THUKELA WATER PROJECT DECISION SUPPORT PHASE

RESERVE DETERMINATION STUDY
BASIC HUMAN NEEDS RESERVE

June 2003

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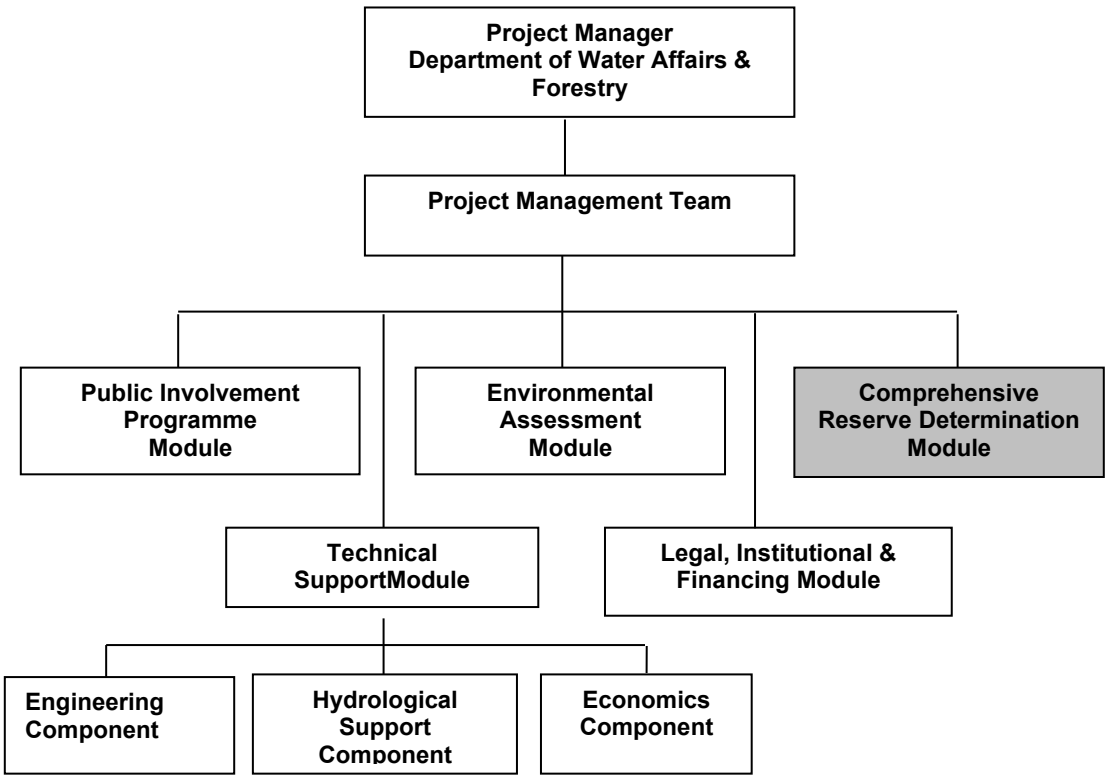
STRUCTURE OF DECISION SUPPORT PHASE



DEPARTMENT OF WATER AFFAIRS & FORESTRY
NATIONAL WATER RESOURCES PLANNING

THUKELA WATER PROJECT DECISION SUPPORT PHASE
RESERVE DETERMINATION MODULE
BASIC HUMAN NEEDS RESERVE

IWR SOURCE-TO-SEA **JUNE 2003**

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LIST OF ACRONYMS AND ABBREVIATIONS

BHNR	Basic Human Needs Requirements
DWAF	Department of Water Affairs and Forestry
EA	Enumerator Area
IFR	Instream Flow Requirement
MCM	Million Cubic Metres
NWA	National Water Act
RDM	Resource Directed Measures
WMA	Water Management Area

1 INTRODUCTION

The “Reserve Determination” Module (Module 3 of 5 for the Thukela Water Project Decision Support Phase) is designed, *inter alia*, to meet the requirements of the National Water Act No 108 of 1998. As such the study has been guided by three major parameters. These are:

- The objectives of Chapter 3 of the National Water Act No 108 of 1998 for a comprehensive reserve determination and the subsequent RDM protocols released by DWAF.
- The requirements of the Terms of Reference as supplied by the Department of Water Affairs and Forestry (Tender WF7405).
- The needs of the Thukela Water Project and associated divisions of the Department of Water Affairs and Forestry. These include broad based planning required to meet overall water resource management objectives in the catchment.

The specific objectives of this Reserve Determination Module are, therefore to:

- Develop scenarios and test these with the Thukela Water Project and stakeholders.
- Recommend one of these scenarios to represent the Ecological Reserve for the quality, quantity and groundwater components for the river and estuary.
- Determine the impact of the recommended Reserve on the allocatable yield.
- Determine whether it is possible to supply the Reserve from existing and proposed schemes.
- Provide mitigation measures if it is not.

The Reserve Determination study is made up of a number of modules and this report considers the Basic Human Needs Reserve (BHNR). The BHNR is required, in terms of the NWA, as a component of the Reserve.

2 METHODOLOGY

The BHNR, for the Thukela Reserve Determination Study, has been generated following a number of steps. The first of these steps was to use demographic data supplied by the Directorate Water Services: DWAF as a basis for analysis. The base information supplied by DWAF was adjusted data from the 1996 census. This data source utilised information that had been collected at an enumerator area (EA) level. The EA is the most fine-grained demographic information available. EAs are the building blocks of the census and EA data is often aggregated into census district information for the purposes of public consumption and broad based planning. Using EA level data a “fine grained” demographic profile of the Thukela catchment was generated.

The EA data for the purposes of this study was further broken down to reflect the likely direct users of the surface water resources of the Thukela. This involved demarcating a 5km buffer zone on either side of the Thukela and its major tributaries. For the purposes of this exercise, and in keeping with the Thukela Reserve Determination Study, the relevant river reaches were those defined as the Thukela, Little Thukela (Injasuthi), Bushmans (Mchezi), Buffalo (Mzinyathi), Sundays, and Mooi Rivers.

The 5km buffer zone was used to estimate the numbers of people who would be likely to be reliant on the flow in the relevant river reach. It was assumed that people outside of this area, although they might be making use of water from the rivers via a formal urban supply or a community water supply scheme, would in the main be using springs, minor streams or groundwater. It should be noted that virtually all major urban settlements in the Thukela catchment fall within the 5km buffer.

This part of the exercise involved demarcating the EA’s within the buffer zone. The percentage of the area of each EA within the buffer zone was used to calculate the number of people within each EA residing within the buffer zone. For example, where 60% of the area of the EA fell within the buffer zone it was deemed that 60% of the population would be within the buffer zone.

The data was further analysed to estimate the population above and below the IFR sites identified for the study. This gives an indication of the amount of water that would need to pass certain IFR sites in order to meet the needs downstream.

3 BASIC HUMAN NEEDS RESERVE FOR THE THUKELA CATCHMENT

The analysed data are presented in the tables below. Tables 3.1 and 3.2 present the entire population of the Thukela catchment i.e. that area greater than the 5km buffer zone discussed above. Tables 3.1 and 3.2 therefore consider the likely water needs of the population of the catchment in its entirety. Scenarios are presented for the currently accepted RDP norm of 25l per capita per day as well as more liberal allowances of 60l and 100/ per day[1]. In addition, the population growth is projected to 2020. It should be noted that accurately projecting population growth is problematic given the uncertainty around the impact of HIV/AIDS. Figure 4.1 illustrates the population within the Thukela Catchment. In order to err on the side of caution a 1.5% per annum growth rate in population growth has been allowed for. Current estimates are that many rural areas, and the Thukela catchment is predominately rural, will have a zero or even a negative growth rate overt the medium term. Table 3.1 gives the water needs of the entire catchment in million cubic metres per annum.

Table 3.1 Annual potential BHNR in the entire catchment expressed in million cubic metres (MCM)

	2001	2005	2010	2015	2020
Population	**1567246**	**1663418**	**1791973**	**1930464**	**2079658**
Water use at 25l per capita per day	14.30	15.17	16.35	17.61	18.97
Water use at 60l per capita per day	34.32	36.42	39.24	42.27	45.54
Water use at 100l per capita per day	57.20	60.71	65.40	70.46	75.90

Table 3.2 examines the total population of the catchment in more detail. In Table 3.3 the population in the catchment is disaggregated into four logical categories of settlement. These are rural villages (18.6% of the population of the catchment), scattered rural settlement (55.9%), urban (19.9%) and peri-urban (5.6%). Growth rates are applied to each of these categories, based on current, settlement based, projections. These projections consider a fairly high growth rate of 2% for the urban and peri-urban areas over the next 20 years. A lower growth rate starting at 1.5% and declining to nil is considered for the rural areas. This is both in keeping with trends towards urbanisation and taking into account the expected impacts of AIDS. Figures for the total catchment differ fairly substantially from those presented in Table 3.1. By the year 2020 the more fine grained analysis predicts a population of 1.87 million people whereas the coarse grained analysis as summarised in table 3.1 predicts a population of 2.07 million.

Table 3.2 Analysis of water demand by settlement type

Year	**2001**	**Water need in MCM per annum**	**2010**	**Water need in MCM per annum**	**2020**	**Water need in MCM per annum**
Settlement	**Population**		**Population**		**Population**	
Rural village	291214	2.66	329723	6.02	338049	12.34
Scattered rural	876548	8.00	944524	8.62	944524	8.62
Urban	312478	22.81	380909	27.81	464326	33.90
Peri urban	87066	3.18	106133	5.81	129375	9.44
Total population	**1567306**		**1761289**		**1876274**	
Total water needs		36.64		48.25		64.30

[1] The Reconstruction and Development Programme (RDP) defined 25l per person per day as an initial supply of water that should be made available to all people within South Africa. Community water supply schemes were largely designed around this target.

Table 3.2 allows for different water demand and consumption levels. A per capita allowance of 200l/c/d has been allowed for urban areas. The peri-urban areas start with an allowance of 100l/c/d at present growing to 200l/c/d per person per day by the year 2020. This would be consistent with a “high road” scenario assuming electrification and growth in prosperity in these areas leading to the purchase of appliances using higher amounts of water such as washing machines. Rural villages start with 25l/c/d growing to 50l/c/d per person per day by the year 2010 and 100l/c/d by 2015. This again assumes growth in prosperity and village electrification. Scattered rural areas retain a 25l/c/d allocation for the entire period under consideration. This is based on the assumption that they will probably never have house connections and the literature shows us that the effort involved in transporting water from stand pipes or protected springs caps consumption at about 25l/c/d.

Table 3.3 presents the summarised estimates for the areas within the 5km buffer zone as defined above. The total population living within the 5km buffer zone in 2001 is calculated to be 715281 or 45.6% of the total population of the catchment. As with the results of Table 3.2 a per capita allowance of 200l/c/d has been allowed for urban areas. The peri-urban areas start with an allowance of 100l/c/d at present growing to 200l/c/d per person per day by the year 2020. Rural villages start with 25l/c/d growing to 50l/c/d per person per day by the year 2010 and 100l/c/d by 2015. Scattered rural areas retain a 25l/c/d allocation for the entire period under consideration.

Table 3.3 Water demand for 5km buffer zone (expressed in million cubic meters per annum)

Year	2001	Annual water need	2010	Annual water need	2020	Annual water need
Settlement	**Population**		**Population**		**Population**	
Rural village	87364	0.80	99741	1.82	101415	3.70
Scattered rural	316989	2.89	323169	2.95	323169	2.95
Urban	249982	18.25	304727	22.25	352968	25.77
Peri urban	60946	2.22	90208	4.94	103500	7.56
	715281	24.16	817845	31.95	881051	39.97

The table above reflects the probable demand pattern for those people living within the buffer zone and dependant upon run of river. It is not, however, necessarily a BHNR as the amounts applied to some of the settlement types probably exceeds the amounts that could be defined as making up a basic human need.

For those living outside the buffer zone, it is assumed that groundwater is probably of great importance. A groundwater report commissioned for this project (Parsons 2002, in preparation) estimates that current groundwater abstraction for the BHNR is in the region of 18 MCM/a. According to this estimate the population outside of the buffer zone uses approximately 57l/c/d. The groundwater report indicates that the abstraction of groundwater for rural water supply is not expected to pose a threat to the resource as usage, as a percentage of the total amount available is very low. Assuming that this 60 litres per person per day should apply within the buffer zone a BHNR scenario may look something like that summarised in table 3.4.

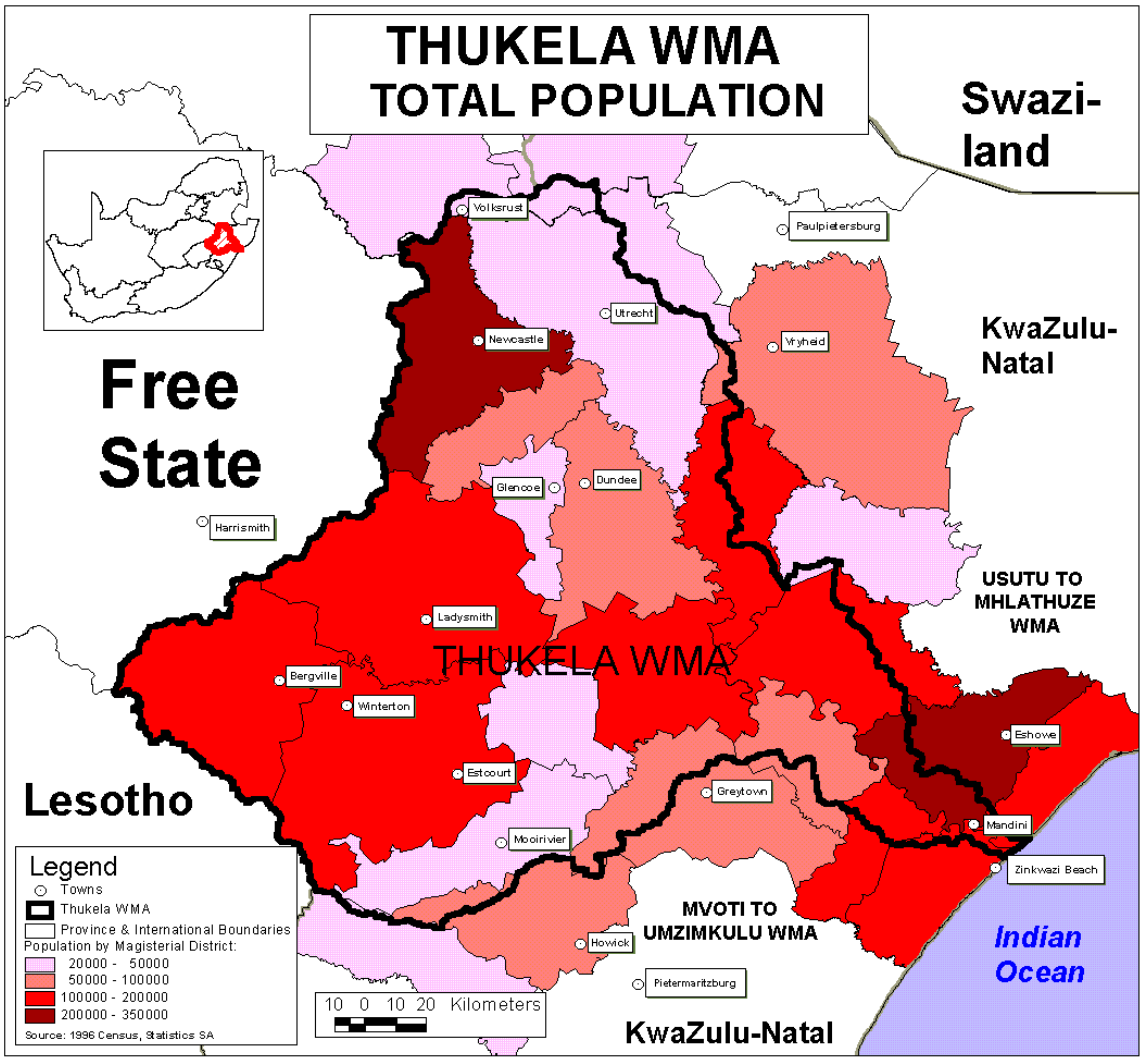
Table 3.4 60l per person per day BNHR allowance for population within 5km buffer zone (expressed in million cubic meters per annum)

Year	2001	Annual water need	2010	Annual water need	2020	Annual water need
Settlement	Population		Population		Population	
Rural village	87364	1.91	99741	2.18	101415	2.22
Scattered rural	316989	6.94	323169	7.08	323169	7.08
Urban	249982	5.47	304727	6.67	352968	7.73
Peri urban	60946	2.22	90208	1.98	103500	2.27
	715281	16.55	817845	17.91	881051	19.30

4 CONCLUSION AND RECOMMENDATION

For those living within the 5km buffer zone it should be assumed that 60l per capita per day constitute the BHNR. This is close to that which is assumed to be abstracted from groundwater, for those not proximate to the river, and is probably sufficient to allow for all basic needs as defined by the NWA. It would also allow some water for uses such as minor subsistence irrigation of vegetables and other crops. This amounts to 16.55 million cubic metres per annum to be provided from the river. The total amount required for all people within the catchment, including those supplied by groundwater would be 34.32 million cubic metres per annum. For the year 2002 the 60l per person allowance for people within the 5km buffer zone would be 19,30 million cubic metres per annum and for the entire catchment it would be 45.54 million cubic metres per annum.

Fig. 4.1 Population distribution in the Thukela WMA



APPENDIX A

Basic Human Needs Reserve Table

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LIST OF TABLES

Table A1: Basic Human Needs Reserve

1	Injasuthi above IFR 3	2&3	4&6&8	Mchezi above IFR 5	5	Sundays above IFR 7	7	9&12& 14	Mooi above 10	10	11	Mzinyathi above 13	13	15	16	Total	25 l model
4404	2119	133070	54180	58402	5491	5953	16811	78092	16628	5126	10518	195153	26258	37760	42795	715281	population
110100	52975	3326750	1354500	1460050	137275	148825	420275	1952300	415700	128150	262950	4878825	656450	944000	1069875	17882025	daily water demand in litres
1.274306	0.613137	38.50405	15.67708	16.89873	1.588831	1.722512	4.864294	22.59606	4.81134259	1.483218	3.043403	56.46788	7.597801	10.92593	12.38281	206.9679	litres per second
0.001274	0.000613	0.038504	0.015677	0.016899	0.001589	0.001723	0.004864	0.022596	0.00481134	0.001483	0.003043	0.056468	0.007598	0.010926	0.012383	0.206968	cm3 per second
1	Injasuthi above IFR 3	2&3	4&6&8	Mchezi above IFR 5	5	Sundays above IFR 7	7	9&12&1 4	Mooi above 10	10	11	Mzinyathi above 13	13	15	16	Total	60 l model
4404	2119	133070	54180	58402	5491	5953	16811	78092	16628	5126	10518	195153	26258	37760	42795	715281	population
264240	127140	7984200	3250800	3504120	329460	357180	1008660	4685520	997680	307560	631080	11709180	1575480	2265600	2567700	42916860	daily water demand in litres
3.058333	1.471528	92.40972	37.625	40.55694	3.813194	4.134028	11.67431	54.23056	11.5472222	3.559722	7.304167	135.5229	18.23472	26.22222	29.71875	496.7229	litres per second
0.003058	0.001472	0.09241	0.037625	0.040557	0.003813	0.004134	0.011674	0.054231	0.01154722	0.00356	0.007304	0.135523	0.018235	0.026222	0.029719	0.496723	cm3 per second
1	Injasuthi above IFR 3	2&3	4&6&8	Mchezi above IFR 5	5	Sundays above IFR 7	7	9&12&1 4	Mooi above 10	10	11	Mzinyathi above 13	13	15	16	Total	100 l model
4404	2119	133070	54180	58402	5491	5953	16811	78092	16628	5126	10518	195153	26258	37760	42795	715281	population
440400	211900	13307000	5418000	5840200	549100	595300	1681100	7809200	1662800	512600	1051800	19515300	2625800	3776000	4279500	71528100	daily water demand in litres
5.097222	2.452546	154.0162	62.70833	67.59491	6.355324	6.890046	19.45718	90.38426	19.2453704	5.93287	12.17361	225.8715	30.3912	43.7037	49.53125	827.8715	litres per second
0.005097	0.002453	0.154016	0.062708	0.067595	0.006355	0.00689	0.019457	0.090384	0.01924537	0.005933	0.012174	0.225872	0.030391	0.043704	0.049531	0.827872	cm3 per second