Feasibility Study for

GROUNDWATER RESOURCE INFORMATION PROJECT

EASTERN CAPE PROVINCE

GROUNDWATER INFORMATION SOURCE REFERENCE SHEET

SOURCE REF NR:	WS 016	Own Archive		Copy attached	X
		Sourced	X	Copy at source	

A: SOURCE DESCRIPTION

District Municipality:	Amatole		Chris Hani		O.R Tambo	
	Ukhahlamba		Cacadu	X	Alfred Nzo	
Local Municipality:	Ndlambe					
Institution where Information is held:	Albany Coast Water Board - BRM					
Branch of Institution:	Bushmans River Mouth					
Contact details: Contact person:	Ron Ball (CEO)					
Contact Tel:	(046) 648 1233					
Contact Email:	albwater@border.co.za					

B: TYPE OF INFORMATION

Information format:	Hard copy	X	Data Summary		Electronic Report	
	Specify Other:					
Report / Info Title:	Alternative Options to Supplement Existing Water Sources					
Report Nr:			Date:			
Author Details:	Ninham Shand					
Author's Qualification:	Hydrogeologist		Govt Dept		Project Manager	
	Engineer	X	Technician		Other	
	Specify Other:					

Captured by: E. Mouton Date: 18/02/2004 Signed: E Mouton

C: GEOHYDROLOGICAL CATEGORIZATION

Project Type	Source development		Feasibility Study	X	Sanitation Study	
	Specify Other:					

Reference Co-ordinate:	Latitude	Longitude
	S	E

	Yes	No	Complete	Incomplete
Lithological & Construction Logs		√		
Hydrocensus Data		√		
Pump Testing Data	√			√
Chemical Water Analysis Data		√		
Geohydrological Data	√			√
Spring Data	√			√
Remote Sensing Data		√		
Map Data		√		

Comments: Looks at possibility of development for Merville Spring Desalination Reverse Osmosis and for Dams

Reviewed by: P. Mouton Date: 16 March '04 Signed: EM pp

Nijhami Strand

4. ALTERNATIVE OPTIONS TO SUPPLEMENT EXISTING WATER SOURCES

4.1 GENERAL

A number of alternative options to supplement the existing water source have been investigated since 1984, some in greater detail than others. Brief details of the investigations are summarized below.

4.2 DEPARTMENT OF WATER AFFAIRS INVESTIGATION IN 1984

A hydrogeological investigation of the coastal dune sand aquifer system between the mouth of the Bushmans River and Boknes was undertaken by the Geohydrology Division of the Department of Water Affairs in 1984.

The details of this investigation are available as Technical Report No. GH3441 "Hydrogeological Investigation of the Coastal Sand Aquifers between Boesmansriviermond and Boknes, Eastern Cape Province", by the Geohydrology Division of the Department of Water Affairs.

Briefly the conclusions and recommendations of the report amongst others are that the estimated long term yield of the aquifer at Diaz Cross is 300 000 m^3/year and that between 1990 and 2000, this aquifer should be exploited to meet the future water demand of the Albany Coast Water Board.

4.3 KARIEGA RIVER SPRING

Based on a recommendation by the Department of Water Affairs, a spring situated approximately 15 km North-west of Kenton-on-Sea on the Kariega River was pump tested in April 1988 in order to determine the long term yield of the spring. A private contractor carried out the pump testing from 19 - 24 April 1988, under the supervision of the Geohydrology Division of the Department of Water Affairs.

The details of the pump testing are available in Technical Report No. GH3595 "Water Supply, Albany Coast Water Board Pumping Test on

Briefly, the report concluded that the spring could be pumped continuously at 30 ℓ/s for 7 days followed by a period of recovery of 3½ days. The report recommended that the optimum management strategy would however be to pump the spring for 18 hours at 20 ℓ/s followed by a period of recovery of 6 hours.

Based on the recommendations in the above report and at the request of the Albany Coast Water Board, Ninham Shand carried out a preliminary analysis to determine the feasibility of utilising the spring as a supplementary source and to determine, for comparison purposes, the approximate unit cost of water should the spring be developed. In our opinion, the assumptions as to the yield of the spring were too optimistic in view of the fact that surface runoff in the river which resulted from rain during the test period, contributed significantly to the yield of the spring while being pump tested. We therefore for the purposes of our analysis, assumed a maximum pumping rate of 15 ℓ/s for 22 hours per day. At this delivery rate the source was unable to meet the long term demand, and for this reason, and to enable comparisons to be made with alternative long term sources, it was assumed that a supplementary source would need to be developed.

Based on the above assumption, the unit cost of the water just after completion of the scheme was calculated to be R1-92/m^3 (April 1989 costs).

The quality of the water from the spring is not very good and in our opinion could deteriorate once the spring is heavily pumped. In view of this, and especially in view of the uncertainty regarding the reliability of the source, it was recommended that all other available options be investigated before considering utilizing the Kariega Spring as an alternative source. This recommendation was accepted by the Albany Coast Water Board.

TABLE 6 : COST OF ALTERNATIVES

Costs given in R1 000 (July 1988)

Possible Scheme/ Source	Capital Cost of Works	Capitalised Running Costs	Total Capitalised Costs
Diaz Cross Sand Dune Aquifer (including supplementary source)	1 443	972	2 415
The Merville Spring	2 571	1 731	4 302
The Settlers Dam	4 892	12 490	17 382
The Sarel Hayward Dam	3 786	11 238	15 024
The Spring Grove Dam	4 581	2 912	7 493
Bushmans River Off-channel Storage	17 321	30 622	47 943

4.4.3 Conclusions and Recommendation

The conclusions and recommendations by the Department of Water Affairs given in Report No. OKS/1/88 were briefly as follows :

(i) The Diaz Cross Coastal Dune sand aquifer and the Kariega Spring were by far the most suitable options for providing a long term water supply to the Albany Coast Water Board.

(ii) A detailed study of these two options should be carried out to determine which would provide the best source of supplementary water for the present supply to the Albany Coast Water Board.

(iii) In the event of Diaz Cross water being utilized, care should be taken as to the management of the water extraction to ensure an acceptable quality of water. In this regard, expert advice should be obtained.

4.5 OTHER INVESTIGATIONS

In April to June of 1989, at the request of the Albany Coast Water Board, Ninham Shand carried out a brief preliminary analysis on a number of alternative schemes to determine a unit cost of water to enable comparisons to be made.

The schemes analysed were as follows :

(i) Kariega River Spring (15 ℓ/s and 20 ℓ/s)
(ii) Sea water Desalination
(iii) Dam on the Kariega River
(iv) Dam on the Kariega River with desalination.

A summary of the unit costs immediately on completion of the schemes is given in Table 7 below, and were based on the following assumptions.

* The water consumption will increase as given in Table 2 of our report of June 1987.

* All the alternative water supply schemes are supplementary to the existing supply, i.e. maximum possible use is made of the existing supply.

* The schemes were sufficient to meet the demand until 2010 (based on the projected demand given in Table 2 of our report of June 1987).

TABLE 7 : SUMMARY OF UNIT COSTS IN R/m^3 (1989 costs)

Scheme	Unit Cost R/m^3
Kariega Spring (15 ℓ/s) plus supplementary source	1-92
Kariega Spring (20 ℓ/s)	2-02
Sea water desalination	2-33
Dam on the Kariega River (no desalination)	4-03
Dam on the Kariega River (with desalination)	6-37

REYNDERS

2. KARIGA RIVER SPRING:

AN INVESTIGATION OF AN ADDITIONAL/ALTERNATIVE SOURCE OF FRESH WATER FOR THE ALBANY COAST WATER BOARD

A spring in the Kariga River, on the farm Merville, was visited on Monday 18 May, by Mr Wilmot, farm owner, and Mr A. Reynders of the Directorate Geohydrology.

The spring, or springs, which discharges into a deep rock-lined pool, is situated some 15 km NNW of Kenton-on-Sea. The pool is estimated to be approximately 200-250 m in length and 15-20 m wide at the widest point. At its centre it is in excess of 6 m deep.

Although an outflow of only 1 l/s was observed at the downstream side of the pool, it is likely that substantial seepage takes place through the thick alluvium.

A water sample, collected during April 1987, indicated a total dissolved solid content of 1 235 mg/l, as opposed to the 1 757 mg/l of the dune water scheme.

Discussions with Mr Wilmot revealed the following:

1. Extensive pumping from the pool during the 1982-83 drought resulted in pools further downstream drying up - again indicative of seepage through the allumium.

2. 15 ha of pasture was irrigated during the 1982-83 drought. 15 l/s Approximately 54 m^3/h was extracted from the pool for 5 days a week for a period of 12 weeks. Although the waterlevel dropped during pumping, complete recovery was observed after 12 hours. (pool pumped for 10 hours, rested for 14 hours).

3. A powerline has already been installed to the pool.

4. The area is accessible to a four wheel drive vehicle only.

RECOMMENDATIONS:

1. In view of the high cost of installing a pipeline from the pool to the nearest ACWB reservoir, an extensive yield test must be undertaken.

2. It is suggested that either:

(a) the pool be pumped for 12 hours at 30 l/s, and rested for 12 hours, during which time the recovery is carefully monitered. This should be done over a period of at least 10 days;

or (b) the pool be pumped for 10 days at a flow rate determined by a series of step tests prior to the main test. The recovery after 10 days non-stop pumping would then be carefully monitored.

3. Water samples should be taken at regular intervals to determine any changes in quality.

CONCLUSION:

Although the cost of installing a pipeline from the pool to the nearest reservoir may be high, a reliable source of fresh water which can be gravity-fed to the coastal villages must be carefully investigated.