Wetland Offset Strategy for the Proposed Kendal 30-year ADF:

Phase 2 – Assessment of Possible Target Sites

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DOCUMENT SUMMARY DATA

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1. BACKGROUND AND SCOPE OF WORK

Wetland Consulting Services (Pty.) Ltd. (WCS) was requested by Tania Oosthuizen of Zitholele Consulting to assist in the compilation of a wetland offset strategy for the Kendal 30-year ADF Project in the Mpumalanga Province.

WCS is also involved with environmental authorisation processes for the Kendal 30-year ADF Project and undertook the specialist wetland delineation and assessment study as part of the EIA/IWULA process being run by Zitholele Consulting. As such WCS is familiar with the wetlands on site and in the immediate surroundings.

The wetland types that are to be affected include hillslope seepage wetlands and pan/depression wetlands. Each hydro-geomorphic (HGM) type is characterised by particular dominant hydrological drivers, and these translate into the provision of varying sets of ecological goods and services, at a range of different levels. The required offset strategy should aim to target the same type, or similar, wetland systems to ensure equitable compensation for the loss of wetland habitat and functionality on site.

The broad objectives of this report are:

1. To develop an approach to the wetland offset strategy;
2. To determine and quantify the required offset targets using the recently developed and revised offset calculator (SANBI & DWS, 2014); and
3. To identify, at a desktop level, a number of possible target sites for implementation of the offset.

2. WETLAND OFFSETS IN SOUTH AFRICA

2.1 What are Wetland Offsets?

A useful and widely accepted definition of biodiversity offsets is provided by the Business and Biodiversity Offsets Programme (BBOP):

> "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, 2009).

Wetland offsets fall under the broader umbrella of biodiversity offsets, and from the definition above, the goal of wetland offsets can be said to achieve a ***measurable*** "No Net Loss" or "Net Gain" in conservation outcomes as a means of compensating for residual adverse impacts to wetlands.

The "No Net Loss" principle requires that the gains provided by an offset program equal or exceed the losses that have occurred as a result of the project impacts. There is thus a need for an accounting system to accurately quantify and calculate the losses and gains – in the wetland offset guidelines (SANBI & DWS, 2014) this is achieved through the use of hectare equivalents. The gains provided by the offset should be equivalent to the losses in terms of type (e.g. wetland type or condition), time and space. What this means for wetland offsets is that generally the following concepts apply:

- Offsets should be like for like (e.g. the loss of a pan would require a pan as offset, while offsetting a highly degraded wetland system to compensate for the loss of a pristine system would not generally be acceptable)
- Ideally offset gains should materialise before, or at the same time, as wetland losses
- All values of the lost wetland system should be targeted (e.g. if a wetland supports African Grass Owls and plays an important role in flow regulation, both these functions should be provided for in the offset target. This might require increasing the offset target area to cater for both functions).
- To ensure that "No Net Loss" is realised, an offset strategy needs to be accompanied by rehabilitation and enhancement of the target functions and values, as protection alone does not provide the gains that count towards "No Net Loss". Where offsets are done on a 1:1 basis (i.e. 1ha of wetland is offset to compensate for the loss of 1ha of wetland), a net loss of 50 % would result, unless interventions are put in place to enhance the functions and values of the offset target.
- Offset multipliers are generally applied to take into account risks and uncertainties about the success or performance of planned offset measures.

The SANBI & DWS offset guidelines recognise five types of offsets:

Protection-based offset: 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, , a legally binding conservation servitude, or a long term Biodiversity Agreement under NEMA) and putting in place appropriate management structures and actions to ensure that conservation outcomes are secured and maintained in the long-term.

Averted loss offset: Refers to physical activities which prevent the loss or degradation of an existing wetland system and its biodiversity, where there is a clearly demonstrated threat of decline in the system's condition.

Rehabilitation/restoration offset: Refers to activities which result in an improvement in wetland condition, functions, and associated biodiversity. Rehabilitation / restoration involves the manipulation of the physical, chemical, and/or biological characteristics of a degraded wetland system in order to repair or improve wetland integrity and associated ecosystem services. By increasing the condition of a wetland system and its biodiversity, a positive contribution is made towards the goal of no net loss.

Wetland Establishment: This involves the development (i.e. creation) of a new wetland system where none existed before by manipulating the physical, chemical, and/or biological characteristics of a specific site.

Direct Compensation: Direct compensation involves directly 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.

2.2 Wetland Offset in South Africa

No National policies or guidelines currently exist for wetland offset in South Africa, although a number of wetland offset projects have been undertaken and wetland offsets form conditions of a number of environmental authorisation granted in South Africa.

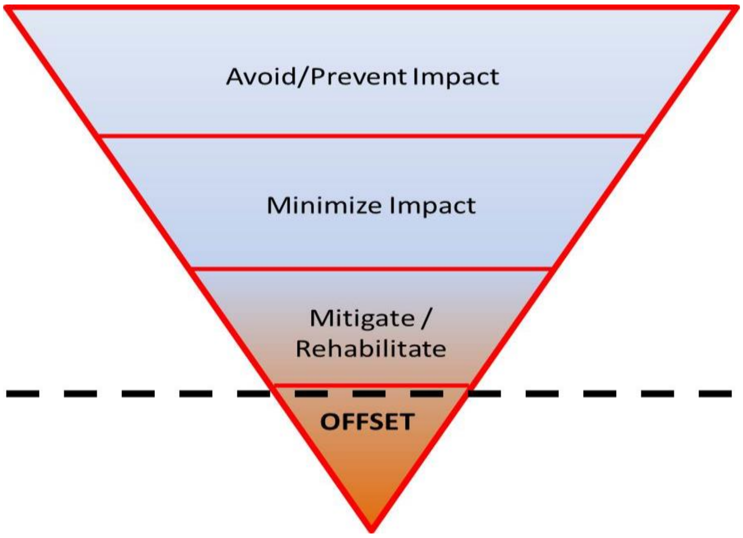
Recognising the need for guidance and standardisation in the development of wetland and biodiversity offsets, a number of organisations and institutions have initiated processes to lead towards the formal adaptation of policies and guidelines in this regard. The Department of Environmental Affairs (DEA), together with SANBI, released a draft National Framework for Biodiversity Offsets for stakeholder comment in 2013 which provides national definitions and understanding of key concepts relating to biodiversity offsets and is intended to provide authorities with a template to prepare specific guidelines on biodiversity offsets. The SANBI & DWS offset guidelines (SANBI & DWS, 2014), a draft document currently in its eighth revision (dated December 2014), forms such a specific guideline proposing an approach and methodology to wetland offsets in South Africa. This document has been released for public comment by SANBI and the DWS, and has subsequently been released for distribution, but has not yet been formally adopted.

The SANBI & DWS wetland offset guidelines have been adopted as the guiding document for the development of the Kendal wetland offset strategy.

2.3 When to Offset

The BBOP definition of biodiversity offsets is clear that offsets should only be undertaken for ‘significant residual adverse biodiversity impacts arising from project development ***after appropriate prevention and mitigation measures have been taken***’. This approach is also strongly supported by both SANBI and the DWS, the parties responsible for the development of the South African wetland offset guidelines (SANBI & DWS, 2014).

The application of the mitigation hierarchy to all aspects of the project impacting on wetlands is key.



It is important that wetland offsets are not seen as a means of obtaining authorisation for development activities within wetlands, but rather as a final step within the mitigation hierarchy to deal with residual impacts to wetlands that cannot be avoided, reduced or mitigated in any other way. Implementing an offset strategy should in no way reduce the 'standard' mitigation measures required as part of a mining application, i.e. the need for water treatment or the need to optimize mine and infrastructure layout plans so as to avoid sensitive areas.

3. APPROACH

3.1 Wetland Delineation and Ecological Integrity Assessment

The wetlands within the Kendal 30-year ADF Project study area and adjacent farms have been delineated and assessed (functional assessment, PES and EIS) as part of previous studies undertaken by Wetland Consulting Services as part of the Kendal 30-year ADF EIA application. The delineated wetland boundaries and PES and EIS scores available were used in the offset calculations as part of this study.

The method used in delineation of the wetland boundaries involved a desktop delineation of suspected wetlands and riparian zones by identifying drainage lines and wetness signatures from digital base maps. All identified areas suspected of being wetlands or riparian zones were then further investigated in the field. The wetlands and riparian zones were delineated according to the delineation procedure as set out by the "*A Practical Field Procedure for the Identification and Delineation of Wetlands and Riparian Areas*" document, as published by DWAF (2005). These guidelines consider the following wetland indicators:

- Terrain unit indicator. Wetlands occupy characteristic positions in the landscape and can occur on the following terrain units: crest, midslope, footslope, and valley bottom;
- Soil form indicator;
- Soil Wetness indicator
- The vegetation indicator.

The wetlands were subsequently classified according to their hydro-geomorphic determinants based on a modification of the system proposed by Brinson (1993), and modified for use in South Africa by Marneweck and Batchelor (2002) and subsequently revised by Kotze, Marneweck, Batchelor, Lindley and Collins (2004) and SANBI (2009).

The PES assessment assisted in identifying the current impacts that are undermining the integrity of each wetland HGM unit, and in so doing directing the objectives of the subsequent rehabilitation plan.

The PES categories for each of the wetlands were used to assign the wetlands an integrity score out of 10 as per the scoring used in the WET-Health tool (Macfarlane *et. al.* 2008). These scores were then used to calculate the current functional area, or number of hectare equivalents, of the wetlands in the target area. Rapid assessments were also undertaken of the wetlands under the hypothetical post-rehabilitation scenario, and the gain in hectare equivalents calculated to estimate whether the rehabilitation measures will satisfy the no-net-loss of wetland habitat principle stipulated as the primary goal of offsetting.

3.2 Development of an Offset Strategy

Environmental authorisation is likely to require some sort of initiative aimed at offsetting the wetlands removed from the landscape by the development/proposed mining operation. This may take the form of:

- Onsite mitigation: the rehabilitation of wetlands that lie within the boundary of the development, but have been excluded from the development footprint;
- Offsite mitigation: the identification of suitable wetland habitat outside the boundaries of the development, and the implementation of rehabilitation measures that result in an appropriate gain in hectare equivalents. This will compensate for the functional wetland area lost to the development;
- The creation of new wetlands on previously terrestrial habitat; and
- The reintroduction of wetland habitat to the post-development landscape. These wetlands may be within previously existing wetland habitat, but the catchment drivers and topography have been completely transformed. The wetlands are therefore constructed to be compatible with the new landscape.

As a first step, the residual impact of the development on wetlands after full application of the mitigation hierarchy needs to be determined. This is done by overlaying the development layout plan onto the delineated wetland areas. All wetland habitats falling within the direct development footprint were considered to be permanently lost and will need to be offset. In addition, wetland habitat immediately adjacent to the proposed development footprint that might be affected due to loss of catchment inputs were also considered, generally up to an approximate distance of 500m from the development footprint, but varying between different wetland types.

The broad wetland offset policy goals proposed by the SANBI offset guidelines (SANBI & DWS, 2014) are as follows:

1. **Formally protecting** wetland systems in a good condition so as to contribute to **meeting national conservation targets** for the representation and persistence of different wetland and wetland vegetation types;
2. **No net loss in the overall wetland functional area** by providing gains in wetland area and / or condition equal to or greater than the losses due residual impacts;
3. **Providing appropriate and adequate compensation for residual impacts on key ecosystem services;** and
4. **Adequately compensating** 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.

In order to achieve these goals, three types of offset targets are to be determined and this is done by application of the wetland offsets calculator. Using the SANBI & DWS offset calculator, both functional and ecosystem conservation offset targets were calculated for the proposed Kendal 30-year ADF Project based on the extent of wetlands that will be lost or disturbed.

3.2.1 Wetland Offset Calculations

To calculate hectare equivalents and the required wetland offset targets, the wetland offset guidelines and calculator was used, as detailed in the document:

> SANBI & DWS. 2014. *Wetland Offsets: a best-practice guideline for South Africa*. South African National Biodiversity Institute and the Department of Water Affairs. Pretoria. 69 pages.

The 'hectare equivalent' is used as the common currency to evaluate gains and losses in regulating and supporting ecosystem services provided by wetlands. 'Hectare equivalents' can be seen as a measure of the functional area of a wetland (e.g. in effect, a 10ha wetland that has been moderately modified – PES score of 3 – can be seen to only perform the functions of a 7 ha wetland). Hectare equivalents are determined by converting the PES score to a level of intactness score (10 – PES score) and multiplying this by the wetland area.

Hectare equivalents were calculated according to the formula detailed in the SANBI Guidelines:

(10 – PES)/10 x Area = Hectare equivalent

As an example, for a 107ha wetland with a PES score of 3.2 (PES category CD), the equation would be as follows:

(10 – 3.2)/10 x 107 = 72.76 hectare equivalents

The above calculations are generally done for affected wetland systems before development and then again for the assumed condition after development, and the difference in hectare equivalents becomes the target value for the offset project.

The offset targets determined are separated into three subparts, namely:

- The *wetland functioning target*, which represents the gain in wetland functional area that is required to ensure a no net loss of wetland functioning from the landscape. This employs the risk of failure multiplier and the temporal risk multiplier;
- The *ecosystem conservation target*, which incorporates the conservation, threat status or protection multiplier, which ensures that there is a no net loss or ensures a gain in biodiversity value for the local landscape following the development;
- The *species of conservation concern target*, which considers the presence of threatened or other important species associated with the wetlands.

4. ASSUMPTIONS AND LIMITATIONS

For the purpose of this report, the baseline wetland information from the following reports was utilised:

> *WCS, 2014. Baseline Wetland Delineation and Assessment for the Kendal 30-Year ADF Project. Report reference 1032-2013.*

To calculate hectare equivalents and the required wetland offset targets, the SANBI & DWS (November 2014) wetland offset calculator was used, as detailed in the document:

> *SANBI & DWS. 2014.Wetland Offsets: A best-practice guideline for South Africa. South African National Biodiversity Institute and Department of Water and Sanitation. First Edition. Pretoria. 53 pages.*

This guideline is still undergoing a review process by various government departments and stakeholders. The process will hopefully result in the formal endorsement of these guidelines as a SANBI & DWS guideline document. SANBI & DWS are releasing the current version for use by the wetland community as we feel that it will both be useful to the wetland community, and also allow the identification of any problems in the document before formal endorsement. However, these guidelines currently have no formal status and cannot be considered to be formally endorsed by any government department.

5. FINDINGS

A detailed wetland specialist study was undertaken as part of the EIA process being run by Zitholele. This section provides only a brief summary of the findings of the wetland delineation and assessment study as applicable to the offset strategy. The reader is referred to the full wetland specialist report for further detail:

> *WCS, 2014. Baseline Wetland Delineation and Assessment for the Kendal 30-Year ADF Project. Report reference 1032-2013.*

The above report details the wetland delineation and assessments undertaken for 4 alternative sites. Only the summarised findings for the preferred site, Site H, are detailed here. It must be noted that since compilation of the above report, the development footprint for Site H has been slightly changed. The maps and area calculations provided below, though based on the delineation detailed in the above report, have been updated to reflect the current proposed development footprint.

5.1 Wetland Delineation and Classification

Approximately 86.5 ha of wetland habitat was delineated within the footprint of Site H, making up 11.4 % of the site. This includes a large pan (11.6 ha) located partially (9.4 ha) within the site which is used for water storage and abstraction for irrigation, as well as a further small depression and several hillslope seepage wetlands. The natural wetland types recorded on site are as follows:

- Pan/depression wetlands
- Hillslope seepage wetlands

No farm dams were observed within Site H.

Table 1. Table showing the extent (in hectares) of the wetlands recorded directly within the footprint of Site H. The pan falls only partially within the Site H footprint. The full extent of the pan is 11.6 ha.

Wetland Type	Area (ha)	% of wetland area	% of footprint area
Pan/depression	12.6	14.6%	2.4%
Hillslope seepage	73.9	85.4%	13.9%
TOTAL	**86.5**	**100.0%**	**16.3%**

Site H is located along a watershed, being located on the boundary between quaternary catchments B20E and B20F. As a result most of the wetlands recorded on site, with the obvious exception of the central pan, drain away from Site H either to the north or south.

All of the north draining hillslope seepage wetlands on site are located within an extensively cultivated area, with cultivation often extending into the wetland margins, resulting in habitat degradation and the presence of numerous ruderal species along the wetland verges. However, the seepage wetlands represent the only remaining natural habitat in these areas. The large hillslope seepage wetland in the north eastern corner of the site originates within the Kendal Power Station fenced off security area and drains into an unnamed tributary of the Wilge River.

The central pan was fully inundated at the time of the site visit and appears to be a permanent pan, though this is assumed to be as a result of the storage and abstraction of water from the pan. A pump house was observed on the north eastern shore of the pan, together with an excavation into the pan to allow access to deep water for abstraction pipes. It has subsequently been confirmed that the pan is being used to store and abstract water for irrigation purposes.

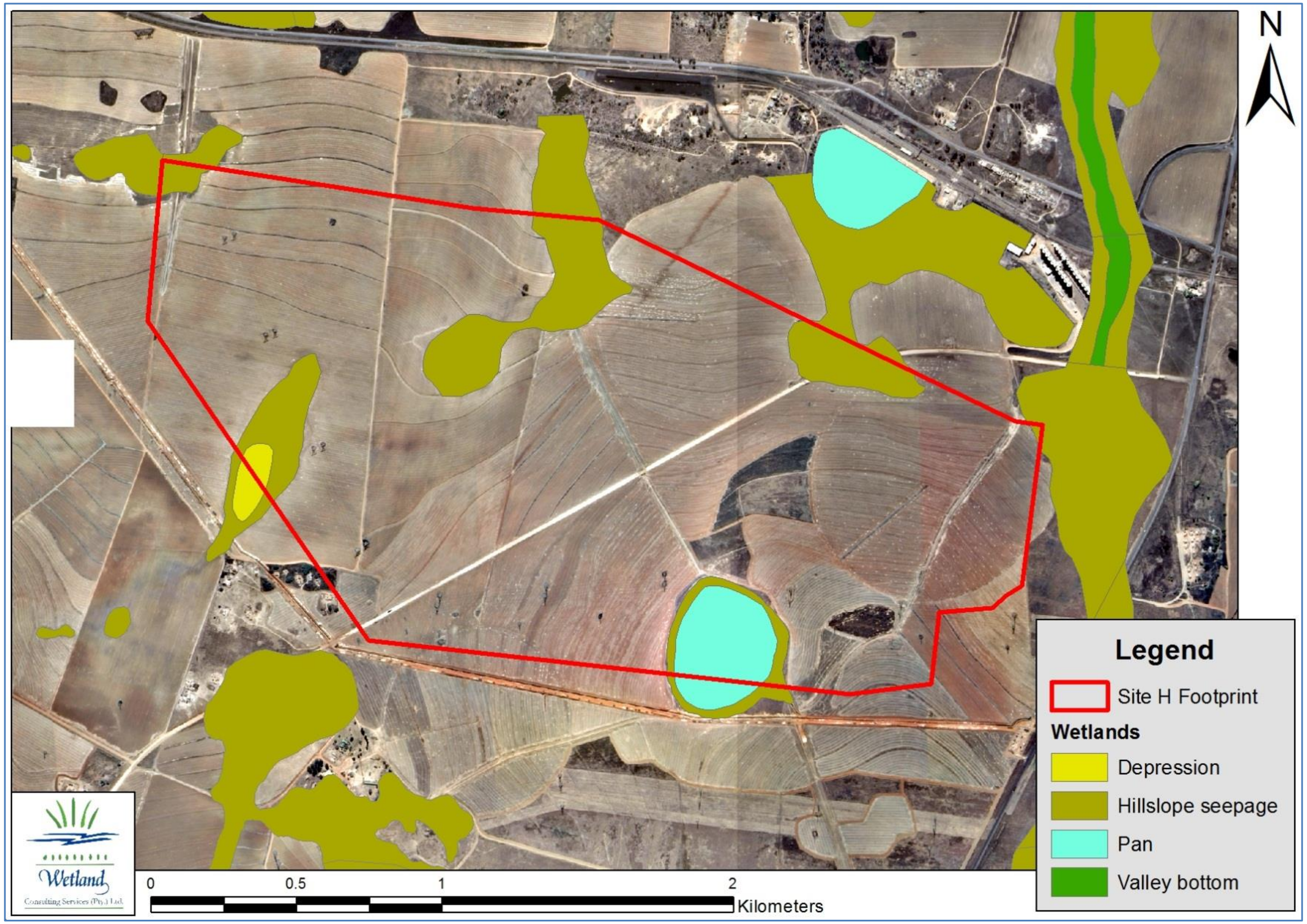


Figure 1. Map of the delineated wetlands within Site H.

Figure 2. Photographs of some of the wetlands recorded within Site H (clockwise from top left): view across the large pan; the large hillslope seepage wetland in the north eastern corner of Site H; depression wetland along the western boundary of Site H; and hillslope seepage wetland draining north from Site H.

5.2 Present Ecological Status Assessment (PES)

The wetlands within Site H were mostly considered largely modified (PES category D), with the hillslope seepage wetlands most significantly impacted by cultivation and associated disturbances, and the large central pan having been altered by the storage and abstraction of water from the pan. The large hillslope seepage wetland in the north east of the study area is however characterised by a large expanse of natural wetland vegetation and shows limited impacts within the central portions of the wetland. This system is thus considered to be in only a moderately modified condition (PES category C).

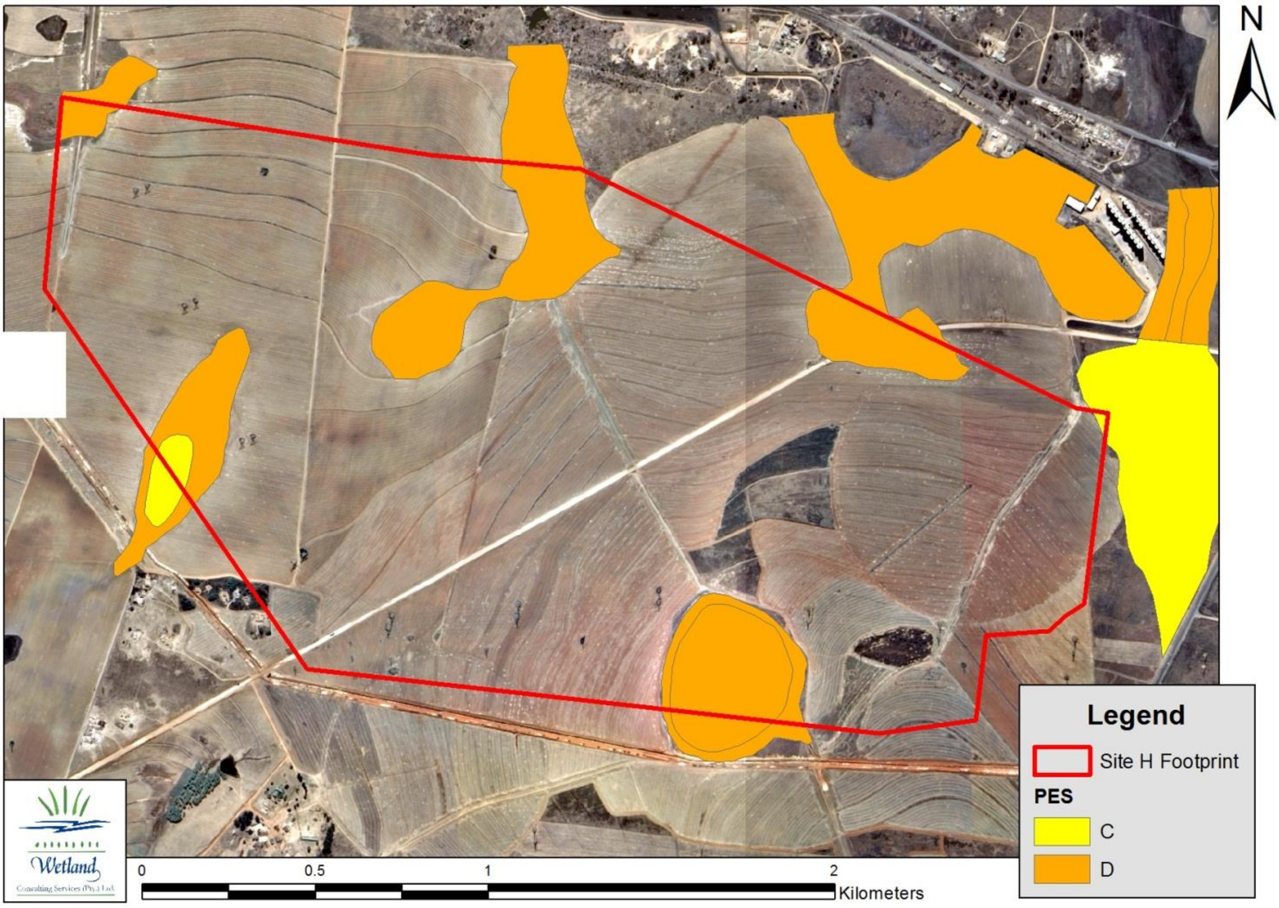


Figure 3. Map of PES results for Site H.

Table 2. Table showing the results of the PES assessment (all figures are in hectares).

Wetland Type	C	D	TOTAL
Pan/Depression	1.0	9.4	10.4
Hillslope seepage	0.2	32.2	32.3
TOTAL	**1.2**	**41.5**	**42.7**
% of wetland area	**2.84%**	**97.16%**	**100.00%**

6. WETLAND OFFSET REQUIREMENTS

6.1 Expected Wetland Losses and Impacts

The proposed Kendal 30-year ADF Project will result in the permanent loss of all wetland habitats located within the direct footprint of the proposed ADF and associated infrastructure. A total of 86.5 ha of wetland falls within the direct development footprint and will be permanently lost. Added to this direct loss is a further 1.5 ha of pan/depression wetland habitat in which all functionality is expected to be lost as more than 50 % of each of the two pan/depression wetlands will be permanently lost due to the proposed ADF, with the remaining sections unlikely to remain functional.

It is however expected that some of the remaining adjacent wetlands will also be impacted. Although an extensive list of mitigation measures has and will be proposed and detailed in the full EIA/IWULA reports, some residual impact is likely to remain, resulting in further wetland degradation. These are referred to as indirect impacts and refer to the loss of wetland functionality that can occur due to habitat degradation, although the wetlands themselves will remain post-mining.

Even though the ADF will be capped and vegetated following completion of mining, no wetland habitat is expected to reform on the ADF and the direct loss of wetland habitat within the ADF footprint can thus not be mitigated. The loss of this wetland habitat will thus require a wetland offset.

With regards to the indirect impacts, the mitigation hierarchy was followed in an attempt to first avoid impacts, then minimise impacts, and finally mitigate impacts. Refer to the full EIA/IWULA reports for more details in this regard.

Despite the mitigation measures however, some residual impact to the immediate adjacent wetlands is expected to remain as a result of loss in catchment yield and changes in flow characteristics. This residual impact will also require offset mitigation.

Figure 4 below shows the delineated wetlands on site as well as the extent of expected direct and indirect wetland losses that have been considered in this report.

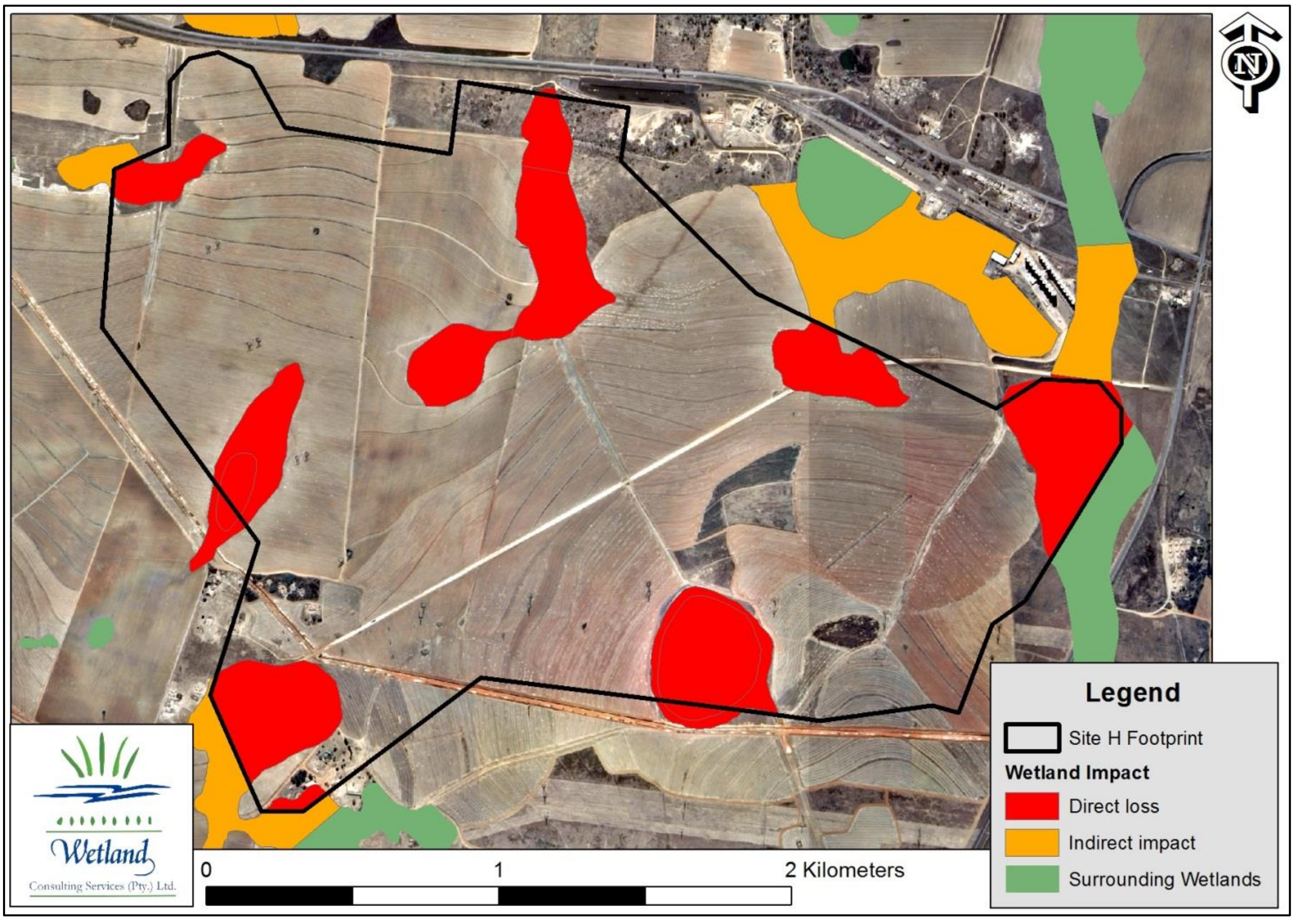


Figure 4. Map showing the extent and location of direct and indirect impacts considered in the wetland offset calculations.

6.2 Development Phases

The proposed Kendal 30-year ADF and associated infrastructures will be developed in phases, with 5 phases identified. The footprint of the various phases roughly coincides with the area required for 5 years of ash disposal (see Figure 5 below).

Wetland losses and the resultant wetland offset targets were determined for each phase (refer to Figure 5 below and Tables 3 – 5 in the following section).

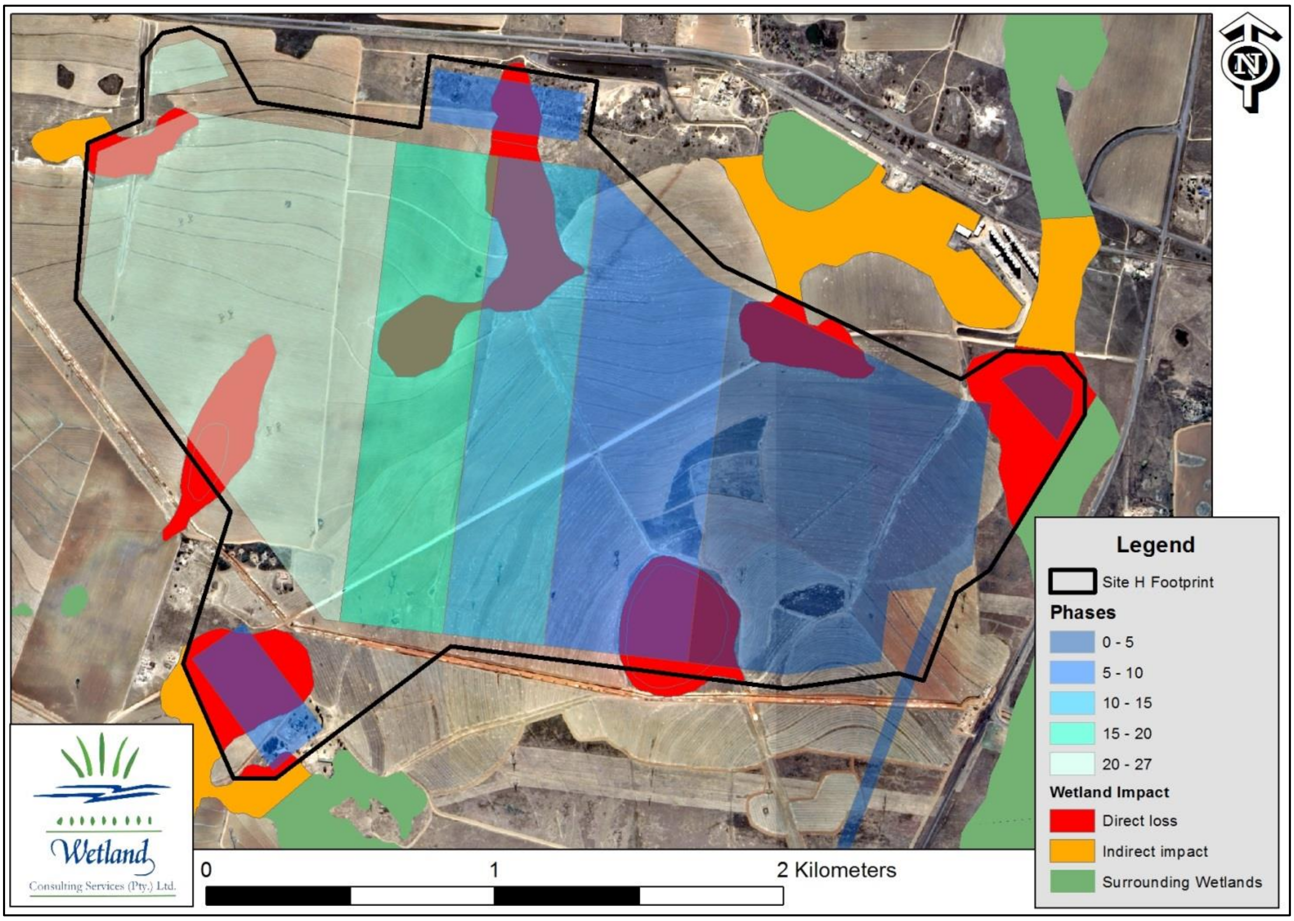


Figure 5. Map showing the 5 project phases and the wetland impact, direct and indirect, associated with each phase.

6.3 Required Offset Targets

6.3.1 Functional and Ecosystem Conservation Targets

The results of the wetland offset calculations using the SANBI & DWS offset calculator are represented in summarised form in Table 3 below.

***The required functional offset target for impacts associated with the proposed Kendal 30-year ADF Project would be 63.5 hectare equivalents*.**

***In total, 78.6 hectare equivalents would be required for the ecosystem conservation wetland offset target for impacts associated the proposed Kendal 30-year ADF*.**

Table 3. Required wetland offset targets as determined based on the expected direct and indirect wetland losses.

Year	Wetland Unit	Wetland Type	Loss (ha)	PES	EIS	Integrity	Functional Offset Target	Habitat hectare equivalent	Ecosystem Conservation Ratio	Ecosystem Conservation Target
0 - 5	1	Pan	11.62	D	D	50%	5.81	5.81	7.59	44.1
0 - 5	2	Hillslope seepage	4.44	D	D	60%	2.66	1.73	0.50	0.9
0 - 5	7	Hillslope seepage	8.03	D	D	59%	4.74	4.02	0.49	2.0
0 - 5	7	Hillslope seepage	25.42	D	D	59%	5.08	2.54	0.49	1.3
0 - 5	8	Hillslope seepage	15.68	D	D	73%	11.45	10.66	1.07	11.5
0 - 5	11	Hillslope seepage	8.32	D	D	56%	1.66	0.83	0.79	0.7
5 - 10	6	Hillslope seepage	3.83	D	D	60%	2.30	1.53	0.50	0.8
5 - 10	9	Hillslope seepage	13.83	D	C	45%	6.22	4.15	0.53	2.2
5 - 10	9	Hillslope seepage	10.81	D	C	45%	2.16	1.62	0.53	0.9
10 - 15	6	Hillslope seepage	12.51	D	D	60%	7.51	5.01	0.50	2.5
15 - 20	6	Hillslope seepage	6.26	D	D	60%	3.75	2.50	0.50	1.2
20 - 27	3	Depression	2.45	C	C	70%	1.72	1.72	5.06	8.7
20 - 27	4	Hillslope seepage	8.47	D	D	58%	4.91	2.12	0.50	1.1
20 - 27	5	Hillslope seepage	4.72	D	D	44%	0.94	0.94	0.50	0.5
20 - 27	5	Hillslope seepage	2.80	D	D	44%	1.23	0.00	0.50	0.0
20 - 27	10	Hillslope seepage	7.17	D	D	50%	1.08	0.72	0.50	0.4
20 - 27	10	Hillslope seepage	2.89	D	D	50%	0.29	0.29	0.50	0.1
		TOTAL	**149.26**				**63.52**			**78.6**

Table 4. Table showing the direct and indirect wetland losses.

	Wetland Impact	Functional Offset Target	Ecosystem Conservation Target
Direct Loss	89.9	52.3	74.8
Indirect Loss	59.3	11.2	3.7
Total Loss	**149.3**	**63.5**	**78.6**

Table 5. Table showing the total wetland losses (direct and indirect) grouped per development phase

Development Phase (Years)	Wetland Loss	Functional Offset Target	Ecosystem Conservation Target
0 - 5	73.5	31.4	60.3
5 - 10	28.5	10.6	3.8
10 - 15	12.5	7.5	2.5
15 - 20	6.3	3.8	1.2
20 - 27	28.5	10.2	10.7
Total Loss	**149.3**	**63.5**	**78.6**

The functional offset target would need to be achieved through rehabilitation activities within remaining wetlands on site (and if required, offsite) that result in a total hectare equivalent gain of 63.5 hectare equivalents. Ideally the rehabilitation aspect of the functional offset target should take place as close as possible to where the wetland functional area is being lost, i.e. within the direct vicinity of the Kendal 30-year ADF Project so that the impacted systems benefit from the realised gain in eco-services. Undertaking the rehabilitation activities on land already owned by the applicant would also aid in avoiding potential pitfalls in terms of obtaining landowner consent to undertake rehabilitation activities. If, however, insufficient suitable rehabilitation opportunities exist within the remaining wetland areas on site and immediate adjacent areas, which is highly likely, further potential targets would need to be located elsewhere.

The ecosystem conservation/protection-based offset should ideally be located within the same quaternary catchment as the wetland systems that are being lost, and should be undertaken on a like-for-like basis as far as possible, i.e. the loss of hillslope seepage wetlands should be offset through the protection of hillslope seepage wetlands. Further motivations would be required should offset sites be identified and located outside of the impacted catchment areas.

6.3.2 Species of Conservation Concern Targets

No Red Data plant species were observed within the wetlands on site, though a number of protected species do occur in the general area. None of these were however observed within Site H during the wetland survey.

- *Crinum bulbispermum*
- *Erythrina zeyheri*
- *Gladiolus crassifolius*
- *Gladiolus eliottii*
- *Hypoxis hemerocallidea*

All of these species are protected in terms of the Mpumalanga Nature Conservation Act (Act 10 of 1998).

No Red Data mammal species were observed within the study area during the wetland assessment. However, scats of the Cape Clawless Otter (*Aonyx capensis*) were observed within wetland systems in the general area, and Serval (*Felis serval*) is also known to occur. Both these species are however expected to be associated mostly with the valley bottom wetland systems and are considered unlikely to frequent Site H on a regular basis, if at all, given the extensive cultivation and fragmentation of remaining wetland habitat on site.

Numerous Red Data listed bird species are expected to occur in the general area, including:

- Blue Crane
- Greater Flamingo
- Lesser Flamingo
- African Grass Owl
- Black-winged Pratincole
- Secretarybird

Once again, none of these species were recorded within Site H during the wetland survey. The Greater Flamingo is most likely to utilise the pan wetland on site, though the modification of the pan habitat through storage and abstraction of water is likely to have made the available habitat less suitable for flamingos.

Given the above, no species of conservation concern targets are proposed for the Kendal 30-year ADF Project. It is however recommended that a like-for-like wetland offset be pursued as far as possible, specifically relating to pan habitat. Targeting pan habitat as part of the offset will ensure that flamingo habitat will be protected as part of the offset implementation.

7. IDENTIFICATION OF OFFSET TARGET AREAS

7.1 Offset Target Area

An important criterion for offset site selection is that the candidate wetlands are situated in the same catchment and ideally in the same quaternary catchment or sub-catchment as the wetlands that will be lost. The rationale being that the ecological benefits added to the landscape by rehabilitation efforts will manifest themselves on the same water resource that has been affected by the loss of wetlands. At the same time, given the extensive mining activities within the Mpumalanga Highveld, the risk associated with rehabilitating wetlands within these mining areas must be recognised and considered in the site selection process, and consideration of sites further afield, away from mining activities, can also be considered and motivated for.

Factors contributing to the selection of candidate offset wetlands are as follows:

1. Identify areas with similar characteristics in terms of wetlands and landuse to those being lost by development according to the following hierarchical categories:
   a. The same quaternary and sub-catchment areas as the wetlands to be offset. This is aimed at ensuring that the restoration of wetland functioning is kept as close to the development as possible, so that the people and ecosystems directly affected may also gain the benefits of the rehabilitation measures;
   b. The same geological formations as those underlying the wetland areas to be offset. The rationale behind this is that wetland types which share similar landscape settings and geological formations tend to respond in the same way to changes in the catchment characteristics. They also perform similar ecological functions in the landscape;
   c. The same vegetation types i.e. have similar species compositions as those of the wetlands to be lost. This is likely to ensure that the requirements in terms of wetland biodiversity are met;
   d. The extent of similar wetland types, according to their hydro-geomorphic (HGM) classification, as those to be lost within the proposed Kendal 30-year ADF Project, i.e. to maintain the principle of a like for like offset. Approximately fifteen ecological services have been attributed to wetlands. There is evidence that wetland function can be linked to wetland type (Kotze *et. al*., 2004), with the biophysical characteristics of the different wetland types, together with conditions in the surrounding catchments, determining the magnitude and importance of the various wetland functions they are able to perform. With different wetland types being more effective at performing certain ecological functions than others, the removal of one wetland type from the landscape, and its replacement with another, may result in a change in the types of important eco-services provided to the landscape. It was assumed that the rehabilitation and protection of required areas of similar wetland types within selected catchments would be most likely to appropriately compensate for the loss of functionality of the wetlands in the new mining areas.

e. Landownership. Rehabilitating and securing wetlands in the long-term is most easily achievable on land owned by the development proponent. Where offset target wetlands are located on land owned by private individuals, lengthy negotiations might be required to secure access and management of the wetlands, and outright land purchases could also be required, adding considerably to the cost of implementation.

In light of the above criteria, and given the expanding mining and power generation activities within the immediate vicinity of the proposed Kendal 30-year ADF development site, the following criteria were proposed as a first attempt at identifying a suitable target area for identifying possible offset target wetlands (Figure 5):

- The two quaternary catchments in which the Kendal 30-year ADF will be located;
- A 10km radius around the proposed development site; and
- All Eskom owned land within the Upper Olifants Catchment (as per the database provided).

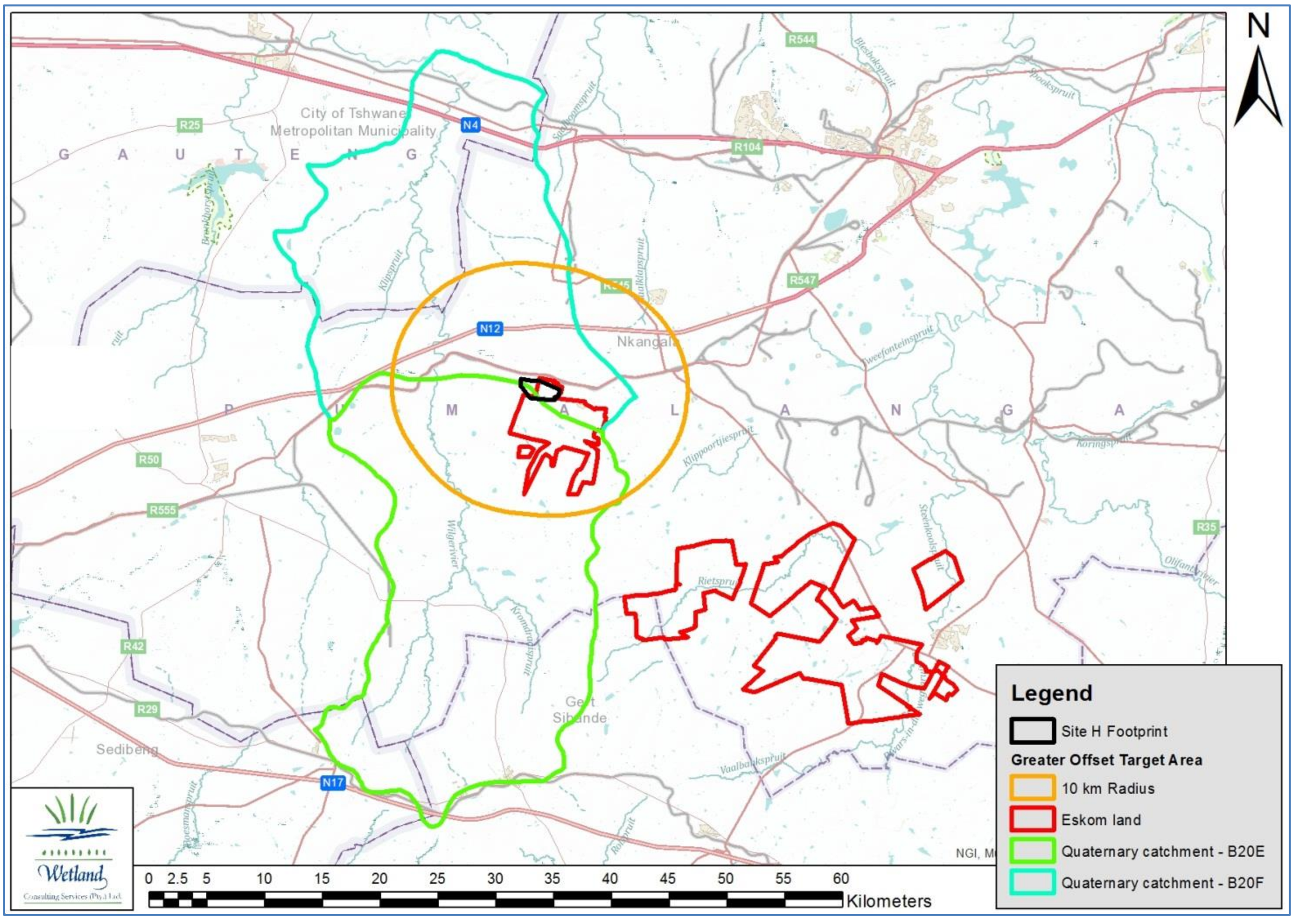


Figure 6. Map of the greater offset target area identified for further investigation to identify target wetlands.

7.2 Identification of Offset Target Wetlands

To achieve a like-for-like wetland offset, the target wetlands need to include pan/depression wetlands and hillslope seepage wetlands. It is likely that the pan/depression target will be the more difficult to achieve. The focus in finding potentially suitable target wetlands was thus on identifying pan wetlands that would form suitable targets, and then finding hillslope seepage wetlands associated with the pan and within the immediate surroundings that could be used to meet the offset target.

All pan wetlands within the offset target area (Figure 5) were identified by making use of the following datasets:

- NFEPA wetland database (National Wetland Inventory Version 4);
- 1:50 000 topographical maps and associated vector data for inland waterbodies; and
- A rapid scan of 1:10 000 aerial imagery of the area to include pans not covered by the above two datasets.

The resultant dataset (in ESRI shapefile format) from the above exercise was then further refined as follows:

- The dataset was cleaned by merging all polygons into individual wetland systems (e.g. the NFEPA dataset often has a single pan split into 2 or more polygons as a result of the automated classification utilised);
- All pan/depression wetlands classified as artificial (manmade) were deleted from the dataset;
- All pan/depression wetlands were more than 75% of the surface area was located outside the offset target area were deleted;
- All wetland systems that had been incorrectly classified as pan/depression wetlands in the NFEPA dataset were deleted; and
- All remaining pan/depression wetlands smaller than 5 ha in size were deleted from the dataset. Targeting small pans will require a large number of pans to meet the required target and result in a fragmented offset. However, if no suitable pans are found, these smaller pans could be revisited as possible target wetlands.

Of the remaining wetlands, a number of pans are known to be targeted for opencast coal mining, mining which is currently being applied for or which has already been approved – all such pans were not considered suitable.

Lastly, a number of the remaining pan wetlands are known to be targeted for offsetting by a mining house – these pans were also excluded from consideration.

Following the above process, a dataset of 26 possible target pan/depression wetlands remained, as detailed in Figure 6. Comments on the suitability of each of the pans are provided in Table 4, based on a desktop perusal of aerial imagery.

Of the 26 identified pans, 16 were considered potentially suitable targets at first glance, with the remaining 10 pans discarded due to various considerations, as detailed in Table 4.

Table 6. List of potential target pan/depression wetlands.

Number	NFEPA Wetland Type	NFEPA Natural / Artificial	Wetland Vegetation	Area (ha)	Discussion
1	Depression	Natural	Mesic Highveld Grassland Group 4	69.49099	Possible Kusile offset. Many properties
2	Depression	Natural	Mesic Highveld Grassland Group 4	49.14622	Adjacent ash dump. Water storage?
3	Depression	Natural	Mesic Highveld Grassland Group 4	42.96207	Potential target. Limited seepage
4	Depression	Natural	Mesic Highveld Grassland Group 4	40.35840	Potential target. Large seepage wetland
5	Depression	Natural	Mesic Highveld Grassland Group 4	29.72898	Potential target. Limited seepage
6	Depression	Natural	Mesic Highveld Grassland Group 4	24.45648	Potential target. Eskom owned
7	Depression	Natural	Mesic Highveld Grassland Group 4	19.88822	Potential target. Eskom owened. Sand mining
8	Depression	Natural	Mesic Highveld Grassland Group 4	19.05663	Mining near pan. irrigation
9	Depression	Natural	Mesic Highveld Grassland Group 4	17.68287	Potential target. Eskom owned. Water storage?
10	Depression	Natural	Mesic Highveld Grassland Group 4	17.48224	Potential target. No seepage wetland
11	Depression	Natural	Mesic Highveld Grassland Group 4	15.31477	Many nearby excavations. Mining?
12	Depression	Natural	Mesic Highveld Grassland Group 4	14.04508	Used for irrigation
13	Depression	Natural	Mesic Highveld Grassland Group 4	12.62410	Potential target. Limited seepage
14	Depression	Natural	Mesic Highveld Grassland Group 4	10.78140	Kusile Site C Pan, possible Kusile offset
15	Depression	Natural	Mesic Highveld Grassland Group 4	10.26046	Potential target. Limited seepage
16	Depression	Natural	Mesic Highveld Grassland Group 4	8.75977	Many nearby excavations. Mining?
17	Depression	Natural	Mesic Highveld Grassland Group 4	8.46014	Highly impacted, half developed
18	Depression	Natural	Mesic Highveld Grassland Group 4	7.61320	Stream diversion immediately adjacent
19	Depression	Natural	Mesic Highveld Grassland Group 4	6.26170	Potential target. Limited seepage
20	Depression	Natural	Mesic Highveld Grassland Group 4	5.93129	Potential target. Highly ephemeral
21	Depression	Natural	Mesic Highveld Grassland Group 4	5.77240	Potential target. Limited seepage
22	Depression	Natural	Mesic Highveld Grassland Group 4	5.61076	Potential target. Limited seepage
23	Depression	Natural	Mesic Highveld Grassland Group 4	5.42184	Potential target. Community on bank
24	Depression	Natural	Mesic Highveld Grassland Group 4	5.12448	Potential target. Limited seepage
25	Depression	Natural	Mesic Highveld Grassland Group 4	5.01313	Potential target. Large seepage wetland
26	Depression	Natural	Mesic Highveld Grassland Group 4	8.01400	Potential target. Eskom owned. Sand mining

In prioritising the remaining 16 pans, consideration was given to the following:

- Hillslope seepage wetland associated with the pans. Pans with large hillslope seepage wetlands were considered more suitable, given the requirement for hillslope seepage wetland habitat in the offset;
- Pans on Eskom owned land were considered more suitable than pans on privately owned land as more control can be exercised over these pans and the long-term future of the offset can be more easily secured; and
- Size of the pan. The larger the pan, the more likely that rehabilitation activities will realise the functional offset target.

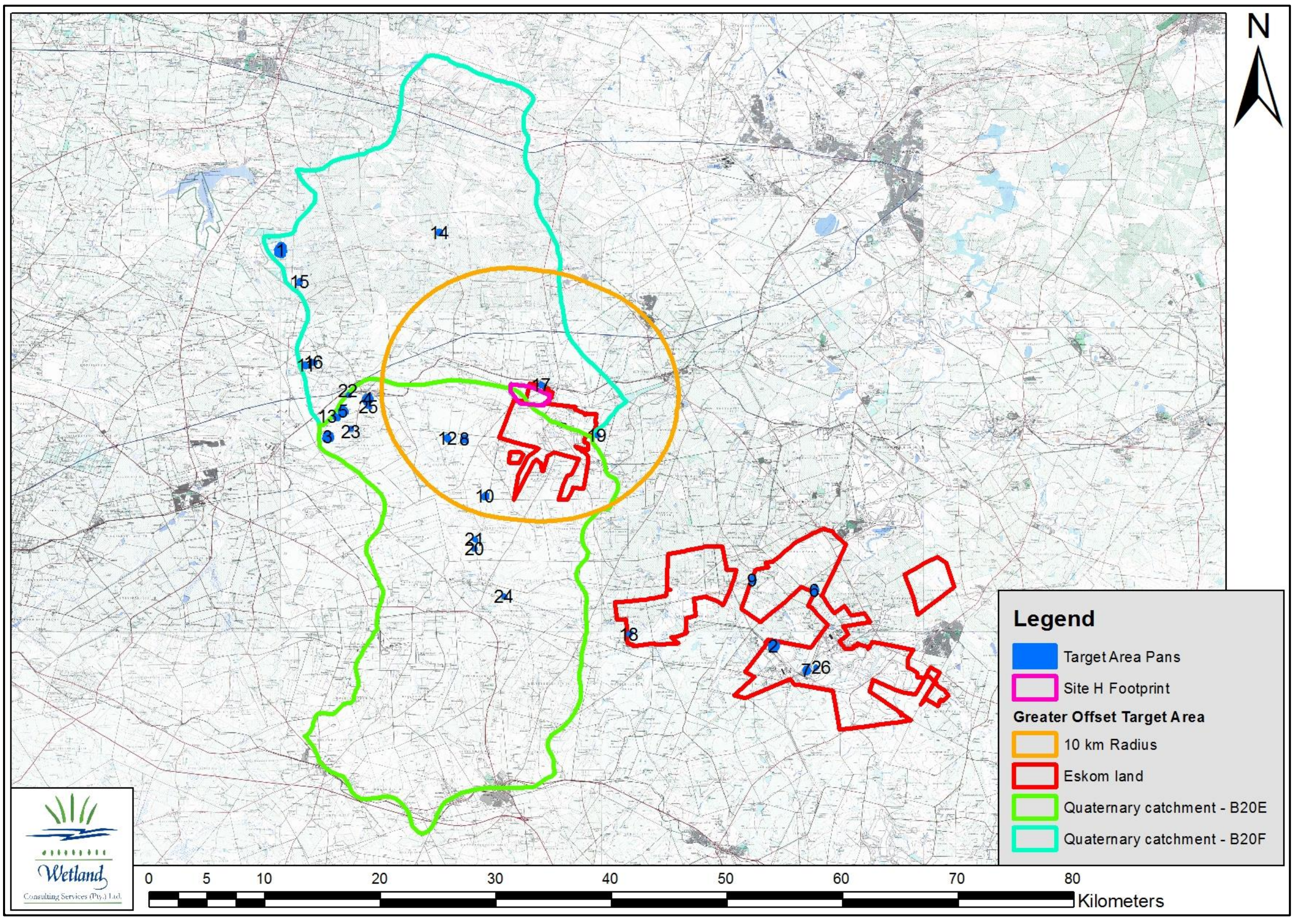


Figure 7. Map of possible pan/depression target wetlands within the greater offset target area (scale of pans somewhat distorted for illustration purpose).

7.3 Target Wetlands for Field Investigation

Six pans in four clusters were selected for further investigation in the field as potential offset target areas, thus resulting in 4 sites for investigation. 3 of these sites are located on predominantly Eskom owned land in the Kriel/Matla vicinity, with the fourth site, a cluster of 2 pans, located on privately owned land in the vicinity of Argent. More detail on these pans is provided in Table 5.

Table 7. Possible target wetlands for further investigation

Alternative	Pan Number	NFEPA Wetland Type	Area (ha)	Discussion	Landownership (where available)	Farm Name	Portion
1	4	Depression	40.35840	Potential target. Large seepage wetland	Private - Portion 5 Private - Portion 4 Private - Portion 6	Schoongezicht 225IR Rondevley 208IR Boschpoort 211IR	1 & 5 4 6
	25	Depression	5.01313	Potential target. Large seepage wetland			
2	6	Depression	24.45648	Potential target. Eskom owned	Eskom - Portion 0 and 5 Eskom - Portion 1	Frischgewaagd 60IS Vaalpan 68IS	0, 5 1,14
3	7	Depression	19.88822	Potential target. Eskom owned. Sand mining	Eskom	Driefontein 69 IS	9, 10, 12, 27
	26	Depression	8.01400	Potential target. Eskom owned. Sand mining			
4	9	Depression	17.68287	Potential target. Eskom owned. Water storage?	Eskom - Portion 4 and 47 Exxaro Coal - Portion 26	Vierfontein 61IS	4, 26, 47

In selecting the above wetlands for further investigation as possible suitable offset target areas, a number of risks need to be recognised:

- It is not known at this stage if any of these pans overly existing mining rights or if these pans are earmarked for future mining. It is recommended that this be determined going forward;
- It is not known if any of these target pans have already been undermined, though it is suspected that some of the pans on Eskom owned land may well have been undermined. It is recommended that further information is obtained as to the method of undermining and the stability of the wetlands going forward;
- A number of the proposed target wetlands have been significantly impacted, specifically some of the pans on Eskom owned land have substantial historical sand mining along their edges, and some of the pans might have/may be used for water storage. These impacts might reveal the pans as unsuitable target sites following field investigation;
- Depending on which pan or pans are eventually selected as preferred target wetlands for implementation of the offset, additional hillslope seepage wetland area might be required to meet the target; and
- Pans on privately owned land will require negotiations with landowners in terms of securing and managing the target wetlands in the long-term. This could lead to the requirement of land purchases or the negotiation of a servitude agreement with the landowners.

8. FIELD ASSESSMENT OF TARGET SITES

8.1 Alternative 1

Two pans (total of 33 ha) and a large hillslope seepage wetland (175 ha) draining towards a farm dam on an unnamed tributary of the Wilge River occur on site. The wetlands are located within an agricultural setting and are surrounded mostly by cultivated fields (mostly dryland but including 1 centre pivot). To the north a small informal settlement near Argent extends to within close proximity of the pan, and it appears as though the pan is used for grazing purposes by this community.

The hillslope seepage wetland has been impacted by past cultivation and some sand mining along its western margin. More significantly however, a series of drains and trenches have been excavated within the seepage wetland, leading to desiccation of the wetland habitat. One of these trenches runs the full length of the wetland and extends into the pan basin of the upper larger pan, presumably to allow for overflow of the pan into the seepage wetland and into the downslope dam, which is used for irrigation purposes.

The hillslope seepage wetland has been classified as a wetland FEPA (Mbona et. al., 2014).

The larger of the two pans was found to support a large diversity, and large numbers, of waterbirds, including species such as the *vulnerable* Greater Flamingo (more than 240 birds counted on two separate occasions) and locally uncommon species such as South African

Shelduck and Blacknecked Grebe. Suitable habitat for the *vulnerable* African Grass Owl was observed along the smaller pan, and this species is considered likely to occur.

A single grab water sample collected in May 2015 (full results are attached in Appendix 1 – Sample KO1) indicated no discernable mining impact with sulphate levels at 13 mg/l and TDS at 717 mg/l. pH was at 9.1.

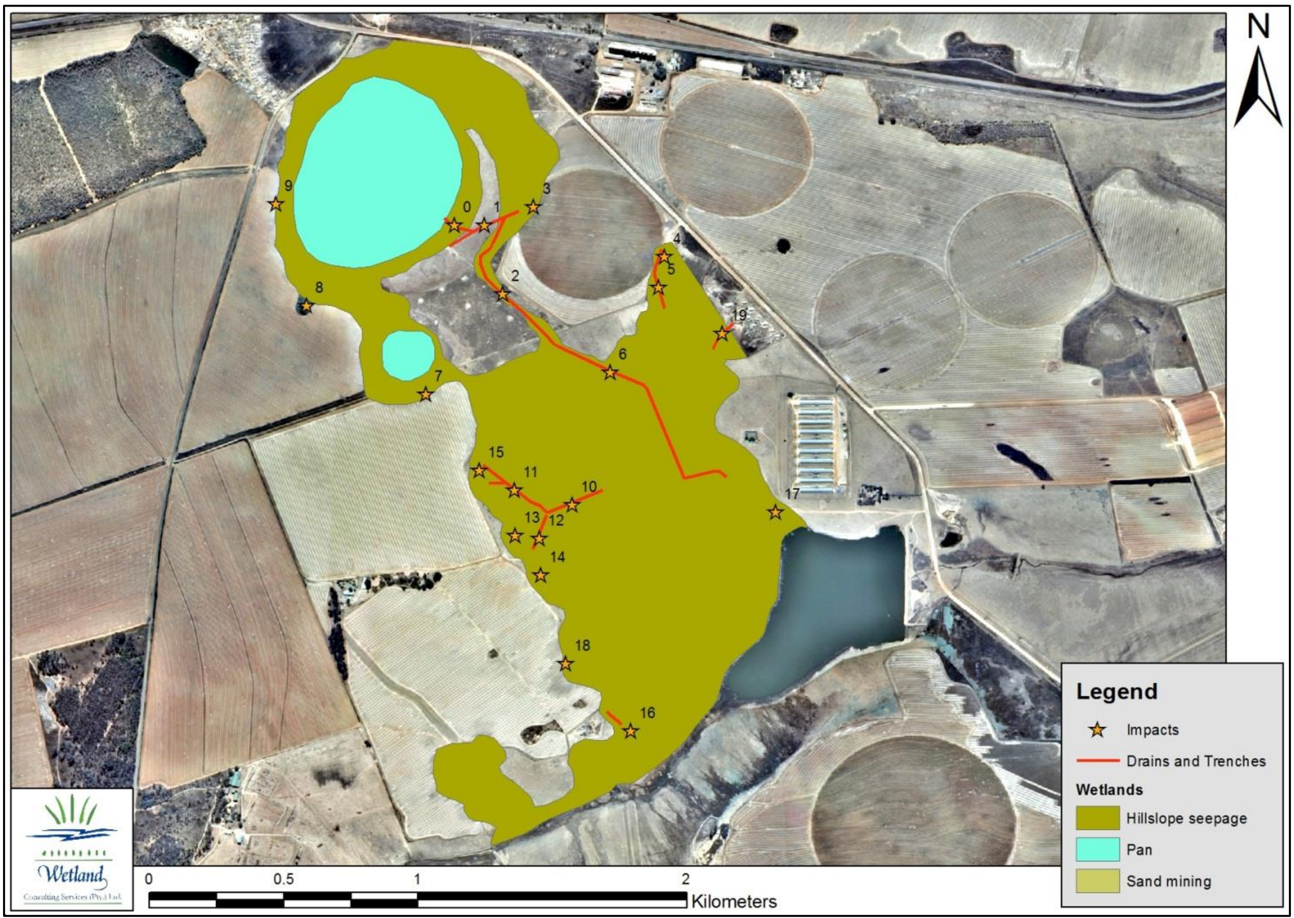


Figure 8. Map of the delineated wetlands with locations of possible rehabilitation interventions highlighted.

Figure 9. Photographs of the wetlands on site.

The PES assessment results for the 3 wetland units on site are provided in Table 6 below. The assessment indicated the wetlands to be mostly in a moderately modified condition, with the small pan falling just within a B category (largely natural).

Table 8. Results of the PES assessment.

Wetland	Area (ha)	PES category	PES score
Pan	30.2 ha	**C**	2.42
Pan	2.7 ha	**B**	1.98
Hillslope seepage	174 ha	**C**	3.6

In terms of ecological importance and sensitivity, the two pans were considered to be of **High ecological importance and sensitivity** given their role in supporting rare and endangered species, as well as the generally good condition of the pans. The hillslope seepage wetland, which has been classified as a wetland Freshwater Ecosystem Priority Area (FEPA), has undergone more extensive habitat modification (PES category C overall, but PES category D in terms of vegetation) and is therefore considered to be of Moderate importance and sensitivity.

Figure 10. Photographs of some of the impacts that could be targeted for rehabilitation interventions on site.

8.2 Alternative 2

A single pan (28.7 ha) with associated hillslope seepage wetland habitat (54 ha) occurs within the Alternative 2 site. The wetlands are located within an agricultural setting and are surrounded mostly by cultivated fields, though a coal conveyor passes in close proximity just to the west of the pan. It is strongly suspected that the pan and seepage wetland have been undermined, though no surface disturbance due to mining was observed within the wetlands.

A cement structure assumed to have been associated with past discharge to, or abstraction from, the pan was observed on the western shoreline of the pan, while further broken cement structures were observed within the pan basin. It is not known what the purpose of these structures was.

The hillslope seepage wetland shows signs of disturbances related to past cultivation of some sections of the wetland. No signs of erosion were however observed within the seepage wetland.
The pan within the alternative 2 site was completely dry at the time of sampling, limiting the confidence in the PES and EIS assessments.

Figure 11. Map of the delineated wetlands with possible rehabilitation interventions highlighted.

Figure 12. Photographs of the wetlands on site.

The PES assessment results for the 2 wetland units on site are provided in Table 7 below. The assessment indicated the wetlands to be in a moderately modified condition. In the case of the pan however it must be noted that this is a low confidence assessment.

Table 9. Results of the PES assessment.

Wetland	Area (ha)	PES category	PES score
Pan	28.7	**C**	2.14
Hillslope seepage	54	**C**	2.82

In terms of ecological importance and sensitivity both wetlands were considered to be of **Moderate ecological importance and sensitivity**.

Figure 13. Photographs of some of the impacts observed on site. Few opportunities for rehabilitation interventions were noted.

8.3 Alternative 3

Two pans and associated hillslope seepage wetlands were observed within the Alternative 3 site, as detailed in Table 8 below.

Table 10. Wetland type and extent recorded within the Alternative 3 site.

Wetland	Area (ha)
Eastern pan	7.9
Eastern hillslope seepage	30.0
Western pan	17.75
Western hillslope seepage	33.8

Both pans appear to be permanent systems, though they differ markedly from each other. The eastern pan is a shallower system with a more fluctuating water level. The fluctuating water level, with resultant concentration of salts during low water levels is likely also the reason behind the somewhat higher salinity levels (EC 266 mS/m) within this pan compared to the western pan (EC 136 mS/m). The shoreline of the eastern pan is also generally unvegetated, consisting of bare sand along most of the perimeter. This pan provides ideal waterbird habitat and supported a number of Greater Flamingo.

The western pan appears much deeper and has a more stable water level. The pan perimeter is well vegetated with tall stands of *Phragmites australis*. The presence of many White-breasted and Reed Cormorants indicates the likely presence of fish within the pan, suspected to be alien carp. Large powerlines cross across the pan basin with pylons located within the pan basin near the eastern shoreline. White-breasted Cormorants nest in these pylons.

In the case of both pans the associated seepage wetlands have been heavily impacted by sand mining activities. Although sand mining activities appear to have ceased years ago, lots of bare soil areas remain and no attempt to rehabilitate the disturbed area seems to have been made. Stands of the alien invasive tree *Acacia mearnsii* occur in places.

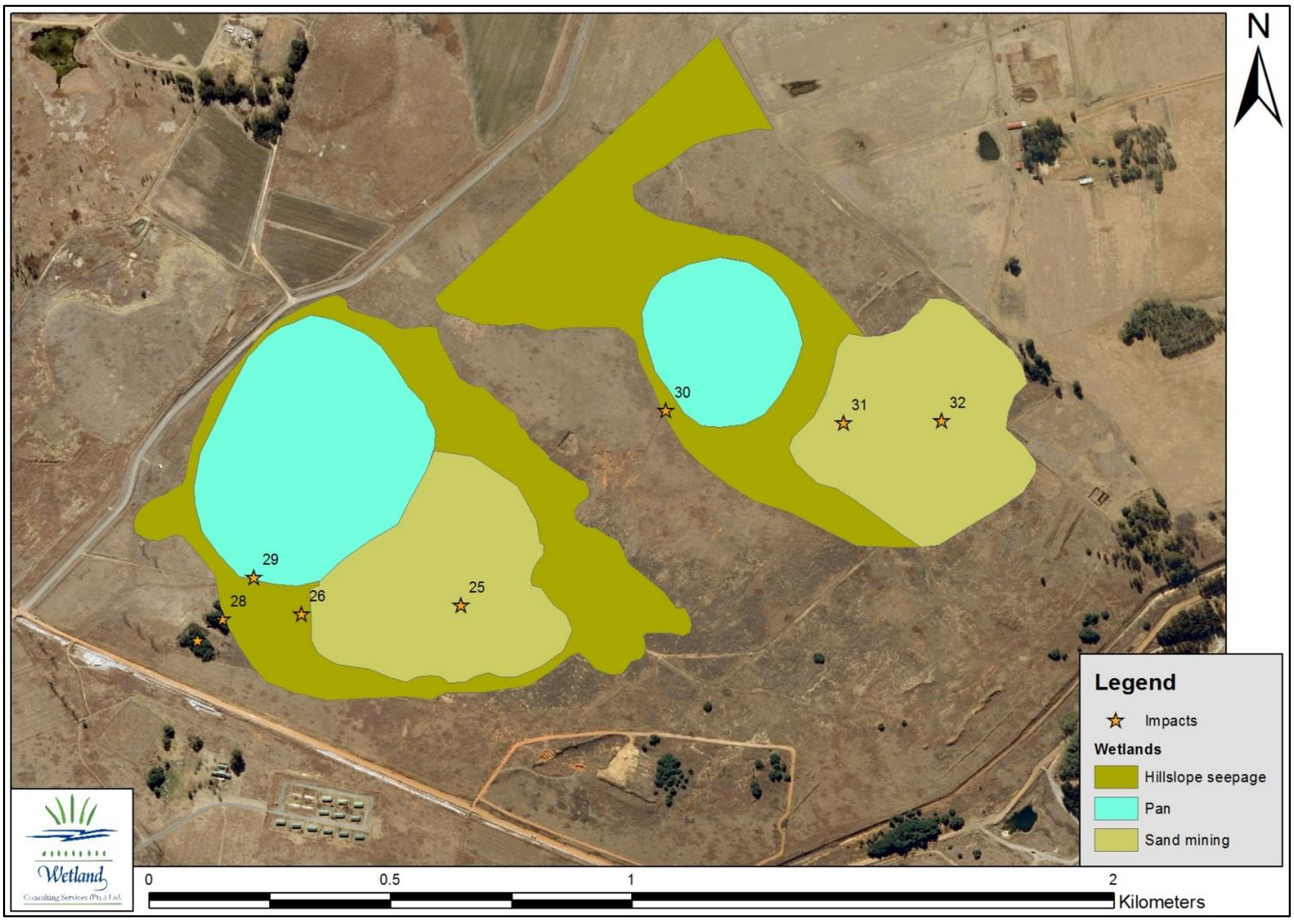


Figure 14. Map of the delineated wetlands with possible rehabilitation interventions highlighted.

Figure 15. Photographs of the wetlands on site.

The PES assessment results for the wetland units in the Alternative 3 site are provided in Table 9 below. The assessment indicated the wetlands to be in a moderately modified condition. In the case of the western pan however it must be noted that this is a low confidence assessment.

Table 11. Results of the PES assessment.

Wetland	Area (ha)	PES category	PES score
Eastern Pan	7.9	**C**	2.3
Eastern Hillslope seepage	30.0	**D**	4.1
Western Pan	17.75	**C**	3.2
Western Hillslope seepage	33.8	**D**	4.2

In terms of ecological importance and sensitivity both **pan wetlands were considered to be of Moderate ecological importance and sensitivity** while the hillslope seepage wetlands, given their extensive transformation, were considered Low/Marginal ecological importance and sensitivity.

Figure 16. Photographs of some of the impacts that could be targeted for rehabilitation interventions on site.

8.4 Alternative 4

Upon arrival at the pan within Alternative 4 it was immediately apparent that the pan was heavily impacted. 6 large evaporator sprayers were observed actively discharging mine water into the pan, resulting in elevated water levels extending into the surrounding maize fields. White salt deposits along the pan shore line also suggested water quality impairment (see Figure 16). Based on the above observations the pan was discarded as a possible target site and no further assessments were undertaken on the pan.

Figure 17. Map of the wetland on site showing mine water discharges into the pan and resultant elevated water levels and salt deposits.

9. WETLAND REHABILITATION INTERVENTIONS

Planning a wetland rehabilitation strategy is a three-phase process involving:

1. The identification of the problems compromising wetland ecological integrity;
2. Setting rehabilitation objectives based on an analysis of the problems and the feasible extent of addressing them in order to make ecological gains; and
3. Formulating solutions aimed at achieving the set objectives.

A range of problems undermining wetland ecological integrity were identified during the site visits (refer to Table 10 and Figures 7, 10 and 13). Addressing these impacts forms the underlying goal of the proposed wetland rehabilitation interventions.

Rehabilitation inherently implies that there is a concession that it will not be possible to reinstate all of the driving ecological processes within the wetlands because:

- The hydrology of the catchment has been fundamentally altered; or
- The physical impact within the wetland will be too costly to reverse.

Only those impacts that can be realistically addressed were therefore considered and used to form the basis of the rehabilitation objectives. Under the current scenario, the goal of rehabilitating the wetlands to a more natural state is considered to be realistic. The aim is usually to improve the PES scores of the wetlands considered suitable by at least one category. For example, the goal of rehabilitation would be to improve a wetland HGM unit currently considered Largely Modified (D) to Moderately Modified (C) or better. Given the generally good condition of the target wetlands, as well as the fact that many of the target wetlands are pans, an improvement of a full PES category is unlikely to be possible for most of the target wetlands.

A summary of the generic rehabilitation objectives, together with the rationale behind their implementation is presented in Table 10.

Table 12. Summary of observed impacts and conceptual rehabilitation interventions proposed (refer to Figures 7, 10 and 13).

Alternative Site	Impact Number	Description of the problem/Issue	Rehabilitation Objectives	Expected Outcomes	Type of Interventions likely to be required
Alternative 1	0 1 2 5 6 10 11 12 19	Drains/trenches channelling flow and lowering local water table	Plugging of drains to prevent formation of preferential flow paths and raise local water table	Improve water retention and distribution within the wetland. Increase saturation of the wetland, with resultant improvement in vegetation.	Earthen plugs, possibly with reinforcing in places.
	3 4 7 9 18	Cultivation extending into wetland area	Re-establish indigenous grassland vegetation within wetland	Improve species richness and vegetation composition within the pan catchment area	Withdrawal of cultivation from wetland habitat. Ploughing, shaping and re-seeding.
	8	Alien vegetation.	Removal of alien invasive vegetation.	Improve species richness and vegetation composition within the pan catchment area. Improve watermake to pan by reducing evapotranspiration losses from alien vegetation.	Physical removal of alien vegetation using Working for Water guidelines. Developing monitoring and evaluation plans
	13 14 15	Digging/Sand burrowing within the pan catchment area	Infilling of excavated areas within the pan catchment areas	Improve flow retention and distribution within the wetland. Improve aesthetic appeal of the catchment area as well as the integrity of the area. Improve species richness and vegetation composition within the wetland.	Earthworks, shaping and re-vegetation
	16	Dams/ Flow impoundment. Reduced flow in downstream reaches.	Removal of impeding structure or lowering of impeding structure	Promote water distribution, increase wetness signature and promote vegetation establishment and re-colonisation and improve species richness.	Earthworks, shaping and re-vegetation
	17	Culvert	Improve flow connectivity.	Improve water retention and distribution within the wetland.	Installation of additional culverts/crossing upgrade

Alternative Site	Impact Number	Description of the problem/Issue	Rehabilitation Objectives	Expected Outcomes	Type of Interventions likely to be required
Alternative 2	20 21	Abandoned cement infrastructure/waste in wetland	Removal of redundant infrastructure	Improve aesthetic appeal of the wetland habitat	Physical removal of cement infrastructure/waste
	22 23	Cultivation extending into wetland area	Re-establish indigenous grassland vegetation within wetland	Improve species richness and vegetation composition within the wetland	Withdrawal of cultivation from wetland habitat. Ploughing, shaping and re-seeding.
	24	Farm roads in wetland	Rehabilitation of road footprint and re-establishment of indigenous grassland vegetation within wetland	Improve species richness and vegetation composition within the wetland. Reduce disturbances due to vehicle traffic in wetland. Reduce road kill of wetland fauna	Earthworks, shaping and re-vegetation
Alternative 3	25 31	Digging/Sand burrowing within the hillslope seepage wetland	Infilling of excavated areas within the pan catchment areas	Improve flow retention and distribution within the wetland. Improve aesthetic appeal of the catchment area as well as the integrity of the area. Improve species richness and vegetation composition within the wetland.	Earthworks, shaping and re-vegetation
	26 27 28 29 30 32	Alien vegetation.	Removal of alien invasive vegetation.	Improve species richness and vegetation composition within the wetlands and their direct catchment areas. Improve watermake to pan by reducing evapotranspiration losses from alien vegetation.	Physical removal of alien vegetation using Working for Water guidelines. Developing monitoring and evaluation plans

In addition to addressing the above impacts through targeted rehabilitation measures, the following management measures would be proposed amongst others:

- Establishment of a 30m buffer zone around wetland habitat. The buffer zone should be characterised by indigenous grassland vegetation, i.e. cultivation will need to be withdrawn from the buffer zone and the area re-vegetated.
- Grazing management plans should be developed for the wetlands and implemented to ensure that livestock number stay within the carrying capacity of the wetlands. Sensitive areas, e.g. springs, might need to be fenced off to prevent damage by cattle trampling.
- Burning management plans should be implemented to ensure correct burning practices. Both too frequent and infrequent burning can be detrimental to the wetland vegetation. Such burning management plans should take cognisance of winter breeding bird species dependant on wetland habitat, e.g. African Grass Owl and Marsh Owl.

10. EVALUATION OF OFFSET TARGET SITES

10.1 Evaluation of Possible Gains

The SANBI & DWS (2014) wetland offset calculator was applied to all three target sites to evaluate the possible gains that could be realised through rehabilitation of the wetlands. The results are summarised in Tables 11 and 12 below.

In terms of the functional offset requirement of 63.5 ha-eq., the three alternatives together only contribute approximately 33.5 % of the target, with most of the gains realised in Alternative 1. This includes an adjustment factor of 0.66 to account for inherent risk of failure in rehabilitation interventions. Depending on the land tenure agreement of the final offset, as well as the generally low risk interventions proposed, this adjustment factor could potentially be adjusted to 0.8. In the case of Alternative 1, this would increase the gains from 14.6 ha-eq. to 17.7 ha-eq.

Table 13. Results of the functional offset evaluation calculator for the three alternatives investigated.

Alternative	Wetland	Area	Functional Value Before	Functional Value After Rehabilitation	Change in Functional Value	Preliminary contribution	Adjustment factor	Final Functional Offset Contribution	TOTAL per Alternative
Alt 1	Seepage	174.66	68.00%	79.00%	11.00%	19.2126	0.66	12.7	**14.6**
Alt 1	Pan	30.2	76.00%	85.00%	9.00%	2.718	0.66	1.8	
Alt 1	Pan	2.7	80.00%	85.00%	5.00%	0.135	0.66	0.1	
Alt 2	Pan	28.7	79.00%	85.00%	6.00%	1.722	0.66	1.1	**2.6**
Alt 2	Seepage	54	72.00%	76.00%	4.00%	2.16	0.66	1.4	
Alt 3	Pan E	7.9	77.00%	85.00%	8.00%	0.632	0.66	0.4	**4.2**
Alt 4	Seepage E	30	59.00%	67.00%	8.00%	2.4	0.66	1.6	
Alt 5	Pan W	17.75	68.00%	75.00%	7.00%	1.2425	0.66	0.8	
Alt 6	Seepage W	33.8	58.00%	64.00%	6.00%	2.028	0.66	1.3	
TOTAL								**21.3**	

Pans typically provide very little opportunity for improving functionality as generally no interventions are possible/required within the pan basin. However, form a water resources protection point of view, pans, being inwardly draining systems generally isolated from the surrounding drainage network, do not contribute significantly to functions such as water quality maintenance or streamflow augmentation. The most important function of pans is considered to be the support of biodiversity. It might therefore be more appropriate to focus on the ecosystem conservation aspect of the offset target.

In terms of the ecosystem conservation target of 78.6 ha-eq, it is clear that this target will be much easier to achieve, with Alternative 1 potentially realising 178 % of the target. These figures are based on the minimum acceptable security of tenure for the shortest acceptable period. If security of the offset was increased and the offset was permanently secured, the indicated gains in the table below could be doubled. The figures below also include the implementation of a 30m buffer zone around all wetlands.

Table 14. Results of the offset evaluation calculator for the ecosystem conservation target.

Alternative	Wetland	Area	Habitat intactness	Area of buffer	Wetland Habitat Contribution	Buffer Zone Contribution	Contribution Towards Ecosystem Conservation Targets	TOTAL per Alternative
Alt 1	Seepage	174.66	60.00%	39	104.796	9.75	114.546	**139.7**
Alt 1	Pan	30.2	76.00%		22.952	0	22.952	
Alt 1	Pan	2.7	80.00%	0	2.16	0	2.16	
Alt 2	Pan	28.7	79.00%		22.673	0	22.673	**61.5**
Alt 2	Seepage	54	66.00%	12.8	35.64	3.2	38.84	
Alt 3	Pan E	7.9	77.00%		6.083	0	6.083	**57.7**
Alt 4	Seepage E	30	57.00%	8.2	17.1	2.05	19.15	
Alt 5	Pan W	17.75	68.00%		12.07	0	12.07	
Alt 6	Seepage W	33.8	54.00%	8.4	18.252	2.1	20.352	
TOTAL							**258.8**	

10.2 Risks and Uncertainties

The various alternative sites do however pose a number of risks and uncertainties that will need to be considered and over which additional clarity will be required prior to implementation of the offset:

Alternative 1

- Mining Rights – no mining has as yet taken place within the Alternative 1 site. It is however not known if a mining right exists for the area and if future mining of the site might be proposed. This will need to be ascertained.
- Private property – Alternative 1 is privately owned. Implementing the offset on this site will require either purchase of the land or some form of land tenure agreement. It is not known how open the land owners will be to such negotiations.
- Argent township – a small informal settlement occurs in close proximity to the pan on Alternative 1. Further expansion of the township could pose a number of risks to the pan in terms of water quality deterioration, stormwater inputs, litter inputs, frequent burning and potentially overgrazing.
- Communal grazing – it appeared as though the pan on alternative 1 was being used for communal grazing. If the land is indeed owned and used communally, securing land tenure agreements might be more difficult.

Alternative 2

- Mining – it is believed that this pan has already been undermined. The stability of the undermining and risk of future subsidence is not known.
- Future mining – the pan is located within a mining rights area. Future mining of remaining coal resources will need to be considered.
- Lack of water in the pan – the pan was dry at the time of sampling and water quality could not be assessed. Potential coal mining impact to pan water quality should be determined prior to selection of the pan for offset implementation.

Alternative 3

- Mining – it is believed that this pan has already been undermined. The stability of the undermining and risk of future subsidence is not known.
- Future mining – the pan is located within a mining rights area. Future mining of remaining coal resources will need to be considered.
- Future mining infrastructure expansion – numerous mine infrastructure expansion projects are known to be proposed for the general area. Where these intrude into the pan catchments, they could impact on the feasibility of implementing a successful offset project.

10.3 Selection of Preferred Alternative

Although Alternative 1 on its own does not meet the functional offset target, Alternative 1 was selected as the preferred alternative for implementation of the offset from a wetland perspective:

- Alternative 1 provides the most significant gains in terms of both functional targets and ecosystem conservation target, and exceeds the requirements for the ecosystem conservation target. As biodiversity support and maintenance are seen as the most important functions of pans, the ecosystem conservation target should probably form the primary focus of the offset.
- The wetlands within Alternative 1 are in a generally good condition, supporting the principle of "protecting what is good first, before trying to fix what is broken".
- The pans on site are known to support a number of Red Data bird species. Protection and rehabilitation of the pans will therefore contribute to the maintenance of biodiversity, which is considered to be the main function of pans. This will provide a valuable offset for the loss of the Kendal Site H pan.
- The large hillslope seepage wetland is considered a wetland FEPA. Rehabilitation of the seepage wetland would therefore fit in with regional and national wetland conservation targets.
- The wetlands are considered to provide a like-for-like offset for the wetlands being lost as part of the Kendal 30-year ADF.
- Alternative 1 is located closest to the impacted area amongst the three alternatives considered.
- The wetlands form part of the Wilge River sub-catchment, the same sub-catchment impacted by the proposed Kendal 30-year ADF.

The biggest stumbling block for Alternative 1 is the fact that it is not owned by Eskom. Securing access to land for implementation of the offset and then securing the long-term protection of the offset will pose a significant challenge. If this cannot be overcome, Alternative 3 is considered the next best option. However, the risks raised in Section 10.2 above will need to be addressed, and consideration should also be given of adding additional hillslope seepage wetland into the Alternative 3 offset so as to come closer to meeting the offset requirement.

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