliminary field visit:

- Wetland delineation on the 1:50 000 topographical maps.
- GPS waypoints around the wetland.
- Digital photos taken at each waypoint.
- Spreadsheet with wetland information collected on each site.

The opinion after the preliminary field visit was to focus specifically on the problems that existed in each wetland and on the rehabilitation measures that had been suggested to address such problems. Indicators were identified for each wetland that could be used to determine if the rehabilitation structures were successful or not (refer to Table 1).

(2) Rietvlei.

A preliminary field visit to the Rietvlei wetland on 28 August 2002 was combined with an arranged World Summit on Sustainable Development (WSSD) wetland tour to Rietvlei Nature Reserve in Gauteng.

Wetland information:

(a) Kromme (Eastern Cape).

Mr. Pierre Joubert, Mr. Edwil Moore and Mr. Chris Cowling accompanied the reacherch team to all the rehabilitation structures. Erosion, frequent fires and cultivated areas in the wetland were some of the main problems.

(b) Mbongolwane (Natal - Eshowe).

The research team visited Mbongolwane wetland on the 4th of July 2002. Vuyani Machi met with the team at the George Hotel and took the team to Mbongolwane. Sizakele Mthethwa accompanied the team all over the area. At two rehabilitation sites (Amatigulu and Uvova) the structures were still under construction during the visit. The research team also visited the communal vegetable garden and saw some small subsistence farming plots. Other human impacts on the wetland: washing and bathing in the wetland, sugarcane cultivation, some afforestation and sand mining. There is also the concern about possible cholera, bilharzia and malaria in the area. A planned broad walk across the wetland would enable the school children to cross the wetland safely everyday.

The key issues here are the small-scale cultivation plots, the size of a bathroom ($\pm$ 2 m X 2m). They were observed on aerial photos (1:30 000).

It is therefore necessary to be able to observe the proportions of cultivated plots on key areas. In 1995 Donovan Kotze did a baseline survey and he is keen to repeat the survey in December 2002 – January 2003.

This area has a high unemployment rate. WfWetlands and awareness campaigns are successful in training people about wetland benefits. The wetland lies in communal land and permission was requested from the Tribal authority to visit the area.

Traditional sleeping mats and conference bags @ R29.00 made from (Inkwane) *Cyperus latifolius* are a good example of sustainable utilization of the wetland resource and generates an income for the rural woman. The rehabilitation of the Mbongolwane wetlands is three-fold:

1. To secure the major gully
2. Rehabilitate the smaller dongas
3. Encourage farmers to withdrawal from sensitive areas in the wetland.

(c) Seekoeivlei (Free State - Memel).

Reports are available on past land use & disturbances. The name of the nature reserve in which the wetland occurs is called Seekoeivlei though the farm name is called Zeekoeivlei. The research team visited the wetland on the 2nd of July 2002 and was accompanied by the Reserve Manager – Mr. Georg Wandrag. Mr. Nacelle Collins from the Free State Department of Tourism, Environmental and Economic Affairs gave some valuable insight about the Seekoeivlei wetland.

(d) Wilge River (Free State - Harrismith).

According to Mr. Nacelle Collins the Wilge River wetland has been surveyed. The wetland stretches over three farms. These are:

- Bedford 2 1845 - The portion of the wetland containing peat is in this portion of the wetland.
- Chatsworth 388 - George Gallaway (083) 7022653
- Wilge River 319 - Willem de Jager (058) 62-32707 - The rehabilitation has been performed on this portion of the wetland, thus the reason why the wetland is called the Wilge wetland

The farmers were informed concerning the planned visit but were not able to join the team in the field that day. One rehabilitation structure was aimed to stop the head cut erosion.

(e) Zoar (Mpumalanga - Piet Retief).

During the field visit on the 3rd of July the wetland was dry and burned. Problem: fire break across the wetland. This needs to be addressed with mitigatory measures to ensure a win situation for all the parties involved. Mondi is the landowners on which the middle section of the wetland occurs. Land upstream and downstream belongs to private owners. However a good working relationship exists between the landowners.

(f) Rietvlei (Gauteng – Pretoria).

Appendix 5 contains information about the Rietvlei Wetland Rehabilitation

Project.

ii) Deliverable.
A visit- and progress report.

iii) Limitations to the report.

- Unfortunately Dr. Donovan Kotze (University of Natal) attended a conference 1-5 July 2002 and was not able to join the preliminary field visit team at Mbongolwane.

d) PHASE 4:

i) A preliminary field assessments and identification of test sites within each study site:

- Kromme River (Eastern Cape -Kareedouw).
- Wilge River (Free State – Harrismith).
- Seekoeivlei (Free State - Memel).
- Mbongolwane (KwaZulu Natal – Eshowe).
- Zoar (Mpumalanga – Piet Retief).
- Rietvlei (Gauteng – Pretoria) this was not part of the initial project proposal but is seen as a necessary extension of the project as only one peatland has been included in the proposal.

ii) Deliverable

- A report on the field assessment regarding possible changes and prognosis and subsequent recommendations also indicating the reasoning behind the selection of test sites as well as indicating their position.

iii) Limitations to the report

- Developments pending the South African Wetland Action Group (SAWAG) meeting: possible changes and prognosis and subsequent recommendations also indicating the reasoning behind the selection of test sites will be discussed as well as the fieldwork schedule (Appendix 3).

e) PHASE 5:

i) Carry out fieldwork to verify satellite and remote sensing images (processed by ISCW) and testing the suitability, accuracy and acceptability of identified indicators and possible recommendations with the support of ISCW – remote sensor. Determine and interpret cover patterns for each indicator listed and identified (vegetation, water, land use) in the above mentioned areas.

Compiling a report on all 6 study sites containing the information mentioned above as well as the following:

a) Fieldwork information and maps (map production and GIS done in assistance with ICSVCW remote sensor.
b) Determine if the identified indicators are represented in the wetlands as well as indicating whether the indicators are representative of the wetlands.
c) Existing and newly established knowledge of the indicators.
d) A validation of selected indicators after image processing will be done through

field observations to determine the accuracy of the indicators.

ii) Deliverables

A detailed suitability report (after approved draft in consultation with NDA and ISCW) on the accuracy and suitability of the selected indicators per wetland, with recommendations and possible other indicators to be investigated.

The deadline date for the final report is: 28 February 2002.

f) PHASE 6:

i) Reproduction of final maps and report by ISCW.

4) INTERNATIONAL SYMPOSIUM ON VEGETATION MONITORING

I will use this study as a basis for my MSc with Prof. George Bredenkamp (African Vegetation and Plant Diversity Research Centre, Department of Botany, University of Pretoria) and therefore wish to submit an abstract for a poster presentation at the:
International Symposium on Vegetation Monitoring
March 24 – 26, 2003,
Swiss Federal Research Institute WSL
Birmensdorf, Switzerland.

Appendix 1: Contact details of key persons.

Contact details of key persons.

NAME	INSTITUTION	TELEPHONE NO.	FAX NO.	CELL NO.	E-MAIL
Kromme River (Eastern Cape -Kareedouw)					
Mrs. Eliria H. Haigh	Institute for Water Research (IWR)	046 622 2428 or 046 603 8532	046 622 9427	083 256 6578	lilh@iwr.ru.ac.za
Mr. Pierre Joubert	Gamtoos Irrigation Scheme	042 283 0329		082 553 0947	gamtoos@lantic.net
Mr. Edwil Moore	Working for Wetlands – Joubertina	042 273 244			
Mr. Vincent Eagen		042 296 2855		082 737 0607	
Mbongolwane (KwaZulu Natal – Eshowe)					
Dr. Donovan Kotze	University of Natal - Institute of Natural Resources			082 548 9646	kotzeD@na.ac.za
Mr. Damian Walters	Mondi Wetlands Project, National Training Coordinator			083 684 8000	
Mr. Paulis Dlamini	Local Working for Wetlands Manager			083 656 5185	
Ms. Sizakele Mthethwa	(LandCare facilitator)			082 348 4237	
Mr. Vuyani Machi	(Farmers support group)			072 486 2579	
Seekoeivlei (Free State - Memel)					
Mr. Nacelle Collins	Dept. Tourism, Environmental and Economic Affairs, Free State)	058 622 3520		082 449 9012	nbc@ohs.dorea.co.za
Mr. Georg Wandrag	(Reserve Manager)	058 924 0183	058 924 0159	082 779 3410	kubu@intrcom.co.za
Wilge River (Free State - Harrismith)					
Mr. Nacelle Collins	Dept. Tourism, Environmental and Economic Affairs, Free State.)	058 622 3520		082 449 9012	nbc@ohs.dorea.co.za
Mr. Piet Blom & Mr.Jurie Blom	Farms. The portion of the wetland containing peat is in this portion of the wetland (Bedford 2 1845)	058 623 0070			
Mr. George Gallaway	Farmer (Chatsworth 388)		058 623 1816	083 702 2653	
Mr. Willem de Jager & Mr. Kobus de Jager	Farmer (Wilge River 319) The rehab has been performed on this portion of the wetland.	058 62 32707		083 629 9611	
Zoar (Mpumalanga – Piet Retief)					
Mr. David Lindley	Mondi Wetlands Project			083 222 9155	lindley@wetland.org.za
Mr. Francois Maritz	(Environmental manager for the whole of that area)			082 800 2165	Francois_maritz@mondi.co.za
Mr. Hagen Gevers	(Forester)	017 820 0205	017 820 0743	082 650 6958	
Mr. Mark Prigge	previous forester for Zoar				
Rietvlei (Gauteng – Pretoria)					
Mr. Riaan Marais	Rietvlei Nature Reserve Manager	012 345 2274			
Mr. Rodger Browne	Working for Wetlands	012 667 1815		082 358 8712	

Appendix 2: Examples of letters.

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

FAX COVER PAGE

TO: George Gallaway (Piet & Jurie Blom)

DATE: 24 June 2002

FROM: Althea Grundling
Ihlaphosi Enviro Services cc
P.O. Box 912924
SILVERTON
0127

e-mail: peatland@mweb.co.za
tel/fax: (012) 808 5342

PAGES: 2

COMMENT:

Dear George Gallaway (Piet & Jurie Blom)

A project has been awarded to ISCW for a pilot study to evaluate various remote sensing systems for use in the auditing and monitoring of rehabilitated wetlands. A preliminary field visit to the Wilge wetland is planned for **1 July 2002.**

The main purpose for the preliminary field visits:

- It will serve as an introduction of the five wetlands involved in the study (Wilge River, Zeekoeivlei, Zoar, Mbongolwane and Kromme River) to the study team.
- Meet with and inform all key persons involved with the wetlands about the project.
- The idea is not to do intensive field surveys but to explore the wetland terrains on a broad scale. Baseline data has already been done for each one.

The Preliminary Field Visit Group:
Chris Kaempffer (Institute Soil Climate and Water - Pretoria) Cell: 083 287 4113
Eric Economan (Institute Soil Climate and Water - Pretoria) 012 310 2500
Elna van den Berg (Institute Soil Climate and Water - Pretoria) 012 310 2500
Terry Newby (Institute Soil Climate and Water - Pretoria) 012 310 2500
Tony Palmer (Institute Soil Climate and Water - Rhodes)
Dirk Pretorius (National Department of Agriculture) 012 319 7545
Georg Schutte (National Department of Agriculture) 012 319 7551
Althea Grundling (Ihlaphosi Enviro Services cc) 012 808 5342

Attached: The itinerary for the preliminary field visits.
The time planned for the visit **9:30 – 15:00.** We will phone on the 1st of July to arrange a suitable venue for us to meet you.

Groetnis
Althea Grundling

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

FAX COVER PAGE

TO: Kodus de Jager en Willem de Jager

DATE: 24 June 2002

FROM:
Althea Grundling
Ihlaphosi Enviro Services cc
P.O. Box 912924
SILVERTON
0127

e-mail: peatland@mweb.co.za
tel/fax: (012) 808 5342

PAGES: 2

COMMENT:

Dear Kodus de Jager en Willem de Jager

A project has been awarded to ISCW for a pilot study to evaluate various remote sensing systems for use in the auditing and monitoring of rehabilitated wetlands. A preliminary field visit to the Wilge wetland is planned for 1 July 2002.

The main purpose for the preliminary field visits:

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Georg Schutte (National Department of Agriculture) 012 319 7551
Althea Grundling (Ihlaphosi Enviro Services cc) 012 808 5342

Attached: The itinerary for the preliminary field visits.
The time planned for the visit **9:30 – 15:00**. We will phone on the 1st of July to arrange a suitable venue for us to meet you.

Groetnis
Althea Grundling

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

TO: Reserve Manager: Georg Wandrag
(058 924 0183 or 082 779 3410)

DATE: 13 Augustus 2002

FROM: Althea Grundling
Ihlaphosi Enviro Services cc
P.O. Box 912924
SILVERTON
0127

e-mail: peatland@mweb.co.za
tel/fax: (012) 808 5342

PAGES: 1

COMMENT:

Dear Geoge Wandrag

Herewith the information concerning the wetland project that was unsuccessfully e-mailed to you before the field visit at Zeekoeivlei on the 2nd of July 2002.

A project has been awarded to ISCW for a pilot study to evaluate various remote sensing systems for use in the auditing and monitoring of rehabilitated wetlands. A preliminary field visit to the Zeekoeivlei wetland took place on the 2nd **of July 2002.**

The main purpose of the preliminary field visits:

- It will serve as an introduction of the five wetlands involved in the study (Wilge River, Zeekoeivlei, Zoar, Mbongolwane and Kromme River) to the study team.
- Meet with and inform all key persons involved with the wetlands about the project.
- The idea is not to do intensive field surveys but to explore the wetland terrains on a broad scale. Baseline data has already been done for each one.

The Preliminary Field Visit Group:

Chris Kaempffer (Institute Soil Climate and Water - Pretoria) Cell: 083 287 4113
Eric Economan (Institute Soil Climate and Water - Pretoria) 012 310 2500
Elna van den Berg (Institute Soil Climate and Water - Pretoria) 012 310 2500
Dirk Pretorius (National Department of Agriculture) 012 319 7545
Althea Grundling (Ihlaphosi Enviro Services cc) 012 808 5342

Please accept my apologies for sending you the information now. I have attended a Symposium in France and had huge e-mail problems.

I will inform you soon concerning the development of the project.

Groetnis
Althea Grundling

Appendix 3: South African Wetland Action Group Meeting.

peatland

From: peatland <peatland@mweb.co.za>
To: <christa.le_roux@capetown.gov.za>; <rondevlei@sybaweb.co.za>; JONES, G, GENEVE, STUDENT <gjones@botzoo.uct.ac.za>; <BelcheA@dwaf.gov.za>; Lesley Gibson <Lesley@geobell.org.za>; <shawka@cncjnk.wcape.gov.za>; <impsond@cncjnk.wcape.gov.za>; <gvika@pawc.wcape.gov.za>; <patrick@wessa.wcape.school.za>; <Candice.Haskins@capetown.gov.za>; <Craig.Haskins@capetown.gov.za>
Cc: Coetzee Jacqui (CPT) <Jacqui@dwaf.gov.za>; <davidkl@nda.agric.za>; John Dini <Jdini@ozone.pwv.gov.za>; David Lindley <lindley@wetland.org.za>
Sent: Wednesday, September 25, 2002 11:53 PM
Subject: South African Wetland Action Group (WAG) : Meeting in October.

Dear All

I am writing to you on behalf of John Dini, DEAT, Pretoria.

We are planning our annual SA Wetland Action Group (WAG) meeting from 28 - 30 October 2002. The purpose of SAWAG is for field workers, administrators and scientists active in wetland conservation to maintain effective linkages, exchange ideas and experiences and to co-operate on initiatives of common interest. The focus of the group is on palustrine (marsh/floodplain) wetlands, a wetland type that has generally been overlooked in the past. A key emphasis of the Group is on actions in the field, rather than merely serving as a talk-shop.

We have identified the Western Cape as one of our focal areas in terms of supporting existing efforts by Western Cape environmental/conservation persons (such as yourself), bodies and authorities in raising wetland awareness and in wetland conservation. We have thus decided to have the WAG meeting of 28 – 30 October in the Cape Town area (the last meeting was held in Nysvlei – Limpopo Province, last year) and we would like to invite you to attend the meeting in Cape Town. It is important for us to hear from you about your experiences in dealing with wetlands, such as projects, challenges, problems, policies etc.

The Ramsar wetland theme for this year is: Wetlands - water, life, culture. It may also be an appropiate theme for the WAG meeting!

We would also appreciate it if you can be directly involved in the arrangements of this event:

- We are looking for a suitable venue that will hold about 40 - 60 people, that is appropriate for a meeting with a wetland theme, and which preferably has accommodation as well. Some of the wetlanders must pay for their own travel, accommodation and food and we would like to have venue that is not expensive – we are also not charging any fees towards WAG participants.
- Toni Belcher (DWAF regional office) have offered us the DWAF conference facilities (no cost – but accommodation close by may presents a problem) in Bellville and Dalton Gibbs (Nature Conservation Officer, City Of Cape Town) have offered us the facilities Rondevlei Nature Reserve at good rate – accommodation close by at a good rate might still present a problem. We would love to visit some wetlands/projects on Wednesday 30 October, and perhaps you have some suitable venue' s in mind.
- The agenda is not fixed yet and suggestions from you would be appreciates such as a plan for how to go about establishing a provincial wetland forum (who should take the

lead, etc)

Could you please indicate if you are available during this time and if you could support with arrangements and in the provision of a venue and accommodation? We need to send out final invitations early next week and we would appreciate a prompt response.

We are also planning to have the annual national Working for Wetlands (WfWet) Project Management meeting at the same venue back-to-back with the WAG meeting (and you are welcome to attend this meeting as well). This meeting will mainly deal with wetland rehabilitation implementation issues. Most of the WfWet project managers will attend WAG as well. WfWet is a partnership between Working for Water (via DWAF), DEAT and the Mondi Wetland project, as well as NDA.

The topics on the Agenda for the WFWet PM Meeting are the following:

- Norms and Standards for wetlands
- Wetland Quotation Package
- Workshop Wetland Self Assessment Standards
- Introduce Wetland WIMS to PM
- Project approval process for 2003/2004

Groet'nis and I trust I will hear soon from you.

Piet-Louis

Piet-Louis Grundling
DEAT Working for Wetlands Co-ordinator
Working for Water Programme
Private Bag X352
Hartbeespoort
0216
e-mail:
tel/fax: (012) 808 5342
cell: 083 231 3489

Appendix 4: Itinerary for the preliminary field visit.

Preliminary field visit itinerary.

DATE	WETLAND	PROGRAMME
1 July 2003	Wilge River	**Departure:** Pretoria 06:00 **Arrive:** Harrismith 09:30 **Departure:** Wilge 15:00 **Arrive:** Memel 16:30
2 July 2003	Seekoeivlei	**Departure:** Seekoeivlei 15:00 **Arrive:** Piet Retief 16:30
3 July 2003	Zoar	**Departure:** Zoar 13:00 **Arrive:** Eshowe 16:00
4 July 2003	Mbongolwane	Mbongolwane
5 July 2003		**Departure:** Pretoria 07:00 **Arrive:** Harrismith 13:30
8 July 2003		**Departure:** Pretoria 06:00 **Arrive:** Harrismith 17:00
9 July 2003	Kromme River	Kromme River Wetland
10 July 2003		**Departure:** Kareedouw 06:00 **Arrive:** Pretoria 17:00

Appendix 4: Itinerary for the preliminary field visit.

Preliminary field visit itinerary.

DATE	WETLAND	PROGRAMME
1 July 2003	Wilge River	**Departure:** Pretoria 06:00 **Arrive:** Harrismith 09:30 **Departure:** Wilge 15:00 **Arrive:** Memel 16:30
2 July 2003	Seekoeivlei	**Departure:** Seekoeivlei 15:00 **Arrive:** Piet Retief 16:30
3 July 2003	Zoar	**Departure:** Zoar 13:00 **Arrive:** Eshowe 16:00
4 July 2003	Mbongolwane	Mbongolwane
5 July 2003		**Departure:** Pretoria 07:00 **Arrive:** Harrismith 13:30
8 July 2003		**Departure:** Pretoria 06:00 **Arrive:** Harrismith 17:00
9 July 2003	Kromme River	Kromme River Wetland
10 July 2003		**Departure:** Kareedouw 06:00 **Arrive:** Pretoria 17:00

Appendix 5: The Rietvlei Rehabilitation Project.

CITY OF TSHWANE
"We are the same"

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

WORKING FOR
Patron in Chie
Nelson Mande

The Rietvlei Wetland Rehabilitation Project

The Rietvlei Wetland Rehabilitation project lies within the Rietvlei Nature Reserve – owned and managed by the City of Pretoria/Tswane. The Rietvlei Dam provides 15% of Pretoria's water and the area contains Bankenveld – grassland under threat in the Gauteng region.

The rehabilitation of Rietvlei is important because it:

- Promotes waste water purification through the natural systems of reeds and peat.
- Addresses the control of alien, invasive plant species
- Protects vital habitats associated with the globally important grasslands biome.
- Exemplifies innovation in combating land degradation.
- Stems the emission of carbon stored in the peat substrate, and
- Creates wetland awareness and education.

Rietvlei addresses poverty through labour intensive job creation and capacity building while the conserving water resources of a dry country. 60% of its budget is uplifts the poor. 60% of its workforce is women.

Sixty people are employed on a budget of R 1 million for 11 months of the year by WfW and an additional 20 – 30 people for an additional 3 months of the year on a Landcare budget of R 250 000 per year.

It is intended that the wetland will be rehabilitated to such as extent that only maintenance is necessary. It is also hoped that trained workers will be able to run their own businesses after funding ends.

The Rietvlei wetland rehabilitation project is part of Working for Wetlands. It is a partnership between the Working for Water Programme (Department of Water Affairs and Forestry), Department of Environmental Affairs & Tourism (DEAT), Mondi Wetland Project, as well as the Rietvlei LandCare Programme and City of Tshwane.

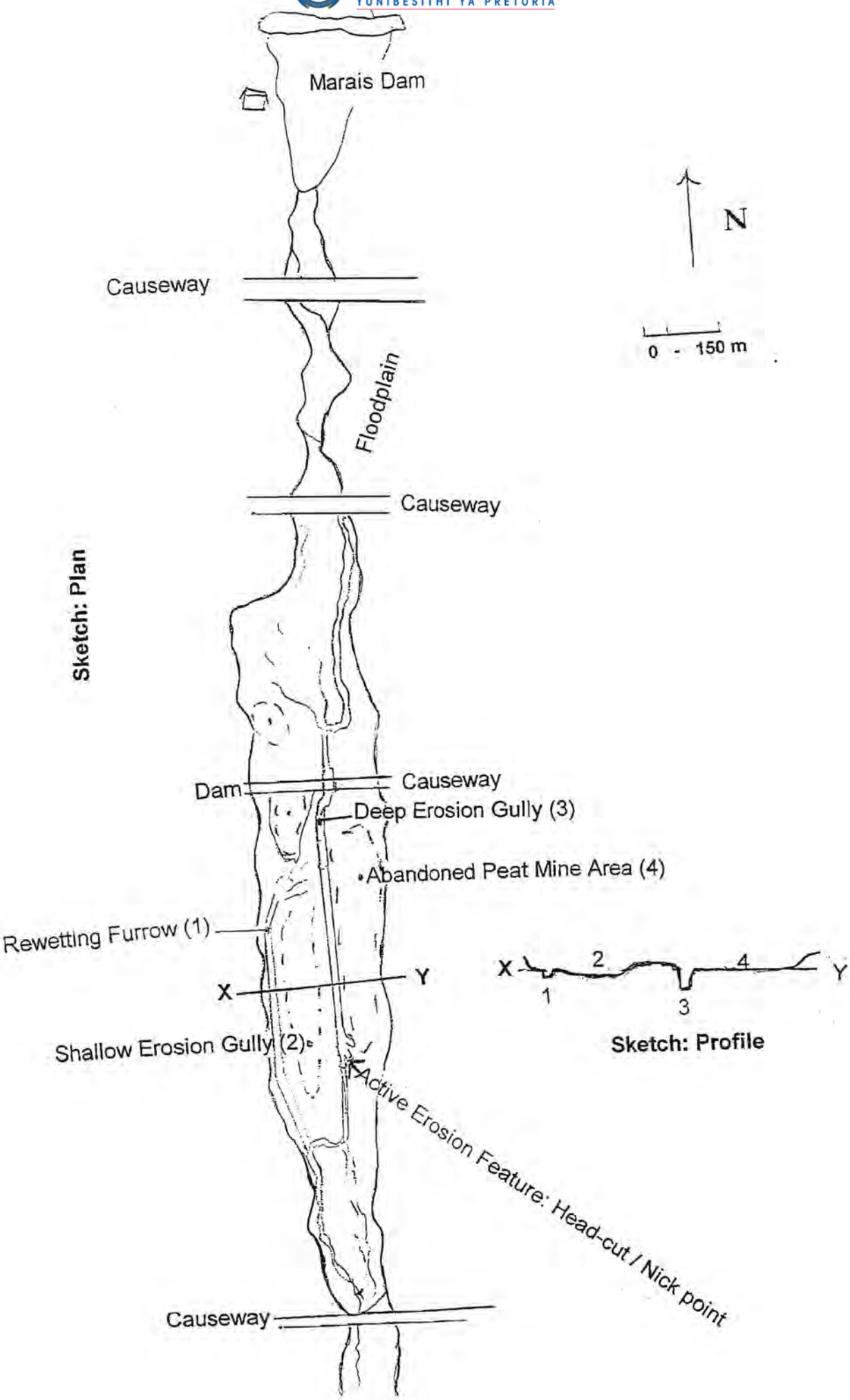
Contact Details:
Piet-Louis Grundling
DEAT Working for Wetlands Co-ordinator
Working for Water Programme
e-mail: peatland@mweb.co.za
Tel/Fax:+ 27 012 808 5342
Cell: + 27 83 231 3489

Roger Browne
Technical Advisor
Working for Water Programme
Northwest/Gauteng Region
e-mail: brownej@iafrica.com
Tel/Fax: + 2712 667 1815
Cell: + 27 83 231 3489

LANDCARE
SOUTH AFRICA

Mondi Wetlands Project

Department: Environment Affairs and Tourism
Department: Water Affairs and Forestry
Department: National Department of Agriculture



APPENDIX 5

INTERPRETATION OF AERIAL PHOTOGRAPHS DEPICTING LANDSCAPE CHANGES AT THE HUDSONVALE PEAT BASIN IN THE KROMME RIVER WETLAND.

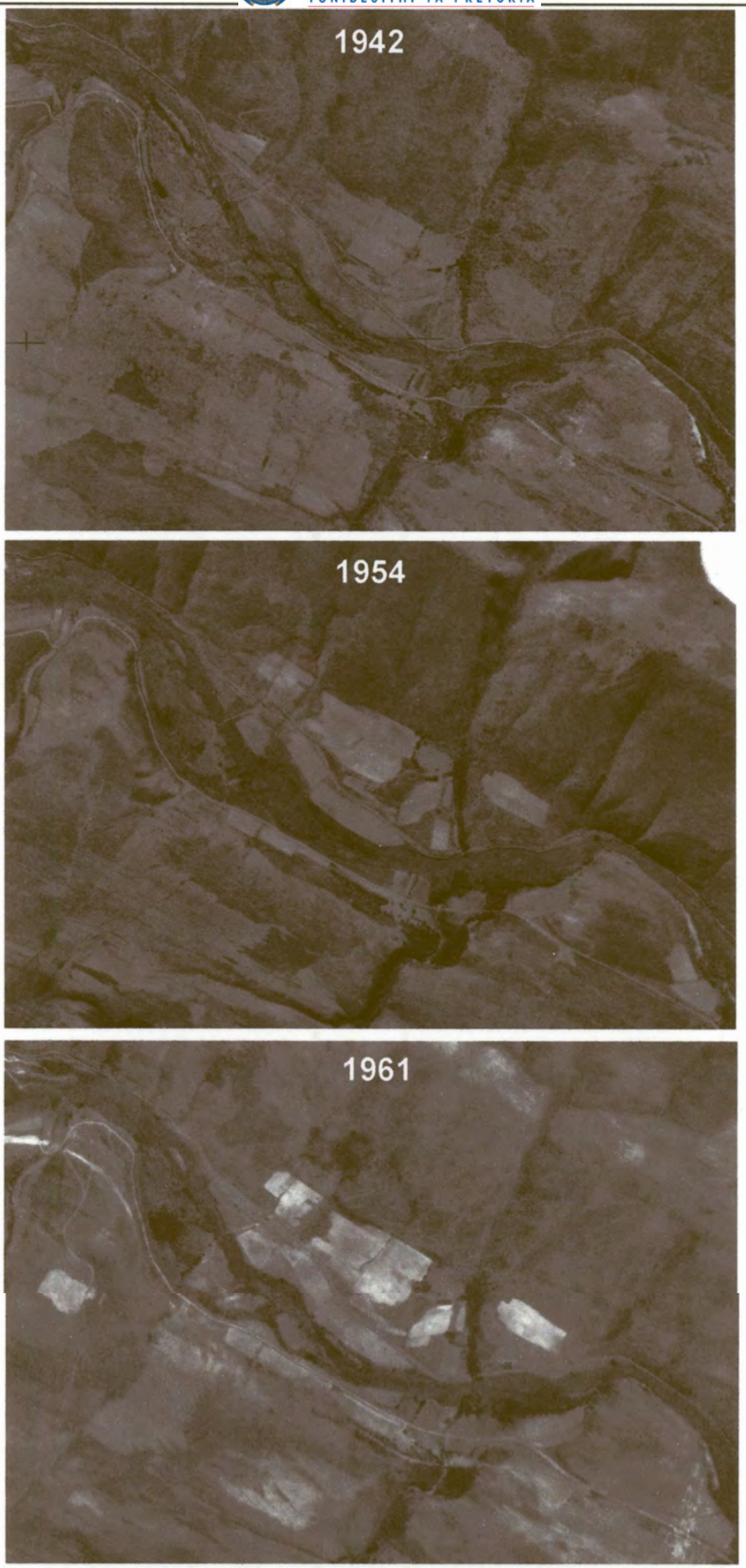


Figure 1: Landscape changes in the peat basin on the farm Hudsonvale is described from aerial photographs (1942 - 1961)(Haigh et al. 2002).

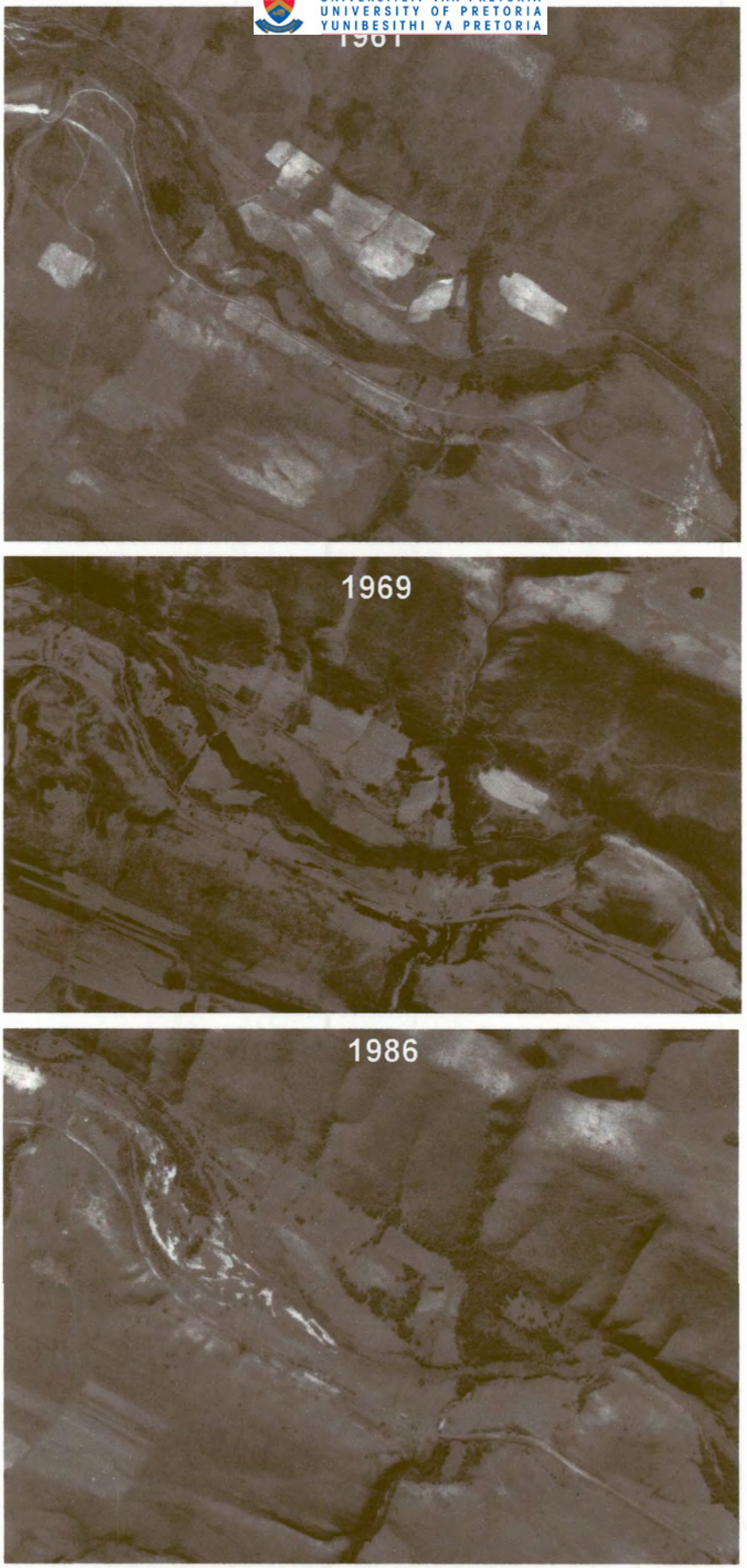


Figure 2: Landscape changes in the peat basin on the farm Hudsonvale is described from aerial photographs (1961 - 1986)(Haigh et al. 2002).