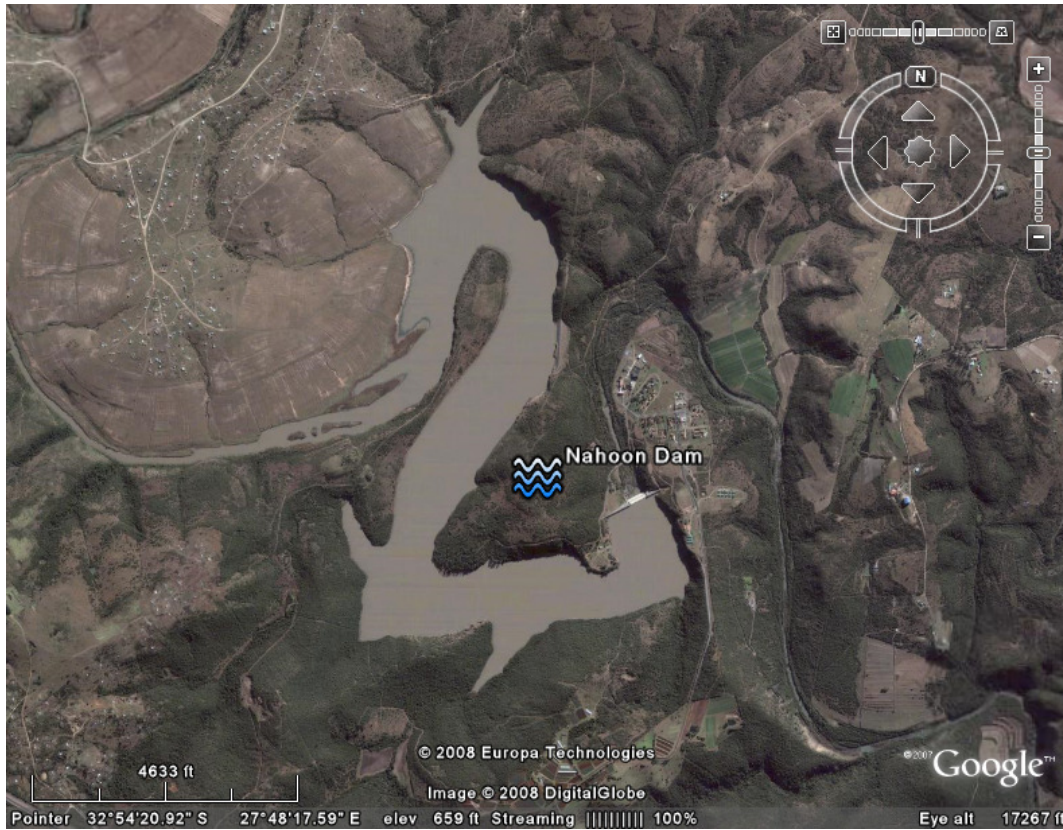


# **BIEMONITORING OF THE NAHOON RIVER SYSTEM**



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## **EXECUTIVE SUMMARY**

The main objective of the South African National River Health Programme (NRHP) makes use of the instream and riparian biological communities like the fish, macroinvertebrates and vegetation to assess the ecological health or condition of rivers. These biological communities are always found in rivers and they are often affected by any disturbance that occurs in the river ecosystem.

This report provides the results of the biomonitoring survey that was undertaken in November 2007. Field indices used for data collection included the South African Scoring System version 5.0 (SASS5) for Macroinvertebrates and the Fish Assemblage Integrity Index for fish (FAII).

Five biomonitoring sites were selected in the Nahoon river system; this includes one site in the Qwantsa River (a tributary to Nahoon River) and they are:

<b>Site</b>	<b>Description</b>	<b>Coordinates</b>	<b>Site Code</b>
1	Nahoon Woolfridge	S32° 51' 25.20", E27° 43' 09.71"	R3Naho-Woolf
2	Nahoon Newlands Bridge	S32° 52' 1.86", E27° 45' 54.82"	R3Naho-Newla
3	Qwantsa Newlands Bridge	S32° 53' 42.59", E27° 45' 19.63"	R3Qwan-Newla
4	Nahoon Baden Powell	S32° 57' 42.06", E27° 52' 19.14"	R3Naho-Baden
5	Nahoon Horse shoe Valley	S32° 56' 30.75", E27° 53' 46.57"	R3Naho-Horse

## **GOALS AND OBJECTIVES OF RHP**

The goal of the NRHP is to obtain information on the ecological state of South Africa's river ecosystems in order to make proper management decisions regarding natural resources.

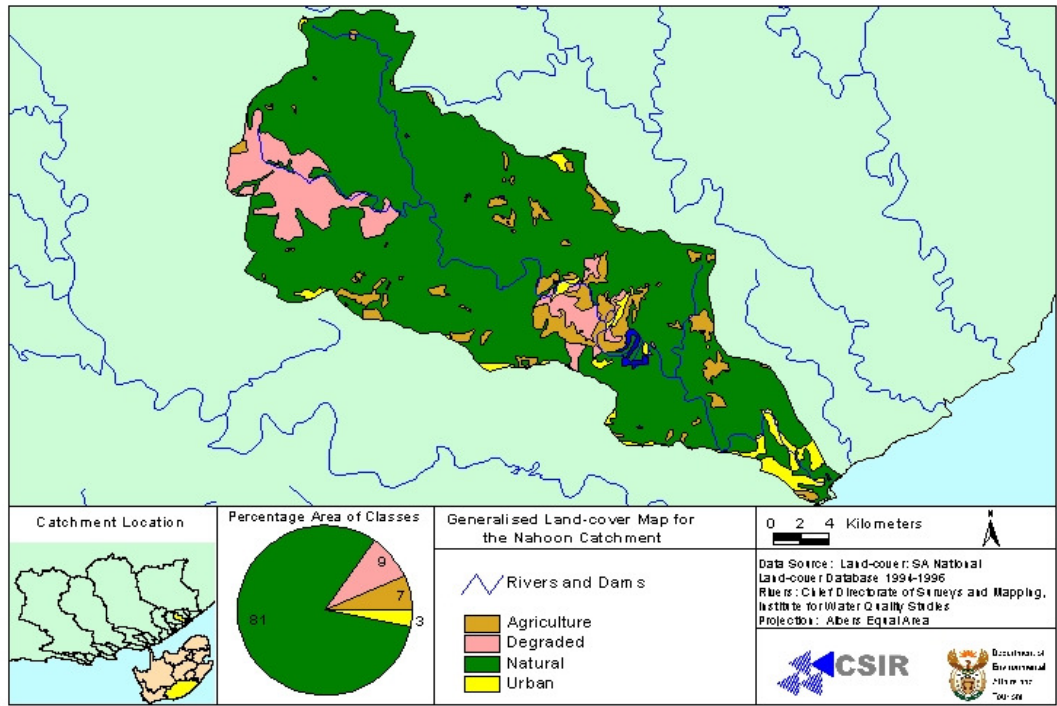
The main objective is to measure and assess; as well as to detect and report on spatial and temporal trends in the ecological state of aquatic ecosystems. This assists in identifying emerging problems regarding the aquatic ecosystems.

## **INTRODUCTION**

DWAF Eastern Cape River Health Programme involves the use of Biomonitoring tools to determine the health of the aquatic ecosystems. The programme aims to promote standardized and continuous monitoring and reporting on the Eastern Cape rivers health. Nahoon River is one of the systems monitored in the Eastern Cape, hence, monitoring survey was conducted and this report provides information on its current state.

Nahoon river has x main tributaries. Nine sites were selected for Biomonitoring of this river system.

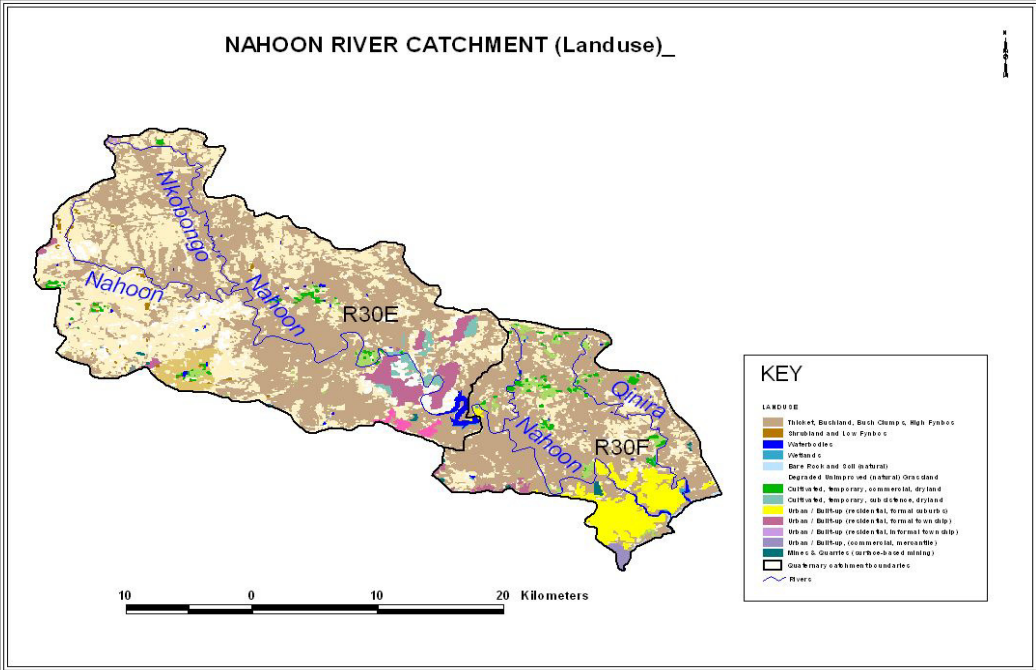
## **GENERAL DESCRIPTION**



**Figure 1.** Generalized Map for Land use in the Nahoon Catchment

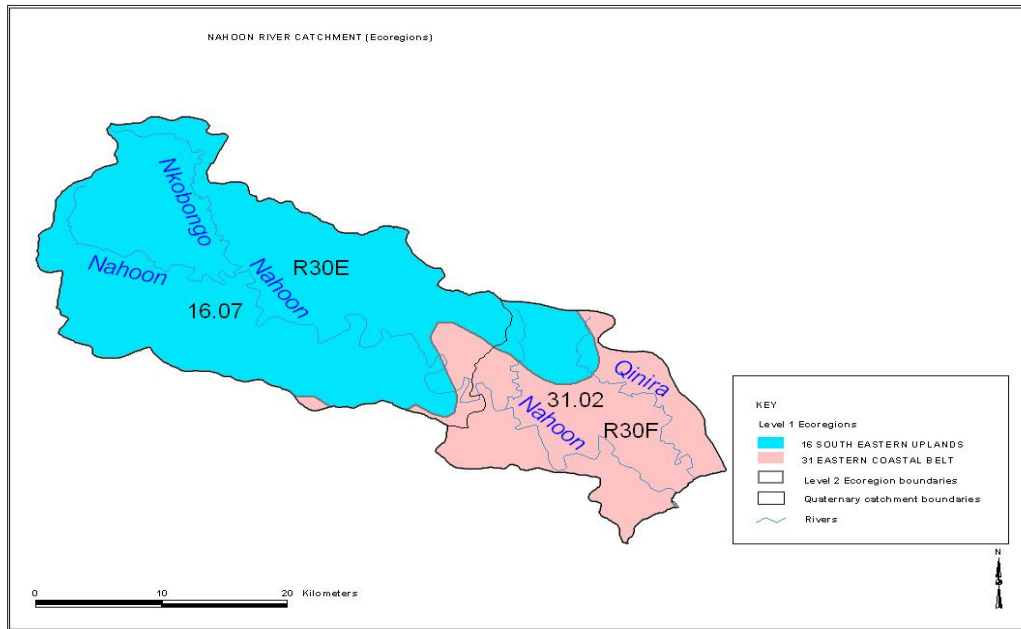
The Nahoon river system is situated in the Mzimvubu to Keiskamma Water Management Area (WMA12), in the Amatole Region; Buffalo city Municipality in the Eastern Cape Province  
The Nahoon estuary (32°59' S; 27°57' E) is situated near the coastal city of East London in the Eastern Cape. The river is approximately 77 km long with a catchment area of 584 sq. km.

**Land Use**



Agriculture, mainly subsistence farming, temporary commercial dryland agriculture and commercial forestry comprised 7% of the land-cover in the Nahoon catchment. About 9% of the catchment was degraded, comprising mainly degraded grassland and bushland. Approximately 81% of the catchment was natural and consisted mainly of thicket and bushland and grassland. Urban development accounted for 3% of the land-cover and his mainly consisted of residential and industrial development associated with the coastal city of East London (Ref. DEDAE; 2001).

## **Ecoregions**



The Nahoon river catchment falls within two level 1 ecoregions, namely, Ecoregion 16-South Eastern Uplands and Ecoregion 31 – Eastern Coastal Belt. Most of this catchment falls within South Eastern Uplands; hence more sites were selected in this Ecoregions.

## **OBJECTIVE OF THE SITE VISIT**

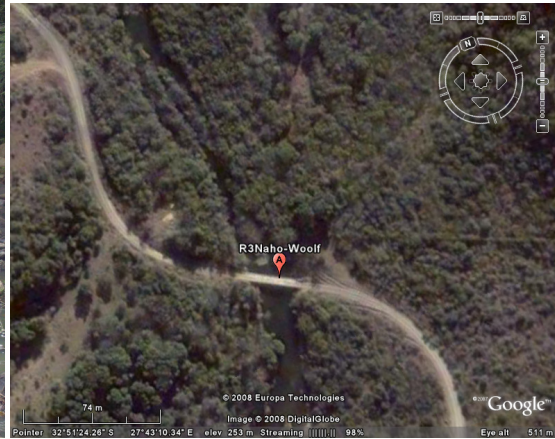
The objective of the site visit was to determine the state of Ecological Health of the Nahoon River system. This includes version 5 of the South African Scoring System (SASS 5) for Macroinvertebrates, Fish Assemblage Assessment Index (FAII) for fish, and water quality at each sampling site.

## **MATERIALS AND METHOD**

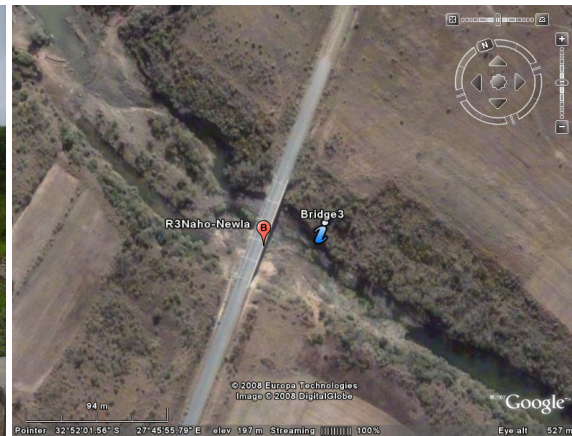
Water Quality parameters (pH, Conductivity, Temperature, etc) were measured on site using a multimeter (See Table 3). Sampling of fish and macroinvertebrates was conducted at each Biomonitoring site. Macroinvertebrates were sampled using SASS 5 method and fish were sampled using a seine-net. Fish caught were identified to species level with the number of juveniles and abnormalities recorded.

## **FINDINGS**





**Site 1:** Ground and satellite photo of Nahoon River, Woolfridge (This is the best River health site in the upper reaches and it is far from being pristine). The riparian vegetation mainly indigenous, few exotic plants such as Lantana were spotted but no Black/Silver Wattle or Eucalyptus trees around this site. No abstraction or gauging weir at least 500 meters upstream or downstream of this site. Site in ecoregion 16.



**Site 2:** Ground and satellite photo of Nahoon River, Newlands Bridge. Land use around this site includes several active commercial non commercial farming activities e.g. Poultry farming (Reggie Farm), irrigated crop farming, Dairy farming, Live stock farming, etc. The displacement between site 1 and site 2 is 4.5 kilometers and the present commercial farming activity is concentrated within a small area of just under 20 square kilometers. Rural settlements are the dominant form of residential built up activity in this area. The riparian vegetation is still mainly natural (Acartia trees commonly known; Umga tree) dominates this area, and still no observed black/silver wattle or Eucalyptus trees in this area. Site ecoregion 16.





Site 3: Ground and Satellite photos of Rwantsa River at the bridge, this is a Nahoon River tributary. Land use around this site is mainly rural settlements; most of the vegetation around this site has been cleared for residential development. Live Stock subsistence farming is dominant and there are small pockets back yard crop farming that is not even worth mentioning. Access to portable drinking water is in the form of stand pipes and sanitation facilities are that of pit latrines. In terms of alien tree invasion, a tree informally called Queen of the night has established itself above 1 in100 floodline; there were no black wattle or eucalyptus trees around this site. Site in ecoregion 16.



Site 4: Ground and satellite photos of Nahoon River at the Baden Pawell near High Gate. This site is situated in ecoregion 31 (eastern coastal belt). Land use around and upstream this site includes industrial (da Gama factory, Johnson & Johnson, commercial farming (crop irrigated lands, e.g. Pine apples; live stock farming), formal residential town settlement (e.g. Summer pride). This area has access to portable water, but there is also use of boreholes. Sanitation facilities are a mixture of flushing toilets with septic tanks and those that are connected municipality sewage works. Habitat integrity around this site is low; there is an impeding structure that functions as both a low water crossing and an abstraction weir. There is another abstraction weir less than 300 meters upstream of this impeding structure within the same water course. Approximately 30 to 50 adult eucalyptus trees within the riparian zone of this site, in terms of plant physiology



Site 5 Ground and satellite photos of Nahoon River at Horse shoe Valley (Dorchester Heights). The site also sits in Ecoregions 31, Land use around and upstream of this site includes cultivated irrigated, commercial, dry land. Commercial land use activities include a large Transnet/Spoornet Transport Depot, Cambridge Abattoir, Hemingways Casino, Urban built up, residential and formal suburbs. Large patches of indigenous riparian vegetation have been cleared up for commercial farming activities. This area is well serviced in terms of water supply and sanitation services. Satellite picture shows a combination of a low

water bridge and an abstraction weir and this is illegal under the new national water act, act 36 of 1998, but structures are much older than that (older than 20 years). Habitat integrity around this site is low, there more than 20 adult Eucalyptus trees (invader plant) within the riparian zone, invader plant not yet dominant (the situation is still reversible).



Site 6: This is an estuary not a river health site Ground and satellite photos of Nahoon River at Abordsfort. The site also sits in Ecoregions 31, land use here is mainly urban built up, residential and formal suburbs. Satellite picture shows a combination of a low water bridge and an abstraction weir and this is illegal under the new national water act, act 36 of 1998, but structures are much older than that (older than 20 years). Habitat integrity around this site is low, upstream of this bridge the river is 100 % fresh water and downstream of this structure conditions are estuarine. The tidal /estuarine conditions are supposed to continue much further upstream of this bridge/weir but because of the impeding bridge/weir, the tidal energy or ocean current artificially stops at the weir (see satellite photo of site 6).

**Invertebrates**

**Table 1. The SASS 5 results of Nahoon River and its tributaries, with their biological bands.**

River Site Sampled	Total SASS score	Total no. of Taxa	Total ASPT	Class
Nahoon				
Wolf ridge	104	17	6.1	C
Below Reggie/Bridge	103	19	5.4	D
Rwantsa Bridge	***	***	***	**
Baden Powel	162	28	5.8	C
Horse shoe Valley	***	***	***	**

Meaning of symbols or abbreviations:

- \*\*\* Not sampled; environmental flows too low for sampling.
- \*\* Not classified

Key: ASPT interpretation  
 <5 = poor (highly impacted site)  
 5-5.9= Fair (Impacted site)  
 6-6.9= Good site  
 7& above = natural site



**. Fish**

TABLE 1. The results of fish caught in Nahoon River and its tributaries and estuaries. The (A) next to the fish indicates that it's an adult, the other (A) Alien species,(J) Juveniles, (I) Indigenous species.

SITE	SPECIES	NUMBER OF FISH SAMPLED
SITE 2	<i>Micropterus salmoides</i> (A)	3J
	<i>Glossogobius callidus</i> (I)	9J
	<i>Tilapia sparrmanii</i> (A)	4J
SITE 4	<i>Micropterus salmoides</i> (A)	13J

Note: In others sites no fish were caught, and site 5 was not sampled due to very low flow conditions



*Tilapia sparrmanii* and *Micropterus salmoides*, the alien fish species found in site 2



*Glossogobius callidus*, the indigenous river goby. *Micropterus salmoides*, a large mouth bass caught in site 4

**WATER QUALITY**



**Table 3. Water Quality parameters measured in Nahoon river and its tributaries in February 2008.**

Sampling Points in the Nahoon River	pH	Temperature (°C)	Oxygen Absorbed (mg/l)	Conductivity (cm/s)
Nahoon Woolfridge	9.81	22.8	0.22	46
Nahoon Newlands Bridge	9.65	24.8	0.42	83
Rwantsa Newlands Bridge	**	**	**	**
Nahoon Baden Powell	9.99	25.7	0.39	78
Nahoon Horse shoe Valley	**	**	**	**

Period	Res. Inflow (ML) R3R001	Rainfall (mm) Total	Evap. (mm) [S]	Weir d/stream Volume (ML)	Pipeline (R3H004) Vol
12/1997	35138.38	805.5	1214.1	24550.45	8374.34
12/1998		800.4	1151.6		6839.87
12/1999	53505.2	795	1139.1	45368.96	5710.28
12/2000	23500.75	903.3	1189.5	16896.22	6338.21
12/2001				55174.87	6951.14
12/2002	12080.46	708.4	1285.1	8944.25	6228.67
12/2003	20512.98	895.3	1180.8	11452.78	5885.21
12/2004	26973.87	1113.5	1205.7	19996.91	6009.42
12/2005	71575.45	1209.3	944.2	67031.33	5462.65
12/2006	9871.01	532	1121.2	7468.95	6884.37

## DISCUSSION

### **Aquatic Biotic Modifications relative to current best attainable conditions SASS 5)/Water Quality:**

**Wolf ridge:** Community structure and function less than the reference condition. Community composition lower than expected due to loss of some sensitive forms. Basic ecosystem functions are still predominantly unchanged.

**Nahoon Newlands Bridge:** Fewer families present, due to loss of most intolerant forms. Basic ecosystem functions have changed. This is to be expected as the site is just below commercial agricultural activities and the presence of rural settlements. Oxygen Absorbed an electrical conductivity has almost doubled and corresponds to the SASS 5 results

**Rwantsa Newlands Bridge:** Not done due to low environmental flows.

**Nahoon Baden Powell:** Aquatic Biotic modifications are the same as in Wolf ridge site, at this part of the catchment the river. Oxygen absorbed and Electrical conductivity shows a slight improvement, Nahoon dam seldom over flows and there is three impeding structures, flow energy dynamics of this river have been altered tremendously in this part of the catchment, therefore one would not be surprised if there is no strong correlation between SASS 5 and physiochemical constituents.

**Nahoon Horse shoe Valley:** Biomonitoring was not done due to low flows, but one would expect the class to be the same as that of Baden Powell as the land use and habitat integrity is much the same.

### **Fish**

From all the five sites of Nahoon River Catchment that was surveyed in 2007, according to the assessment of the fish integrity (FAII) using the Fuzzy fish index (FFI) sampling was done only in four sites,

Wolfridge, Newlands Bridge, Rwantsa and Baden Powell. In Wolfridge and Rwantsa no fish were caught. In Rwantsa the net was always trapped in stones, therefore the sampling was unsuccessful. In Site 5 there were very low flows, no sampling was done.

According to the Fuzzy Fish Index (FFI) Site 2 is at D, indicating that the site is in fair condition. At least *Glossogobius callidus*, which is an indigenous species was found and in higher numbers than each of the alien species.

Site 4 sits at an E Class. This is in a poor condition as a large number of alien species was found and not a single indigenous species was found.

## **CONCLUSION**

### **Fish**

According to the fish assessment, the Nahoon river systems is at a fair to poor condition. All sites of Nahoon River showed some concern since they clearly showed the dominance of alien species. The team that conducted the fish assessment has started removing the alien species by not returning them to the site, this will continue as long as the alien species are found until a suitable procedure is found for removing these alien species.

An option of using a fish shocker needs to be explored. It will be more helpful in sites where the net cannot be used because of rocks, as some fish hide very well under the rocks.

Although there is much increase of socio economic development around the Nahoon catchment, Dam flows in the Nahoon River shows no increase of raw water supply to the Water Treatment Works, therefore more water is being taken from other catchments (e.g. Buffalo river catchment). This implies that water restrictions are already being exercised to prevent further over use of water in an already stressed catchment. Unless mother nature brings more mild rain frequently, it would also appear that the alarm to save Nahoon River flows came a bit too late.

The Nahoon River catchment requires further in-depth study with more emphasis on:

1. Environmental flows.
2. Optimal water use
3. Resource protection.

## **RECOMMENDATIONS**

Removal eucalyptus trees at Baden Pawell and Horse valley sites would lead to the recovery of nearly 15000 liters of river water per day. Inter transfer of bulk river water from other catchments should be evaluated.