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### **Present Ecological Status (PES) assessment for wetlands adjacent to the Kusile 10-year Ash Dam**

Wetland Consulting Services (Pty.) Ltd. (WCS) was requested by Prime Africa Consultants to extend the PES assessment undertaken for the 10-year ash dam to include the valley bottom wetlands adjacent to the proposed development site.

A PES assessment for the pan/depression wetland and associated hillslope seepage wetland, as well as the contact seepage wetlands, was previously undertaken by WCS (*Wetland Verification, Delineation and Impact Assessment for Kusile Ash Dump*, April 2011, Ref: 689/2011). The findings from this PES assessment are reproduced in full in this memo, but have been expanded to include the valley bottom wetlands to the north and south of the proposed ash dam footprint.

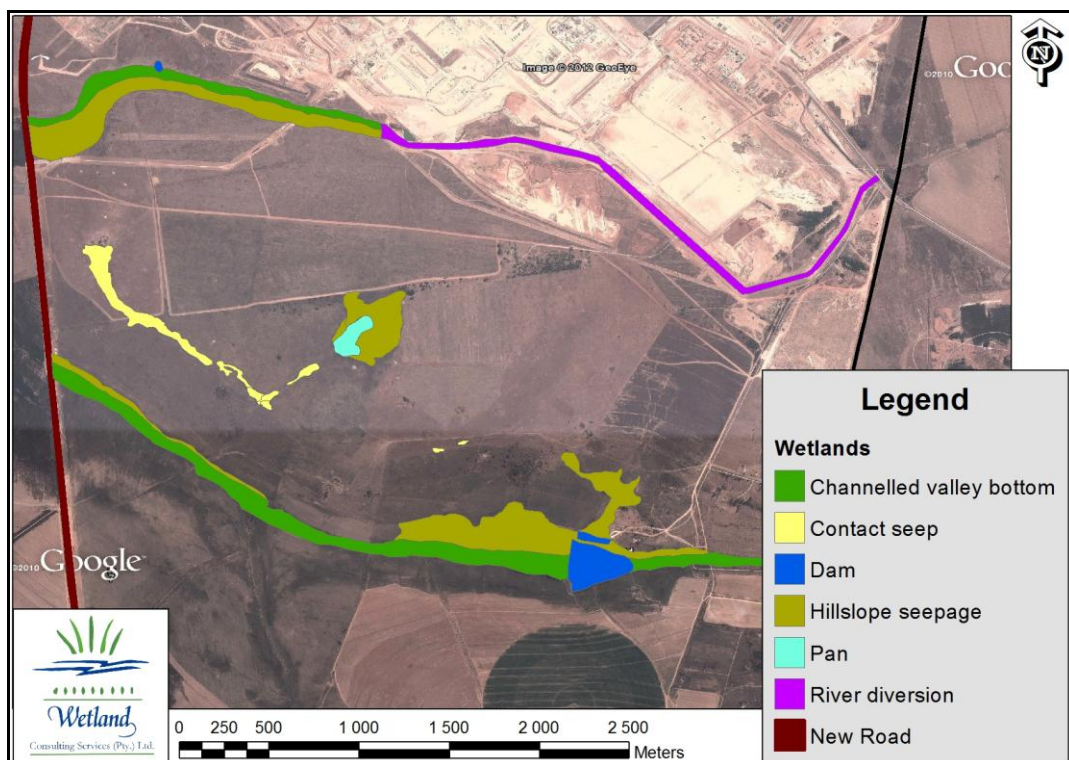


Figure 1. Map of wetlands covered by the PES assessment.

A PES assessment for the contact seeps, as well as the pan and associated hillslope seepage, had already been undertaken (results repeated in full below), while this memo expands the PES to include a further 5 hydro-geomorphic wetland units:

- Wetland Unit 4 – northern valley bottom wetland
- Wetland Unit 5 – hillslope seepage wetland along Unit 4
- Wetland Unit 6 – southern hillslope seepage wetland
- Wetland Unit 7 – hillslope seepage along Unit 6 (south west)
- Wetland Unit 8 – hillslope seepage along Unit 6 (south east)

### **Present Ecological State (PES) Assessment**

Two tools have been developed to facilitate the derivation of PES scores, namely the Index of Habitat Integrity (IHI) developed by Rountree et al, 2009, and Wet-Health, developed by Macfarlane et al., 2008. Both these tools have limitations in that they were developed primarily to assess conditions of floodplain and valley bottom wetlands and hillslope seepage wetlands linked to drainage lines. The former tool was developed to provide a rapid assessment of the PES specifically for application in reserve studies, while the latter tool was developed to support the Working for Wetlands program. The objective of the latter tool was to provide a semi quantitative assessment of the state of a wetland prior to rehabilitation, and one post rehabilitation to demonstrate “improvement”. The intention in defining the health category (PES) of a wetland is to provide an indication of the current “condition” of a wetland in order to inform a management class. The latter provides the guidelines that inform the water quality and quantity required to maintain or improve the quality of the water resource.

An attempt was made to apply the tool Wet-health to provide an indication of the departure of the wetlands from an unimpacted state.

Wet-Health comprises three modules, a hydrological, geomorphological and vegetation module, each one providing indicators that collectively contribute to determining the PES. A water quality component was added using the protocol in the tool, Index of Habitat Integrity for valley bottom and floodplain wetlands, as edited by Rountree et al in DWAF, 2007.

#### **1.1.1 Hydrology**

There are no obvious indications of changes in the hydrology influencing the two wetland types, namely the hillslope seepage and depression or pan. It is possible that the conversion of the original grassland to cultivation within portions of the catchment may have influenced the rate and/or volume of water through and into the systems, as might have the small copse of wattles. Based on site observations the changes in hydrology to both the systems is considered to be small, with an impact rating of between 0.5 for sections of the hillslope seepage wetlands and 1 for others. This translates to a total impact score 0.5 for the combined system, suggesting a health category of A, Table 1.

**Table 1. Assessment of hydrological changes in to the wetlands on the site**

HGM Unit	HGM Type	Impact Score	Health Category
1	Isolated Hillslope seepage associated with pan	0.7	A
2	Depression (includes Pans)	0.2	A
3	Contact seepage wetlands	0	A

4	Channelled valley bottom	7.0	E
5	Hillslope seepage (footslope)	1.0	B
6	Channelled valley bottom	4.0	D
7	Hillslope seepage (footslope)	0	A
8	Hillslope seepage	3.5	C

**Table 2. Summary of impact scores and health category associated with changes in hydrology**

DESCRIPTION	IMPACT SCORE RANGE	HEALTH CATEGORY
No discernible modifications, or the modifications are of such a nature that they have no impact on the hydrological integrity.	0-0.9	A
Although identifiable, the impact of the modifications on the hydrological integrity are small.	1-1.9	B
The impact of the modifications on the hydrological integrity is clearly identifiable, but limited.	2-3.9	C
The impact of the modifications is clearly detrimental to the hydrological integrity. Approximately 50% of the hydrological integrity has been lost.	4-5.9	D
Modifications clearly have an adverse effect on the hydrological integrity. 51% to 79% of the hydrological integrity has been lost.	6-7.9	E
Modifications are so great that the hydrological functioning has been drastically altered. 80% or more of the hydrological integrity has been lost.	8 - 10	F

### 1.1.2 Geomorphology

There were no signs of erosion, deposition, head cuts or other signs of geomorphological changes in the wetlands other than the intentionally excavated section of a contact seepage wetland. The excavation into the hillslope seepage wetland reduces the “health” of this small section of seepage but this does not significantly influence the overall rating of the combined system. The combined system is thus considered as unimpacted, with an impact rating of 0.5, or in an A state, Table 3.

**Table 3. Assessment of the changes in geomorphology associated with the various wetlands on the site**

HGM Unit	HGM Type	Impact Score	Health Category
1	Isolated Hillslope seepage associated with pan	0	A
2	Depression (includes Pans)	0	A
3	Contact seepage wetlands	0.7	A
4	Channelled valley bottom	5.2	D

5	Hillslope seepage (footslope)	2.4	C
6	Channelled valley bottom	3.5	C
7	Hillslope seepage (footslope)	0.5	A
8	Hillslope seepage	3.9	C

**Table 4. Summary of impact scores and health category associated with changes in geomorphology**

IMPACT SCORE	DESCRIPTION	PGS CATEGORY
0-0.9	Unmodified, natural.	A
1-1.9	Largely natural. A slight change in geomorphic processes is discernable but the system remains largely intact.	B
2-3.9	Moderately modified. A moderate change in geomorphic processes has taken place but the system remains	C
4-5.9	Largely modified. A large change in geomorphic processes has occurred and the system is appreciably altered.	D
6-7.9	Greatly modified. The change in geomorphic processes is great but some features are still recognizable.	E
8-10	Modifications have reached a critical level as geomorphic processes have been modified completely.	F

### 1.1.3 Vegetation

An assessment of the vegetation within the catchments and in the wetlands themselves suggests that some disturbance has taken place. Typically some cultivation and cattle grazing and trampling has occurred in some sections of, particularly the hillslope seepage wetlands on the perimeter of the depression. The occurrence of the small copse of wattles is also indicative of disturbance. However the extent of the changes was not assessed as being extensive or intensive resulting in an overall impact score of 1.5, equating to a PES of B, Table 5.

**Table 5. Assessment of the changes in vegetation associated with the various wetlands on the site**

HGM Unit	HGM Type	Impact Score	Health Category
1	Isolated Hillslope seepage associated with pan	2.1	C
2	Depression (includes Pans)	0	A
3	Contact seepage wetlands	0.1	A
4	Channelled valley bottom	2.4	C
5	Hillslope seepage (footslope)	1.9	B
6	Channelled valley bottom	4.2	D
7	Hillslope seepage (footslope)	0.5	A

8	Hillslope seepage	5.1	D
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**Table 6. Summary of impact scores and health category associated with changes in vegetation.**

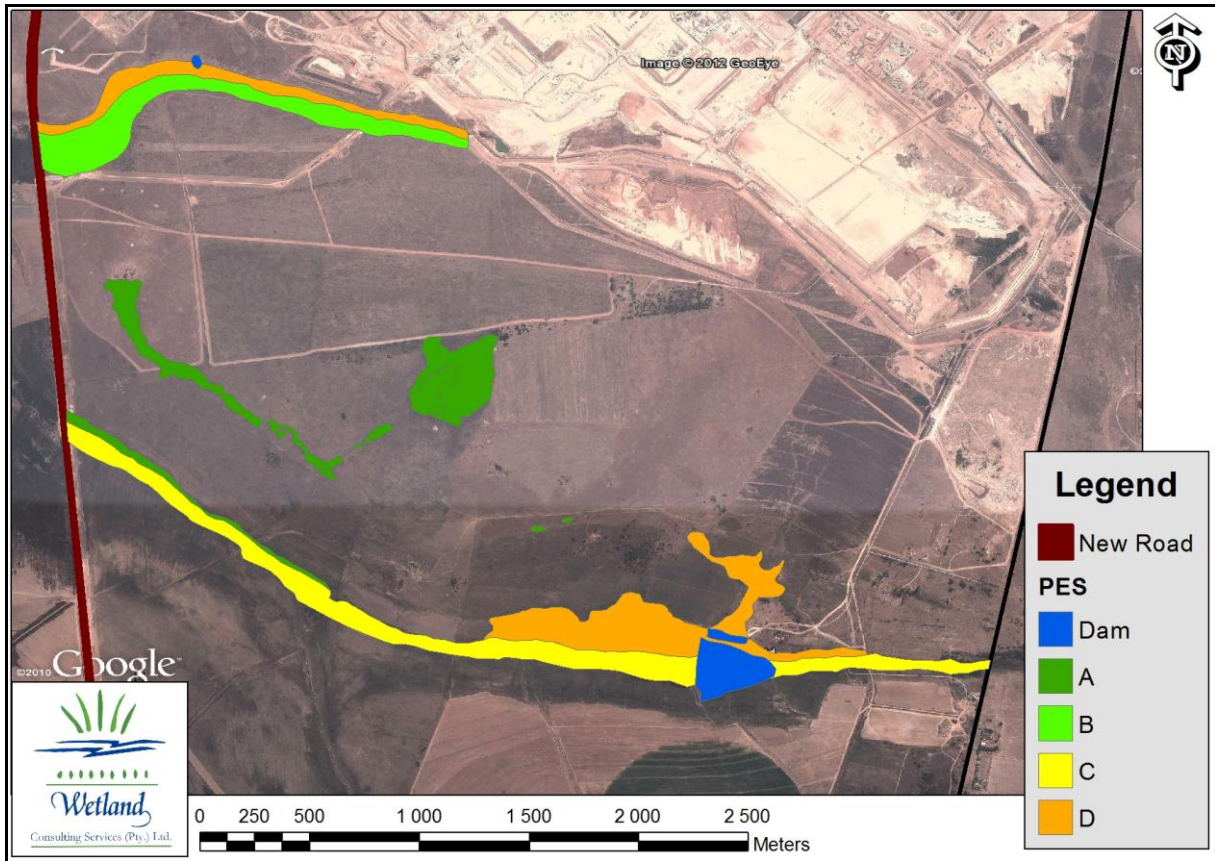
Description	Overall Impact Score	Present Vegetation State Category
Vegetation composition appears natural.	0-0.9	A
A very minor change to vegetation composition is evident at the site.	1-1.9	B
Vegetation composition has been moderately altered but introduced; alien and/or increased ruderal species are still clearly less abundant than characteristic indigenous wetland species.	2-3.9	C
Vegetation composition has been largely altered and introduced; alien and/or increased ruderal species occur in approximately equal abundance to the characteristic indigenous wetland species.	4-5.9	D
Vegetation composition has been substantially altered but some characteristic species remain, although the vegetation consists mainly of introduced, alien and/or ruderal species.	6-7.9	E
Vegetation composition has been totally or almost totally altered, and if any characteristic species still remain, their extent is very low.	8 - 10	F

#### 1.1.4 Summarised PES

When the results of the three modules detailed above are combined, the PES results for the wetlands are as follows (Table 6 and Figure 2):

**Table 7. Summarized results of the PES assessment.**

HGM Unit	HGM Type	Impact Score	Health Category
1	Isolated Hillslope seepage associated with pan	0.9	A
2	Depression (includes Pans)	0.1	A
3	Contact seepage wetlands	0.2	A
4	Channelled valley bottom	5.2	D
5	Hillslope seepage (footslope)	1.7	B
6	Channelled valley bottom	4.2	C
7	Hillslope seepage (footslope)	0.5	A
8	Hillslope seepage	5.1	D



**Figure 2. Results of the PES assessment.**

Please feel free to contact us should you have any questions.

Regards,

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Wetland Consulting Services (Pty.) Ltd.