5. **Catchment Characteristics**

5.1 **Physical Characteristics**

The physical and natural characteristics of the Usutu to Mhlathuze Water Management Area are displayed in Figures 10 and 11 on pages 38 and 39.

The WMA is made up of two major rivers namely; the Pongola River (international waters between South Africa and Swaziland) and the Mhlathuze River. The Mkuze and Mfolozi with its Black and White tributaries are smaller rivers but are of national importance. There are also smaller rivers called Ngwempisi, Hlelo, Swartwater, Assegai, Usuthi and Mpuluzi.

The Pongola River rises at some 2200 m above mean sea level near Wakkerstroom (in Mpumalanga) and descends steeply through the major portion of its catchment to the west of the Lebombo Mountains. It has an area of 7081 km². It passes between the Lebombo and Ubombo ranges through a narrow gorge and the lower reaches of the river lie on the Maputuland Plain east of the mountains. Here it has a slope of 1 in 3000; the abrupt change in gradient stems the flow rate of the river on the plain, causing a deposition of part of the sediment load and the flooding of extensive areas adjacent to the river course. The Pongolapoort Dam was constructed at the eastern end of the narrow gorge separating the Lebombo and Ubombo ranges. It has a mean assured yield of 862 million m³ per annum sufficient to provide an assured annual duty (duty? Not sure what is meant here) of 1220mm to approximately 48 000 ha (Heeg and Breen, 1982).

The Mhlathuze River catchment has a surface area of 4,209 km². It rises in the west at an altitude of 1,519m and flows over 100km eastwards to the sea. There are nine quaternary catchments and the coastal area is characterised by several freshwater lakes. By South African standards this is a high rainfall catchment, with rainfall generally ranging between 800 - 1400 mm along the coastal belt. There are some rain-shadow pockets where rainfall is between 700-
800 mm. The Goedertrouw Dam was constructed on the Mhlathuze River in 1980. It currently has a capacity of 300 million m³ and is principally for provision of water to the industrial complex at Richards Bay.

The high rainfall coastal belt is heavily afforested to the north, includes agriculture, and, most importantly, heavy industry. The deep-sea port of Richards Bay is situated at the mouth of the Mhlathuze River and all industrial development is focused within the Empangeni / Richards Bay complex. This is one of the most important industrial complexes in South Africa, based on the export of coal from Northern KZN and Mpumalanga, and on heavy industrial development, notably aluminium smelting, pulp and paper, and fertilisers. Power, water, and export facilities are the generators of the industrial sector and there are expectations that this sector may double in size over the next 20 years.

The predominant geological formation in the WMA belongs to the Bluff Formation covering 16% of the WMA. It runs in a thick band from the southernmost part of the province up to the northernmost Assegaai catchment border of the WMA. This is closely followed by the Vryheid sandstone formation that mottles the inland areas. Of almost equal cover of 8-10% each are the Pietermaritzburg Shale, Dwyka Tillite, Dolerite and the basement granite and gneiss. The Acid Pongola Rocks Formation, Natal Group Sandstone and Rhyolite cover 3-5% each. Water bodies and Lake St Lucia cover 4.7% of the WMA.

The area is covered with soils of varying agricultural potential; very high potential soils fall on the Makatini Flats and the Pongola River flood plains. High potential soils are confined to the surrounds of Mkuze and Hluhluwe Game Reserves. The remainder of the WMA represents soils of moderate agricultural potential with pockets of low potential soils.
Figure 10: Usutu to Mhlathuze WMA river catchment map (Click for larger view)
Figure 11: Usutu to Mhlathuze WMA physical properties (Click for larger view)
5.2 Land Use

Figure 12 on page 41 shows the land use of this WMA which includes the major urban settlements of Richards Bay, Empangeni, Ulundi, Vryheid, Paulpietersburg and Piet Retief. A number of minor settlements are spread inland. These include Mtinzini, Eshowe, Melmoth, Amsterdam, Pongola and Jozini. The remaining settlements are either small farming cooperative areas or rural settlements.

This WMA supports largely coal mines in the Vryheid area (Hlobane Collieries), but there is also mining activity around Piet Retief and at Richards Bay (Richards Bay Minerals). There is heavy industry in the urban areas of Richards Bay and Empangeni on the coast, as well as a few bulk users around Piet Retief and Paulpietersburg.

The majority of land is used for agriculture with areas of grassland. There are large amounts of forestry around Richards Bay up to the St. Lucia wetland areas, as well as around Melmoth, Nongoma and the northern areas from Paulpietersburg up to the top of the WMA in the west.

The agriculture found in this WMA includes large areas of beef pastures, wheat and maize cropping with sugar cane (irrigated and dry-land) along the coast and up towards Pongola. Cotton and citrus are also grown in the coastal areas up to Pongola, with vegetables, nuts, soya and other crops and dairy pastures being spread from the coast to the inland regions. The majority of irrigation is done using sprinkler irrigation systems, but micro irrigation is also used in the western areas. About 30% of the irrigation water losses occur in the canals below and coastward from Pongolapoort Dam.

The Usutu to Mhlathuze WMA supports large natural park and wetland areas. The entire coastline from St Lucia up to the Mozambique border at Kosi Bay is a wetland sanctuary. Other reserves include Tembe Elephant park, Umfolozi, Ndumo, Itala and Hluhluwe reserves.

The major dams to be found in this WMA include Pongolapoort, Zaaihoek, Goedetrouw and Klipfontein. There are a number of small dams in this WMA that are largely utilized for irrigation purposes.
Figure 12: Usutu to Mhlathuze land use (Click for larger view)
5.3 **The Natural Environment**

An overall summary of the characteristics of the natural environment is depicted in Figure 13 on page 46.

KwaZulu-Natal estuaries are naturally productive systems, reportedly having the highest fish species diversity in Southern Africa. For many estuaries, a cyclical system is created by floods and mouth closures, inundating the flood plain, providing a protective environment for the young fish and marine organisms which are flushed out to sea at periods of floods or when the mouth breaches. Up to 40% of the Tugela Bank prawn stock spend their juvenile stage in the Port of Richards Bay, significantly higher when the St Lucia mouth is closed. Richards Bay, with restricted freshwater inflow and a permanently open mouth, is in good ecological condition given the amount of development (DTEA, 1998).

Studies by the KwaZulu-Natal Nature Conservation Services (KZN NCS) reveal that there are substantial wetlands losses nationwide. As an example, it is estimated that 58% of the Mfolozi catchment wetlands were lost by 1988. Wetlands are faced with the following pressures; increase in human population, cropping and overgrazing, timber production, mining and industrial pollution and urbanisation. In 1990, policy proposals were drawn up from a six-year research project involving 13 different government agencies and 9 different private sector organisations collectively referred to as the Wetland Steering Committee. The Rennies Wetlands project has been initiated under the auspices of the Wildlife and Environment Society of South Africa and the World Wildlife Fund for Nature of South Africa. At a provincial level, MONDI, SAPPI and the South African Sugar Association, among others, have wetlands rehabilitation projects (DTEA, 1998).

In terms of the vegetation types in the Mhlathuze WMA, there are fourteen different types. Arid and lowveld types of vegetation are the most dominant covering 26% of the area which is moderately well conserved. 20.6% of the Coastal Forest and Thornveld are conserved in proclaimed nature reserves in KZN. The Highland Sourveld and Dohne sourveld (covering 2%) are noted for their high endemism and plant species richness. None of the Dohne sourveld is conserved in Natal. 7% of the area is covered in Zululand Thornveld type where 4.2% is found in some proclaimed nature reserves province wide. About a fifth of this veld type is grassland which is rich in endemics (Acocks, 1953).
Areas of heritage importance cover more than 50 km2 area of this WMA. 400 km2 of the whole area is protected areas with proclaimed conservation sites such as the Mfolozi, Hluhluwe, lake St Lucia as shown on the following list;

<table>
<thead>
<tr>
<th>Name</th>
<th>Area (HA)</th>
<th>Year of proclamation of reserve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pongola Bush</td>
<td>858</td>
<td>1973</td>
</tr>
<tr>
<td>Pongolapoort dam</td>
<td>1 917</td>
<td>1979</td>
</tr>
<tr>
<td>Richards Bay</td>
<td>1 200</td>
<td>1935</td>
</tr>
<tr>
<td>Umlalazi</td>
<td>1 028</td>
<td>1948</td>
</tr>
<tr>
<td>Great St Lucia</td>
<td>258 686</td>
<td>1895</td>
</tr>
<tr>
<td>Wetland</td>
<td>96 453</td>
<td>1895</td>
</tr>
</tbody>
</table>

Additional sites after the amalgamation with KwaZulu are not included.

Table 4 : List of protected areas controlled by KZN Nature Conservation Services

Alien plant infestations in the various conservation sites in this WMA are of prime importance to the KwaZulu-Natal Nature Conservation Services (KZN NCS). Numerous attempts have been made to control or eliminate such undesirable infestations where they occur. According to the KZN NCS policy, as stated in the management plans for the various reserves, is to maintain the diversity of indigenous plant species occurring in the reserve and to remove alien plant species outside intensive use areas. In several game and nature reserves, intensive investigations have been carried out and documented. 1% of its annual budget was dedicated to the removal of alien plants (Macdonald and Jarman, 1985).
The percentage of alien invading plants cover per tertiary catchment (WRC, 1998) reveal that there is more than 20% infestation by alien plants in the southern most areas including the Mhlathuze catchment. The level gradually decreases going North east with the Mfolozi acquiring 1-5%, the Mkuze 5-10% with the lower reaches where most of conservation sites are a modest 0.1-1% cover.

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>RECIPIENT</th>
<th>AVERAGE TRANSFERE million m³ / annum</th>
<th>USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usutu</td>
<td>Olifants</td>
<td>81</td>
<td>Industrial power</td>
</tr>
<tr>
<td>Tugela</td>
<td>Mhlathuze</td>
<td>46</td>
<td>Industrial and domestic</td>
</tr>
<tr>
<td>Assegai</td>
<td>Vaal</td>
<td>81</td>
<td>Industrial and domestic</td>
</tr>
</tbody>
</table>

Table 5 Interbasin transfere schemes Basson, et al 1997.

The deep water harbour constructed at Richards Bay and the associated rail link to the interior has created the potential for large scale development in the region. The main industries in the WMA are heavy mineral and aluminium smelters and pulp and fertiliser manufacturers. At Empangeni, the industrial development is directed towards the needs of agriculture and forestry. Other large industries in the area are the sawmill at the KwaMbonambi and the sugar and paper mills at Felixton.

5.4 Ecological status of rivers in the Usutu to Mhlathuze WMA

Based on the Desktop Reserve determination carried out by DWAF, the Present Ecological Status Categories show almost ¾ of this system to be largely natural (classes A & B) and hence in good condition (Table 5). Of concern are the 6% (in the upper catchment of the Pongola and the upper reaches of the Pongolapoort Dam) which are classified as ‘largely modified,’ class D. The intensive agriculture (irrigated) regions associated with the lower portions of the Mhlathuze River, and below Pongolapoort Dam, are understandably rated as ‘moderately modified,’ class C. In the former case (as with the lower reaches of the Mfolozi system) this is principally associated with the severe modification and
degradation of the riparian zones in the lower section of the river with sugar cane largely replacing natural coastal swamp, and the river canalised by associated agricultural activities. The lower quartenary catchments of the Mfolozi should also probably have been classified as ‘largely modified’ in the Desktop Reserve study based on this impact.

<table>
<thead>
<tr>
<th>Class</th>
<th>No. Quartenaries</th>
<th>Area of Quartenaries (km²)</th>
<th>% of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A - unmodified</td>
<td>37</td>
<td>17338</td>
<td>39</td>
</tr>
<tr>
<td>B – largely natural</td>
<td>44</td>
<td>15671</td>
<td>35</td>
</tr>
<tr>
<td>C- moderately modified</td>
<td>22</td>
<td>8708</td>
<td>20</td>
</tr>
<tr>
<td>D – largely modified</td>
<td>7</td>
<td>2616</td>
<td>6</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>110</strong></td>
<td><strong>44333</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Table 6 Summary of Desktop Reserve determination of Present Ecological Status Categories of rivers in the Usutu to Mhlathuze WMA

5.5 **Biodiversity**

This WMA is particularly richly endowed with ecological features of both local, national and international interest and concern. Chief of these is undoubtedly the Greater St. Lucia Wetland Park which has been declared a World Heritage Site, with two parts of it registered as Wetlands of International Significance under the Ramsar Convention. The Park comprises the last remaining subtropical area containing its original diverse components of wild plants and animals on the south-eastern coast of Africa, and one of the last remaining in the world. Within the Park are exceptional wetland, terrestrial and marine ecosystems with accompanying species that include many endemic and internationally recognized threatened species and migratory species. The high species richness of the Park is outstanding, principally due to its regional position at the interface between tropical and subtropical African biota, but also due to past speciation events within the Maputaland Centre of Endemism. Landscapes are also outstanding and the geomorphological processes by which they are formed believed to be of universal importance (DEAT 1999). Other significant biodiversity features
within this WMA include the relatively extensive network of game reserves and state forests representing and preserving important and significant species and landscapes (e.g. the Hluhluwe/Umfolozi Game Reserve Complex and the Black and White Rhino conservation). Much of the uniqueness of these systems is driven (and hence strongly affected) by catchment processes.

Analysis by the KZN Nature Conservation Service indicates that the North Coast region (covered by this WMA) is one of two areas in the province having the highest degree of endemism for reptiles. This also applies to the 26 endemic and threatened fish and crustacean species for the province with the most important areas for these being the Pongola and St Lucia catchments and the St Lucia Estuary (Goodman 2000). In summary their (KZN NCS) report highlights that on a provincial basis the sites of highest biodiversity value are primarily scattered through the Northern KwaZulu-Natal (this WMA) and Midlands regions (Goodman 2000).
Figure 13: Natural environment of the Usutu to Mhlathuze WMA

Data Sources:
WET (Acoc's Veld Types, School of Bioresource Engineering, University of Natal, Pietermaritzburg)
1995, Catchment Boundaries, Department of Water Affairs and Forestry
1996, National Land Cover Database, Council for Scientific and Industrial Research, Pretoria
1995, Protected Areas, Kwa-Zulu Natal Nature Conservation Services

Usutu/uMhlatuze Water Management Area:
Natural Environment