


1 JBS05 (EWR 6: KLIP (KLIP RIVER))

The information is summarised from DWA (2008a,b; 2009a; 2010a).

1.1 SITE DESCRIPTION

EWR 6 is in MRU Klip C which extends from the Lower Foothill geomorphic zone to Lowland zone. The cross-section runs across a bedrock/boulder riffle area, and there are numerous such areas in the reach. The bed is alluvial (cobble- dominated). The left bank (LB) is bedrock, so no paired terraces occur. There is less than 20% undercutting, and stabilized by vegetation. An unnatural canal on upper zone is present and there is up to 40% cover by exotics. Fish habitat, flow-depth categories and cover is well represented at site but the presence of small weir at the site may alter natural habitat and species composition slightly. Macroinvertebrate habitat is moderate.

Location	EWR 6	Altitude	1593 m
Longitude	29.48503	Latitude	-27.36166
EcoRegion	Highveld/Southern Central Kalahari 11.06	Quaternary catchment	C13D
Water Management Area	Upper Vaal	Geomorphological zone	Lower Foothills
			
EWR 6, Klip, September 2007			

1.2 PRESENT ECOLOGICAL STATE (PES)

Geom	The site is representative of the reach and consists of a bedrock/boulder riffle area, cobble beds with some fines; in a long reach consisting of dolerites. The right bank (RB) is bedrock, so no paired terraces occur. Upstream there is a large meandering floodplain located in the sandstone areas. There seems to be little impact on the site, and the bedrock nature of the river also makes the site relatively insensitive to flow changes. The site is a bedload system, and although there are dams far upstream, the fines component at the site suggests that the impact of the upstream dam is lessened due to subsequent tributary inputs of sediment.
WQ	Data records from water quality station C1H002Q01; Klip River at Sterkfontein/Delangesdrif (1974 – 2004; n = 1239) and Rand Water data from C-KD Klip River at Delangesdrif (2003 – 2008; n = 56) were used for the physico-chemical PES assessment. Increased organic pollution levels at the site are of concern and may be due to the presence of dead cows in the vicinity, observed during December 2007 and April 2008. There is evidence that the upstream wetland plays an important role in the filtration of water and improvement of water quality. This is evident from the presence of wetland diatom species e.g. <i>Pinnularia gibba</i> , <i>Diadesmis contenta</i> and <i>Tryblionella debilis</i> (September 2007 sample).
Fish	It is perceived that all the expected fish species are still present within this RU although the FROC of some species have been reduced from reference conditions. Although <i>Labeobarbus aeneus</i> and <i>B. pallidus</i> were not sampled during the current study, they have been sampled at site C1Klip-

	<p>Unspe1 during 2001 (Kotze and Niehaus, 2001). It is estimated that the decreased FROC of <i>Labeobarbus aeneus</i> may be attributed to the decreased flow (which resulted in less habitat for breeding, feeding and refuge) and presence of migration barriers (weirs and farm dams). The FROC of <i>B. pallidus</i> (if it naturally occurred in this reach) may have been reduced by decreased water quality (the only moderately intolerant species expected), together with a loss of habitat.</p>
Inverts	<p>Sep 07: SASS5 score: 173 No of Taxa: 28 ASPT: 6.2 Apr 08: SASS5 score: 169 No of Taxa: 30 ASPT: 5.6</p> <p>The site is in an excellent ecological state, despite the very low flows and limited biotopes present during the September 2007 site visit. Key indicators recorded at this site were taxa that are highly sensitive to deterioration in water quality, such as Polymitarciidae, Oligoneuridae, Heptageniidae, Leptophlebiidae, Perlidae and Psephenidae. The only consistently missing taxon was Hydroptilidae.</p>
Rip veg	<p>The site falls within the Amersfoort Highveld Clay Grassland vegetation type, which has a conservation status of "Vulnerable" with 75.5% remaining.</p> <p>Marginal zone: Dominated by non-woody vegetation (mainly sedges and grasses). The zone is moderately impacted by the removal of sedge species. Exotic species (non-woody weeds) have a 10% presence and has a small impact on this zone.</p> <p>Lower zone: Dominated by non-woody vegetation (mainly sedges and grasses). Cover and species composition of the non-woody component has been reduced due to the high proportion of exotics (presence of 20 – 40% exotic non-woody weeds) and especially the shading impact of <i>S. babylonica</i>. There has also been vegetation loss due to soil erosion around <i>S. babylonica</i> trees.</p> <p>Upper zone: Is essentially a grass/tree/shrub mix and is seriously impacted by the presence of exotics (40 – 60% non-woody weeds mainly) and vegetation removal due to farming, roads and artificial canals. There is higher proportion of <i>Leucosidea</i> spp. due to canalisation.</p>
Diatoms	<p>Three diatom samples were taken at this site (September and December 2007, April 2008) and no additional data was available. SPI scores ranged between 12 – 12.8 for samples taken during 2007 – 2008 (moderate water quality) and the overall biological water quality EC is a B/C. The diatom samples and physico-chemical data indicates elevated nutrient and turbidity levels due to agricultural runoff. Due to the high seasonal sediment flows the turbidity is variable. Cattle trampling in the riparian and instream zone is present which may impact slightly on the water quality at the site. Overall the data set indicates low nitrogen and phosphate levels as well as low salt values and metal values are below detection limits.</p>

1.3 MAIN IMPACTS AT THE SITE

	PES	Causes	Sources	F/NF
WQ	B/C	Variable turbidity.	High seasonal sediment flows.	F
		Elevated nutrients and salinity levels.	Agricultural runoff.	NF
		Benthic growth.	Cattle and agriculture.	
Geom	B	Slight reduction in system connectivity.	Small farm dams.	NF
		Increased sediment supply due to erosion in smaller tributaries, buffered somewhat by upstream wetland.	Cattle grazing.	
		Slight reduction in transport capacity due to reduction in base flows and moderate floods.	Presence of dams in the upper catchment.	F
Rip veg	B/C	Reduced non-woody cover.	Exotic species, especially <i>S. babylonica</i> .	NF
		Reduced or absent woody recruitment.	Reduced moderate floods.	F
		Reduced or absent woody recruitment.	Disturbance at the site, agricultural activities, roads within the riparian zone and sedge removal.	NF
Fish	B	Loss of habitat (decreased FS and fast deep (FD)) diversity as a result of flow modification (especially during natural low flow periods).	Dams in main stream and tributaries.	F
		Decreased overhanging vegetation as cover for fish.	Increased bank erosion related to agricultural and livestock farming activities.	NF
		Increased sedimentation resulting in deterioration of substrate as habitat (clogging interstitial spaces, loss of important spawning habitats, etc.).		

	PES	Causes	Sources	F/NF
		Decreased substrate quality related to increased benthic growth.	Increased nutrients from point and diffuse sources.	
		Decreased water quality affect species with requirement for high water quality.	Effluents from mines and agricultural areas (pesticides).	
		Presence of migration barriers reduces migration success (breeding, feeding and dispersal) of some species.	Weirs in Klip River and also farm dams in tributaries reduce refuge areas.	
Inverts	B	Decreased low flows.	Abstraction and various small weirs.	F
		Nutrients and associated benthic growth.	Cattle.	NF
		Sedimentation.	Roads, farming activities.	

1.4 RESULTS: PRESENT ECOLOGICAL STATE

Driver Components	PES	Trend
GEOMORPHOLOGY	B	Stable
WATER QUALITY	B/C	Negative
DIATOMS	B/C	
Response Components	PES	Trend
FISH	B	Stable
MACRO INVERTEBRATES	B	Stable
INSTREAM	B	
RIPARIAN VEGETATION	B/C	Negative
ECOSTATUS	B/C	

The B/C PES EcoStatus is due to flow related impacts which include reduced base flows and moderate floods due to weirs and farm dams. Non-flow related impacts include agriculture, cattle grazing, and alien vegetation. The sole reason for the PES not being a B EcoStatus is because the current vegetation EC (B/C EC) is due to the high proportion of exotic species

1.5 SUITABILITY AS FUTURE BIOMONITORING SITE

The Klip River is largely natural and is an important tributary of the Vaal River, in terms of providing natural variable flow downstream of Grootdraai Dam (DWAf, 2009a). Considering the good condition of the site and the importance of this tributary it should be included in future monitoring programmes.
