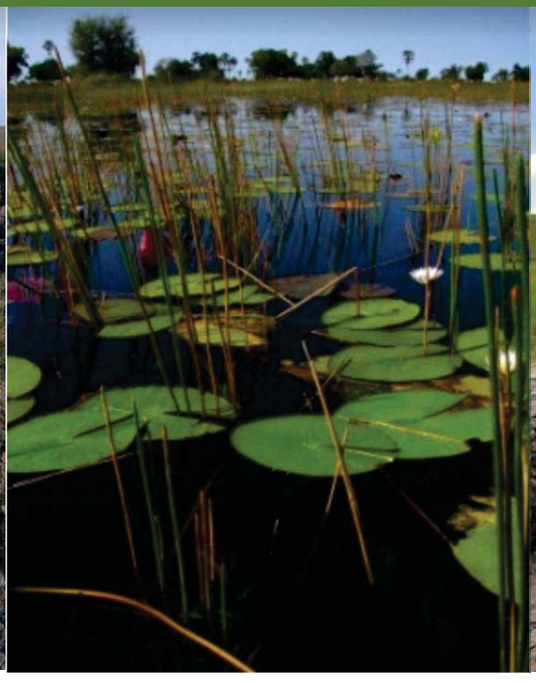
Wetlands in Working Landscapes

WETLAND OFFSETS:
A Best Practice Guideline for South Africa

Authors: South African National Biodiversity Institute & Department of Water and Sanitation
Series Editors: Arno R de Klerk, John Dini, Stephen Holness and Paul Oberholster



WATER RESEARCH COMMISSION

TT 660/16

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

SANBI
Biodiversity for Life
South African National Biodiversity Institute

grasslands
LIVING IN A WORKING LANDSCAPE

CSIR
our future through science

COALTECH

WETLAND OFFSETS:
A Best Practice Guideline for South Africa

Report to the
Water Research Commission

by

South African National Biodiversity Institute
and the
Department of Water and Sanitation

Report compiled by

D Macfarlane[1], SD Holness[2], A von Hase[3], S Brownlie[4], JA Dini[5], V Kilian[6]

Series Editors: AR De Klerk*[7], JA Dini[5], SD Holness[2] & PJ Oberholster[8]

[1] Eco-Pulse Environmental Consulting Services CC
[2] Nelson Mandela Metropolitan University
[3] Forest Trends
[4] deVilliers Brownlie Associates
[5] South African National Biodiversity Institute, Pretoria
[6] Department of Water and Sanitation
[7] CSIR Natural Resources and the Environment, Pretoria
[8] CSIR Natural Resources and the Environment, Stellenbosch

* email: ADKlerk@csir.co.za

WRC Report No. TT 660/16

April 2016

Obtainable from

Water Research Commission
Private Bag X03
Gezina, 0031
South Africa

orders@wrc.org.za or download from www.wrc.org.za

The publication of this report emanates from a project entitled *Limiting and mitigating the impact of coal mines on wetlands* (WRC Project No. K5/2230/3).

APPROVAL

This report has been approved by the Department of Water and Sanitation as an official guideline to aid the development of appropriate wetland offsets in situations where an offset is required. Wetland offsets should be developed in close consultation with the Department.

ISBN 978-1-4312-0775-6
Printed in the Republic of South Africa

EXECUTIVE SUMMARY

This guideline serves as a practical tool to aid in the consistent application of wetland offsets in South Africa. The guideline is primarily aimed at wetland offsets required as part of water use authorisation processes (e.g. in an application for a Water Use Licence under the National Water Act) where compensatory actions are required to achieve water resource management and biodiversity conservation objectives. The guideline is equally relevant for use in environmental impact assessment (EIA) processes (e.g. as part of the environmental authorisation process in terms of the National Environmental Management Act or in an application for a mining licence or development of an Environmental Management Programme under the Mineral and Petroleum Resources Development Act).

Wetland offsets are enduring measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse impacts on wetlands. They are implemented to address any anticipated significant residual impacts arising from development projects after appropriate avoidance, minimisation and rehabilitation measures have been taken into account. The goals of wetland offsets are to achieve 'No Net Loss' and preferably a net gain with respect to the full spectrum of functions and values provided by wetlands. These include:

- Water resource and ecosystem service value, especially in relation to regulating and supporting functions pertinent to water resource management and disaster risk reduction, such as flood control and water quality enhancement, but also including direct services such as food and water provisioning and cultural services such as spiritual, recreational, and cultural benefits that sustain communities;
- Ecosystem Conservation, especially in terms of meeting national, provincial and local objectives for habitat protection and avoiding a deterioration in ecosystem threat status; and
- Species of Conservation Concern, to ensure that the status of threatened, rare or keystone wetland-dependant species is maintained or improved.

This guideline has been developed in response to the growing need for practical guidance on wetland offsets, which are increasingly being prescribed through regulatory processes in response to ongoing loss and degradation of wetland resources. It has been specifically designed for application where significant, large-scale residual wetland impacts are encountered (e.g. large scale infrastructure projects and opencast mining). The document nevertheless provides an equally useful framework to inform wetland offset design and implementation in other contexts where there are smaller, but still significant, residual impacts and a wetland offset is still required (e.g. agriculture or small development projects).

The guideline provides practical guidance for determining the size and characteristics of a wetland offset, and determining the requirements for its implementation, once a decision on the need for a wetland offset has been taken through the water use authorisation process by the Department of Water and Sanitation (DWS). Where this guideline is being used in other authorisation processes, the decision on the need for a wetland offset will be determined through an environmental impact assessment process and interactions with the relevant regulatory authority. It should thus be seen in the broader context of other relevant policies and guidelines including policy documents from the DWS and/or other applicable departments (such as Environmental Affairs and Mineral Resources), the national policy framework for biodiversity offsets and any provincial biodiversity offset policies and guidelines. In the event of any conflict between this guideline and existing policy and legislation, the latter will prevail.

The guideline emphasises that wetland offsets are applied within the mitigation hierarchy and are only aimed at compensating for significant residual impacts of project development on the environment after all appropriate steps have first been taken to avoid/prevent, minimise/reduce and remediate/rehabilitate impacts. Wetlands offsets cannot, therefore, be applied as the only or first mitigation option; the prior sequence of mitigation steps must first be exhausted. The guideline details how to calculate the residual impacts of a development in terms of Water Resources and Ecosystem Services, Ecosystem Conservation, and Species of Conservation Concern. It also sets out the offset ratios to be used in determining an

appropriate offset. It then provides guidance on the identification of appropriate offset sites and measures, and details the process of calculating whether or not the proposed offset receiving area sufficiently meets the requirements in terms of objectives and targets for Water Resources and Ecosystem Services, Ecosystem Conservation and Species of Conservation Concern. The offset ratios applied at the receiving site are designed to accommodate issues of risk and security of tenure, and aim to incentivise good practice. The guideline document is supported by an electronic Wetland Offset Calculator to assist with calculations. The guideline includes two appendices. Appendix A includes a list protection levels and ecosystem threat statuses for wetland groups required for the calculations of offsets, while Appendix B provides specific guidance on the use of the Wetland Offset Calculator which is also relevant for manually doing the calculations.

It must be made very clear that:

- Wetland offsets are a final compensation or mitigation measure where an approved project has significant residual impacts after all other reasonable mitigation measures have been fully implemented. They are not an alternative to the full application of the mitigation hierarchy.
- Wetland offsets are not an easy or quick way out for obtaining approval for a development in an area where wetlands are impacted. The implementation of a wetland offset requires careful identification of suitable wetland sites which need to be appropriately managed, secured and monitored for the long term, and hence costs may be high.
- The addition of a wetland offset to an otherwise unacceptable impact on wetlands does not change the acceptability of the impact, and hence should not influence the decision-making process regarding the authorisation of a proposed development.

ACKNOWLEDGEMENTS

This guideline was written and edited by Doug Macfarlane, Stephen Holness, Amrei von Hase, Susie Brownlie, John Dini and Valerie Kilian. The front cover was designed by Aimee Ginsburg.

The development of this guideline was informed through discussions with a wide range of stakeholders whom we would like to acknowledge for their contributions. It is not possible to list everyone. However, we would like specifically to acknowledge:

- Anthea Stephens; SANBI Grasslands Programme
- Arno De Klerk; CSIR
- Barbara Weston; DWS, RDM, Reserve Requirements
- Bonani Madikizela; WRC
- Doug McCulloch; Wetland Consulting Services
- Gary Marneweck; Wetland Consulting Services
- Gerhard Cilliers; DWS, RQS, Resource Quality Monitoring
- Jackie Jay; DWS; IWRP, Water Resource Planning Systems
- Jeanne Nel; CSIR
- Jeffrey Manuel; SANBI
- Jo Burgess; WRC
- Johann Beukes; Coaltech
- Leanie de Klerk; CSIR
- Mandy Driver; SANBI
- Mark Botha; Independent Consultant
- Namisha Muthraparsad; DWS, Compliance Monitoring: Industries
- Naomi Fourie; DS; Compliance Monitoring: Afforestation
- Paul Meulenbeld: DWS, WAIU, Instream Water Use
- Paul Oberholster; CSIR
- Ronald Mulaudzi, DWS, WAIU, Instream Water Use
- Valerie Kilian DWS, Compliance Monitoring: Institutions
- Wietsche Roets DWS, WAIU, Instream Water Use

The Reference Group consisted of Jo Burgess and Bonani Madikizela (Water Research Commission), Andre Beetge (SANBI), Johann Beukes (Coaltech), Vik Cogho (Glencore), Clinton Lee (South 32), Reginald Mabalane (Chamber of Mines), Wendy Mey (South 32), Ritva Mühlbauer (Anglo Coal), Meera Ormea (Eskom), Martin Platt (Anglo Coal), Wietsche Roets (Department of Water and Sanitation), Rod Schwab (Department of Water and Sanitation), Koos Smit (Exxaro), Graham Trusler (Digby Wells Environmental), Annalise van Zyl (Glencore), Pieter Viljoen (Department of Water and Sanitation), and Elmien Webb (Glencore).

The development process for the wetland offsets guideline has been supported by a programme of work focusing on mining, jointly implemented by the SANBI Grasslands, Ecological Infrastructure and Working for Wetlands Programmes. These SANBI initiatives received financial support from the Global Environment Fund, Coaltech Research Association and the Water Research Commission. Their contributions in support of the broader programme of work are gratefully acknowledged. This does not imply any specific endorsement or otherwise by any of these organizations. Furthermore, none of these organizations was editorially or otherwise involved in the compilation of this guideline.

This page was left blank intentionally

CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

CSIR	Council for Scientific and Industrial Research
DEA	Department of Environmental Affairs
DWA	Department of Water Affairs (formerly DWAF; now DWS)
DWS	Department of Water and Sanitation (formerly DWA)
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
FEPA	Freshwater Ecosystem Priority Areas
GIS	Geographic Information Systems
NBA	National Biodiversity Assessment
NEMA	National Environmental Management Act
NEMPAA	National Environmental Management: Protected Areas Act
NFEPA	National Freshwater Ecosystem Priority Areas
PES	Present Ecological State
SANBI	South African National Biodiversity Institute
WRC	Water Research Commission

CHAPTER 1: INTRODUCTION

1.1 WETLANDS IN SOUTH AFRICA

Wetland ecosystems[1] constitute irreplaceable ecological infrastructure for managing water resources, as well as providing a range of other ecosystem services. Society cannot rely solely on complex and expensive engineering solutions to provide drinking water and to cleanse waste water. The ecosystem services provided by wetlands include their ability to improve water quality and contribute to the maintenance of baseflow in rivers. In the context of climate change, with predicted increases in the variability and intensity of rainfall events, wetlands have the potential to play a more important role than ever before in mitigating extreme episodes like floods and droughts[2].

Wetlands are warehouses of biodiversity, supporting a rich diversity of species that have both economic and intrinsic value. Many of these species are used for food, craft manufacture, medicines, building material and fuel, both for subsistence and commercially. The health and wellbeing of people thus depend on maintaining healthy wetlands and other freshwater ecosystems that provide these vital ecosystem services. Wetland-derived ecosystem services are especially important for the poorest and most vulnerable sectors of the population. It is the rural poor who are most directly dependent upon natural ecosystems such as wetlands for their survival, and who suffer disproportionately in terms of health, economic and general wellbeing from wetland degradation and loss.

The 2011 National Biodiversity Assessment (NBA) (Driver et al., 2012) provides the first ever national assessment of wetland ecosystems and provides clear evidence of widespread loss and degradation of wetlands. Although no systematic national survey of wetland loss has been undertaken, studies in several major catchments have revealed that between 35% and 60% of the wetlands, and the benefits they provide, have been lost or severely degraded. It is likely that the extent of wetland loss for the country as a whole lies within this range. The wetlands that remain, and that have been mapped to date, make up only 2.4% of South Africa's surface area.

A disturbing 65% of wetland ecosystem types are threatened (48% critically endangered, 12% endangered and 5% vulnerable[3]), making wetlands the most threatened of all ecosystems assessed in the 2011 NBA. Floodplain wetlands have the highest proportion of critically endangered ecosystem types, followed by valley-head seeps and valley-bottom wetlands. These wetland classes, especially floodplain wetlands, are frequently associated with highly productive land and are often the ones that are dammed, drained or bulldozed for agricultural purposes.

Wetlands are very poorly represented in South African protected areas: only 11% of wetland ecosystem types are well protected, with 71% not protected at all, reflecting the fact that wetland ecosystems have not been taken systematically into account in establishing and expanding protected areas. Furthermore, protected areas alone are unlikely ever to do the full job of protecting wetlands, which are vulnerable to impacts in their catchments beyond the boundaries of protected areas. This fact highlights the importance of

[1] The definition of wetlands used in this guideline is that contained in the National Water Act (Act No. 36 of 1998) which defines wetlands as '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 in normal circumstances supports or would support vegetation typically adapted to life in saturated soils'.

[2] Readers are referred to the synthesis report for the National Biodiversity Assessment 2011: An assessment of South Africa's biodiversity and ecosystems (Driver et al., 2012), its freshwater component (Nel and Driver, 2012), and the National Freshwater Ecosystem Priority Areas assessment (Nel et al., 2011b) for an overview of wetlands in South Africa. This introduction chapter borrows heavily from these references, particularly Driver et al., 2012.

[3] Critically endangered ecosystems are ecosystem types that have very little of their original extent left in natural or near-natural condition. Endangered ecosystems are ecosystem types that are close to becoming critically endangered. Vulnerable ecosystems are ecosystem types that still have the majority of their original extent left in natural or near-natural condition, but have experienced some loss of habitat or deterioration in condition. More details are provided in section 3.3.3 of this document, and full definitions of these categories, including exact thresholds for each, are provided in Driver *et al.* (2012: 40-41).

integrated water resource management in securing the quality, quantity and timing of freshwater flows on which the functioning of wetlands depends. In addition to managing damaging land-use practices in the catchment, maintenance of intact buffers of natural vegetation around wetlands is a critical component of maintaining wetland function and value.

The degradation of South African wetlands is a concern recognised by government as requiring urgent action, and the protection of wetlands is considered fundamental to the sustainable management of South Africa's water resources. Loss of wetlands does not just lead to biodiversity impacts, but even more critically modifies the underlying ecosystem drivers, namely water quantity (such as flow regime and flow contributions from interflow versus groundwater versus surface water) and water quality (physical, chemical and biological). This has a bearing on water security, cost of treatment and supply.

At the heart of concerns about wetland loss and degradation is the recognition that wetlands constitute crucial 'ecological infrastructure' that provides a wide range of important direct and indirect ecosystem services to people. Direct services typically comprise both provisioning and cultural services. Provisioning services refer to a suite of resources supplied by wetlands, particularly water, but also food, fuel and fibre. These services are typically relevant to adjacent communities where people have a high dependence on natural resources to support local livelihoods. Spiritual enrichment, aesthetic experiences or recreational services are also associated with some wetlands while others provide opportunities for tourism, education and cultural practices. These are referred to as cultural services. From a water resource perspective, wetlands also provide a wide range of indirect ecosystem services that are an expression of the physical, chemical and biological processes that operate in wetlands. The services derived from these processes include flood attenuation, stream flow regulation, water purification through the assimilation of nutrients and removal of toxicants, erosion control and sediment trapping. Finally, wetlands provide vital supporting services which are necessary for the production of other ecosystem services such as primary production, soil formation and nutrient cycling. Understanding these services and the potential implications of negative impacts on, or destruction of, wetlands is essential to inform sound decision making in relation to ongoing development pressures.

Transformation of wetlands has also had a significant effect on wetland habitats and the biota that is dependent on these areas. These impacts are exacerbated by catchment-scale impacts such as deterioration in water quality and alteration in hydrological regimes that can undermine ecological functioning. This has led to situations where certain ecosystem types are transformed well beyond levels necessary for maintaining biodiversity pattern in the landscape and have increased the local extinction risk of wetland-dependant species such as the Wattled Crane. It is therefore important that biodiversity impacts are also considered and appropriately accounted for through offset activities.

1.2 WETLAND OFFSETS

Wetland offsets[4] are enduring measurable conservation outcomes resulting from actions designed to compensate for anticipated significant residual adverse impacts on wetlands. They are implemented to address any significant residual impacts arising from development projects after appropriate avoidance/ prevention, minimisation and rehabilitation measures have been taken into account. The goals of wetland offsets are to achieve 'No Net Loss' and preferably a net gain with respect to the full spectrum of functions and values provided by wetlands. These include:

- Water Resources and Ecosystem Services, especially in relation to regulating and supporting functions pertinent to water resource management and disaster risk reduction, such as flood control and water quality enhancement, but also include direct services such as food and water provisioning, and cultural services such as spiritual, recreational, and cultural benefits that sustain communities;

[4] Definition developed from the biodiversity offset definition of the Business and Biodiversity Offsets Programme "Biodiversity offsets are measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development after appropriate prevention and mitigation measures have been taken. The goal of biodiversity offsets is to achieve no net loss and preferably a net gain of biodiversity on the ground with respect to species composition, habitat structure, ecosystem function and people's use and cultural values associated with biodiversity." (BBOP, 2012a).

- Ecosystem Conservation, especially in terms of meeting national, provincial and local objectives for habitat protection and avoiding a deterioration in ecosystem threat status; and
- Species of Conservation Concern, to ensure that the status of threatened, rare or keystone wetland-dependant species is maintained or improved.

Wetland offsets are applied within a mitigation hierarchy and are only aimed at compensating for significant residual impacts of project development on the environment after all appropriate and feasible steps have first been taken to avoid/prevent, minimize/reduce and remediate/rehabilitate impacts. First, a development proposal should try to avoid or prevent negative impacts on wetlands and the ecosystem services and biodiversity they support by seeking alternative types of development, or alternative locations, different scales of development, different layouts and siting of development components, etc. When all reasonable and feasible alternatives have been identified and considered, every effort should be made to minimise remaining negative impacts and to rehabilitate or remediate affected areas.

Residual impacts are those impacts remaining after measures to minimise and rehabilitate/ remediate harm have been implemented. Significant residual impacts would then need to be remedied through compensation measures, which may involve wetland offsets. The hierarchy of steps that need to be followed prior to considering offsets is presented in Figure 1. Adherence to this sequence of mitigation steps is a prerequisite to considering and planning wetland offsets. Wetland offsets cannot, therefore, be applied as the sole or first mitigation option; the prior sequence of mitigation steps must first be exhausted.

Any significant residual impacts of a proposed project/development will be considered by the DWS through the water use authorisation process. They will be evaluated against management objectives for the water resources in question (including Resource Quality Objectives where these already exist), to determine whether the proposed changes to the watercourse are acceptable. On this basis a decision will be made on whether the project should go ahead or be refused. Should it be decided that the proposed impacts are not compatible with water resource management objectives, even with mitigation and rehabilitation measures, then the application for a water use licence will be refused. However, if the changes posed to the watercourse are acceptable in relation to the water resource management objectives (with relevant mitigation measures and on-site rehabilitation measures), compensation measures for the significant residual impacts, which may include a wetland offset, will be considered and discussed as a condition of this authorisation process.

The calculation and technical requirements in this guideline document will then be implemented, as part of the process to finalise the authorisation, to investigate the application of a wetland offset as a possible compensation measure. The sustainability of the development and proposed wetland offsets will be verified as part of this water use authorisation approval process. If a wetland offset is required, relevant conditions will be included in the license authorisation. Should wetland offsets not be a viable compensation measure (as determined by these investigations) or if the applicant is unwilling to commit to the required wetland offset measures, then the water use authorisation will be refused.

Figure 1: The Mitigation Hierarchy. Wetland offsets are applied within a mitigation hierarchy and are only aimed at mitigating or compensating for residual impacts of development projects on the environment after all appropriate and feasible steps have first been taken to avoid/prevent, minimise/reduce and remediate/rehabilitate impacts.

1.3 THE PURPOSE OF THIS DOCUMENT

This guideline has been developed in response to the growing need for practical guidance on wetland offsets, which are increasingly being prescribed through regulatory processes in response to ongoing loss and degradation of wetland resources. It has been specifically designed for application where significant, large-scale residual wetland impacts are encountered (e.g. large scale infrastructure projects and opencast mining). The document nevertheless provides an equally useful framework to inform wetland offset design and implementation in other contexts where there are smaller, but still significant, residual impacts and a wetland offset is still required (e.g. agriculture or small development projects).

The guideline provides practical guidance for determining the size and characteristics of a wetland offset, and determining the requirements for its implementation, once a decision on the need for a wetland offset has been taken through the water use authorisation process by the DWS. Where this guideline is being used in other authorisation processes, the decision on the need for a wetland offset will be determined though an environmental impact assessment process and interactions with the relevant regulatory authority. The guideline should thus be seen in the broader context of other relevant policies and guidelines including, amongst others, policy documents from the DWS and/or other applicable departments such as Environmental Affairs, its provincial counterparts and Mineral Resources. In the event of any conflict between this guideline and existing policy and legislation, the latter will prevail.

This guideline serves as a practical tool to aid in the consistent application of wetland offsets in South Africa. The guideline is primarily aimed at wetland offsets required as part of water use authorisation processes (e.g. in an application for a Water Use Licence under the National Water Act) where compensatory actions can contribute to achieving water resource management and biodiversity conservation objectives. The guideline is equally relevant for use in environmental impact assessment (EIA) processes (e.g. as part of the environmental authorisation process in terms of the National Environmental Management Act or in an application for a mining licence or development of an Environmental Management Programme under the Mineral and Petroleum Resources Development Act).

The guideline outlines how wetland offsets should be applied within the mitigation hierarchy, in order to compensate for significant residual impacts of project development on the environment after all appropriate steps have first been taken to avoid/prevent, minimise/reduce and remediate/rehabilitate impacts. The guideline details how to calculate the residual impacts of a development in terms of Water Resources and Ecosystem Services, Ecosystem Conservation, and Species of Conservation Concern. It also sets out the offset ratios to be used in determining an appropriate offset. It then provides guidance on the identification of appropriate offset sites and measures, and details the process of calculating whether or not the proposed offset receiving area sufficiently meets the requirements in terms of objectives and targets for Water Resources and Ecosystem Services, Ecosystem Conservation and Species of Conservation Concern. The offset ratios applied at the receiving site are designed to accommodate issues of risk and security of tenure, and aim to incentivise good practice. The guideline document is supported by an electronic Wetland Offset Calculator to assist with calculations. The guideline includes two appendices. Appendix A includes a list protection levels and ecosystem threat statuses for wetland groups required for the calculations of offsets, while Appendix B provides specific guidance on the use of the Wetland Offset Calculator which is also relevant for manually doing the calculations.

In summary the purpose of this document is to:

- Standardise criteria, procedures and processes on how to design and implement offsets for residual negative impacts on wetlands;
- Describe the goals and principles of wetland offsets;
- Provide a standardised method for calculating appropriate offset requirements;
- Provide guidance on selection of appropriate sites for wetland offsets and offset mechanisms; and
- Provide a standardised method for calculating whether or not a proposed offset is sufficient and appropriate.

CHAPTER 2: APPROACHES AND PRINCIPLES

2.1 POLICY CONTEXT FOR WETLAND OFFSETS

This Wetland Offsets Guideline is not designed to be a policy document and does not provide an extensive description of the broad policy context and enabling legislation for offsets. Rather, it aims to provide technical guidance on the design and implementation of wetland offsets. This document should be read in combination with appropriate policy, strategy and framework documents such as:

- Draft DWS Guideline: Assessment of Activities/ Developments Affecting Wetlands (DWS, 2014a).
- Draft DWS Position Paper for the Protection, Use, Development, Management and Control of Wetlands (DWS, 2014b).
- The Department of Water Affairs Operational Policy for Developments and Activities affecting Water Courses (DWA, 2012).
- Resource Quality Objectives applicable to the water resources and Water Management Area in which the impacts to wetlands will take place and in which offsets are proposed.
- The Draft National Policy Framework for Biodiversity Offsets (SANBI/DEA, 2013) provides an overarching framework and national context for biodiversity offsets in South Africa. It provides national definitions and an understanding of key concepts relating to biodiversity offsets, and outlines the legal context for biodiversity offsets in South Africa. It is also intended to provide authorities with a template to prepare area- and/ or ecosystem-specific guidelines on biodiversity offsets (e.g. this guideline), and the procedures that need to be in place to implement offsets.
- Provincial biodiversity offset guidelines and/ or policies, e.g. KwaZulu-Natal (EKZNW, 2013), the Western Cape (DEADP, 2011), and in Gauteng (GDARD, 2013). The KwaZulu-Natal guideline includes specific provisions for wetland offsets, as a subset of biodiversity offsets.

2.2 THE PURPOSE OF WETLAND OFFSETS IN SOUTH AFRICA

The broad goal of wetland offsets, through the development and water use authorisation processes, is to achieve 'No Net Loss' and preferably a net gain with respect to a full spectrum of functions and values provided by wetlands. This requires that significant residual[5] impacts of development projects on wetlands are fully compensated for, through the implementation, by project proponents, of measures to rehabilitate and/or secure wetlands at other locations. The specific goals of wetland offsets are to:

1. Provide appropriate and sufficient compensation for significant residual impacts on indirect (regulating and supporting) and direct (provisioning and cultural) ecosystem services that wetlands provide, to ensure that water resource management objectives and biodiversity conservation targets are not undermined and that beneficiaries of wetland services are not negatively affected. This is achieved through:
   1.1. Appropriate and sufficient gains in wetland functional area and condition equal to, or greater than, the losses due to residual negative impacts.
   1.2. Directing offset activities that would improve key indirect (regulating and supporting) ecosystem services to wetlands where these services could best be enhanced, and where these offset activities would best contribute to achieving water resource objectives.
   1.3. Appropriate and sufficient compensation for significant residual impacts on important direct (provisioning and cultural) ecosystem services provided by wetlands, to ensure that affected communities are not unduly disadvantaged by the loss of these services.
2. Contribute to meeting national and/or provincial biodiversity conservation targets for the representation and persistence of different wetland types,, thereby ensuring that cumulative impacts of

[5]Residual impacts are those impacts which remain after the earlier steps in the mitigation hierarchy to avoid, minimise and rehabilitate impacts have been exhausted.

increased water use, development and land use change do not jeopardize the ability to meet the country's targets;

3. Adequately compensate for residual impacts on threatened or otherwise important (e.g. wetland-dependent) species through appropriate offset activities that support and improve the survival and persistence of these species.

2.3 GENERAL PRINCIPLES FOR THE DESIGN AND IMPLEMENTATION OF WETLAND OFFSETS

There are a number of key principles, concepts and issues that should be addressed in the design and implementation of any wetland offset. These principles are primarily derived from the Principles on Biodiversity Offsets published by the Business and Biodiversity Offsets Programme (BBOP, 2012a, b). The key principles are:

- **No net loss**: This is an overarching policy and design principle of cardinal importance. Achieving no net loss for a particular development project requires that the project's impacts are balanced or outweighed by measures taken to avoid, minimise, rehabilitate on-site and offset, so that no loss remains (BBOP, 2012a, b). The interpretation of no net loss applied in the current guideline is that unavoidable loss should be offset through securing sufficiently improved condition of other wetlands through rehabilitation activities, and improving the overall security and sustainability of the wetland network through averted loss, improved management and long-term protection of wetlands. It does not take a literal interpretation which would require that where wetlands are lost that new ones need to be established.

- **Adherence to the mitigation hierarchy**: An offset compensates for significant adverse impacts that remain after appropriate avoidance, minimisation and on-site rehabilitation options have been exhausted. Offsets should only be considered once all feasible and effective actions and project alternatives to avoid, minimise and rehabilitate damage have been taken into account.

- **Limits to what can be offset**: There are situations where residual impacts cannot be fully compensated for by a wetland offset because of the significance of the impact (e.g. on a highly threatened wetland type) or the value of the wetland affected (e.g. a wetland type that is unique or restricted in distribution). There are thus limits to what can be offset. In cases where projects with impacts that are not offsettable are nevertheless still approved, these guidelines can still be used to ensure that the greatest possible degree of compensation is attained.

- **Landscape and catchment context:** Landscape and catchment context should be taken into account to ensure that any offsets are sustainable and result in an optimum overall outcome. In the past, offset policies have tended to strictly favour exact like-for-like offsets in locations close to the impact site. Increasingly, however, it has been recognized that in some instances local offset sites may not be suitable or available, and better outcomes could be achieved by locating offsets in alternative locations which may be further afield, or by being more flexible in terms of offset design and requirements.

- **Like-for-like:** This principle refers to the targeting, through offset activities, of the same wetland type as the one impacted by development. Offset policies tend to favour like-for-like offsets although out-of-kind offsets should be used where they provide greater or more sustainable water resource and conservation benefits than like-for-like options. For example, offsets may trade up to wetland types of a higher priority for conservation than the wetland type being impacted or target key wetlands in strategically identified wetland offset receiving areas, wetlands of a different type and/or in a different catchment where these offsets will be more sustainable, or wetlands which are of higher priority for meeting resource quality objectives or biodiversity objectives than the wetlands being lost to development.

- **Additional conservation outcomes**: Offsets need to be a new contribution to conservation outcomes, i.e. over and above what would have occurred without the offset in place.

- **Stakeholder participation and transparency:** The design and implementation of offsets should be undertaken in an open and transparent manner, providing for stakeholder engagement, respecting recognised rights, and seeking positive outcomes for affected parties. The design and implementation of a wetland offset should also be well documented, and incorporate best available science and other knowledge. This participation process is a requirement of legislation and must be part of the water use authorisation and environmental authorisation processes.

- **Equity**: A wetland offset should be designed and implemented in an equitable manner, which means the appropriate sharing among stakeholders of the rights, responsibilities, risks and rewards associated with a project and offset in a fair and balanced way, while respecting legal and customary arrangements.

- **Long-term outcomes**: Offset outcomes need to last at least as long as the project's residual impacts and preferably in perpetuity. This requires that legal and financial assurances are in place to ensure that sites are legally protected and effectively managed to ensure they maintain their value as an offset. Adaptive management is required in the long term, including appropriate management planning, supportive monitoring and evaluation. Offsets must be measurable, auditable and enforceable, through explicitly worded conditions, covenants and/or contracts.

2.4 WAYS OF ACHIEVING WETLAND OFFSETS

Where a wetland offset is deemed appropriate, various actions may be used to deliver the required outcomes. These actions can be broadly grouped into the different categories listed below.

- **Protection**: This refers to the implementation of legal mechanisms (e.g. declaration of a Protected Environment or Nature Reserve under the National Environmental Management: Protected Areas Act (NEMPAA), a legally binding conservation servitude, or a long term Biodiversity Agreement under NEMA) and putting in place appropriate management structures and actions which ensure that the value of the wetland offset is maintained. This may include specifying protection measures using the relevant provisions of the National Water Act, as well as inclusion of offset sites into appropriate land use zones to ensure that conservation outcomes are secured and maintained in the long-term. Protection is required for all offsets.

- **Rehabilitation**: Rehabilitation results in an improvement in wetland condition, function, and associated biodiversity. Rehabilitation involves the manipulation of the physical, chemical, or biological characteristics of a degraded wetland system in order to repair or improve wetland integrity and associated ecosystem services. It could involve actions such as blocking drainage canals, removing artificial obstructions to flow, assisting the regeneration of the natural vegetation and/ or clearing of invasive alien species on the wetland site or in its buffer zone. By improving the condition of a wetland system and its biodiversity, a positive contribution is made towards the goal of no net loss. Where an offset is undertaken through rehabilitation, long term protection and suitable management to maintain the full value of the offset wetland is required.

- **Averted loss:** In this guideline, this term refers to physical activities which prevent the loss or degradation of an existing wetland system, its ecosystem services and its biodiversity, where there is a clearly demonstrated threat of decline in the system's condition, ability to provide ecosystem services or contribute to overall water resource management objectives. This would apply in situations such as where active erosion in a wetland is stabilised to prevent an erosion gully from propagating further into the wetland, where excessive sediment inputs are prevented from entering a wetland through the stabilization of erosion alongside the wetland or by creating structures to trap such sediment before reaching the wetland, or where there is significantly improved management of a wetland (e.g. long term improved management of the catchment, reduced grazing pressure or control of invasive alien species beyond the wetland and its buffer zone impacting on wetland ecosystem functioning). Long term protection and suitable management to maintain the full value of the offset wetland is required

- **Establishment**: This activity involves the development (i.e. creation) of a new wetland system where none existed before by manipulating the physical, chemical, or biological characteristics of a specific site. Successful establishment would result in 'gains' in wetland area, functions and possibly biodiversity values. It is important to note however, that while selected ecosystem services may quite readily be created through establishment, it is very difficult if not impossible to create the same complexity of ecological processes and biodiversity as that found in healthy, natural wetlands. In general, establishment as a mechanism for delivering an offset should therefore be avoided, and should only be used where no other alternatives exist. Long term protection and suitable management to maintain the full value of the offset wetland is required.

- **Direct Compensation**: Direct compensation involves compensating affected parties for the ecosystem services lost as a result of development activities. This is ideally done by providing an equivalent substitute form of asset or in some cases may take the form of monetary compensation. This form of offset action is generally most relevant to direct services (e.g. loss of provisioning services like grazing) but may occasionally be applied to compensate for losses of regulating and supporting services (e.g. through the artificial treatment of polluted water). In general, direct compensation is not a desired offset mechanism, but it may contribute to an integrated offset approach which ensures overall no net loss through a range of mechanisms.

Which of these measures is appropriate in a given situation will depend on the specific circumstances, the objectives and targets of the offset, and what is feasible in the light of constraints (e.g. other land uses or existing mineral rights is the catchment). Often, a combination of different measures and activities may be required to deliver the offset, and to help address risks and uncertainties.

2.5 WHERE DO WETLAND OFFSETS FIT INTO LEGAL REQUIREMENTS AND AUTHORISATION PROCESSES?

The stage and timing of investigation of wetland offsets in an application for authorisation will vary, depending on the specific requirements and administrative processes of the applicable legislation and regulatory authority. Wetland offsets may need to be addressed during a range of authorisation processes including a Section 21(c) and (i) Water Use License Application (WULA) process under the National Water Act (Act 36 of 1998), a Basic Assessment or Scoping and Environmental Impact Assessment process in terms of the National Environmental Management Act, and/or the preparation of an Environmental Management Programme in terms of the Mineral and Petroleum Resources Development Act.

It is beyond the scope of this guideline to detail exactly how the wetland offset administrative process will work in each case. Regardless of the exact regulatory instrument and procedures, the offset design process should be undertaken adhering to the mitigation hierarchy and the principles presented in Section 2.3, and engaging the appropriate national or provincial competent authorities in an iterative manner at the appropriate stages in the application and authorisation processes. The purpose of this iterative engagement is to test and ensure the appropriateness and likely acceptability of wetland offsets, and the adequacy of any wetland offset investigation.

The full application of the mitigation hierarchy (especially the full assessment of alternative options) is required for the Water Use Authorisation process. All options for avoidance/ prevention, minimisation/ reduction, and rehabilitation/ remediation need to be considered before investigating offsets. Wetland offsets constitute compensation and will only be considered by DWS if the earlier stages in the mitigation hierarchy have been fully applied. In other words, wetland offsets should never be used as an alternative to full application of all feasible prior steps in the mitigation hierarchy. Critically, in the Water Use Authorisation process, wetland offsets are used to compensate for significant residual impacts of the chosen project alternative. They are not part of the assessment process to inform a decision on the best practicable environmental option, and do not influence the decision on whether or not the project should proceed. Wetland offset proposals cannot, therefore, be used to justify the selection of project options which would otherwise have had unacceptably high negative impacts.

During an environmental application and authorisation process in terms of the National Environmental Management Act, should the early scoping phase of the EIA identify the likelihood that an offset would be required to deal with significant residual impacts on wetlands, then a detailed offset investigation, culminating in the necessary offset report and concept offset management plan, would be required by the competent authority. Similar to the water use authorization processes in terms of the National Water Act, the need for an offset emerges from the EIA process. Once again, the offset is required and designed to compensate for significant residual impacts of the most appropriate alternative, rather than being part of the process for selecting that alternative.

Using these guidelines, it should generally be possible to design an integrated offset that will meet the requirements of all relevant authorisations required for a particular development project. Designing such an offset that will meet the needs of all authorities will however require timeous and ongoing consultations with these authorities. Where wetland offsets are considered as part of both water use authorisation and environmental authorisation processes, it may be advisable to run the processes together to streamline public participation and finalise the technical documents required by DWS and DEA. Suitable wetland specialists will be required to ensure all information requirements on hydrological drivers, wetland hydraulics, water quality and biodiversity are addressed.

2.6 PHASED APPROACH TO DEVELOPING A WETLAND OFFSET PLAN

As detailed in the previous section, wetland offsets need to respond to the specifics of the wetland being impacted upon, may need to meet multiple objectives, need to be developed with stakeholder involvement, and may need to comply with the requirements of authorisations under a number of different pieces of legislation. In view of these complexities, a phased approach to developing the offset provides the best opportunity for planning an acceptable, successful, efficient and implementable offset (Figure 2). This approach involves the development of a preliminary offset proposal which is submitted for review by the regulating authorities prior to being refined for incorporation into a formal Wetland Offset Plan.

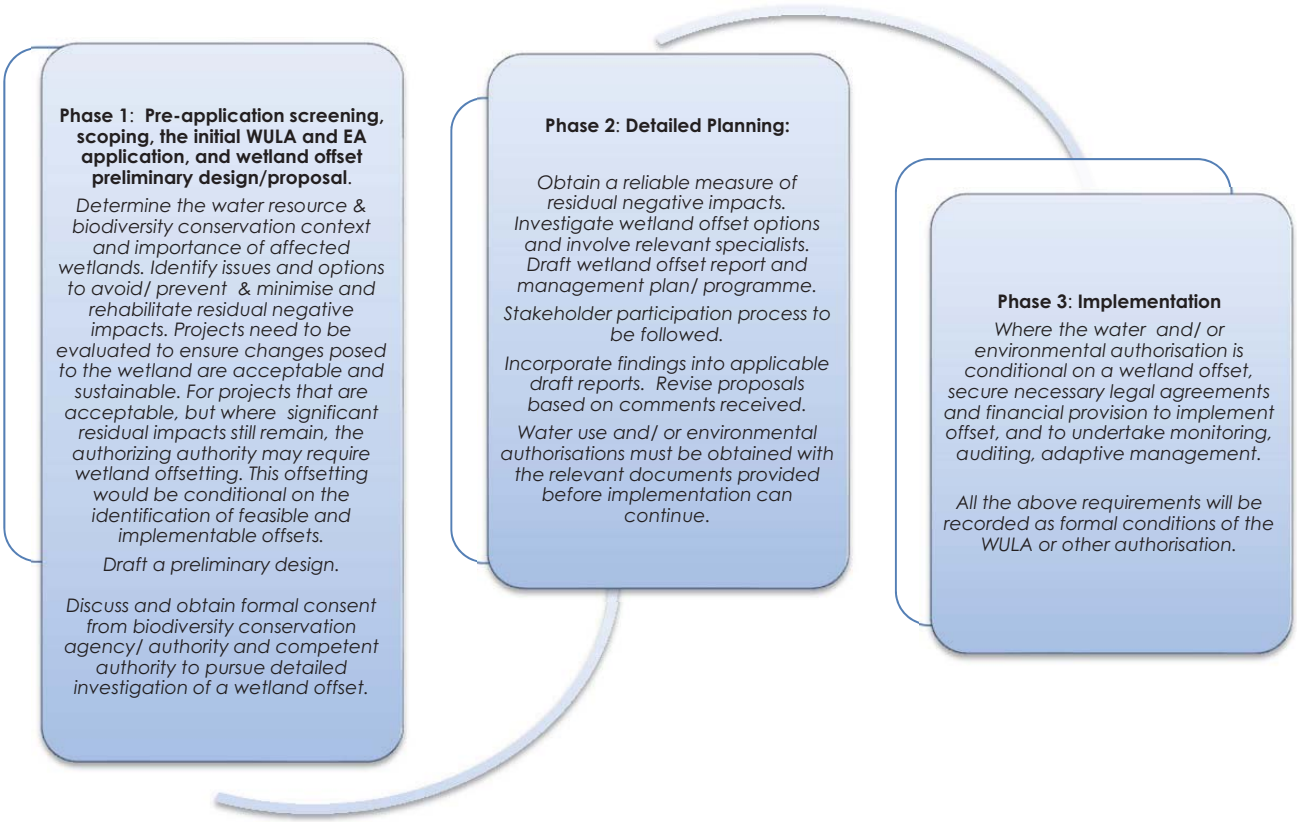


Figure 2: Phased approach to wetland offsets, integrated within a generic water use or environmental impact assessment process.

The initial '**Pre-application Screening, Scoping and Preliminary Design'** phase (Phase 1) is largely focussed on the required WULA and EIA processes necessary to determine the feasibility and sustainability of the proposed project and the potential impacts on wetlands. The focus should be on trying to avoid the need for an offset altogether, through exploring a range of project alternatives (primarily location, siting, design and technology options). It is of the utmost importance as a first step in this process, therefore, to determine the water resource, ecosystem services and conservation context and importance of affected wetlands, and to identify potentially significant impacts and risks. This information highlights where the proposal needs to be modified – or alternatives sought – to avoid these impacts. Where impacts cannot be avoided, it is then important to determine the scope for minimising and rehabilitating probable negative impacts, in order to arrive at a reliable measure of the remaining impacts. Projects would then be evaluated by the relevant authority to assess the acceptability of the impacts on wetland resources. For projects that have an acceptable level of impact, but where significant residual impacts remain, the authority may require the inclusion of an offset.

A reliable measure of residual impacts is necessary. The assessment must take into account the full range of potentially significant residual impacts on water resources and important ecosystem services, ecosystems and Species of Conservation Concern. Once a reliable measure of probable residual impacts has been obtained, it is necessary to broadly determine the size and type of offsets required.

Wetland offsets should only be investigated in circumstances where the project impacts are acceptable and the project is recommended for approval, but where there are nevertheless still significant residual impacts which the authority requires to be addressed (through an offsetting process) before a licence is granted or an application approved. The feasibility of offsetting must then be investigated: are there potential offset sites that would satisfy offset requirements, is it likely that these sites could be secured as offsets, and would and could the offset be successfully implemented? Phase 1 generally culminates in the development of a Preliminary Offset Proposal or Design, listing potentially suitable offset sites. At this stage, it is important to obtain consent from the appropriate authorities to pursue more detailed investigation of a wetland offset. Should these authorities confirm that a wetland offset would be acceptable and appropriate, then a detailed offset investigation should be initiated.

During Phase 2, **Detailed Planning**, the focus is on finding the most appropriate offset sites and activities to meet offset requirements. Where there are a number of alternatives, these should be compared in terms of their suitability and ability to achieve desired outcomes. After an initial comparative evaluation of potential sites, a more detailed analysis using the methodology and approaches described this guideline must be carried out to see whether or not the most promising site/s would enable offset requirements to be met. It may be necessary to involve a range of wetland specialists in this exercise, depending on the type of residual impact (e.g. impacts on Species of Conservation Concern would require specialist input, investigation of impacts on provisioning or cultural services might require a social specialist or resource economist, while in other cases geohydrological, hydrology, hydraulics, and water quality inputs may be necessary). The associated management and cost implications of selecting different alternatives must be determined. The feasibility of securing candidate sites would also need to be investigated. Key stakeholders in the area of the development project and the offset site/s, as well as relevant authorities, must be identified and invited to give input, and to review draft offset proposals.

The assessment of residual impacts and offset requirements due to a development, the process of offset site selection and the calculation of potential gains at the offset site/s need to be clearly described in a draft Wetland Offset Report. The proposed offset activities would need to be described, including the mechanisms to secure the offset sites. In addition, the proposed management of the offset site/s must be described in a concept Wetland Offset Management Plan or Programme, setting out key approaches to managing the site/s. Prior to the authorisation of the proposed development, it would be unreasonable to require detailed management plans for wetland offset sites. The draft Wetland Offset Report and associated concept Wetland Management Plan/ Programme would form part of the Water Use Licence Authorisation application and/or Environmental Authorisation reports. These reports would need to be made available to stakeholders

for their comment. Following any comments received on the draft reports, the offset design and proposed management plan should be revised as appropriate, and submitted to the competent authority for a final decision. If authorised, however, a detailed Wetland Offset Management Plan or Programme would be required to be submitted to the competent authority as a condition of authorisation within a specified timeframe. This Plan must give explicit performance targets, describe management actions and their timing, the roles and responsibilities of different parties, monitoring and corrective/adaptive management and any reporting requirements. Assurances with regard to adequate financial provision for site management must be given.

During Phase 3, **Implementation**, and assuming that the competent authorities have authorised the proposed development conditional on a wetland offset, it would be necessary to finalise the relevant legal agreements, guarantee sufficient financial provision, and flesh out the Wetland Offset Management Plan or Programme. These will be specified conditions of the Water Use Licence and proof of draft legal agreements, assurance of financial provisions, etc. will be required before the licence is issued.

CHAPTER 3: ASSESSING IMPACTS ON WETLANDS AND CALCULATING OFFSET REQUIREMENTS

This chapter outlines the process for assessing impacts on wetlands and calculating offset requirements. It outlines the approach in five sections:

- Overall approach
- Assessing Offset requirements for Water Resources & Ecosystem Services
- Assessing Offset Requirements for Ecosystem Conservation
- Assessing Offset requirements for Species of Conservation Concern
- Establishing clear objectives and targets to guide the offset design process.

3.1 OVERALL APPROACH

The approach to quantifying offset requirements is rooted in the purpose of offsets outlined in Section 2.2. This approach involves an evaluation of three key components: Water Resources and Ecosystem Services, Ecosystem Conservation, and Species of Conservation Concern (Figure 3). Each of these components needs to be evaluated to ensure that the significant residual impacts on the full range of values associated with the wetland are included. Accurate identification and evaluation of impacts is essential to enable adequate mitigation measures, including offsets to be determined. A broad overview of the key questions and associated approach to addressing each component is summarized here:

1. **Water Resources and Ecosystem Services:** What are the key ecosystem services provided by the wetland, especially in relation to water resource management, and to what extent will they be negatively affected? In the absence of more suitable tools, wetland area and condition are used to provide a surrogate measure for the indirect (regulating and supporting) services that are critical for water resources. It is also important to understand the wider catchment context of the wetland and to be able to identify key regulating or supporting services that will be impacted by planned development activities. The evaluation also needs to identify if there are any important direct (cultural and provisioning) services provided by the wetland and examine how changes in these services will affect users. This assessment requires an understanding of local use and the dependence of people on the affected wetland.
2. **Ecosystem Conservation**: How important is the wetland ecosystem in contributing to biodiversity conservation targets? The conservation importance of the wetland is informed primarily by the ecosystem threat status and protection level of the wetland, as assessed by the freshwater component of the 2011 National Biodiversity Assessment (Nel and Driver, 2012). It also relates to the priority of the system within the assessment carried out through the National Freshwater Ecosystem Priority Areas (NFEPA) project (Nel *et al.*, 2011a, b), within applicable fine-scale biodiversity plans, and in bioregional plans. The conservation value of a wetland is also strongly influenced by local conditions and context, including the integrity of adjacent terrestrial areas and the local catchment, and connectivity to other wetlands.
3. **Species of Conservation Concern**: Are threatened and other important species associated with the wetland, and to what degree are they likely to be impacted?

In each case, the significance of potential impacts needs to be assessed, together with the potential to offset these impacts. Importantly, if there is no significant residual impact within a particular component (e.g. if no Species of Conservation Concern occur in the wetland), then no further consideration of that component would be required in determining offset requirements.

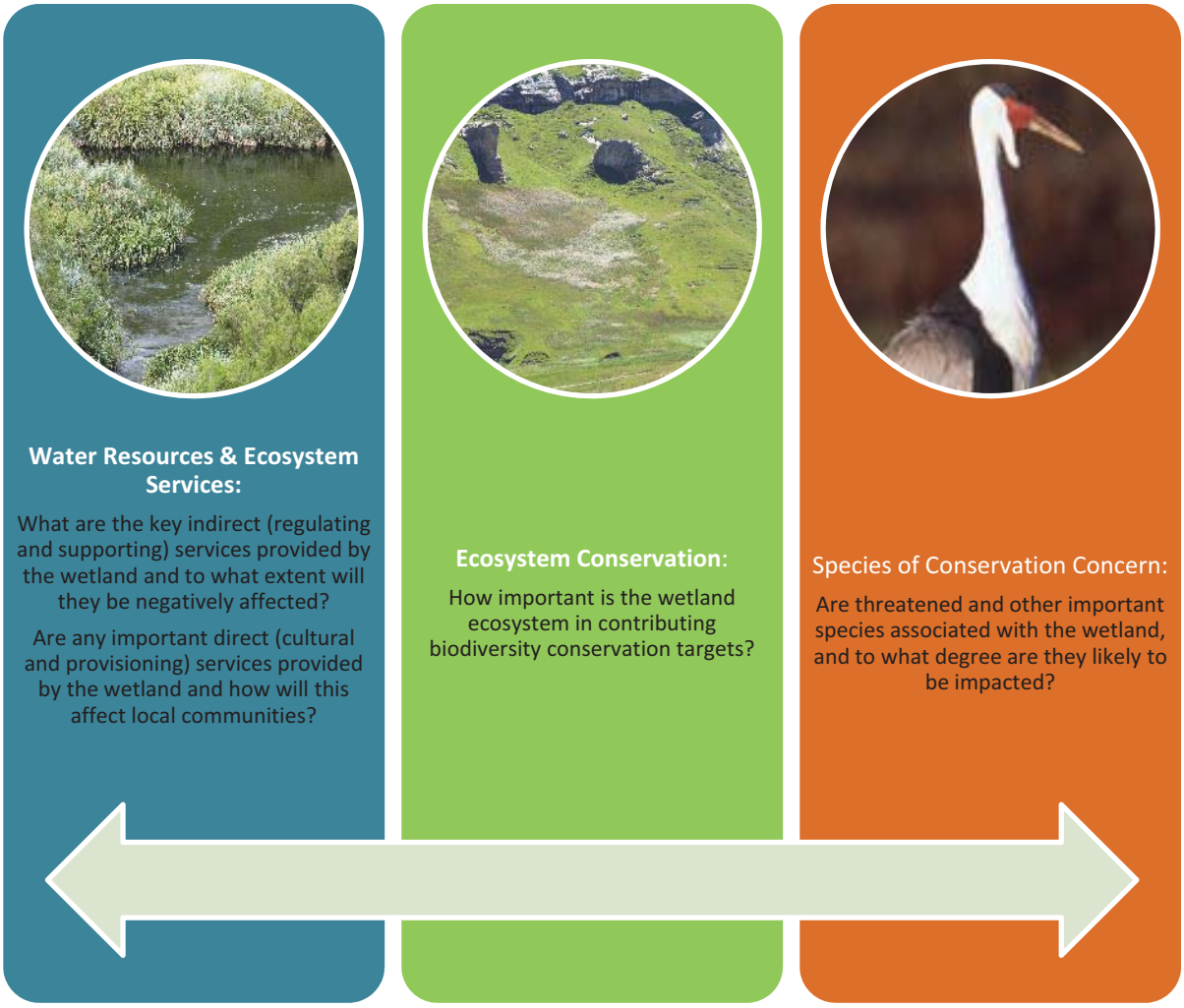


Figure 3: Key components to be taken into account when determining wetland offset requirements.

For significant residual impacts, a structured process is then followed for determining the offset requirements for each relevant component. A similar approach is followed for all components. This process is summarised in Figure 4. For each component (e.g. the impact on Water Resources and Ecosystem Services), a structured process is followed which involves:

- Determining the extent, type and condition of wetlands to be impacted. This assessment will differ in detail for each component, but typically involves a careful identification, delineation and classification of the feature involved (e.g. the extent of the wetland or specific habitat for a threatened species), and an assessment of current ecological condition.
- Assessing the change in condition of wetland features or attributes as a result of the development activities[6]. This assessment draws on the baseline established in the previous step and predicts the likely change in ecological condition (and other attributes) after the development project has been implemented. It must be emphasised that this assessment looks only at the residual impact, after all other steps in the mitigation hierarchy (avoidance, minimisation and on site rehabilitation) have been implemented. This assessment needs to be based on:

[6] Wetland offsets are designed to deal with the residual impact of the project being considered, and need to take into account the actual baseline or existing condition of the wetland, rather than assuming that the wetland is in a pristine or perfectly functioning state prior to the development. The main exception to this is where the actual "before" condition of the wetland is unknown, in which case it should be assumed that the wetland was indeed in a completely natural and fully functional state. In theory this should not be required, as in all cases detailed knowledge of wetlands is required as part of the baseline work for EIA authorisation processes. However, in certain cases where there has been deviation from an ideal process or some non-compliance with regulations, it is reasonable for the competent authorities to specify a natural state as the pre-development project baseline condition for calculations in the offset process.

  - A sound understanding of the proposed development and associated activities;
  - The identification of impacts and risks of the development to the affected wetland;
  - An understanding of the condition and functioning of the affected wetland and sensitivity to proposed development activities. This includes assessment of the Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS)[7];
  - The identification of measures to avoid or minimise impacts on the wetland and associated local catchment; and
  - A precautionary approach which realistically assesses the level of potential success of rehabilitation and other mitigation measures. Importantly, the ability to restore, rehabilitate or recreate a full complement of biodiversity in a wetland (including all aspects of species composition, ecosystem structure and function) should not be overestimated. Although there is clear evidence that wetland functionality can be improved, there is little evidence that the full complement of biodiversity would return to rehabilitated or recreated wetlands.
- Using extent of impact and change in condition to calculate a measure of the residual impacts anticipated as a result of the development. This is typically reflected in terms of "hectare equivalents"[8] of intact wetland to be impacted.
- Adjusting the initial "hectare equivalents" value by multiplying by relevant offset ratios that take additional factors into account. This requires a consideration of the wider catchment/landscape and conservation context. This calculation gives you the offset requirements specific to each component.

A Wetland Offset Calculator has been developed to simplify the calculations described above. This is a simple Microsoft Excel tool that is structured to easily capture relevant information for each wetland, and produce the outputs required to quantify the required offset. The results of each assessment must then be used to calculate offset requirements for the project as a whole. Specific guidance for undertaking the assessments of each component, together with how to use the offset calculator, now follows in the remainder of this chapter.

[7] See Kleynhans and Louw (2007) for a detailed explanation of Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS). PES and EIS are standard components of most assessments of wetlands required for DWS authorisation process.

[8] To enable the quantification of an appropriate offset, it is important to establish a common unit or currency that will allow residual losses (due to the proposed impacts) and gains (due to the proposed offset) to be consistently measured and compared. This is central to the concept of offsets, and the goal of achieving no net loss. In the past, the area of wetland residually affected (as measured in hectares, for example) was a commonly used currency and is still used in many instances. However, the approach taken in this guideline, based on international best practice, uses a more refined currency that better incorporates a measure of ecological function, quality and/or integrity. The basic "hectare equivalents" of intact wetland used in this guideline are a combination of extent of wetland impacted and the change in condition or functionality. They are used as a surrogate for measuring residual loss and have been adopted here as the primary currency for evaluating impacts of proposed development on wetland ecosystems. The hectare equivalent concept is discussed in greater detail, together with worked examples, in Cowden and Kotze (2009; sections 11.2.1 and 12.8.2).

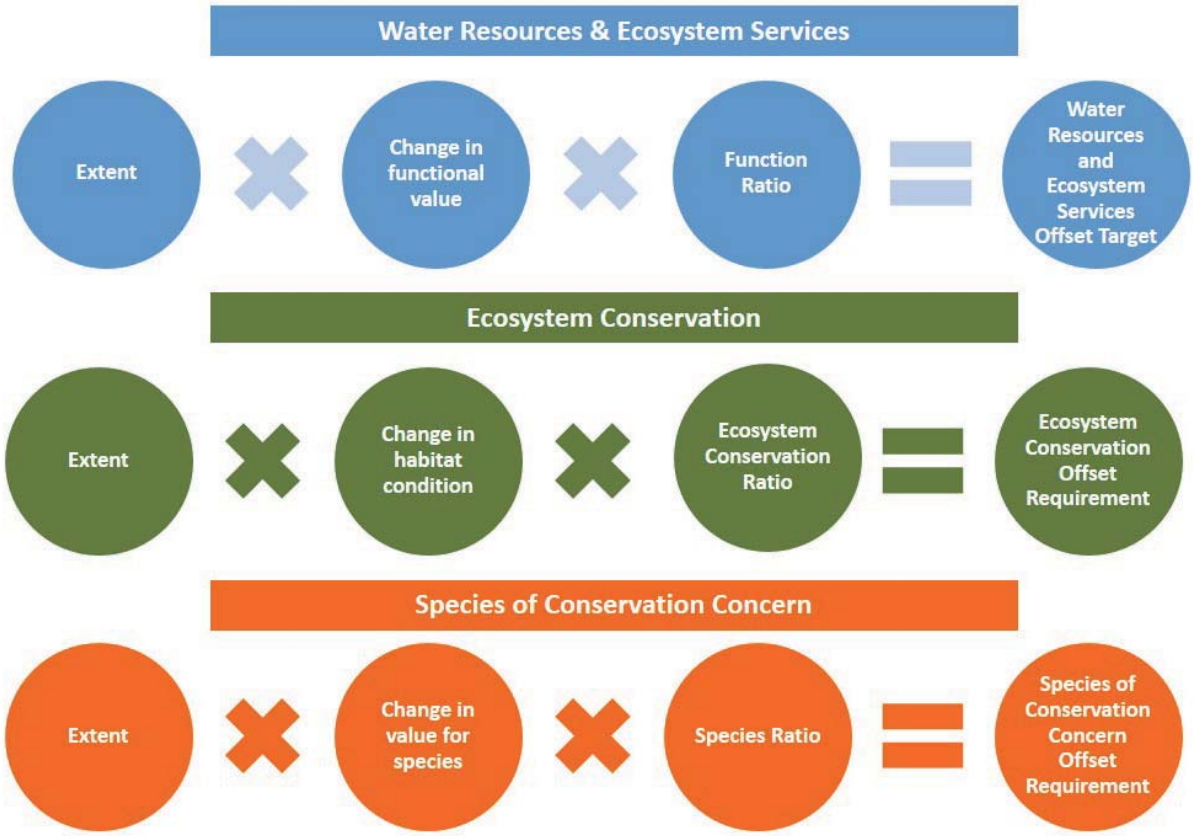


Figure 4: Outline of the approach used to identify the required offset for Water Resources and Ecosystem Services, Ecosystem Conservation and Species of Conservation Concern.

3.2 DETERMINING OFFSET REQUIREMENTS FOR WATER RESOURCES AND ECOSYSTEM SERVICES

The method outlined in this section is designed to determine offset requirements for Water Resources and Ecosystem Services. It focusses on the key indirect (regulating and supporting) services provided by the wetland and methods for calculating the extent to which they will be negatively affected. Direct (cultural and provisioning) services need to be individually assessed[9].

The following sections outline the process to follow to identify offset requirements for Water Resources and Ecosystem Services. The process includes the following steps:

1.) Map and classify the wetlands that will be impacted by the proposed development.
2.) Assess and quantify the anticipated residual impacts on Water Resources and Ecosystem Services.
3.) Modify the basic hectare equivalent measure to obtain a final offset requirement for Water Resources and Ecosystem Services.

[9] It is also critical to determine whether there are additional impacts and offset requirements for direct (cultural & provisioning) services, as development projects can have a significant impact on direct use values provided by wetlands to people. This is particularly relevant in rural contexts where communities are frequently heavily reliant on wetland areas for their livelihoods (e.g. grazing, harvesting of natural resources, subsistence cultivation). There may however be other contexts where direct use values are negligible and do not require any form of compensation. Tools such as WET-Ecoservices (Kotze *et al*., 2007) can be used to determine whether or not direct use values are an important consideration. Where this is flagged as a potential concern, input from relevant specialists would need to be obtained to better understand these values and the need for compensation. The appropriate mechanism for compensation would then need to be determined with appropriate input from affected parties. As the value of direct services is dependent on local circumstances, it is not possible to provide generic guidelines on determining offsets for these services, and each offset for direct services would need to be set on a case by case basis.

3.2.1 Map and classify the wetlands that will be impacted by the proposed development

Prior to, or as part of the impact assessment, wetlands associated with the planned development must be clearly delineated and mapped using appropriate wetland delineation guidelines (e.g. DWAF, 2005; DWAF, 2008). This should include wetlands that will be directly impacted by the development together with other wetlands that are likely to be indirectly impacted (e.g. from the altered hydrology of the wetland being directly impacted).

3.2.2 Assess and quantify the anticipated residual impacts on Water Resources and Ecosystem Services

The condition or quality of the affected wetland can affect its capacity to provide regulating and supporting services for downstream users (e.g. drainage of a wetland may significantly reduce the ability of the wetland to provide a water quality enhancement function). In the absence of more suitable measurement systems, change in wetland area and condition are used to provide a surrogate measure for the impact on indirect services provided by wetland ecosystems. A crucial element in the offset calculation is therefore predicting the change in wetland condition as a result of a development or impacting activity. First, the wetland's present condition relative to a natural or fully functioning state needs to be assessed[10]. The present functional value should be expressed as a percentage of a similar wetland in a natural or fully functional state. Second, the future condition (after any required rehabilitation) of the wetland at the end of the project relative to a natural or fully functional wetland needs to be predicted. A wetland that will be completely destroyed will have 0% remaining value. Thirdly, the change in wetland condition due to residual impacts is calculated by subtracting the future value from the current value. The estimated change in wetland functionality is calculated by multiplying this change in condition by the area of wetland affected (in hectares) to give a basic indication of the offset required for Water Resources and Ecosystem Services in hectare equivalents.

3.2.3 Modify the basic hectare equivalent measure to obtain a final offset requirement for Water Resources and Ecosystem Services

Wetlands in some areas may be playing more valuable roles than those in other areas. The loss of these wetlands may thus have a greater relative impact on Water Resources and Ecosystem Services, and would require an increased offset target to adequately compensate for the services to be lost. These areas may include:

- Strategic Water Source Areas (Nel *et al.,* 2013) which could compromise water regulation/ supply for downstream users;
- Areas of high water stress (e.g. a water stressed catchment as designated by DWS) where such loss could exacerbate the situation;
- Other specific areas designated as important by a regulatory authority;
- Wetlands providing critical flood attenuation, water quality enhancement or carbon sequestration functions that cannot be easily replaced;
- Other circumstances identified as part of the authorisation process that warrant an increase in offset targets.

In these cases, there would be a need to apply a ratio to increase offset targets to cater for the increased significance of the impacts. The size of increase in the required offset and/or augmentation of the offset with particular offset activities should be discussed and agreed with the competent authority and the rationale should be carefully documented. A default ratio of 1.5 is suggested when any of these triggers are identified.

[10] Note that a tool such as WET-Health (Macfarlane et al. 2009) could be used to evaluate wetland condition at the start of the project. A detailed assessment such as that provided by a Level 2 WET-Health assessment, and supplemented with detailed mapping, is recommended. Alternative tools may well be available and fit for this purpose, and the reference to specific tools in this guideline does imply that these are the only suitable tools or that DWS endorses or requires their use. Given the need for specialised technical expertise for undertaking a sound assessment of wetland functionality, it needs to be conducted by a recognised wetland specialist with appropriate training and experience. It is also recommended that the exact tool to be used is approved in advance by the relevant regulatory authority.

There may, however, be a justification for higher offset ratios for loss of indirect services; these higher ratios would need to be justified in collaboration with relevant government departments.

In summary, the final offset requirement for Water Resources and Ecosystem Services is calculated by:

- Accurately delineating the area of wetlands that are associated with the planned development.
- Calculating the change in wetland condition from its current state to its state after the proposed development as a result of residual impacts from the development.
- Calculating the change in wetland functionality by multiplying the change in condition by the area of wetland affected by the development.
- Identifying and applying any ratios for situations where loss of indirect services is particularly significant due to local or regional circumstances.

The Wetland Offset Calculator accompanying these guidelines facilitates these calculations, by automating the steps wherever possible. Direct (cultural and provisioning) services need to be individually assessed.

3.3 ASSESSING OFFSET REQUIREMENTS FOR ECOSYSTEM CONSERVATION

3.3.1 Map and classify the wetlands that will be impacted by the proposed development

As with the Water Resources and Ecosystem Services component, it is necessary to map the wetlands that will be impacted. Given that the focus here is on ecosystem protection, wetlands should be classified according to the ecosystem type and associated conservation status. This classification is currently done at the Wetland Vegetation Group scale (see Nel and Driver (2012) for an explanation of the classification), as nationally available data are not yet robust enough at the wetland type level. Where ecosystem status has been more accurately assessed at a regional scale, this information should be used.

3.3.2 Assess and quantify the anticipated residual impacts on the condition of wetland habitat

The condition of wetland habitat is a primary determinant of the capacity of a wetland to support biodiversity (i.e. wetlands with highly transformed habitat are unlikely to support significant biodiversity) and therefore provides a suitable surrogate for the potential of a wetland to contribute to national wetland conservation targets. A critical element in the offset calculation is therefore identifying the change in wetland habitat condition as a result of a development or impacting activity. Firstly, wetland habitat condition at the start of the project needs to be expressed as a percentage of the intactness of a natural/pristine wetland. This requires the use an appropriate tool to assess habitat condition of the wetland prior to development[11]. A wetland would have a 100% habitat condition score if the wetland was supporting completely natural habitat, and would have a 0% value if it was completely destroyed and lacked any natural habitat. Second, the predicted future habitat condition (after any required rehabilitation) of the wetland at the end of the project, relative to a natural or pristine wetland needs to be predicted. A wetland that will be completely destroyed will have 0% remaining value. Thirdly, the change in wetland habitat condition due to residual impacts is calculated by subtracting the future value from the current value. The estimated change in wetland habitat condition is multiplied by the area of wetland affected (in hectares) to give a basic indication of the offset required for Ecosystem Conservation in hectare equivalents.

[11] In the absence of more appropriate measures, the vegetation module of WET-Health can be used as a surrogate measure of condition. This is regarded as a more appropriate measure than the integrated PES score as the suitability of a wetland to support biodiversity is most strongly linked to vegetation attributes. Given the need for specialised technical expertise for undertaking a sound assessment of wetland habitat condition, it needs to be conducted by a recognised wetland ecologist with appropriate training and experience.

3.3.3 Modifying the basic hectare equivalents to obtain a final offset requirement for Ecosystem Conservation

In order to determine the significance of an impact on a wetland, and hence the size of offset required, it is necessary to understand the importance of the wetland for contributing to national and/or provincial biodiversity conservation goals. The guidelines provide a structured approach to assessing wetland conservation value and determining the required offsets. The offset ratio for Ecosystem Conservation is calculated based on a suite of wetland characteristics that are important in determining conservation value. These include (i) ecosystem threat status and protection levels; (ii) regional and national conservation context and (iii) local site context. The rationale and method for assessing each of these and for calculating a final Ecosystem Conservation ratio is outlined in the sections that follow. The Wetland Offset Calculator accompanying these guidelines facilitates these calculations, by automating the steps wherever possible.

(i) Ecosystem threat status and protection levels

The 2011 National Biodiversity Assessment (Driver *et al.,* 2012) used two headline indicators to assess all ecosystems:

1. **Ecosystem threat status** indicates the degree to which ecosystems are still intact or alternatively losing vital aspects of their structure, function and composition, on which their ability to provide ecosystem services ultimately depends. Ecosystems are categorised as critically endangered (CR), endangered (EN), vulnerable (VU) or least threatened (LT), based on the proportion of each ecosystem that remains in good ecological condition relative to a series of thresholds.
2. **Protection level** provides an indication whether ecosystems are adequately protected or under-protected. Specific ecosystems are categorised as not protected, poorly protected, moderately protected or well protected, based on the proportion of each ecosystem that occurs within a protected area recognised in the National Environmental Management: Protected Areas Act (NEMPAA).

Readers are referred to Nel *et al.* (2011b) for more information on how the above indicators were determined for wetland ecosystems through the NFEPA project; and to Driver *et al.* (2012) for details of how this information was incorporated into the 2011 National Biodiversity Assessment.

From the perspective of biodiversity conservation targets, the significance of the loss of a particular wetland is directly linked its ecosystem threat status and protection level. In general, impacts on a wetland that has a higher threat status and is not sufficiently represented in the protected area network are more significant than impacts on a wetland that has lower threat status and better protection.

For the purposes of offsets, wetlands are evaluated at the Wetland Group level[12], as described in Nel *et al.* (2012). These 133 distinct wetland ecosystems are based on groupings of national vegetation types and reflect differences in geology, soils and climate, thereby providing an indication of the regional context in which a wetland occurs and thus its ecological characteristics. The assessment of ecosystem threat status and protection levels is currently done at this scale, rather than for finer scale wetland types, such as the 791 wetland ecosystem types identified through the NFEPA project (Nel *et al.,* 2011b) as nationally available data are not yet robust enough at these finer scales. Where more suitable classifications and assessments are available at a provincial level, they should be used in preference to the Wetland Vegetation Groups.

The combined ratio for a specific Wetland Vegetation Group is calculated by multiplying the individual threat status and protection ratios. The component ratios used are:

- Threat status: Critically Endangered = 15; Endangered = 7.5; Vulnerable = 3; Least Threatened = 1
- Protection level: Not Protected = 2; Poorly Protected = 1; Moderately Protected = 0.75; Well Protected = 0.25

[12] The NFEPA Wetland Vegetation Group GIS dataset is available on SANBI's Biodiversity GIS: http://bgis.sanbi.org/NFEPA/NFEPAmap.asp#wetlandecosystemtypes.

The national ecosystem threat status and protection levels of Wetland Vegetation Groups are listed in Annexure 1, but note that these values are subject to revision by finer scale local assessments and updated national and provincial assessments.

(ii) Regional and National Conservation Context

Individual wetlands, clusters of wetlands and catchments have been prioritised for conservation through a number of systematic biodiversity planning processes. The NFEPA project involved a structured and systematic selection of priority wetlands required to meet national conservation targets (Nel *et al.,* 2011a, b). Similarly, provincial and local systematic biodiversity plans, which have been undertaken in large parts of the country, have identified specific wetlands as priorities (e.g. as Critical Biodiversity Areas). Collectively, these sites have been built into an integrated network of priority wetlands that together meet required biodiversity targets.

Loss of priority wetlands for biodiversity conservation at regional or national level is undesirable, and consequently offset ratios are maximised for priority wetlands and reduced for wetlands not identified as priorities in national or regional plans.

Regional and National Conservation Context is evaluated by reviewing available national and regional datasets, and using this information to score the wetland using the guideline in Table 1. The assessment asks if the wetland is identified as a Freshwater Ecosystem Priority Area (FEPA) wetland (Nel *et al.,* 2011a), or if the wetland is part of an existing protected area proclaimed under NEMPAA (including Ramsar sites even if they are not a declared protected area), or is identified as a Critical Biodiversity Area or Ecological Support Area in a systematic biodiversity plan, bioregional plan, or equivalent.

Ratios for Regional and National Conservation Context are based on the classes listed in Table 1.

Table 1: Ratios for Regional and National Conservation Context.

Importance class	Description	Ratio
Not specifically identified as important	Not a priority wetland in a local or regional conservation plan. Not identified as a wetland priority in the NFEPA project.	0.5
Identified as moderately important	Ecological Support Area identified in a local or regional conservation plan but not identified as a wetland priority in the NFEPA project.	0.75
Identified as having high importance	Wetland falls within a protected area, or is a Critical Biodiversity Area identified in a local or regional conservation plan, or is an identified Wetland FEPA.	1.0

Given that much regional and national planning is undertaken at quite a coarse scale, it is possible that conservation priorities may not be appropriately identified through these planning processes. It is therefore important that the information in these plans be used as a starting point, and should be interpreted and refined based on wetland site and contextual attributes. If it can be demonstrated that the wetland was incorrectly mapped, this information should be used to influence the scoring. So, for example, where a wetland was identified as a priority based on intactness but is in fact highly degraded, then its importance should be downgraded accordingly. Conversely, where a wetland should be a FEPA (e.g. due to high biodiversity values), but has not been selected, this oversight should be corrected.

(iii) Local site context

Although eventually it may be possible to have national datasets that sufficiently encompass local site context, this is currently not the case, and hence the value of a wetland for biodiversity conservation also needs to take into account site-specific and local landscape attributes. To cater for such variation, local site context ratios have been developed based on three criteria, namely:

a) The uniqueness and importance of biota present in the wetland;
b) The integrity of adjacent terrestrial areas and local catchment; and
c) The degree to which the wetland is connected to other functional wetland ecosystems.

The local context ratio is calculated using a combined weighted score for these criteria. This calculation is explained at the end of this section. Guidelines for how each of these criteria should be assessed are detailed below.

a) Uniqueness and importance of biota present in the wetland

Impacts on wetland habitat that is particularly diverse or supports populations of important wetland-dependent biota are regarded as far more significant than impacts on wetlands lacking such features and having low biodiversity value. The following site attributes that are typically evaluated by a specialist when rating the Ecological Importance and Sensitivity (EIS) of a wetland should be considered when assessing the local uniqueness and importance of the wetland:

- The presence of Species of Conservation Concern (e.g. critically endangered or endangered species), even if for only part of the year;
- The presence of large populations of wetland-dependent species (e.g. the wetland supports an unusually large population of *Kniphofia* spp);
- The importance of the wetland in providing breeding or feeding sites for migratory species (e.g. the wetland supports an important breeding population of Barn Swallows); and
- The diversity of habitat types (e.g. the wetland is characterised by a wide variety of different habitat types suitable for a range of biota).

Scoring should be based on the classes shown in Table 2.

Table 2: Ratios for uniqueness and importance of biota present in the wetland.

Biodiversity value class	Description	Ratio
Low biodiversity value	The wetland is characterised by low diversity and does not support any particularly important species or populations.	0.5
Moderate biodiversity value	The wetland is characterised by biota typical of the region but which is not particularly unique or diverse. Large populations of wetland-dependent species and / or important migration, breeding or feeding sites are absent from the wetland.	0.75
High biodiversity value	The wetland is characterised by one or more special habitat or biodiversity attributes that make the site important for local conservation efforts. This includes wetlands (i) supporting important populations of Species of Conservation Concern; (ii) supporting large populations of wetland-dependent species; (iii) providing important migration, breeding or feeding sites for migratory species; or (iv) characterised by unusually high natural habitat diversity.	1.0

A site-level biodiversity assessment is required for actual offset calculations. Where desktop-level planning is being undertaken, available datasets that have either documented or predicted the occurrence of Species of Conservation Concern may be useful in informing this assessment. If appropriate information is not available, a precautionary approach should be applied by assuming the wetland has "high biodiversity value".

b) Integrity of adjacent terrestrial areas and local catchment

Wetland condition is usually closely related to the condition of adjacent terrestrial areas and local catchment. Adjacent intact terrestrial areas support wetland hydrological functioning; provide a buffer for wetland-

dependent species; screen wetlands from anthropogenic disturbances such as raised toxicant, sediment and nutrient inputs; and reduce impacts from human presence and traffic (e.g. noise and light pollution). Wetland species also depend on terrestrial habitats to varying degrees. For example, many semi-aquatic species rely on terrestrial habitats for the successful recruitment of juveniles and to maintain optimal adult survival rates. In addition, these areas provide potentially useful corridors, allowing the connection of breeding, feeding and refuge sites crucial to maintaining the viability of populations of semi-aquatic species.

As it is often difficult to precisely delineate the extent of the adjacent terrestrial area that is of importance to a particular wetland, a default 500 m buffer (which aligns with DWS regulations) is used as the starting point. However, where local justification and data exists, a more accurately mapped local catchment or area of influence can be used instead. The integrity of adjacent terrestrial areas and the local catchment is evaluated using the following method. Landcover in the adjacent terrestrial areas should be mapped and assessed according to its ability to support wetland-dependent species. Table 3 provides broad-level guidance in this regard, but should be tailored according to available datasets and expert input.

Table 3: Compatibility scores for use in determining integrity of adjacent terrestrial areas and the local catchment.

Broad Landcover Category	Compatibility Score
Cultivated lands	0.5
Degraded natural habitat	0.5
Eroded areas	0.25
Intact natural habitat	1
Forest plantations	0.25
Mines & quarries	0
Urban / built-up land	0

An area weighted average of land use compatibility scores within the adjacent terrestrial areas and local catchment is then calculated and used to obtain a measure of integrity of adjacent terrestrial areas and local catchment. Scores calculated must be expressed as a range from 0 (totally incompatible land use) to 1 (highly compatible land use. A site level assessment using revised land cover mapping is required for actual offset calculations, but national level datasets can be used for rapid assessments and screening[13].

c) Local Connectivity

Landscape connectivity is important for local ecological processes, including species movement, which reduces isolation and allows for genetic exchange, thus reducing the risk of local species extinctions (e.g. during periods of drought). This attribute is simply evaluated by assessing the connectivity of the impacted wetland to other wetlands and aquatic habitats. Consideration should be given to (i) the proximity of other wetland and/or riparian habitat to the wetland of interest (particularly within 500m of the wetland); (ii) the level of fragmentation of habitat and therefore connectivity that remains and (iii) the condition and associated biodiversity value (as supporting habitat) of adjacent or linked aquatic ecosystems. These aspects can be assessed at a desktop level using a GIS[14] or available aerial photography (including Google Earth imagery). The classes in Table 4 are applicable.

[13] Where a desktop assessment is being undertaken, the percentage natural habitat within 500m of the wetland can be used as a surrogate. This information is captured as “PERNAT500” in the NFEPA wetlands dataset. The NFEPA Wetland Map is available on SANBIs Biodiversity GIS: http://bgis.sanbi.org/NFEPA/NFEPAmap.asp#wetlandsmap4.

[14] For a desktop-level assessment, NFEPA wetland clusters can be used to identify wetlands with good connectivity. For detailed planning, a site-based assessment of connectivity must be undertaken using available information.

Table 4: Ratios for the local connectivity component of the evaluation.

Connectivity class	Description	Modifier
Low connectivity	The wetland has very little surface connection with other water resources in the landscape (e.g. very high levels of fragmentation with few wetlands nearby).	0.5
Moderate connectivity	The wetland is moderately connected with other water resources in the landscape. (e.g. moderate levels of fragmentation but with reasonable connectivity to intact wetlands and /or riparian zones).	0.75
Good connectivity	The wetland is well connected with other water resources in the landscape. (e.g. wetland clusters within 1 km of each other and embedded in a relatively natural landscape).	1.0

d) Calculating the overall local site context ratio

The local site context ratio is calculated based on the weighted contribution of the underlying site context ratios, namely:

- The uniqueness and importance of biota present in the wetland: Since this criterion provides a direct measure of actual biodiversity value, it is weighted considerably higher than the other criteria considered at a local level. A weighting of 70% is applied when calculating the local site context ratio.
- The integrity of adjacent terrestrial areas and local catchment around the wetland: These areas provide important supporting habitat for wetlands and allow species to carry out various activities, however the functional value of such areas is dependent on the actual habitat value of the wetland. As such, the importance of buffer zones is secondary to the uniqueness and importance of biota present. A weighting of 20% is applied to this criterion when calculating the ratio for local site context.
- The degree to which the wetland is connected to other aquatic ecosystems: Whilst connectivity is regarded as being an important consideration, it only becomes relevant where a wetland is able to support wetland-dependent biota. It is also recognised that wetlands are able to support biota if both the wetland and the adjacent terrestrial area provide suitable habitat, even if there is little connectivity to other wetlands in the landscape. As such, this criterion is down-weighted significantly relative to the other two site-based criteria. This criterion therefore contributes only 10% towards the local site context score.

(iv) Calculating the final Ecosystem Conservation Ratio

The final Ecosystem Conservation ratio is calculated by multiplying the three modifiers for (i) ecosystem threat status and protection level; (ii) regional and national context and (iii) local context. Effectively, the highest possible offset ratio (for a wetland belonging to a Critically Endangered and Not Protected wetland type, and which is identified as a conservation priority (e.g. a FEPA), is of high biodiversity importance in a local context, has a completely intact adjacent terrestrial area and is well connected to other wetlands), would be **30:1**. It is important to note however that this would represent a largely theoretical case for intact wetlands as impacts to such wetlands would typically have been regarded as unacceptable and the project would not be approved. Ratios for a Least Threatened and Well Protected wetland type, which had the lowest values for all local site attributes, would be less than **0.25:1** and may not be significant enough to require offsetting unless very large wetlands were involved.

Offset targets for Ecosystem Conservation are calculated by multiplying the final Ecosystem Conservation ratio described above to the predicted losses in wetland habitat as a result of the proposed development. Once these requirements have been determined, they need to be clearly documented as part of the offset proposal.

3.4 ASSESSING OFFSET REQUIREMENTS FOR SPECIES OF CONSERVATION CONCERN:

3.4.1 Identify the Species of Conservation Concern that would be impacted by the proposed development

An assessment of wetland habitat purely for purposes of evaluating Ecosystem Conservation value and ecosystem services may not adequately identify the presence of, or residual impacts on, Species of Conservation Concern[15]. For this reason, these species, especially those that are wetland-dependent, and their habitat, warrant a separate assessment. The assessment needs to be done in such a way as to obtain a meaningful measure of the residual negative impacts of development on Species of Conservation Concern, and to determine appropriate offset targets that would adequately compensate for these impacts. Importantly, if none of these species make use of the wetland being investigated, then this assessment is not required.

Given the expertise required to undertake this kind of work, it would generally be necessary for an appropriate specialist to conduct such assessments. This will entail providing input on the size and viability of the population affected by the proposed development, evaluating the significance of the potential impacts on the species, and identifying adequate offset requirements and options to compensate for the impacts. Such an assessment would typically be undertaken as part of a broader specialist biodiversity study for the area, involving experts from specific disciplines as needed (e.g. ornithologist for threatened birds, herpetologist for reptiles and frogs, etc.). An outline of a recommended approach for addressing this aspect is presented here and can be used as a guide to inform such an assessment.

The first step required is to determine the potential occurrence of species of special conservation concern (particularly of wetland-dependent species) that could be impacted by the proposed development. Such an assessment requires a desktop assessment of available information, together with consultation with local stakeholders (e.g. provincial conservation agency, landowners, conservancies, wildlife clubs, local universities, birding clubs etc.). Key aspects that should be considered in flagging species that could be affected by the proposed development and require further investigation include:

- **The distribution of the species**: This should ideally be informed by a map of known and potential occurrence within South Africa. Here, the NFEPA wetlands report and coverage (Nel *et al.*, 2011a, b) is a useful information source, as it indicates into which broad Wetland Vegetation Group a specific wetland falls, and it flags wetlands identified as important for a limited range of threatened biota. Records of species occurrences and distribution maps may also be available from provincial conservation bodies (and are typically included in systematic conservation plans). Where not available, reference to species guides and consultation with relevant experts may be required.
- **The conservation status of the species:** The threat status of the species provides a very useful indication of the potential significance of impacts on the species population. Such information can be obtained from a range of reference sources including Red Data Books, Red Lists (e.g. SANBI's Red List for Plants (http://redlist.sanbi.org/), gazetted lists of Threatened or Protected Species, and from databases maintained by provincial conservation agencies.
- **Core habitat requirements**: Core habitat is the area of natural habitat essential for the long-term persistence of individuals or populations of a species. An understanding of the core area requirements and key habitat characteristics required for the species to live, breed and persist can provide a very useful indication as to whether or not the species is likely to occur at the site. This may include, for example, information on recommended minimum patch size or range, special habitat attributes, seasonal migration patterns (if relevant) and use of the wetland at certain times of the year (even if presence is not permanent), or condition of vegetation required for the species.

[15] Species of special concern include Red Date Book or Red List taxa in threatened or conservation concern categories, Threatened or Protected Species listed under the National Environmental Management: Biodiversity Act, endemic taxa, locally threatened taxa and/ or any particular taxa of special management concern.

If no biodiversity elements have been flagged through this assessment, no further assessment may be required unless specifically requested by a competent authority or the provincial conservation agency. Where the occurrence of threatened species or otherwise important species has been flagged, further effort is required to determine whether or not they occur at the site and if so, what measures are necessary to protect them.

3.4.2 Assessing residual impacts on Species of Conservation Concern

An assessment of the predicted impact of proposed development on Species of Conservation Concern is required in order to establish appropriate offset requirements to cater for these species. Specific methods for quantifying impacts on threatened species, for use in offset design, have not yet been developed for the South African context. Specialists undertaking this assessment will therefore need to develop an appropriate species impact measure for local application, in consultation with the relevant authorities.

In some instances the requirements of a species are strongly linked to habitat and can thus be reliably predicted using suitable habitat as a surrogate. In such cases, the area and suitability of relevant core breeding or foraging habitat may be used as a surrogate to measure the probable residual impacts of development on the species, and to determine preliminary offset targets. For species whose presence is not strongly linked to specific habitat, a measure of the number of individuals or other suitable population measures, such as the number of breeding pairs, may be a more appropriate means of quantifying potential impacts.

Whichever measurement system is applied, it is important that the rationale for its selection is clearly justified and that the unit of measurement is clearly communicated. This unit of measurement must then be applied both to measuring residual impacts and to determining gains at proposed offset locations. If more than one Species of Conservation Concern is present, it will be necessary to repeat this assessment for each species.

Once any necessary specialist species surveys have been undertaken, the impacts of the proposed development on the identified Species of Conservation Concern must be evaluated. This assessment should therefore be undertaken by an appropriate specialist and be informed by a range of aspects including but not necessarily limited to:

- A sound understanding of the significance of the proposed development activities on any Species of Conservation Concern;
- The proportion of the species (e.g. individuals, breeding pairs, population etc.) and of its habitat likely to be affected by the development impacts;
- Sensitivity or vulnerability of the species to the proposed impacts. This may include sensitivity to direct disturbance (human presence, noise, dust, light, physical disturbance) or from peripheral development or associated activities (e.g. tourism activities), sensitivity to pollutants that could have a direct effect on the species (e.g. pesticides, nutrients, salts), and sensitivity to factors that may affect species habitat (e.g. alteration of hydrological regimes, burning practices);
- Habitat fragmentation; and
- Disruption or destruction of ecological corridors or links in the landscape that are important for that species.

Once selected, the measurement system must be used to specify the anticipated impact of planned development activities on Species of Conservation Concern. This score should be based on the change in the ‘species impact measure’ before and after development.

3.4.3 Modifying the basic species impact measures to obtain a final offset requirement for Species of Conservation Concern

Ratios may be used to increase offset requirements for Species of Conservation Concern in line with the significance of anticipated impacts. There is very little guidance available for determining ratios for Species

of Conservation Concern. Ratios should, however, be guided by factors such as threat status and the importance of the wetland in meeting species protection targets. Species offset ratios will therefore need to be proposed by the biodiversity specialist and negotiated in consultation with the appropriate regulatory authority and conservation agency. Species offset ratios would range upwards from 1:1, which would be a minimum requirement to avoid net loss. Conservation targets for each Species of Conservation Concern are calculated by multiplying the 'species impact measure' by the relevant species ratio. This process is repeated for each Species of Conservation Concern.

3.5 ESTABLISH CLEAR OBJECTIVES AND TARGETS TO GUIDE THE OFFSET DESIGN PROCESS

Once significant residual impacts have been identified and a decision made to offset them, the next step is to identify and clearly articulate wetland offset requirements. This should be done by clearly defining specific objectives (aligned with the overall purpose of offsets introduced in Section 2.2) and associated measurable targets for each of the three components (i.e. Water Resources and Ecosystem Services, Ecosystem Conservation and Species of Conservation Concern).

It is important to emphasize that the individual targets for each offset component are effectively independent and separate calculations. **If appropriate receiving environments exist, it may be possible to identify wetland offset sites which could contribute to each of the three components and meet all the offset requirements simultaneously.** However, there is no guarantee that this would be the case. The following chapters examine how best to go about identifying an appropriate offset site or sites, and then how to determine whether or not the offset site is of sufficient quality and extent to serve as a satisfactory offset.

CHAPTER 4: OFFSET SITES: ASSESSING POTENTIAL GAINS

This chapter deals with the evaluation of potential offset sites in terms of their meeting the specific offset requirements for the three components, namely Water Resources and Ecosystem Services, Ecosystem Conservation, and Species of Conservation Concern. Each of these components needs to be evaluated separately, and the related offset targets need to be met. However, in some circumstances it may be possible to meet all targets at one site. A wetland which is rehabilitated to meet Water Resources and Ecosystem Services requirements may be of sufficient conservation value to simultaneously to meet the full Ecosystem Conservation target and also the offset needs of any Species of Conservation Concern. However, realistically a combination of sites is likely to be necessary to meet the targets of all three components.

4.1 ASSESSING OFFSET SITES FOR WATER RESOURCES & ECOSYSTEM SERVICES

4.1.1 Identifying suitable sites for meeting Water Resources & Ecosystem Services offset requirements

Site selection is the primary mechanism for ensuring that gains from offset activities would constitute adequate compensation and meet stakeholder expectations. The choice of particular sites will determine not only which ecosystem services would be improved or secured through offset activities, but also who would benefit from these activities. This is particularly important for Water Resources and Ecosystem Service related objectives, as the offset may need to be in a very specific catchment or system to ensure that those affected by the project impact benefit from the gains arising from the offset. While a concerted effort should be made to follow this guideline and to locate wetland offsets within priority offset receiving areas, there may be a number of factors that prevent this from being fully achievable, including:

- Risks that could undermine the long-term sustainability of offset activities, especially through not being able to secure offset sites adequately against future threats e.g. mining;
- The lack of suitable sites for implementing desired wetland offset activities;
- The absence of willing landowners to allow wetland offset activities on their land, or constraints associated with purchasing or otherwise securing such areas for conservation.

In such cases, the proponent must be able to defend the sites selected by clearly documenting what efforts were made to try and comply with the site selection guidelines and why it was either not feasible to meet targets within these areas or why greater overall benefits are achieved by implementing the wetland offsets at alternative sites. Where mining poses a real risk to offsets, for example, there may be good justification to locate offset activities outside of areas with prospecting or mining rights. A clear case would need to be made explaining why the proposed alternative sites would provide an optimal, sustainable and practically implementable offset. It may be useful in such cases to present a range of alternative sites during the Pre-application Screening, Scoping and Preliminary Design phase that could be considered by the competent authority and conservation agency prior to commencing more detailed planning.

This offset guideline advocates that measures to improve wetland functioning should focus on activities that would result in an improvement in regulating and supporting services identified as important based both on local site and regional considerations. The focus is therefore on identifying offset sites that are best placed not only to improve wetland functioning, but which would also enhance the delivery of key regulating and supporting services. Importantly, this emphasis does not imply that exactly the same wetland type or hydro-geomorphic (HGM) unit needs to be replicated at the offset site, but rather that one should be attempting to deliver gains in key ecosystem services identified as part of the impact assessment process.

In line with the underlying principle of ‘like-for-like’ offsets aimed at compensating for residual impacts on wetland ecosystem services, the offset site should, as a general rule, be located as close to the impacted site as possible. The greater the hydrological separation between the impacted wetland and offset site, the higher the likelihood that beneficiaries of offset activities would be different from those affected by the loss of ecosystem services provided by the impacted wetland. For example, in a situation where water quality

enhancement is a key service, if the offset were located in the same local catchment as the impacted wetland, users and biota in the immediate vicinity and further downstream would benefit from the offset activities. If the offset were located outside the local catchment but within the same quaternary catchment, services would still be beneficial to many downstream users but not to local beneficiaries. This mismatch between benefits and beneficiaries is likely to increase as wetland offset activities shift further away from the impacted site. For the above reasons, an effort should be made to identify suitable wetland offset sites locally before moving further afield, unless there is a compelling reason not to do so. In this regard, the hierarchy of selecting suitable offset sites should typically comprise, in order of descending priority:

1. Seeking suitable wetlands within the same local catchment as the impacted wetland;
2. Seeking suitable wetlands within the same quaternary catchment;
3. Seeking suitable wetlands in the same tertiary catchment;
4. Selection of suitable wetlands in a different tertiary catchment.

The need to move further afield would depend on factors such as the availability of suitable sites, ability to manage landscape-level risks and the feasibility of legally securing the selected site. If offsets need to be located outside priority receiving areas, a clear motivation to competent authorities must be provided in the offset proposal. This will be particularly relevant in projects where a case is being made to move out of the same tertiary catchment. The likelihood of such a proposal being acceptable to stakeholders is also likely to decline with increasing displacement of offset sites.

Apart from catchment-level considerations, it is important to select or design wetlands that can deliver the specific ecosystem services being targeted. Wetland type is a simple and useful surrogate in this regard, as wetland functions, from which ecosystem services are derived, are an expression of the physical, hydrological, biological and chemical attributes and processes present in individual wetlands. Some wetland types are better suited to providing certain services than others (e.g. floodplains are typically well suited to flood attenuation whereas hillslope seeps are likely to be most effective at providing water quality enhancement services (Kotze *et al.*, 2007)). The focus should be on delivering the required ecosystem services as effectively as possible, and the easiest way of achieving this is to target wetlands of the same type as the impacted wetland. There may be instances however where targeting alternative wetland types can better meet water resource management objectives.

Where offset receiving areas, which are which are key areas to sustain water resources and/ or to meet biodiversity conservation targets, have been identified by the competent authority as priorities for wetland offsets, these areas should be strongly favoured in site selection. It is likely that where a designated ‘offset receiving area’ is available, that this consideration would over-ride other issues in site selection.

Site selection guidelines have been included in the wetland offset calculator and provide a preliminary indication of the likely acceptability of site to regulating authorities (Table 5).

Table 5: General guidelines on suitability of offset site wetlands for meeting Water Resource and Ecosystem Service requirements.

Criterion	Site attributes	Acceptability Guidelines
Wetland type	Wetland is of the same type as the impacted wetland.	Ideal
	Wetland is of a different type to the impacted wetland.	Acceptable if the wetland delivers similar benefits in terms of Water Resources and Ecosystem Services.
Key services targeted	Selected wetland is well placed to contribute meaningfully towards improving key ecosystem services identified.	Ideal
	Selected wetland is reasonably placed to improve key ecosystem services identified.	Acceptable
	Selected wetland is poorly placed to improve key ecosystem services identified.	Generally unacceptable
Offset site location relative to impacted wetland	Selected wetland is located within the same local (quinary) catchment as the impacted wetland.	Ideal
	Selected wetland is located within the same quaternary catchment.	Acceptable
	Selected wetland is located within the same tertiary catchment.	Generally unacceptable, but may be suitable if there are clear benefits in terms of Water Resources and Ecosystem Services.
	Selected wetland is located in a different tertiary catchment.	Only acceptable under extreme circumstances, and only if there are clear benefits in terms of Water Resources and Ecosystem Services.

4.1.2 Identifying suitable activities for meeting Water Resources & Ecosystem Services offset requirements

Objectives for indirect (regulating and supporting) services are based on a concept of no net loss, which means that the offset activity needs to maintain the overall ability of wetlands to deliver ecosystem services and support water resource management. Satisfying these objectives requires that degraded wetlands are rehabilitated, or that ongoing inevitable loss of wetland functioning is averted. While various options for meeting Water Resources & Ecosystem Services objectives are permissible, rehabilitation and averted loss should be considered preferable to options for the establishment of new wetlands. Note that as certain activities (such as wetland establishment) are considered riskier than others in terms of their ability to meet offset targets, these activities are discouraged when it comes to assessing the potential contribution a site makes to meeting targets (see next section).

Wetland rehabilitation should be informed by the appropriate South African guidelines on rehabilitation, including Wet-RehabPlan (Kotze *et al.*, 2009) and Wet-RehabMethods (Russel, 2009). These documents should be used to inform the development of detailed rehabilitation plans at site level.

Direct provisioning services (e.g. cropping within a wetland or harvesting of reeds) are strongly linked to local communities. In many instances it may not be possible to compensate for these services through typical wetland offset activities. In some instances, it may be feasible to compensate for these losses by providing communities with access to alternative sites that could provide similar or substitute goods. Another option would be to compensate affected parties financially for any direct losses, e.g. through a land sale agreement.

For practical purposes, financial compensation may be the simplest way to compensate for losses of provisioning services, although not always optimal in terms of sustaining livelihoods.

4.1.3 Assessing the offset contribution for meeting Water Resources & Ecosystem Services offset objectives

An assessment of the improvement in the functional value of the targeted wetland is used to calculate the preliminary contribution of offset activities to meeting targets for Water Resources & Ecosystem Services. This assessment uses the same assessment protocol as applied to the development site, and is based on the predicted improvement in wetland functioning as a result of offset activities. To undertake this assessment, accurate delineation of the receiving wetlands is first required. An appropriate assessment tool is then used to obtain an indication of the functional value of the wetland (i) before and (ii) after planned offset activities[16]. Functional hectare equivalents are then calculated by multiplying the change in functional value by the area of wetland that will improve in condition and be secured through the offset.

Given the lack of locally available tools to quantify changes to particular functional values, the condition of the wetland is typically used as a surrogate for functionality. Tools such as WET-Health (Macfarlane *et al.,* 2008) can be used to measure the condition of the targeted wetland prior to the implementation of the offset, and to predict the same wetland's condition upon completion of offset activities. In some instances, offsets may focus on averted loss activities. In this case, the change in wetland condition is determined by the difference between the current condition and the projected condition in the affected area in the absence of offset activities.

The change in functional value must be expressed as a percentage. To calculate the change in functional value, the pre-offset implementation score (% functionality compared to a pristine natural wetland of comparable type) is simply subtracted from the post-offset score.

4.1.4 Adjusting the offset contribution to account for implementation risk

The final offset contribution is adjusted to take the risk of failure of proposed offset activities into account. Risk is linked to the type of offset activity planned, with wetland establishment considered to be significantly more risky than rehabilitation or averted loss activities. Studies of wetland offsets reviewed by Sheldon *et al.* (2005) found that many projects have not been successful at replacing the functions lost through development impacts. Studies show that half the projects from before 2005 involving re-establishment failed, though there is some evidence of better success rates more recently (Hruby, 2011). The risk of failure of wetland establishment is likely to be substantially higher than rehabilitation projects as it is more difficult to create a water regime appropriate for a wetland than to restore one. Based on these issues and international experience, a set of modifiers has been (Table 6).

Table 6: Risk ratios to take implementation risk into account for meeting objectives for Water Resources & Ecosystem Services.

Planned offset activity	Risk ratio
Rehabilitation & Protection	0.666
Averted loss & Protection	0.666
Establishment & Protection	0.333

In summary, the anticipated contributions to meeting Water Resources & Ecosystem Services targets are calculated by:

1. Delineating the wetland that will receive the offset.

[16] For averted loss activities, there will need to be a careful assessment of the difference between the likely future state of a wetland without any offset activity, and with the activity in place.

2. Calculating the predicted change in wetland functionality (in percent) as a result of the offset implementation activities and the area of wetland over which this change will apply.
3. Identifying the appropriate risk ratio for the activity being contemplated.
4. Multiplying the risk ratio, area of wetland and functionality change (%) together to calculate the number of hectare equivalents that will be gained.

Predicted hectare equivalent contributions then need to be evaluated against the number of hectare equivalents required, in order to establish whether or not planned offset activities are likely to be sufficient to meet offset requirements. Where offset targets cannot be met at a single site, additional sites will need to be added until such time that offset targets can be achieved.

In instances where specific targets have been set for specific direct services, the degree to which any targets for key direct services can be achieved must also be assessed. This requires a clear statement of any proposed compensatory actions and how these contribute towards the targets that have been set.

4.2 ASSESSING OFFSET SITES FOR ECOSYSTEM CONSERVATION

4.2.1 Identifying suitable sites for meeting Ecosystem Conservation objectives

Site selection is important to ensure that a meaningful contribution is made to meeting Ecosystem Conservation goals in a strategic and sustainable manner. Where designated offset receiving areas for a specific Wetland Vegetation Group have been identified by the conservation authority, these areas should be prioritized and this consideration should over-ride all others. Should designated offset receiving areas not be available it will be necessary to undertake a more intensive site selection process.

From a wetland protection perspective, wetlands of the same Wetland Vegetation Group should be targeted first for offset activities. The current wetland offset for Ecosystem Conservation is evaluated at the Wetland Vegetation Group level (e.g. Mesic Highveld Grassland Wetland Group) rather than at the level of the specific wetland types or HGM unit (e.g. Mesic Highveld Grassland Group 7 Floodplain Wetlands or seeps within a particular vegetation group). In the design of the wetland offset one would ideally and wherever practical attempt to replicate the suite of specific HGM units present at the development site. However, the actual area of offset necessary is calculated at the Wetland Vegetation Group level, and hence there is no specific requirement to replicate the exact suite of HGM units. The proponent would nevertheless need to ensure that the competent authority accepts that the proposed offset reasonably compensates the actual residual impact. It is possible that a number of different types of wetland may be impacted by a project. In this case, attempts should be made, as far as is practical, to replicate the suite of impacted wetland types in the offset. However, reasonable exchange between types of wetland may be necessary in order to identify an implementable and coherent offset (i.e. it would generally be preferable to have a single implementation site to protect and manage, which did not perfectly replicate the suite of impacted wetlands, than to force the protection and management of numerous disjunct wetlands that perfectly replicated the impacted wetlands).

There may be instances where there is a sound rationale for protecting wetlands in another Wetland Vegetation Group. If this ‘out of kind’ offset is to be considered, emphasis should be placed on securing wetlands with a higher threat status (i.e. trading up) in consultation with the appropriate regulatory authority and provincial conservation agency. Targeting wetlands within an alternative Wetland Vegetation Group of a lower threat status (i.e. trading down) is not generally an acceptable approach, and should only be considered where very significant conservation gains will be made in terms of meeting national or provincial protected area expansion objectives.

Strong preference should be given to wetlands that have been prioritised in national, provincial or local conservation plans, or have been strategically identified as offset receiving areas by appropriate authorities. In the South African context, a range of spatial plans are available to inform this process. At a national level, maps of FEPAs have been developed (Nel *et al.*, 2011a) that highlight specific wetlands, wetland clusters and catchments required to meet national aquatic conservation targets. In addition, provincial conservation plans have been and are being developed to identify provincial-level priorities, including aquatic priority

areas. These products are often refined at a municipal level in the form of biodiversity sector or bioregional plans that identify Critical Biodiversity Areas and Ecological Support Areas.

The viability of maintaining conservation values in the long term should be another key consideration. Connectivity with other intact ecosystems is an important consideration, as is the potential for linkage with existing protected areas. National and provincial protected area expansion strategies should therefore also be considered where available. Locating sites within a context where existing and planned future land uses are compatible with conservation efforts is another important consideration. Where offsets are also required for terrestrial systems, opportunities to link wetland and terrestrial offset sites and activities should be considered, particularly where threatened wetland species require adjoining terrestrial habitat to persist.

Another critical aspect that needs to be considered at a site level is the condition of the wetlands targeted for protection. Research has highlighted that the likelihood of successful restoration of degraded ecosystems and their biodiversity decreases with increasing difference between the current and restored condition (e.g. Moreno-Mateos *et al.*, 2012). Therefore this guideline encourages the protection of intact wetlands in best condition in high priority areas. Wetland protection efforts should therefore avoid heavily degraded systems. Where rehabilitation activities are necessary, the starting condition of the selected wetland should be at most one PES Category lower than the impacted wetland, and the end condition should be at least in the same PES Category as the impacted wetland. Where rehabilitation is necessary the aim should be to restore wetlands to a state that would contribute meaningfully to ecosystem conservation objectives. The offset calculations (see next section) are designed to incentivise the protection of high quality, intact wetlands.

Wetland offset activities are pointless unless their long-term protection is secured through an appropriate legal mechanism (see the following chapter). This is one of the most important (and often limiting) factors determining offset site selection. First, appropriate sites need to be available in the landscape or catchment where gains can be secured and risks managed. It is then essential to determine the feasibility of formally securing the offset site to ensure that any benefits would accrue over the long term. A number of aspects should be addressed in this respect, including:

- The availability of suitable land which the proponent owns or controls;
- Willingness of other landowners to enter into contractual agreement for offset activities on their land;
- The cost and feasibility of legally securing the long-term protection of the site;
- Technical and financial provision for long-term management and monitoring of the site.

Understanding and managing landscape-scale risks is a critical step in the offset site selection process. If such risks were not considered, wetland offset sites could be undermined in future, which jeopardise the outcomes of offset activities and potentially place the proponent at risk of non-compliance with either water-related or environmental authorisations. Offsets should therefore ideally be located in low risk areas where they would not be undermined by current or future developments. Once potential offset sites have been identified, it is therefore useful to assess risks at a landscape level prior to undertaking more in-depth reconnaissance (Hruby *et al.*, 2009). Risks associated with both current and anticipated future land use should be considered. Where risks are regarded as high, it may be preferable to locate offset sites in alternative locations that would be subject to lower risks. In this way, the offset site has a greater potential to persist over time.

Overall, the objective is to identify sensible, coherent, manageable and sustainable offsets that contribute optimally to national conservation and protection objectives for wetlands. Hence the issues outlined in this section, and summarized in Table 7 should be seen as guidelines only, and should form the starting point for the identification and design of an optimal offset. Nonetheless, the logic and process applied in selecting sites for a particular offset should be thoroughly documented as part of the development of the offset proposal.

Table 7: Summary of key issues which should be assessed when evaluating suitability of offset sites for meeting Ecosystem Conservation requirements. Note that the overall objective is to identify a coherent and suitable offset, so in some cases there may be justification for deviation from these guidelines.

Criterion	Site attributes	Acceptability Guidelines
Offset receiving areas	Available and suitable designated offset receiving site pre-agreed or identified by the conservation authority	**Ideal – this consideration should over-ride all others**
Like for Like & Trading up/down	Wetland is within the same Wetland Vegetation Group (ideally also of the same specific wetland type)	Ideal
	Wetland is in another Wetland Vegetation Group of a higher threat status or lower protection level (trading up).	Potentially acceptable
	Wetland is in another Wetland Vegetation Group of a lower threat status or higher protection level (trading down).	Generally unacceptable
Spatial planning	Wetland has been identified as being of high importance in spatial plans	Ideal
	Wetland has been identified as moderately important in spatial plans	Acceptable
	Wetland has not been specifically identified as important in spatial plans	May be acceptable
Wetland condition	Final habitat condition is likely to be better than that of the impacted wetland.	Ideal
	Final habitat condition is likely to be as good as that of the impacted wetland.	Acceptable
	Final habitat condition is likely to be lower than that of the impacted wetland.	Generally unacceptable
Local biodiversity value	The wetland is characterised by habitat and/or species of high biodiversity value.	Ideal
	The wetland is characterised by habitat and/or species of moderate biodiversity value.	Acceptable
	The wetland is characterised by habitat and/or species of low biodiversity value.	Generally unacceptable
Probability of maintaining conservation values	The offset provides an opportunity to consolidate / expand existing protected areas.	Ideal
	The wetland is well connected to other intact natural areas and there are no obvious land use threats to its long term persistence.	Acceptable
	There are actual or potential threats to its long term persistence.	Not generally unacceptable

4.2.2 Assessing the offset's contribution to meeting Ecosystem Conservation offset requirements

Contributions to meeting Ecosystem Conservation targets can be made by formally protecting and managing targeted wetlands and associated adjacent terrestrial habitat and local catchment. An assessment of the area and anticipated intactness of wetland habitat following planned offset activities is used to calculate the preliminary contribution that the wetland offset would make. Guidelines on how these assessments should be undertaken are detailed below.

4.2.2.1 Preliminary gains from wetland protection

The preliminary contribution of wetland protection to Ecosystem Conservation targets is assessed using the same assessment protocol as was applied to the impacted wetland. The only difference is that the evaluation does not evaluate change in condition but rather is only linked to the current condition of the wetland which will be maintained for the offset duration, or the realistic future state of the wetland following successful implementation of planned offset activities. In the absence of more appropriate measures, the vegetation module of WET-Health can be used to evaluate habitat intactness as a surrogate measure of condition. The anticipated condition (or habitat intactness) after offset implementation must be expressed as a percentage (%). A wetland supporting completely natural habitat would score 100% while a wetland that has been completely destroyed and lacks any natural habitat would score 0%. This value is multiplied by the size of the wetland to gain a basic 'hectare equivalent' value. Note that this process is deliberately incentivising the protection of wetlands which are in good condition, or which could easily be rehabilitated to a good condition.

4.2.2.2 Assessing preliminary gains from protection of associated adjacent terrestrial habitat and local catchment

Protection and management of the associated adjacent terrestrial habitat and local catchment around the wetland can contribute meaningfully towards the maintenance of wetland biodiversity. As such, the management and protection of suitable supporting terrestrial and other buffer areas can contribute to meeting Ecosystem Conservation targets.

The assessment is based on the same approach used to assess the integrity of adjacent terrestrial habitat and local catchment at the wetland to be impacted. The first step involves identifying areas to be included in this zone. For the purposes of offset activities, under normal circumstances, adjacent areas extending up to 500m from a wetland boundary (i.e. from the outer edge of the temporarily saturated zone of the wetland) can contribute towards offset targets. Where it can be justified based on increased ecological benefits for the wetland system, it may be possible to motivate for inclusion of larger areas so long as they are effectively managed to ensure their long term value and they are fully protected.

The integrity of the adjacent terrestrial habitat and local catchment is measured using a similar method to that used in the offset requirement calculation, with the contribution to the offset being decreased if this habitat is not all in good condition. Importantly, only the intact natural areas can contribute to meeting the offset target. Further, these areas can only contribute to meeting the overall offset target if they are also secured as part of the offset (i.e. they also need formal legal protection and appropriate management compatible with maintenance of the full ecological value of the system).

Once the area of and land use compatibility scores for the adjacent terrestrial habitat and local catchment have been determined, they are used to calculate hectare equivalents that would be secured through management and protection of these adjacent areas. Given that this is a wetland offset and the greater emphasis is on wetland protection, only 25% of the hectare equivalents from the adjacent terrestrial habitat and local catchment can contribute to the overall wetland offset. Further, this contribution is capped at a maximum of 33.3% of the overall offset requirement to avoid large terrestrial offsets being proposed *in lieu* of actual wetland offsets.

4.2.3 Adjusting the offset's contribution to account for offset security

The final offset contribution towards meeting Ecosystem Conservation targets is calculated by combining the contributions from offset activities in both the wetland and adjacent terrestrial habitat and local catchment. In addition to the reduced weighting given to offset gains in the adjacent terrestrial habitat and local catchment (see previous section), these scores are also adjusted to account for the long-term security of the offset and to incentivise formal long-term protection. As such, any contributions are increased where protection activities go beyond minimum acceptable requirements. The ratios are included in Table 8.

Table 8: Adjustments to Ecosystem Conservation offset for securing legal protection of wetlands beyond the required minimum.

Planned protection measures	Description	Risk Ratio
Minimum acceptable security of tenure for shortest acceptable period	Offset area (including wetland and adjacent terrestrial areas) is secured through a legal mechanism such as a conservation servitude registered on the title deed which prevents change of land use to a type incompatible with maintaining desired wetland offset state for at least 30 years or the period for which residual impacts of the specific project would endure.	1
Minimum acceptable security of tenure for a longer period	Offset area (including wetland and adjacent terrestrial areas) receives full legal protection through a legal mechanism such as a conservation servitude registered on the title deed which prevents change of land use to a type incompatible with maintaining desired wetland offset state for at least 99 years.	1.5
Highest possible level of protection permanently secured	Offset area (including wetland and adjacent terrestrial areas) receives full legal protection through permanent inclusion in and declaration as (part of) a Nature Reserve or area of equivalent status under NEMPAA, or alternatively securing the site through other legal mechanisms such as a conservation servitude on the title deed in combination with long term contractual obligations to manage and maintain the site as if it was a declared Protected Area under NEMPAA.	2

In summary, the contribution of offset activities to meeting Ecosystem Conservation targets is calculated by:

- Identifying the wetland and delineating the area of this wetland that will be subject to offset activities.
- Identifying habitat intactness or condition of the wetland.
- Multiplying these two together to get a basic indication of wetland hectare equivalents.
- Identifying and scoring suitable areas of associated adjacent terrestrial habitat and local catchment in a natural condition which would be secured as part of the offset. A portion of this figure (25%) can be added to the basic wetland hectare equivalent, subject to the buffer not contributing more than a third of the total offset requirement.
- Calculating the final Ecosystem Conservation contribution by multiplying preliminary contributions by the required risk ratio to reflect any increase in security of tenure obtained.

This calculation determines the overall contribution that the offset site would make to meeting the Ecosystem Conservation targets. It is possible that more than one offset site could be necessary to meet the overall requirements.

4.3 ASSESSING OFFSET SITES FOR SPECIES OF CONSERVATION CONCERN

4.3.1 Identifying suitable sites and activities for meeting offset targets for Species of Conservation Concern

Contributions to meeting targets for species conservation should be assessed for each targeted species. Two broad approaches are advocated to compensate for impacts on Species of Conservation Concern. They are (i) protection of intact priority areas for a priority species or (ii) rehabilitation or averted loss activities focussed on improving habitat condition and protection for a priority species. The choice of approach should be informed by an understanding of the risk profile of the species (threat status, areas of occupancy, number of populations, sensitivity, potential response to rehabilitation, etc.). The risk profile of the proposed offset activity also needs to be considered (e.g. protection of intact areas could be intrinsically less risky than rehabilitation or establishment/re-introduction).

For wetland offsets to contribute to safeguarding the representation and persistence of Species of Conservation Concern, it is necessary to demonstrate that they would result in positive and enduring impacts on target species that would fully compensate for the residual negative impacts and promote the persistence of these species. Existing guidelines suggest that where an offset is possible, the offset should contribute through protection or rehabilitation of priority habitat to support viable populations of the affected species within its natural range (EKZNW, 2010). Further, the sites should preferably already accommodate populations of that species. Only in exceptional circumstances, and with the agreement of the relevant conservation agency, could consideration be given to offset sites for alternative threatened species of a higher threat status.

The process of identifying appropriate offset activities and suitable sites will depend on the habitat requirements of the impacted species and will need to be guided by relevant specialists with input from provincial conservation agencies. Some key questions that would need to be addressed in designing the wetland offset include:

- What is the recommended form of offset activity (protection, rehabilitation, averted loss)?
- What is the distribution range of the species and have priority sites for its conservation already been identified?
- What constitutes a suitable site (based on the habitat requirements of the species and specific use of the affected habitat by the particular species)?
- Is there the potential for adequate gains (in habitat or numbers of individuals) and for protecting a viable population of the affected species on an offset site?
- What are the primary drivers threatening the species, and will this offset help to mitigate these threats?
- What management actions are proposed and what assurance is there that they would achieve the required outcomes?
- Is there clear evidence that the habitat at the offset site would be capable of supporting a viable population of the species for which it is intended, or supporting a larger population through the expansion of an existing area in which the species is known to occur?
- Are any trends in surrounding land use and management likely to jeopardise the persistence of species at the offset site?

4.3.2 Assessing the offset's contribution to targets for Species of Conservation Concern

The assessment requires the appropriate 'species impact measure' developed for the impacted site to be applied and assessed at the offset site, to score the likely suitability of the targeted wetland to support the Species of Conservation Concern. The measure used must correspond to that applied at the impact site (e.g. if area of suitable breeding habitat or number of individuals was used to assess extent of impact, the same measure must be applied at the offset receiving site). This is important, in order to measure the extent to which the proposed activities adequately compensate for the impact.

4.3.3 Adjusting the offset's contribution to account for offset security and implementation risk

The final offset contributions are calculated by taking the security of tenure of planned offset activities and the risk of failure of proposed offset activities into account. Additional ratios are used to adjust the final offset contributions.

4.3.3.1 Accounting for increased offset security

Preliminary species contributions are adjusted to account for the security of the wetland offset and to incentivise formal long-term protection mechanisms. As such the value of the offset contribution is increased where protection activities go beyond accepted minimum requirements. The adjustment factors applied to the preliminary offset calculations are the same as those used for Ecosystem Conservation (See Table 8 in Section 4.2.3).

4.3.3.2 Accounting for risks associated with planned offset activities

Offset contributions are also adjusted to take the risk of failure and uncertainty of outcomes of proposed offset activities into account. The risk ratios are based on the type of offset activity planned, with population establishment or re-introduction considered to be higher risk than protection of known populations of a Species of Conservation Concern. The assessment requires the expert input of an appropriate biodiversity or species specialist with knowledge of the risk and uncertainties of different offset options. A potential starting point for this evaluation is given in Table 9.

Table 9: Recommended adjustments to offset contributions for Species of Conservation Concern to accommodate implementation risk.

Level of Risk	Example of offset activities	Risk ratio
Low risk	Protection of a site already supporting a viable population of the targeted species.	1
Medium risk	Site already supports suitable habitat with re-introductions planned together with supporting management to establish a viable population of the species.	0.66
High risk	Site requiring a high level of rehabilitation in order to provide suitable habitat or if risks associated with re-establishment of populations is high based on the characteristics of the species and its population characteristics.	0.33

In summary, the final offset achievement for Species of Conservation Concern is calculated by:

- Identifying the preliminary species offset contributions (expressed as an appropriate 'species impact measure' such as hectares of suitable habitat, number of breeding pairs, etc.).
- Identifying the required risk ratio to reflect the security of the offset site.
- Identifying the required risk ratio to reflect the risk of failure of the offset activity.
- Multiplying them together to arrive at the final contribution to the offset.

This calculation determines the overall contribution that the offset site would make to meeting the species of conservation concern offset requirement. It is possible that more than one implementation site could be needed to meet the overall requirements.

CHAPTER 5: IMPLEMENTING A WETLAND OFFSET

This chapter deals with the planning and implementation requirements of an offset, in order to ensure that it meets the objectives and principles of wetland offsets, as well as specific offset requirements.

5.1 STANDARD REQUIREMENTS FOR ANY WETLAND OFFSETS

Wetland offset activities need to be designed and implemented to ensure the long-term conservation of wetlands and the associated services that they provide. For this reason, a number of standard requirements are relevant to any wetland offset activity:

- Following the phased design of a wetland offset, a Wetland Offset Report and concept Offset Management Plan or Programme would need to be submitted to the competent authority as part of the water resource, environmental, EMPR or other equivalent application or authorisation process.
- The wetland offset needs to be implemented as quickly as possible to avoid any delay between the impact taking place and offset activities delivering tangible benefits. The proposed timeframe for implementation needs to be included in the Wetland Offset Report and concept Wetland Offset Management Plan or Programme, and recorded in the conditions the water use authorisation and/or the environmental authorisation. Specific penalties for delays of non-compliance should be included as conditions of the authorisation (such as triggering non-compliance process for a Water Use Authorisation or specifications of additional offset requirements should implementation be delayed).
- Wetlands can only be considered to be secured if their buffers are secure. A minimum 30m buffer zone must be secured around any wetland offset site. Note that these areas, and significantly larger adjacent terrestrial areas and local catchments, can contribute to meeting the Ecosystem Conservation offset requirement if they are in an intact condition.
- Formal protection of the wetland offset site is required in all instances. The wetland needs to be secured through appropriate legal mechanisms, such as:
    - An ideal outcome is that the wetland offset receives statutory protection using mechanisms such as NEMPAA, Section 12 of the National Water Act and/or Section 49 of the Mineral and Petroleum Resources Development Act. This may involve either:
        - Donation of land owned or purchased by the developer to an appropriate statutory conservation authority, together with financial provision for its long term management, in order for the site to be set aside as a formal protected area proclaimed under NEMPAA;
        - Setting aside land owned (or purchased) by the developer for the purpose of a wetland offset site as a formal protected area under NEMPAA. The developer retains ownership and management of the protected area, while an appropriate statutory conservation authority audits the appropriate implementation of conservation management activities on the land and ensures that the offset is secure.
        - The developer entering into an agreement with the owner of a suitable wetland offset site, whereby the offset areas are set aside as a protected area (under NEMPAA), which permanently ensures the offset site is retained in a suitable state.
    - As a minimum standard, the wetland needs to be secured through a legal mechanism such as a Biodiversity Management Agreement and conservation servitude that obliges the landowner to maintain the wetland in the desired wetland offset state for at least 30 years, or the duration of residual impacts of the specific project. In some cases the land would be owned by the proponent, while in others it may be efficient for the developer to enter into an agreement with the landowner of a suitable wetland offset site, whereby the offset areas become the subject of a legally binding Biodiversity Management Agreement and conservation servitude. The landowner continues to own and manage the land in accordance with the specified management objectives in the offset proposal, the requirements of the conservation servitude and the contractual agreement with the developer. A third party maybe involved in managing the offset site for conservation. This option would involve financial compensation to the landowner or third parties.

- A Wetland Offset Management Plan needs to be developed and implemented for each offset site, in order to secure required outcomes for Water Resource and Ecosystem Services, Ecosystem Conservation and Species of Conservation Concern.
- Appropriate assurances of long-term capacity and financial provision for appropriate management and potentially also financial guarantees of performance need to be in place.
- A monitoring plan must be in place to measure offset performance against targets and compliance requirements. This plan must allow for adaptive management.
- Independent audits of offset performance, as well external review and sign-off of the offset will be required.

5.2 COMPILATION OF A WETLAND OFFSET REPORT

Following the phased design of a wetland offset, a Wetland Offset Report will need to be submitted to the competent authority as part of the water, environmental or other application and authorisation process when wetland offsets are a required. As a guideline, the wetland offset report should include the following information:

- Description of affected wetland resources, including the type, area, condition and protection level and threat status of wetlands to be impacted.
- Description of the residual negative impacts expected for each component (Water Resources and Ecosystem Services, Ecosystem Conservation and Species of Conservation Concern).
- Explicit description of objectives and targets for wetland offset activities in line with wetland offset policy goals.
- A description of the selected wetland offset sites and associated offset activities to meet wetland offset objectives, including:
    - Rationale for the selection of offset activities;
    - Description of any stakeholder process followed;
    - Prioritisation criteria used to inform the site selection process;
    - A description of landscape-level risks considered as part of the site selection process;
    - Process followed to identify and prioritise wetland offset sites, including any motivation for not locating wetland offsets within priority offset receiving areas identified;
    - A description of the sites selected for wetland offset activities;
    - Site-level plans for each wetland offset site including specific site-level objectives and a description of activities planned for each site;
    - Details regarding time-frames for completion of wetland offset activities;
    - A description of the security and risks of failure of offset sites in terms of both tenure and management;
    - An evaluation of the adequacy of the proposed offset site in relation to meeting the objectives and targets set for the wetland offset;
    - An assessment of the viability of proposed offset sites in the long-term.
- An evaluation of any potential negative impacts associated with planned offset activities.
- Statement of any risks associated with the offset, and measures that would be taken to minimise these risks.
- Outline of the process to develop the Wetland Offset Management Plan.
- A clear statement on the roles and responsibilities of different actors.
- A clear statement of financial provisions for the implementation of the offset.

5.3 DEVELOPMENT OF A WETLAND OFFSET MANAGEMENT PLAN

The development of a Wetland Offset Management Plan is essential for the implementation and long-term management of the wetland offset site. This would in all probability only be finalised after a proposed project has been authorised, once offset sites have been selected and their management requirements determined in detail. The contents of this document should include:

- An evaluation of potential risks that need to be addressed as part of the management plan;
- A description of specific management activities necessary to minimise threats/risks and to secure wetland offset sites;
- A monitoring plan outlining specific monitoring and evaluation requirements with explicit performance indicators and success standards required to verify the success of offset activities (see next section);
- Appropriate corrective and adaptive management protocols in response to monitoring results, and audit requirements;
- Independent performance auditing and reporting requirements;
- Roles and responsibilities for all the above activities;
- Stakeholder engagement/communication;
- Financial arrangements and costs linked to the management plan and associated activities, specialist input, management of financial instruments established for the offset (e.g. bond or trust fund).

5.4 DEVELOPMENT OF A MONITORING PLAN

Monitoring forms the basis for evaluating the performance of wetland offset activities, which is defined as the extent to which the project has achieved what it set out to do (i.e. have the objectives and targets of the wetland offset plan been met?). Without monitoring of project outcomes, it would be difficult to justify whether the level of impact on wetlands has been adequately compensated for by the offset activities. Monitoring can also assist in identifying any potential unforeseen problems that may occur during the implementation process which, if left uncorrected, could undermine the success of the offset activities.

The development of a monitoring plan (as part of the Wetland Offset Management Plan) is essential to guide monitoring activities. The monitoring plan must be developed and approved prior to the implementation of wetland offset activities. Monitoring provisions should be designed to provide the authorities with sufficient information to determine if performance standards are being met and when remedial measures are necessary. The content and level of detail of monitoring reports should be commensurate with the scale, scope, and type of the wetland offset project. In some cases where the offset involves an intact natural wetland being permanently included in a formal protected area managed by an appropriate statutory conservation authority, ongoing wetland monitoring beyond that included in normal reserve management may not be required. On the other hand, more risky rehabilitation projects may require fairly intensive monitoring to ensure that the required objectives are being met.

Some general guidance is provided here to inform the development of an appropriate monitoring plan.
Wet-RehabEvaluate (Cowden and Kotze, 2009) has been developed for evaluating the success of wetland rehabilitation projects. It provides a very useful overview of the importance of monitoring and evaluation, and provides a step-by-step process for evaluating rehabilitation projects. This process can easily be adapted for wetland offset projects. Key elements associated with the development and implementation of a monitoring programme include:

- Specifying a series of site-based project objectives for each wetland offset activity and site.
- Defining performance indicators and associated success standards or targets against which the success of wetland offset activities will be measured.
- Developing a monitoring plan for inclusion in the wetland offset management plan. The timing and frequency of monitoring activities needs to be specified in the monitoring plan. This needs to be

tailored according to the specific performance indicators, which will require varying monitoring frequencies due to responsiveness of indicators, seasonal patterns (e.g. vegetation composition), etc. The monitoring will need to take into account different phases of offset implementation:

  - **Pre-implementation:** Baseline monitoring requirements must be identified that need to take place prior to offset implementation.
  - **During implementation:** The primary focus of monitoring during this phase is typically on operational aspects associated with implementation of the wetland offset plan. Regular monitoring is typically undertaken during this period to facilitate adaptive management, whereby issues can be identified at an early stage and potential problems can then be addressed through appropriate corrective actions as implementation proceeds.
  - **Post-implementation:** Once implementation has been completed, ecological monitoring typically becomes most important with a focus on evaluating to what degree targets are being achieved. In the USA, the period for post-implementation monitoring is typically five years (Wilkinson *et al.*, 2008). While this is regarded as a useful guideline for South African circumstances, it may be necessary to extend the monitoring period for projects requiring more time to reach a stable condition or where remedial activities were undertaken (e.g. as a result of failed rehabilitation measures). This period will be decided in consultation with the relevant competent authorities.

- The parties responsible for the implementation of monitoring programs and for compiling monitoring reports should be identified as part of the monitoring plan.
- Budgets and funding requirements for establishing a reliable baseline, monitoring and evaluation, performance reporting and independent auditing, and offset verification, must be clearly and transparently defined. The allocation of adequate budgets to these tasks is critical to the success of wetland offset activities and must be included in the wetland offset plan and associated budget.
- Once approved by the competent authorities, the monitoring plan should be implemented with regular reporting of performance, including any concerns or corrective actions that are needed.
- At regular intervals throughout the monitoring period, performance must be reviewed to enable adaptive or corrective management where appropriate. Periodic independent audits of offset performance should also be undertaken. Regulatory authorities will have their own set of conditions regarding monitoring and evaluation, which need to be factored into the overall design of the monitoring plan.
- Performance must be reviewed at the end of the monitoring period, and the project signed off by the competent authority if performance standards have been met.

5.5 SUBMISSION, REVIEW AND APPROVAL

In cases where the competent authority has specified that a wetland offset is required (i.e. where it has determined that a project is acceptable but where significant residual impacts exist), a detailed wetland offset investigation, culminating in a Wetland Offset Report and associated concept Wetland Offset Management Plan, should form part of the water, environmental or other application and authorisation process/es. The competent authority will review the Wetland Offset Report and concept Wetland Offset Management Plan before giving granting the final authorisation. If this authority is of the view that the offset proposals are sufficiently robust and give assurance of a successful outcome, it would include the implementation of the wetland offset as a formal condition of authorisation. After authorisation, the concept Wetland Offset Management Plan may need to be expanded to include detailed management plans for specific offset sites. Should this be the case, this would need to be stated in the binding conditions of the authorisation.

5.6 IMPLEMENTATION OF THE OFFSET

Once approved, the offset must be implemented within the timelines specified in the Wetland Offset Management Plan. Implementation requires careful oversight and should be undertaken by parties with the requisite level of knowledge, skills and experience. Implementation activities should ideally precede the

impact on the affected wetland. This will minimise the net loss during the time lags between the loss of ecosystem services as a result of the impact and the re-instatement of these services at offset sites.

5.7 MONITORING OF WETLAND OFFSET ACTIVITIES

During the implementation phase, the wetland offset project would need to be monitored and results used to identify any problems, and corrective actions required. Monitoring will need to be undertaken in such a way as to allow for well-informed and defensible statements to be made regarding progress towards achievement of project objectives, which would be reflected in the degree to which various targets for the offset performance have been reached.

Compilation of monitoring reports is recommended on an annual or two-yearly basis, or at the frequency specified in conditions of authorisation. Frequency of reporting should be higher for projects where the chosen offset activities involve high levels of risk and uncertainty. The monitoring requirements will be specified in the authorisation. A final monitoring report will also need to be compiled for each site once the site is ready for verification and sign-off.

Apart from formal monitoring and reporting of offset performance on the part of the proponent, regular site inspections on the part of the competent authority/ies to track performance are encouraged throughout the implementation phase. Such activities would help to identify any concerns and are therefore likely to increase the likelihood of successful implementation. The relevant competent authorities should also conduct compliance monitoring inspections and audits in respect of the authorisations issued.

5.8 VERIFICATION & SIGN OFF

A critical step in the process of wetland offset implementation is the auditing and verification process. Auditing helps to take stock of progress towards achieving the desired or required outcomes, and identifying any additional measures needed to meet wetland offset requirements. Verification is the point at which the relevant competent authorities sign off on the success of wetland offset activities. That is, they confirm that the required outcomes have been achieved and that sufficient measures are in place to give assurance of the long term persistence of the wetland offset site.

Before wetland offset sites can be signed off, it is necessary for offset activities to be audited to (i) verify to what degree the planned and predicted outcomes have been achieved, (ii) verify whether or not the objectives and targets for wetland offsets have been met, and (ii) review the adequacy of the long-term management plan. This audit should be undertaken for each wetland offset site once monitoring reports indicate that performance targets have been reached, or when performance has reached a stable state and is unlikely to show further improvements.

The process of auditing and verification would typically consist of two components.

1. **Desktop review**: This entails the consolidation and review of relevant conditions of the authorisation/s, any subsequent agreements or legal contracts pertaining to the offset, the wetland offset plans and associated required outcomes, Wetland Offset Management Plans, monitoring and any previous audit reports. The focus here would be on obtaining a good understanding of the wetland offset project and on identifying specific outcomes that need to be verified during a site visit.

2. **Site inspection**: Following a review of available information, the party responsible for undertaking verification activities will need to undertake a site inspection. The focus of the site inspection would depend on the specific objectives of wetland offset activities at the site, but would typically need to answer the following questions:

    - Have offset activities required to generate the anticipated gains been completed according to the Wetland Offset Management Plan?

- Have interventions been implemented according to specifications and appropriately maintained?
- Have the specific required outcomes of offset activities at the wetland site been achieved for Water Resources and Ecosystem Services, Ecosystem Conservation and Species of Conservation Concern?
- Have likely threats to the sustained health of the wetland site been identified? Are measures to avoid or prevent these threats adequately incorporated in the management plan?
- Has the site been secured in the long term through appropriate legal mechanisms?
- Have appropriate budget provisions been made for the long-term management of the site, taking into account escalation?

Following the field visit, either an audit report (when the wetland offset site cannot be signed off) or a verification report (on completion of offset activities and attainment of targets) should be compiled that outlines the findings of the assessment. If an audit report is prepared, it should highlight to what degree outcomes have been achieved and stipulate any additional measures that must be implemented to meet offset requirements. Where this report differs from the findings of monitoring reports, the discrepancies must be substantiated with appropriate justification. For both the audit and verification report, a critical review of the adequacy of the Wetland Offset Management Plan should be included and any additions or improvements that are regarded as necessary to ensure the successful long-term management of the site should be highlighted.

5.9 FORMAL SIGN-OFF OF THE WETLAND OFFSET

Sign-off of the wetland offset project should only take place once it has been confirmed that all of the wetland offset objectives and targets have been achieved. Where the verification process indicates that wetland offset activities have not delivered appropriate gains, any residual requirements and additional actions will need to be clearly articulated to the proponent. The formal sign-off process provides an opportunity to re-enforce long-term management and reporting requirements necessary to ensure that benefits associated with offset activities are secured over the long-term. Before formal sign-off by the relevant authorities they must conduct a site inspection with the audit report and/or verification report to verify compliance with the authorisations, and successful implementation of the wetland offset.

CHAPTER 6: MONITORING OF IMPLEMENTATION OF THIS GUIDELINE

Given that the concept of wetland offsets is relatively new in South Africa and that this is the first attempt to develop a guideline for wetland offset activities, monitoring of the application of this guideline is strongly encouraged to inform future revisions of this document. Responsibility for monitoring the implementation of the guideline, and then reviewing the guideline where necessary, will rest with the DWS.

REFERENCES

BBOP. 2012a. Offset Design Handbook. Business and Biodiversity Offsets Programme, Washington D.C.

BBOP. 2012b. Standard on Biodiversity Offsets. Business and Biodiversity Offsets Programme, Washington D.C.

COWDEN, C. and KOTZE, D.C. 2009. WET-RehabEvaluate: Guidelines for the monitoring and evaluation of wetland rehabilitation projects. WRC Report NO. TT 342/09. Water Research Commission, Pretoria.

DEADP. 2011. Information Document on Biodiversity Offsets. EIA Guideline and Information Document Series. Western Cape Department of Environmental Affairs & Development Planning, Cape Town.

DRIVER, A., SINK, K.J., NEL, J.N., HOLNESS, S., VAN NIEKERK, L., DANIELS, F., MADJIET, P.A., JONAS, Z. and MAZE, K. 2012. National Biodiversity Assessment 2011: An assessment of South Africa's biodiversity and ecosystems. Synthesis Report. South African National Biodiversity Institute and Department of Environmental Affairs, Pretoria.

DWA. 2012. The Department of Water Affairs Operational Policy for Developments and Activities affecting Water Courses. Department of Water Affairs, Pretoria.

DWAF. 2005. A practical field procedure for identification and delineation of wetland and riparian areas. Edition 1, September 2005. Department of Water Affairs and Forestry, Pretoria.

DWAF. 2008. Updated Manual for the Identification and Delineation of Wetland and Riparian Areas. Stream Flow Reduction Activities, Department of Water Affairs and Forestry, Pretoria.

DWS. 2014a. Draft DWS Guideline: Assessment of Activities/ Developments Affecting Wetlands. Department of Water and Sanitation, Pretoria.

DWS. 2014b. Draft DWS Position Paper for the Protection, Use, Development, Management and Control of Wetlands. Department of Water and Sanitation, Pretoria.

EKZNW. 2010. Concise Guideline on biodiversity offsets: KwaZulu-Natal Province. Ezemvelo KZN Wildlife, Pietermaritzburg.

EKZNW. 2013. Comprehensive Guideline for Biodiversity Offsets: KwaZulu-Natal Province, South Africa. Ezemvelo KZN Wildlife, Pietermaritzburg.

GDARD. 2013. Final draft Guideline on Biodiversity Offsets in Gauteng Province. Gauteng Department of Agriculture and Rural Development, Johannesburg.

HRUBY, T., HARPER, K. and STANLEY, S. 2009. Selecting Wetland Mitigation Sites Using a Watershed Approach. Ecology Publication #09-06-032.

HRUBY, 2011. Calculating Credits and Debits for Compensatory Mitigation in Wetlands of Western Washington. Publication no. 10-06-011.

KLEYNHANS C.J. and LOUW M.D. 2007. Module A: EcoClassification and EcoStatus determination in River EcoClassification: Manual for EcoStatus Determination (Version 2). Joint Water Research Commission and Department of Water Affairs and Forestry Report, Pretoria.

KOTZE, D.C., ELLERY, W.N., ROUNTREE, M., GRENFELL, M.C., MARNERWICK, G., NXELE, I.Z., BREEN, D.C., DINI, J., BATCHELOR, A.L., and SIEBEN, E. 2009. WET-RehabPlan: Guidelines for planning wetland rehabilitation in South Africa. WRC Report No. TT 336/09. Water Research Commission, Pretoria.

Kotze, D.C., Marneweck, G.C., Batchelor, A.L., Lindley, D.S. and Collins, N.B. 2007. Wet-EcoServices: A technique for rapidly assessing ecosystem services supplied by wetlands. WRC Report No TT 339/09. Water Research Commission, Pretoria.

MACFARLANE, D.M., KOTZE, D.C., ELLERY, W.N., WALTERS, D., KOOPMAN, V., GOODMAN, P. and GOGE, M. 2008. WET-Health: a technique for rapidly assessing wetland health. WRC Report No. TT 340/09. Water Research Commission, Pretoria.

MBONA, M., JOB, N., SMITH, J., NEL, J., HOLNESS, S., MEMANI, S. and DINI, J. 2014. Supporting better decision-making around coal mining in the Mpumalanga Highveld through the development of mapping tools and refinement of spatial data on wetlands. WRC Report No. K5/2281. Water Research Commission, Pretoria.

MORENO-MATEOS D, POWER ME, COMÍN, FA, and YOCKTENG, R. 2012. Structural and Functional Loss in Restored Wetland Ecosystems. PLoS Biol. 10(1).

NEL, J.L. and DRIVER, A., 2012. National Biodiversity Assessment 2011: Technical Report. Volume 2: Freshwater Component. CSIR Report Number CSIR/NRE/ECO/IR/2012/0022/A. Council for Scientific and Industrial Research, Stellenbosch.

NEL, J.L., DRIVER, A., STRYDOM, W., MAHERRY, A. and PETERSEN, C. 2011a. Atlas of Freshwater Ecosystem Priority Areas for South Africa: Maps to support sustainable development of water resources. WRC Report No. TT 500/11. WRC, Pretoria.

NEL, J.L., MURRAY, K.M., MAHERRY, A.M., PETERSEN, C.P., ROUX, D.J., DRIVER, A., HILL, L., VAN DEVENTER, H., FUNKE, N., SWARTZ, E.R., SMITH-ADAO, L.B., MBONA, N., DOWNSBOROUGH, L. and NIENABER, S. 2011b. Technical Report: National Freshwater Ecosystem Priority Areas project. WRC Report No. 1801/2/11. WRC, Pretoria.

NEL, J.L., O'FARRELL, P., LE MAITRE, D.C., SMITH, J. and REYERS, B. 2013. Spatial mapping of ecosystem services. CSIR Report.

RUSSEL, W.B. 2009. WET-RehabMethods: National guidelines and methods for wetland rehabilitation. WRC Report No. 341/09. Water Research Commission, Pretoria.

SANBI/ DEA. 2013. Draft National Policy Framework for Biodiversity Offsets. South African National Biodiversity Institute and Department of Environmental Affairs, Pretoria.

SHELDON, D., HRUBY, T., JOHNSON, P., HARPER, K., MCMILLAN, A., GRANGER, T., STANLEY, S. and STOCKDALE, E. 2005. Wetlands in Washington State. Volume 1: A synthesis of science – final. Washington State Department of Ecology Publication #05-06-006.

WILKINSON, J., BEAN, M. and KIHSLINGER, R. 2008. Design of U.S. Habitat Banking Systems to Support the Conservation of Wildlife Habitat and At-Risk Species. Environmental Law Institute (ELI), Washington D.C.

APPENDIX A: THREAT STATUS AND PROTECTION LEVELS FOR WETLAND GROUPS

These Ecosystem Threat Statuses and Protection Levels for Wetland Groups have been revised using data from the 2014 WRC project No K5/2281 *Supporting better decision-making around coal mining in the Mpumalanga Highveld through the development of mapping tools and refinement of spatial data on wetlands* (Mbona et al., 2014). The methods used were identical to those applied in the National Biodiversity Assessment (Driver *et al*., 2012), but are based on a revised wetland dataset and are reported on at a Wetland Group level.

Table A1: Ecosystem Threat Statuses and Protection Levels for Wetland Groups

Wetland Vegetation Group	Ecosystem Threat Status	Ecosystem Protection Level
Albany Thicket Bontveld	Least Threatened	Poorly Protected
Albany Thicket Escarpment	Critically Endangered	Not Protected
Albany Thicket Valley	Endangered	Poorly Protected
Central Bushveld Group 1	Least Threatened	Poorly Protected
Central Bushveld Group 2	Least Threatened	Poorly Protected
Central Bushveld Group 3	Least Threatened	Poorly Protected
Central Bushveld Group 4	Least Threatened	Not Protected
Central Bushveld Group 5	Least Threatened	Not Protected
Central Bushveld Group 6	Critically Endangered	Not Protected
Central Bushveld Group 7	Least Threatened	Not Protected
Central Bushveld Group 8	Critically Endangered	Poorly Protected
Central Bushveld Group 9	Least Threatened	Moderately Protected
Drakensberg Grassland Group 1	Least Threatened	Poorly Protected
Drakensberg Grassland Group 2	Least Threatened	Not Protected
Drakensberg Grassland Group 3	Least Threatened	Poorly Protected
Drakensberg Grassland Group 4	Least Threatened	Well Protected
Drakensberg Grassland Group 5	Least Threatened	Well Protected
Dry Highveld Grassland Group 1	Endangered	Not Protected
Dry Highveld Grassland Group 2	Critically Endangered	Not Protected
Dry Highveld Grassland Group 3	Least Threatened	Not Protected
Dry Highveld Grassland Group 4	Least Threatened	Not Protected
Dry Highveld Grassland Group 5	Least Threatened	Not Protected
East Coast Alluvium Renosterveld	Critically Endangered	Poorly Protected
East Coast Granite Renosterveld	Invalid type	Invalid type
East Coast Shale Renosterveld	Critically Endangered	Poorly Protected
East Coast Silcrete Renosterveld	Critically Endangered	Not Protected
Eastern Fynbos-Renosterveld Conglomerate Fynbos	Critically Endangered	Not Protected
Eastern Fynbos-Renosterveld Granite Fynbos	Critically Endangered	Not Protected
Eastern Fynbos-Renosterveld Quartzite Fynbos	Least Threatened	Not Protected
Eastern Fynbos-Renosterveld Sand Fynbos	Critically Endangered	Not Protected
Eastern Fynbos-Renosterveld Sandstone Fynbos	Least Threatened	Moderately Protected
Eastern Fynbos-Renosterveld Shale Band Vegetation	Critically Endangered	Not Protected
Eastern Fynbos-Renosterveld Shale Fynbos	Critically Endangered	Poorly Protected
Eastern Fynbos-Renosterveld Shale Renosterveld	Endangered	Not Protected
Eastern Kalahari Bushveld Group 1	Least Threatened	Poorly Protected
Eastern Kalahari Bushveld Group 2	Least Threatened	Not Protected
Eastern Kalahari Bushveld Group 3	Least Threatened	Not Protected
Eastern Kalahari Bushveld Group 4	Least Threatened	Not Protected
Eastern Kalahari Bushveld Group 5	Least Threatened	Not Protected
Eastern Kalahari Bushveld Group 6	Least Threatened	Not Protected
Gariep Desert (Dg)	Endangered	Not Protected
Indian Ocean Coastal Belt Group 1	Least Threatened	Well Protected
Indian Ocean Coastal Belt Group 2	Endangered	Poorly Protected

Wetland Vegetation Group	Ecosystem Threat Status	Ecosystem Protection Level
Indian Ocean Coastal Belt Group 3	Least Threatened	Well Protected
Indian Ocean Coastal Belt Group 4	Endangered	Not Protected
Kalahari Duneveld	Least Threatened	Poorly Protected
Karoo Dolerite Renosterveld	Least Threatened	Not Protected
Karoo Shale Renosterveld	Least Threatened	Poorly Protected
Knersvlakte (Skk)	Least Threatened	Moderately Protected
Lower Nama Karoo	Least Threatened	Not Protected
Lowveld Group 1	Critically Endangered	Not Protected
Lowveld Group 2	Critically Endangered	Moderately Protected
Lowveld Group 3	Critically Endangered	Not Protected
Lowveld Group 4	Critically Endangered	Not Protected
Lowveld Group 5	Critically Endangered	Poorly Protected
Lowveld Group 6	Critically Endangered	Not Protected
Lowveld Group 7	Critically Endangered	Not Protected
Lowveld Group 8	Critically Endangered	Not Protected
Lowveld Group 9	Least Threatened	Poorly Protected
Lowveld Group 10	Endangered	Moderately Protected
Lowveld Group 11	Least Threatened	Moderately Protected
Mesic Highveld Grassland Group 1	Least Threatened	Poorly Protected
Mesic Highveld Grassland Group 2	Endangered	Not Protected
Mesic Highveld Grassland Group 3	Least Threatened	Not Protected
Mesic Highveld Grassland Group 4	Least Threatened	Not Protected
Mesic Highveld Grassland Group 5	Endangered	Not Protected
Mesic Highveld Grassland Group 6	Least Threatened	Poorly Protected
Mesic Highveld Grassland Group 7	Least Threatened	Not Protected
Mesic Highveld Grassland Group 8	Least Threatened	Not Protected
Mesic Highveld Grassland Group 9	Least Threatened	Well Protected
Mesic Highveld Grassland Group 10	Critically Endangered	Not Protected
Mesic Highveld Grassland Group 11	Least Threatened	Not Protected
Mopane Group 1	Endangered	Poorly Protected
Mopane Group 2	Least Threatened	Poorly Protected
Mopane Group 3	Least Threatened	Well Protected
Mopane Group 4	Critically Endangered	Poorly Protected
Nama Karoo Bushmanland	Least Threatened	Not Protected
Namaqualand Cape Shrublands Granite Fynbos	Least Threatened	Not Protected
Namaqualand Cape Shrublands Granite Renosterveld	Least Threatened	Not Protected
Namaqualand Cape Shrublands Quartzite Fynbos	Critically Endangered	Not Protected
Namaqualand Hardeveld (Skn)	Least Threatened	Poorly Protected
Namaqualand Sandveld (Sks)	Least Threatened	Poorly Protected
Northwest Alluvium Fynbos	Critically Endangered	Not Protected
Northwest Quartzite Fynbos	Least Threatened	Poorly Protected
Northwest Sand Fynbos	Critically Endangered	Not Protected
Northwest Sandstone Fynbos	Least Threatened	Moderately Protected
Northwest Shale Band Vegetation	Least Threatened	Well Protected
Northwest Shale Fynbos	Critically Endangered	Not Protected
Rainshadow Valley Karoo (Skv)	Least Threatened	Poorly Protected
Richtersveld (Skr)	Least Threatened	Moderately Protected
South Coast Limestone Fynbos	Least Threatened	Moderately Protected
South Coast Sand Fynbos	Endangered	Poorly Protected
South Strandveld Sand Fynbos	Least Threatened	Moderately Protected
South Strandveld Western Strandveld	Endangered	Poorly Protected
Southern Namib Desert (Dn)	Least Threatened	Poorly Protected
Southern Sandstone Fynbos	Least Threatened	Well Protected
Southern Shale Band Vegetation	Least Threatened	Well Protected
Southern Shale Fynbos	Endangered	Not Protected
Southern Silcrete Fynbos	Endangered	Well Protected

Wetland Vegetation Group	Ecosystem Threat Status	Ecosystem Protection Level
Southwest Alluvium Fynbos	Least Threatened	Well Protected
Southwest Ferricrete Fynbos	Critically Endangered	Poorly Protected
Southwest Granite Fynbos	Endangered	Well Protected
Southwest Quartzite Fynbos	Invalid type	Invalid type
Southwest Sand Fynbos	Critically Endangered	Poorly Protected
Southwest Sandstone Fynbos	Least Threatened	Well Protected
Southwest Shale Band Vegetation	Least Threatened	Well Protected
Southwest Shale Fynbos	Critically Endangered	Poorly Protected
Soutwest Sand Fynbos	Least Threatened	Not Protected
Sub-Escarpment Grassland Group 1	Least Threatened	Not Protected
Sub-Escarpment Grassland Group 2	Least Threatened	Not Protected
Sub-Escarpment Grassland Group 3	Endangered	Not Protected
Sub-Escarpment Grassland Group 4	Least Threatened	Not Protected
Sub-Escarpment Grassland Group 5	Least Threatened	Poorly Protected
Sub-Escarpment Grassland Group 6	Least Threatened	Not Protected
Sub-Escarpment Grassland Group 7	Endangered	Not Protected
Sub-Escarpment Grassland Group 8	Endangered	Not Protected
Sub-Escarpment Grassland Group 9	Vulnerable	Not Protected
Sub-Escarpment Savanna	Endangered	Not Protected
Swamp Forest	Least Threatened	Well Protected
Trans-Escarpment Succulent Karoo (Skt)	Least Threatened	Not Protected
Upper Nama Karoo	Least Threatened	Not Protected
West Coast Alluvium Renosterveld	Critically Endangered	Not Protected
West Coast Granite Renosterveld	Critically Endangered	Not Protected
West Coast Shale Renosterveld	Critically Endangered	Not Protected
West Coast Silcrete Renosterveld	Critically Endangered	Not Protected
Western Fynbos-Renosterveld Conglomerate Fynbos	Critically Endangered	Not Protected
Western Fynbos-Renosterveld Limestone Renosterveld	Critically Endangered	Not Protected
Western Fynbos-Renosterveld Quartzite Fynbos	Critically Endangered	Not Protected
Western Fynbos-Renosterveld Sandstone Fynbos	Least Threatened	Well Protected
Western Fynbos-Renosterveld Shale Band Vegetation	Least Threatened	Well Protected
Western Fynbos-Renosterveld Shale Fynbos	Endangered	Not Protected
Western Fynbos-Renosterveld Shale Renosterveld	Vulnerable	Well Protected
Western Strandveld	Vulnerable	Moderately Protected

Table A2: Ecosystem protection level categories and thresholds

Ecosystem protection level	Proportion of biodiversity target met in a Protected area
Not Protected	Zero or less than 5% of biodiversity target
Poorly Protected	5-49% of biodiversity target
Moderately Protected	50-99% of biodiversity target
Well Protected	>=100% of biodiversity target

APPENDIX B: HOW TO APPLY THE WETLANDS OFFSET CALCULATOR

This appendix provides supporting documentation for using the Wetland Offset Calculator digitally supplied with this report.

6.1 DETERMINING OFFSET REQUIREMENTS

6.1.1 Determining Water Resources and Ecosystem Services Offset Targets

6.1.1.1 Assessing Residual Impacts to Wetland Water Resources and Ecosystem Services

An assessment of the loss in the functional value provided by the wetland is necessary to determine Water Resources and Ecosystem Services offset targets. To undertake this assessment, use an appropriate assessment tool to obtain an indication of the functional value of the wetland (i) prior to and (ii) post-development. Hectare equivalents are then calculated by multiplying the change in functional value (%) by the wetland area.

Given the lack of locally available tools to quantify impacts to particular functional values, the condition of the wetland can be used as a surrogate for functionality. Here, tools such as WET-Health (Macfarlane *et. al.,* 2008) can be used to obtain a measure of the condition of the wetland pre- and post-development. A table to aid the conversion between ecosystem health categories, condition scores and functional values is given in Table B10. The change in functional value must be expressed in percent (%). To calculate the change in functional value, the post-development score (%) is subtracted from the pre-development score (%). The resultant score is then multiplied by wetland area to obtain a measure of the loss in the functional value measured in hectare equivalents.

Table B10: Guide to conversion between ecosystem health categories, condition scores and functional values.

HEALTH CATEGORY	DESCRIPTION	Condition Score	Functional Value (%)
A	Unmodified, natural.	0-0.9	90-100%
B	Largely natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1-1.9	80-90%
C	Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact	2-3.9	60-80%
D	Largely modified. A large change in ecosystem processes and loss of natural habitat and biota and has occurred.	4-5.9	40-60%
E	The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable.	6-7.9	20-40%
F	Modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8-10	0-20%

6.1.1.2 Determining Water Resources and Ecosystem Services Offset Ratios

There may be situations where the loss of wetland functioning is particularly significant due to local or regional circumstances. If this is the case, there may be a motivation to increase offset requirements by applying a ratio to Water Resources and Ecosystem Services offset targets. Undertaking this assessment requires a sound understanding of the catchment context and the importance of wetlands in meeting water resource management objectives. Situations under which there may be a justification to increase functional offset requirements to compensate for wetland loss include:

- Strategic Water Source Areas (Nel et al. 2013) which could compromise water regulation/ supply for downstream users;
- Areas of high water stress (e.g. a water stressed catchment as designated by DWS) where such loss could exacerbate the situation;
- Other specific areas designated as important by a regulatory authority;
- Wetlands providing critical flood attenuation, water quality enhancement or carbon sequestration functions that cannot be easily replaced;
- Other circumstances identified as part of the authorisation process that warrant an increase in offset targets.

There may well be other circumstances that would warrant an increase in the Water Resources and Ecosystem Services offset targets. If this is the case, a brief motivation should be documented. By default, a functional importance ratio of 1.5 is applied in the calculator for any of the triggers identified. There may however be a justification for higher functional offset ratios to be applied in some situations. These would need to be appropriately justified in collaboration with relevant government departments.

6.1.1.3 Calculating Final Wetland Water Resources and Ecosystem Services Offset Targets

This is simply calculated by multiplying the development impact (in hectare equivalents) by the applicable offset ratio.

6.1.2 Determining Ecosystem Conservation Offset Targets

6.1.2.1 Assessing Residual Impacts to Wetland Habitat

An assessment of the impact that wetland loss will have on wetland habitat and the ability to meet wetland conservation targets is necessary to determine Ecosystem Conservation offset targets. To undertake this assessment, use an appropriate tool to assess habitat intactness (condition) of the wetland (i) prior to and (ii) post-development. The residual impact is then calculated by comparing the pre- and post-impact scenarios.

In the absence of more appropriate measures, the vegetation module of WET-Health can be used as a surrogate measure for habitat intactness pre- and post-development. This is regarded as a more appropriate measure than the integrated PES score as the suitability of a wetland to support biodiversity is most strongly linked to vegetation attributes.

The selected habitat intactness measure must be expressed as a percentage (%). A wetland supporting completely natural habitat would therefore score 100% while a wetland that has been completely destroyed and lacks any natural habitat would score 0%. To calculate the change in functional value, the post-development score (%) is simply subtracted from the pre-development score (%). The resultant score is then multiplied by wetland area to obtain a measure of the loss in wetland habitat in hectare equivalents.

6.1.2.2 Determining Ecosystem Conservation Ratios

Ecosystem Conservation ratios are calculated based on a suite of wetland characteristics that are important in determining conservation value. These include (i) ecosystem status; (ii) regional and national conservation context and (iii) local site attributes. The ecosystem status multiplier acts as the starting point but is adjusted downwards where the wetland has not been prioritised at regional or national level and where local site attributes that affect biodiversity value are sub-optimal.

<u>Ecosystem Status</u>

The significance of wetland loss is linked to the ecosystem threat status and protection levels of a given wetland type. An impact to a wetland with a higher threat status (e.g. Endangered) is therefore regarded as more significant than impacts to a wetland of lower threat status (e.g. Least Threatened) and therefore a higher ratio applies to the former. Similarly, impacts to wetland types that are poorly protected are regarded as more significant than impacts to wetlands that are well protected by existing conservation areas.

The threat status and protection levels of **wetland vegetation groups**[17] should be used. The values are provided in the Wetland Offset Calculator spreadsheet as well as in Appendix A of this report. Where more suitable classifications and assessments are available at a regional level, these should be used. The ecosystem status multiplier is simply calculated by multiplying the individual threat status and protection multipliers. The following scoring guidelines are used for this calculation:

- Threat status:

Critically Endangered = 15; Endangered = 7.5; Vulnerable = 3; Least Threatened = 1

- Protection level:

Not Protected = 2; Poorly Protected = 1; Moderately Protected = 0.75; Well Protected =0.25.

Regional and National Conservation Context

Wetlands have been prioritised through a number of systematic conservation planning processes. Maximum offset ratios are applied for priority wetlands, whereas requirements are lower for wetlands not prioritized in national or regional plans[18]. This criterion should be evaluated by reviewing available national and regional datasets and using this to score the criterion using the scoring guideline below (Table B11).

Table B11: Criteria for evaluating regional and national conservation context.

Importance class	Description	Ratio
Not specifically identified as important	Not a priority wetland in a local or regional conservation plan. Not identified as a wetland priority or within a River FEPA catchment (FEPA1).	0.5
Moderate importance	ESA (Ecological Support Area) identified in a local or regional conservation plan or wetlands located within a River FEPA catchment (FEPA1).	0.75
High importance	CBA (Critical Biodiversity Area) identified in a local or regional conservation plan or an identified Wetland FEPA.	1.0

Given that much regional and national planning is undertaken at quite a broad scale, it is possible that priorities may not been appropriately identified through these planning processes. It is therefore important that this information be used as a starting point for further refinement based on wetland site and contextual attributes. If it can be demonstrated that the wetland was incorrectly mapped, this should inform the scoring. So, for example where the wetland was identified as a priority based on intactness but is in fact highly degraded then the importance should be downgraded accordingly. Conversely, where a wetland which should be a FEPA (e.g. due to high biodiversity values), has not been selected, this should be corrected.

Local Context Multiplier

The value of a wetland for biodiversity conservation is largely dependent on site-specific wetland and local landscape attributes. To cater for such variation, local context modifiers have been developed. This is based on an evaluation of three criteria, namely:

(i) The uniqueness and importance of biota present in the wetland (Weight = 70%);
(ii) The integrity of the adjacent terrestrial areas and local catchment around the wetland (Weight = 20%); and
(iii) The degree to which the wetland is connected to other aquatic resources (Weight = 10%).

The local context modifier is then determined by calculating a combined weighted score for these criteria. Guidelines for how each of these criteria should be assessed are provided below.

(i) Uniqueness and Importance of Biota Present in the Wetland

While a measure of habitat integrity (used to calculate the development impact) provides a useful measure of the ability of the wetland to support wetland dependant biota, the uniqueness and importance of biota that will be impacted should also be considered. Impacts to wetland habitats that are particularly diverse or

[17] The NFEPA Wetland Vegetation Group GIS dataset is available on SANBIs Biodiversity GIS: http://bgis.sanbi.org/NFEPA/NFEPAmap.asp#wetlandecosystemtypes.
[18] A range of important reference datasets that can be used to inform this assessment are available on SANBI's BGIS web site (http://bgis.sanbi.org). This includes a range of datasets compiled as part of the National Freshwater Ecosystem Priorities (NFEPA) Project.

support populations of important wetland dependant biota are more significant than impacts to wetlands lacking special features. Since this criterion provides a measure of actual biodiversity value, it is weighted considerably higher than the other two indirect criteria considered at a local level. A weighting of 70% is therefore applied to this criterion when calculating the local site context multiplier.

The following site attributes that are typically evaluated when rating the Ecological Importance and Sensitivity (EIS) of a wetland should be considered when assessing the biodiversity value of the wetland:

- The presence of species of conservation concern (e.g. critically endangered or endangered species are present in the wetland);
- The presence of large populations of wetland-dependant species (e.g. the wetland supports an unusually large population of *Kniphofia* spp);
- The importance of the wetland in providing migration, breeding or feeding sites (e.g. the wetland supports an important breeding population of Barn Swallows); and
- Diversity of habitat types (e.g. the wetland is characterised by a wide variety of different habitat types suitable for a range of biota).

Scoring of this criterion requires a good understanding of the biodiversity value of the site and should ideally be supported by a specialist biodiversity assessment that specifically considers the site attributes referred to above. This information should then be used to select an appropriate biodiversity value class and score using the scoring guideline below (Table B12).

A site level biodiversity assessment is required for actual offset calculations. Where desktop-level planning is being undertaken, available datasets that have either documented or predicted the occurrence of species of conservation concern may be useful in informing this assessment. If appropriate information is not available, a precautionary approach should be applied by scoring the wetland as having high biodiversity value.

Table B12: Criteria for evaluating uniqueness and importance of biota present in the wetland

Biodiversity value class	Description	Ratio
Low biodiversity value	The wetland is characterised by low diversity and does not support any particularly important species or populations.	0.5
Moderate biodiversity value	The wetland is characterised by vegetation and biota typical of the region but which is not particularly unique or diverse. Large populations of wetland-dependant species and / or important migration, breeding or feeding sites are absent from the wetland.	0.75
High biodiversity value	The wetland is characterised by one or more special habitat or biodiversity attributes that makes the site important for local conservation efforts. This includes wetlands (i) supporting important populations of species of conservation concern; (ii) supporting large populations of wetland-dependant species; (iii) providing important migration, breeding or feeding sites; or (iv) characterised by unusually high natural habitat diversity.	1.0

(ii) Integrity of Adjacent Terrestrial Areas and Local Catchment

Recent research has emphasized that relatively undisturbed hinterlands are important for maintaining the populations of many wetland-dependant species. For example, many semi-aquatic species rely on terrestrial habitats for the successful recruitment of juveniles and to maintain optimal adult survival rates. Adjacent terrestrial areas also screen wetlands from anthropogenic disturbances such as human presence and traffic or indirect impacts, such as noise and light pollution. Adjacent areas also provide potentially useful corridors, allowing the connection of breeding, feeding and refuge sites crucial to maintain the viability of populations of semi-aquatic species.

While adjacent terrestrial areas and local catchments provide important supporting habitat to allow species to carry out various activities, the functional value of such areas is still mostly dependent on the actual habitat

value of the wetland. As such, the importance of these areas is secondary to wetland biodiversity attributes. A weighting of 20% is applied to this criterion when calculating the local site context multiplier.

As it is often difficult to precisely delineate the extent of the adjacent terrestrial area that is of importance to a particular wetland, a default 500m buffer (which aligns with DWS regulations) is used as the starting point. However, where local justification and data exists, a more accurately mapped local catchment or area of influence can be used instead. Landcover in the adjacent terrestrial areas should be mapped and assessed according to its ability to support wetland-dependent species.
Table B13 provides broad-level guidance but should be tailored according to available datasets and expert input.

Table B13: Land use compatibility values for use when evaluating integrity of adjacent terrestrial areas and local catchments.

Broad Landcover Category	Compatibility Score
Cultivated lands	0.5
Degraded natural habitat	0.75
Eroded areas	0.25
Intact natural habitat	1
Forest plantations	0.25
Mines & quarries	0
Urban / built-up land	0

A weighted average is then calculated as a measure of the compatibility of landuse within the buffer zone to support wetland-dependant biota. Scores calculated must be expressed as a range from 0 (totally incompatible landuse) to 1 (highly compatible landuse). A site level assessment for which the above guidance is followed is required for actual offset calculations. Where a desktop level assessment is being undertaken, the percentage natural habitat within 500m of the wetland can be used as a surrogate. This information is captured as “PERNAT500” in the NFEPA wetlands dataset or determined based on revised landcover mapping and analysis.

(iii) Local Connectivity

Landscape connectivity is important for local ecological processes including species movement. Whilst connectivity is regarded as being an important consideration, this is only relevant where a wetland is already able to support wetland dependant biota. It is also recognized that wetlands are able to support biota in the absence of good connectivity in instances where the wetland and buffer zone already provides sufficient suitable habitat. As such, this criteria is down-weighted significantly relevant to the other two site-based criteria. This criterion therefore only contributes 10% towards the local context multiplier.

This is simply evaluated by assessing the connectivity of the wetland to wetlands and other aquatic resources. Here, consideration should be given to (a) the proximity of wetland and / or riparian habitat (particularly within 500m of the wetland); (b) the level of fragmentation of habitat and therefore connectivity that remains and (c) the condition and associated biodiversity value (as supporting habitat) of adjacent water resources. These aspects can easily be assessed at a desktop level using a GIS or available aerial photography (including Google Earth imagery). Criteria for this evaluation are given in Table B14.

For a desktop-level assessment, NFEPA wetland clusters can be used to identify wetlands with good connectivity. For detailed planning, a site-based assessment of connectivity must be undertaken using available information.

Table B14: Criteria for evaluating local connectivity.

Biodiversity value class	Description	Multiplier
Low connectivity	The wetland has very little connection with other water resources in the landscape (e.g. Very high levels of fragmentation with few wetlands nearby).	0.5
Moderate connectivity	The wetland is moderately connected with other water resources in the landscape. (e.g. Moderate levels of fragmentation but with reasonable connectivity to intact wetlands and /or riparian zones).	0.75
Good connectivity	The wetland is well connected with other water resources in the landscape. (e.g. Wetland clusters within 1 km of each other and embedded in a relatively natural landscape).	1.0

6.1.2.3 Calculating Final Ecosystem Conservation Offset Targets

The Ecosystem Conservation Ratio is first calculated by multiplying the (i) Ecosystem Status Multiplier; (ii) Regional and National Context Multiplier and (iii) Local Context Multiplier. The final Ecosystem Conservation offset target is then calculated by multiplying the loss in wetland habitat in hectare equivalents by the Ecosystem Conservation Ratio. All calculations are automatically done in the calculator.

6.1.3 Calculating Species of Conservation Concern Offset Targets

The first step involves the identification and screening of species of potential concern that could be impacted by proposed development activities. The potential significance of impacts on species must then be assessed with input from an appropriate biodiversity specialist. Where significant negative residual impacts are anticipated, specific offset targets should then be set for each species using the minimum information requirements outlined below as a guide.

6.1.3.1 Assessing Residual Impacts to Species of Conservation Concern

An assessment of the predicted impact to species of conservation concern as a result of planned developments is required in order to set appropriate species targets. This assessment requires an appropriate species impact measure to be selected and applied to score the potential impact of planned development activities.

Methodologies for specifically quantifying impacts to threatened species for application in offset negotiations have not yet been developed for the South African context. Specialists undertaking this assessment will therefore need to consider the range of options available and use an appropriate species impact measure for local application. In cases where species requirements are strongly linked to habitat, the area and suitability of relevant habitat of the wetland may be used as a surrogate measure to determine preliminary offset targets (typically expressed as a species habitat measure). It is important to note here that measures may need to be tailored according to the specific habitat attributes of concern (e.g. hectares of core breeding or foraging habitat). In other situations, a composite measure of suitability that considers aspects in addition to habitat condition (e.g. local connectivity) may be relevant. For species whose presence is not strongly linked with measurable ecosystem attributes, a count of the number of individuals or other suitable species population measures such as numbers of breeding pairs may be a more appropriate means of quantifying potential impacts. Whichever measurement system is applied, it is important that the rationale for selection is clearly justified and that the unit of measurement is clearly communicated. The same units must then be applied to both the impacted site and proposed offset locations. In the same way, it may be necessary to repeat this assessment for a range of different target species.

Once selected, the selected measurement system must be used to score the anticipated impact of planned development activities on species of conservation concern. This should be based on the change in the species impact measure, which is simply calculated by subtracting the post-development score from the pre-development score.

6.1.3.2 Determining Offset Ratios

Ratios may be used to increase offset requirements for species of conservation concern in line with the significance of anticipated impacts. There is still very little guidance available for determining offset ratios for species of conservation concern. This should however be guided by factors such as threat status and the importance of the wetland in meeting species protection targets. Species conservation ratios will therefore need to be proposed by the biodiversity specialist and negotiated in consultation with the appropriate conservation agency. Species offset ratios should range from 1:1 (minimum requirement) upwards.

6.1.3.3 Calculating Final Offset Targets for Species of Conservation Concern

Offset targets for each species of conservation concern are calculated by multiplying the development impact (expressed as an appropriate species measure) by the relevant species conservation ratio. This process is repeated for each species of conservation concern selected.

6.2 OFFSET RECEIVING AREAS: ASSESSING POTENTIAL GAINS

6.2.1 Contribution Towards Water Resources and Ecosystem Services Targets

6.2.1.1 Evaluating the Alignment with Site Selection Guidelines

Site selection is the primary mechanism for ensuring that gains from offset activities are aligned with wetland offset goals and stakeholder expectations. Indeed, the choice of particular sites will determine not only which ecosystem services are improved or secured through offset activities but also who benefits. As such, it is important that selected offset sites are aligned with best-practice site selection guidelines. These are summarized in Table B15.

Table B15: Summary of site selection issues for offsets to meet Water Resources and Ecosystem Services targets.

Criterion	Site attributes	Acceptability Guidelines
Wetland type	Wetland is of the same type as the impacted wetland	Ideal
	Wetland is of a different type to the impacted wetland	Acceptable if the wetland delivers similar benefits in terms of Water Resources and Ecosystem Services
Key services targeted	Selected wetland is well placed to contribute meaningfully towards improving key ecosystem services identified	Ideal
	Selected wetland is reasonably placed to improve key ecosystem services identified	Acceptable
	Selected wetland is poorly placed to improve key ecosystem services identified	Generally unacceptable
Offset site location relative to impacted wetland	Selected wetland is located within the same local (quinary) catchment as the impacted wetland	Ideal
	Selected wetland is located within the same quaternary catchment	Acceptable
	Selected wetland is located within the same tertiary catchment	Generally unacceptable, but may be suitable if there are clear benefits in terms of Water Resources and Ecosystem Services
	Selected wetland is located in a different tertiary catchment	Only acceptable under extreme circumstances, and only if there are clear benefits in terms of Water Resources and Ecosystem Services

6.2.1.2 Assessing Preliminary Water Resources & Ecosystem Services Offsets Contributions

An assessment of the improvement in the Water Resources and Ecosystem Services value provided by the targeted wetland is used to calculate the preliminary contribution of offset activities towards targets. The preliminary contribution of offset activities to the Water Resources and Ecosystem Services offset target is assessed using the same assessment protocol as applied to the development site. This is based on the predicted improvement in wetland functioning as a result of offset activities. To undertake this assessment, use an appropriate assessment tool to obtain an indication of the functional value of the wetland (i) prior to and (ii) following planned offset activities. The change in functional value measured in hectare equivalents is then simply calculated by multiplying the change in functional value (%) by the wetland area.

Given the lack of locally available tools to quantify changes to particular functional values, the condition of the wetland is typically used as a surrogate for functionality. Here, tools such as WET-Health (Macfarlane *et. al.,* 2008) can be used to obtain a measure of the condition of the wetland prior to and following implementation of planned offset activities. In the case of **rehabilitation / restoration**, the following guidelines should be adhered to:

- The assessment of within-wetland impacts should specifically focus on the area of the wetland targeted for rehabilitation / restoration;
- Detailed mapping of impacted areas should be undertaken with a clear justification for the current and anticipated future scores allocated;
- Where necessary, assumptions should be supported by additional baseline data collection (e.g. vegetation sampling, water table measurements).

In some instances, offsets may focus on **averted loss** activities. In this case, the change in wetland condition is determined by the difference between the current condition and the projected condition in the affected area in the absence of offset activities. Care should be taken to ensure that the extent of averted loss is realistically calculated.

In the case of wetland **establishment**, potential gains need to be assessed based on the anticipated future condition of the wetland relative to an appropriate reference wetland.

To calculate the change in functional value, the post-development score is simply subtracted from the pre-development score and expressed as a percentage (%). The resultant score is then multiplied by wetland area to obtain a measure of the change in the Water Resources and Ecosystem Services value.

6.2.1.3 Calculating Final Functional Offset Contribution

The final offset contribution is adjusted to take the risk of proposed offset activities into account. This is based on the type of offset activity planned with wetland establishment having a higher risk than rehabilitation or averted loss activities.

The adjustment factor applied to the preliminary offset calculations is automatically populated in the calculator based on Table B16. The final functional offset contribution is then simply calculated by multiplying the preliminary functional offset contribution (expressed as hectare equivalents) by the adjustment factor.

Table B16: Adjustment factors which should be used to take risk of failure of the proposed offset activity.

Planned offset activity	Adjustment factor
Rehabilitation & Protection	0.66
Averted loss & Protection	0.66
Establishment & Protection	0.33

6.2.2 Evaluating the Contribution Towards Ecosystem Conservation Targets

6.2.2.1 Evaluating the Alignment with Site Selection Guidelines

Site selection is the primary mechanism for ensuring that gains from offset activities are aligned with wetland offset goals and stakeholder expectations. The location of sites also has a direct bearing on which biodiversity values are maintained or enhanced. As such, it is important that selected offset sites are aligned with best-practice guidelines. These are summarized in Table B17.

Table B17: Summary of site selection issues for offsets to meet Ecosystem Conservation Targets.

Criterion	Site attributes	Acceptability Guidelines
Offset receiving areas	Available and suitable designated offset receiving site pre-agreed or identified by the conservation authority	**Ideal – this consideration should over-ride all others**
Like for Like & Trading up/down	Wetland is within the same Wetland Vegetation Group (ideally also of the same specific wetland type)	Ideal
	Wetland is in another Wetland Vegetation Group of a higher threat status or lower protection level (trading up).	Potentially acceptable
	Wetland is in another Wetland Vegetation Group of a lower threat status or higher protection level (trading down).	Generally unacceptable
Spatial planning	Wetland has been identified as being of high importance in spatial plans	Ideal
	Wetland has been identified as moderately important in spatial plans	Acceptable
	Wetland has not been specifically identified as important in spatial plans	May be acceptable
Wetland condition	Final habitat condition is likely to be better than that of the impacted wetland.	Ideal
	Final habitat condition is likely to be as good as that of the impacted wetland.	Acceptable
	Final habitat condition is likely to be lower than that of the impacted wetland.	Generally unacceptable
Local biodiversity value	The wetland is characterised by habitat and/or species of high biodiversity value.	Ideal
	The wetland is characterised by habitat and/or species of moderate biodiversity value.	Acceptable
	The wetland is characterised by habitat and/or species of low biodiversity value.	Generally unacceptable
Probability of maintaining conservation values	The offset provides an opportunity to consolidate / expand existing protected areas.	Ideal
	The wetland is well connected to other intact natural areas and there are no obvious land use threats to its long term persistence.	Acceptable
	There are actual or potential threats to its long term persistence.	Not generally unacceptable

6.2.2.2 Assessing Preliminary Ecosystem Conservation Offset Contributions

Contributions towards ecosystem conservation targets can be made by formally protecting targeted wetlands and associated adjacent terrestrial habitat and local catchment habitat. Guidelines on how these assessments should be undertaken are detailed below,

Assessing Preliminary Gains from Wetland Habitat Protection

The same assessment protocol applied to the development site should be applied to the offset site. The area and anticipated intactness of wetland habitat following planned offset activities is used to calculate the preliminary contribution that wetland protection activities make towards wetland Ecosystem Conservation offset targets. This is based on the predicted realistic future intactness (condition) of the wetland following successful implementation of planned offset activities. Note that this calculation does not require any evaluation in change in condition, but rather is just based on predicted realistic future intactness (condition) of the wetland to be protected.

The anticipated habitat intactness following successful offset implementation must be expressed as a percentage (%). A wetland supporting completely natural habitat would score 100% while a wetland that has been completely destroyed and lacks any natural habitat would score 0%.

Assessing Preliminary Gains from Adjacent Terrestrial Habitat and Local Catchment Protection

Protection and management of the associated adjacent terrestrial habitat and local catchment around a wetland can contribute meaningfully towards wetland biodiversity maintenance. As such, efforts to manage and protect suitable associated adjacent terrestrial habitat and local catchment are promoted and can contribute towards meeting ecosystem protection targets.

The assessment of associated adjacent terrestrial habitat and local catchment integrity is based on the same approach at the development site. The first step involves identifying areas to be included. For the purposes of offset activities, under normal circumstances, adjacent areas extending up to 500m from a wetland boundary (i.e. from the outer edge of the temporarily saturated zone of the wetland) could contribute towards offset targets. Where it can be justified based on increased ecological benefits for the wetland system, it may be possible to motivate for inclusion of larger areas. Importantly, these areas should only be included if they are **effectively managed to ensure their long term value** and they are **fully protected**. The second step involves the evaluation of land use compatibility, which is undertaken in the same manner as was done at the impacted site. Once the extent and land use compatibility scores for the adjacent terrestrial habitat and local catchment have been determined, they are used to calculate hectare equivalents that would be secured through management and protection of these adjacent areas. Scores for adjacent terrestrial habitat and local catchment compatibility must be expressed as a range from 0 (totally incompatible) to 1 (highly compatible) landuse.

Determining the Preliminary Adjacent Terrestrial Habitat and Local Catchment

Contributions of adjacent terrestrial habitat and local catchment to meeting Ecosystem Conservation targets have been capped to ensure that the offset remains primarily a wetland offset. Given that this is a wetland offset and the greater emphasis is on wetland protection, only **25% of the hectare equivalents from the adjacent terrestrial habitat and local catchment can contribute to the overall wetland offset**. Further, **this contribution is capped at a maximum of 33.3% of the overall offset requirement** to avoid large terrestrial offsets being proposed in lieu of actual wetland offsets (this means that the terrestrial contribution can never be more than half of the contribution from the wetland itself).

6.2.2.3 Calculating the Final Ecosystem Conservation Contribution

The final offset contribution is calculated by adding the contributions for wetland management and protection to the contribution from adjacent terrestrial habitat and local catchment protection. When calculating final Ecosystem Conservation contributions, scores are adjusted to account for the security of the wetland offset and to incentivise formal long-term protection mechanisms. As such, any contributions are increased where protection activities go beyond accepted minimum requirements. The final offset contribution is then simply calculated by multiplying the preliminary offset contribution (expressed as habitat hectare equivalents) by the adjustment factor (Table B18).

Table B18: Adjustments to account for the security of the wetland offset and to incentivise formal long-term protection mechanisms.

Planned protection measures	Description	Adjustment factor
Minimum acceptable security of tenure for shortest acceptable period	Wetland is secured through a legal mechanism such as a conservation servitude on the title deed which prevents change of land use to a type incompatible with maintaining desired wetland offset state for at least 30 years or the specific project life.	1.0
Minimum acceptable security of tenure for a longer period	Wetland receives full legal protection through a legal mechanism such as a conservation servitude on the title deed which prevents change of land use to a type incompatible with maintaining desired wetland offset state for at least 99 years.	1.5
Highest possible level of protection permanently secured	Wetland receives full legal protection through permanent inclusion in and declaration as (part of) a Nature Reserve or area of equivalent status under NEMPAA, or alternatively securing the site through other legal mechanisms such as a conservation servitude on the title deed in combination with long term contractual obligations to manage and maintain the site as if it was a declared Protected Area under NEMPAA.	2

6.2.3 Contribution Towards Meeting Species of Conservation Concern Targets

Contributions towards Species of Conservation Concern targets should be assessed individually for each targeted species.

6.2.3.1 Calculating Preliminary Offset Contributions

This assessment requires appropriate species impact measure(s) to be selected or developed for Species of Conservation Concern. This is then applied to score the anticipated importance/suitability of the targeted wetland in supporting the targeted species following successful implementation of offset activities. The same methodology used at the impact site to quantify impact should be used at the receiving site to quantify gains. Whichever measurement system is applied, it is important that the unit of measurement is clearly communicated and that this currency is applied to both the impacted site and proposed offset locations. If more than one measure is selected, the tool must be used to determine offset contributions for each measure. In the same way, it may be necessary to repeat this assessment for a range of different target species.

Once selected, the selected measurement system must be used to score the anticipated value of the wetland in supporting the targeted species following successful implementation of offset activities. No specific scoring guideline applies.

6.2.3.2 Calculating the Final Contribution Towards Species Conservation Targets

The final offset contributions to species conservation targets are calculated by taking the security of tenure of planned offset activities and the risk of proposed offset activities into account. Here, adjustment factors are used to modify the final offset contributions.

Catering For Security of Tenure of Planned Offset Activities

Preliminary species contributions are adjusted to account for the security of the wetland offset and to incentivise formal long-term protection mechanisms. As such, any contributions are increased where protection activities go beyond accepted minimum requirements. The same values used for the Ecosystem Conservation section are used here (Table B18).

Catering for Risks Associated with Planned Offset Activities

Offset contributions for species of conservation concern should be adjusted to take the risk / uncertainty of proposed offset activities into account (Table B19). This assessment is based on the expert input of an appropriate biodiversity specialist with appropriate knowledge of the risk and uncertainties of different offset options. An appropriate risk class is then selected from the drop-down list provided.

Table B19: Adjustment factors which should be used to take risk of failure of the proposed offset activity

Level of Risk	Example of offset activities	Risk ratio
Low risk	Protection of a site already supporting a viable population of the targeted species.	1
Medium risk	Site already supports suitable habitat with re-introductions planned together with supporting management to establish a viable population of the species.	0.66
High risk	Site requiring a high level of rehabilitation in order to provide suitable habitat or if risks associated with re-establishment of populations is high based on the characteristics of the species and its population characteristics.	0.33

6.2.3.3 Final Offset Contribution Towards Species Conservation Targets

The contribution of offset activities towards targets for each Species of Conservation Concern is calculated by multiplying the preliminary species contributions (expressed as an appropriate species measure) by the adjustment factors for security of tenure and level of risk.


9781431207756